Practical Guidance to Strengthen Facility Estimates

NSF Large Facilities Workshop

May 1-3, 2017

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Purpose

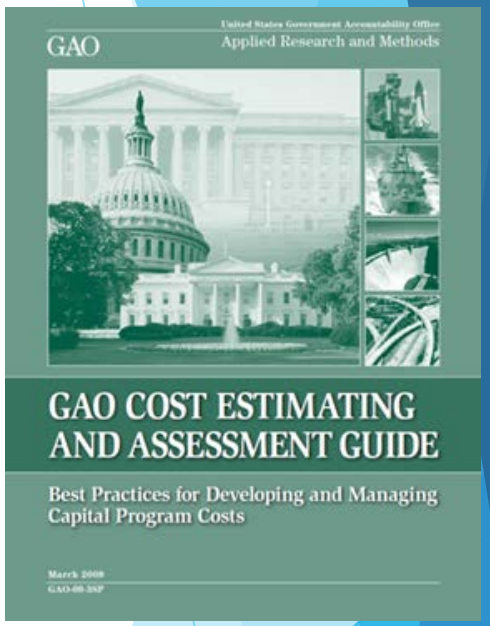
- Strengthen Estimates – Construction, Operations & Maintenance
- Highlight Requirements and Best Practices
- Emphasize Importance of Cost Estimating Plans, Basis of Estimate
- Provide Practical Examples
- Answer Questions

Overview

- Background – AICA, LFM, Definitions
- GAO
  - 12 Steps & 4 Characteristics
  - Cost Estimating Plans (CEP) Examples
  - Basis of Estimate (BOE) Examples
- Independent Contractor – Kforce Government Solutions & Crowe Horwath
  - Role doing independent cost assessments for NSF per GAO
  - NSF CEP & BOE Examples
- Misc Items

American Innovation & Competitiveness Act - Oversight of NSF Large Facilities

One Hundred Fourteenth Congress
of the
United States of America



- "shall strengthen oversight and accountability over the full life-cycle… in order to maximize research investment"
- "ensure that policies for estimating and managing costs and schedules are consistent with the best practices described in the Government Accountability Office Cost Estimating and Assessment Guide"
- "require that any pre-award analysis of a major multi-user research facility project includes the development and consideration of the full life-cycle cost"

AICA - NSF - Construction

- "may not approve or execute any agreement to start construction on any proposed major multi-user research facility project unless…
  - "external analysis of the proposed budget has been conducted"
  - "independent cost estimate (ICE) of the construction of the project has been conducted using the same detailed technical information as the project"
  - "considered the analyses… and the independent cost estimate… and resolved any major issues"

AICA - NSF - Operations

- “shall require an independent cost analysis (ICA) of the operational proposal for each major multi-user research facility”

Large Facilities Manual – Section 4.2

- Strengthen Estimates & Clarify NSF expectations
- Implement AICA Requirements
- Supplement GAO Cost Guide w/ NSF specific info
- Clarify NSF Cost Analysis process
  - Duration & NSF participants
  - Conducted at each Design Stage-Gate Review for Construction
  - Conducted at proposal submission for Operations
  - ICE and ICA inform NSF Cost Analysis > **They DO NOT replace it!**
- Correct information/detail into estimate at proposal submission
  - Reduce burden & frustration for Recipient & NSF
  - Reduce time to award

Cost Estimating Plan (CEP)

- AACE International – Recommended Practice No. 36R-08
  - "establish and communicate how the preparation, development, review and approval of the estimate will be completed"
- LFM – includes NSF specific needs
  - "A plan describing how the cost estimating guidance in this manual will be implemented, how the cost estimate will evolve over time, and how the "Cost Model Data Set" will meet the various needs of the project. The CEP should typically include a narrative and sufficient detail explaining the ground rules and assumptions, roles and responsibilities, practices, systems, and calculations used to develop the cost estimate. "

Basis of Estimate (BOE)

- AACE International – Recommended Practice No. 34R-05
  - "Written documentation that describes how an estimate, schedule, or other plan component was developed and defines the information used in support of development. A basis document commonly includes, but is not limited to, a description of the scope included, methodologies used, references and defining deliverables used, assumptions and exclusions made, clarifications, adjustments, and some indication of the level of uncertainty"
- Project Management Institute
  - "Supporting documentation outlining the details used in establishing project estimates such as assumptions, constraints, level of detail, ranges, and confidence levels."
- LFM
  - PMI definition
  - Additional guidance on our expectations, level of detail, acceptable justifications

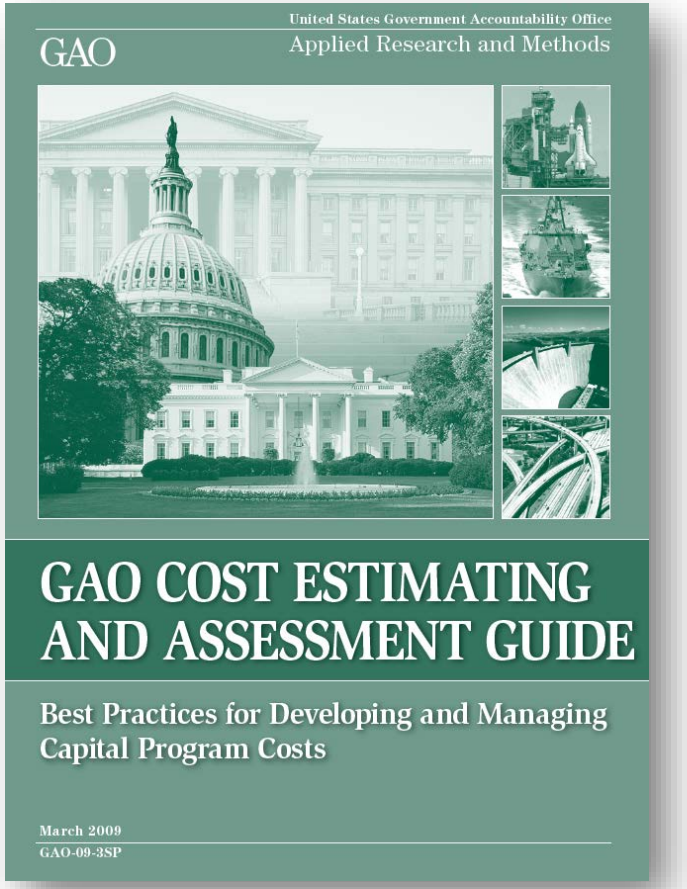
The Role of GAO in Government

Known as the investigative arm of Congress, GAO exists to support Congress in meeting its constitutional responsibilities. To that end, GAO works to

- Help improve the performance of federal government
- Ensure government agencies and programs are accountable to the American people
- Examine the use of public funds, and
- Evaluate federal programs by providing analyses and recommendations to help Congress make informed oversight and funding decisions

Cost Estimating and Assessment Guide

- Drafted 2005-2007, published in 2009
- Outlines GAO's criteria for assessing cost estimates during audits
- Contains 20 chapters with supporting appendixes
- Chapters 1-17: developing credible cost estimates and the 12-step cost estimating process for developing high quality cost estimates
- Chapters 18-20 address managing program costs once a contract has been awarded and discuss Earned Value and risk management
- Also provides case studies of prior GAO audits to show typical findings related to the cost estimating process



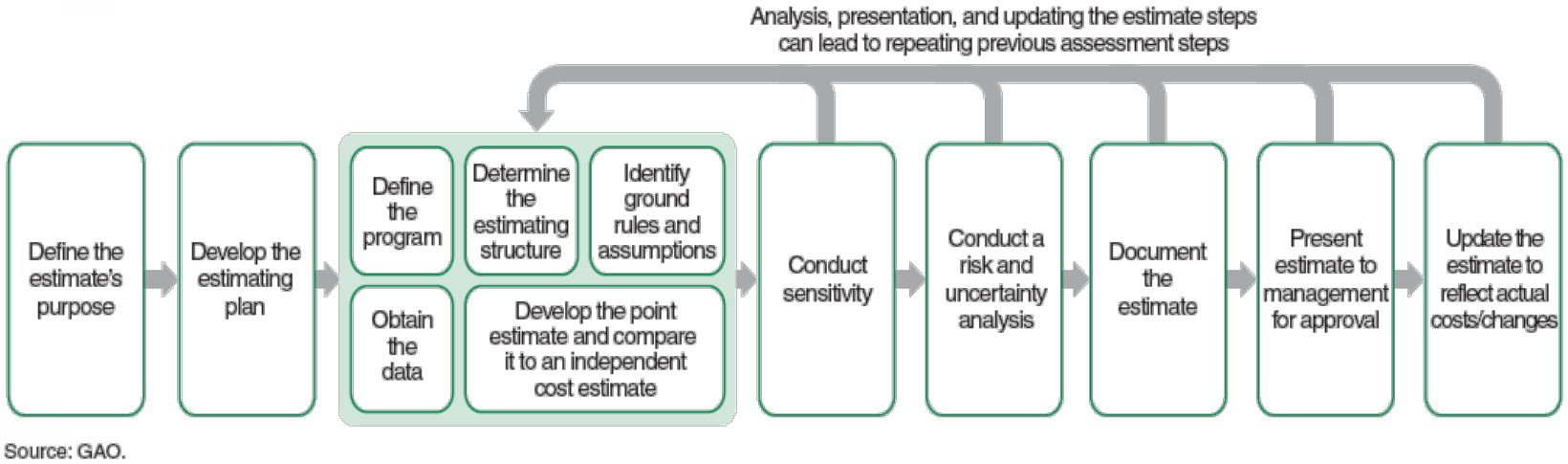
A Reliable Process for Credible Cost Estimates

Initiation and research
Your audience, what you are estimating, and why you are estimating it are of the utmost importance

Assessment
Cost assessment steps are iterative and can be accomplished in varying order or concurrently

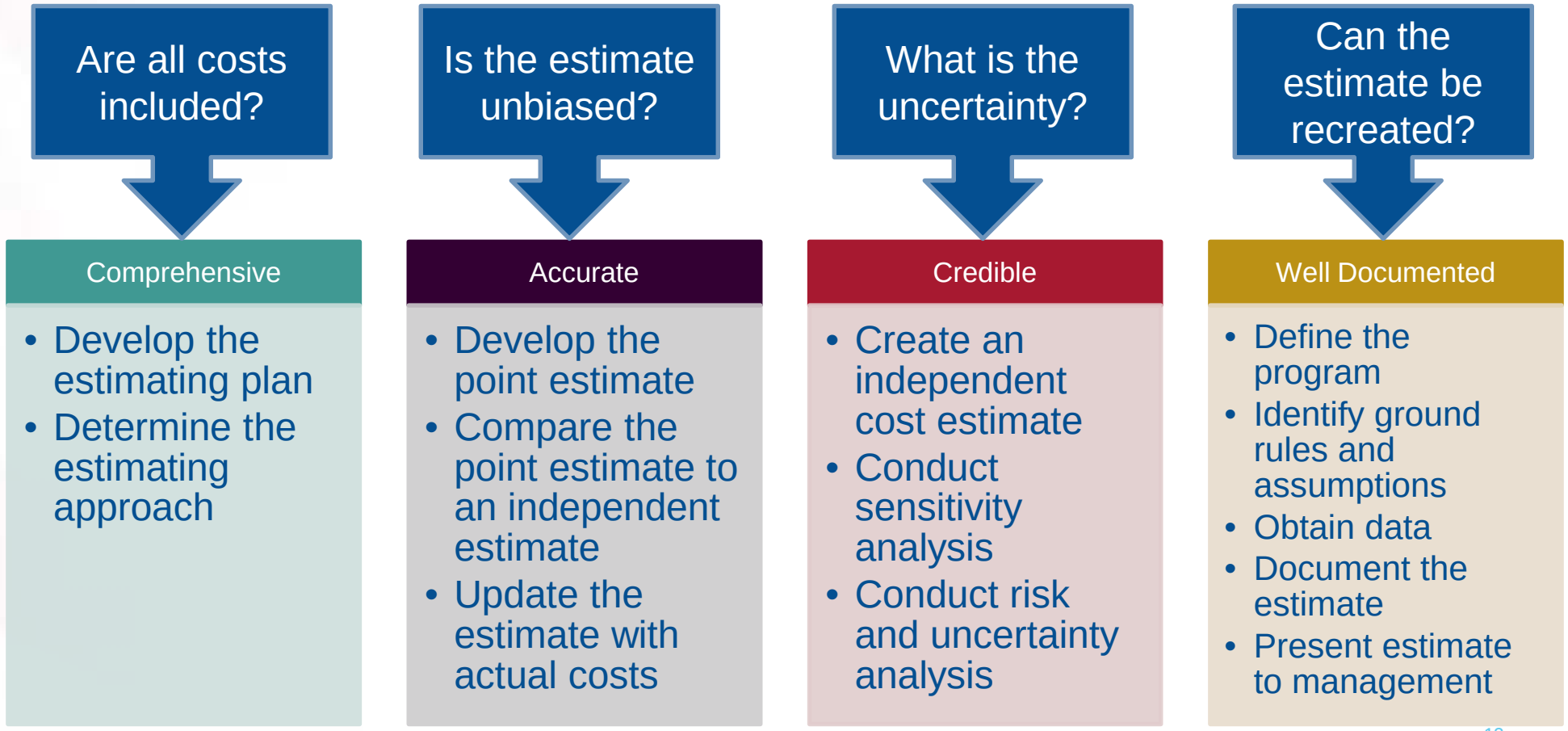
Analysis
The confidence in the point or range of the estimate is crucial to the decision maker

Presentation
Documentation and presentation make or break a cost estimating decision outcome



Source: GAO.

Characteristics of Reliable Estimates



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Comprehensive Cost Estimates

A comprehensive estimate

- Includes both government and contractor costs of the program
- Covers the full life cycle of the program, from inception of the program through retirement **(not just the Construction Stage)**
- Applies to both FAR-based contracts and Cooperative Agreements

Comprehensive Cost Estimates - Examples

California High-Speed Passenger Rail: Project Estimates Could Be Improved to Better Inform Future Decisions – GAO-13-304

> "While the O&M estimate includes common elements for administration and support costs, the O&M WBS is greatly simplified. As a consequence, up to two-thirds of O&M costs are collected in a single cost element."

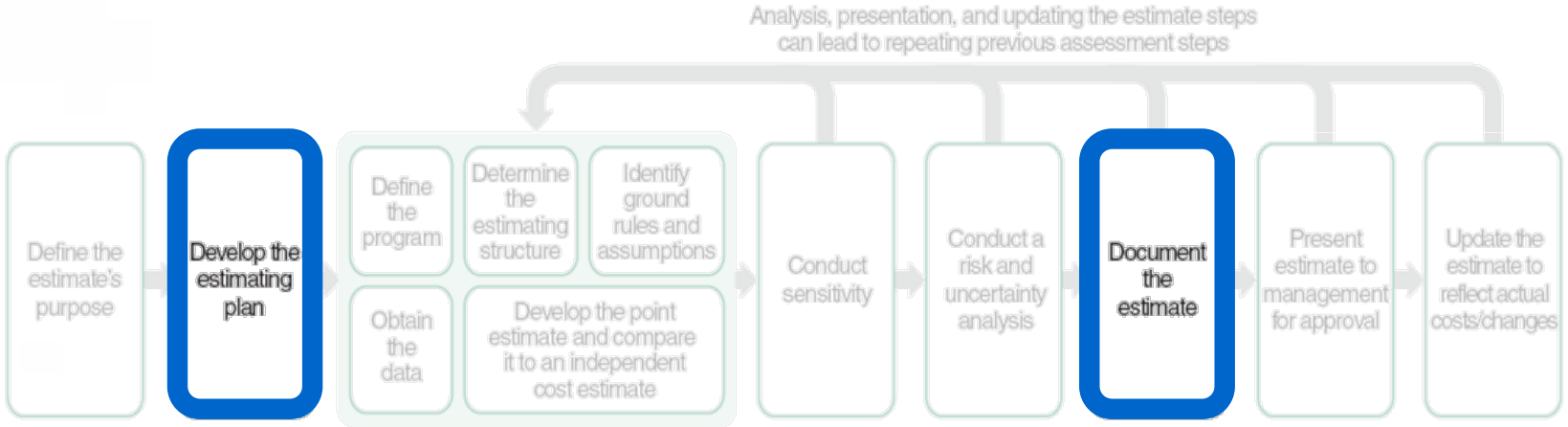
DHS and GSA Need to Strengthen the Management of DHS Headquarters Consolidation – GAO-14-648

> "GAO found that the 2013 cost estimate…does not include a life-cycle cost analysis of the project, including the cost of operations and maintenance."

VA Construction: Improved Processes Needed to Monitor Contract Modifications, Develop Schedules, and Estimate Costs – GAO-17-70

> "All applicable costs for the construction contract appear to be included in the cost estimate…. However, VA's $341-million cost estimate for activating the Denver facility is not well supported."

A Focus on Step 2 and Step 10



Source: GAO.

Step 2: Develop the Estimating Plan

1. A written study plan
   - Determines the estimating team's composition
   - Identifies subject matter experts
   - Includes a schedule for the cost estimating effort
2. Team includes experienced and trained cost estimators
3. Estimating team is from a centralized office

Not meeting Step 2 criteria is typically a cause for why other best practices are not met

Step 2: Census Bureau Estimate Plans

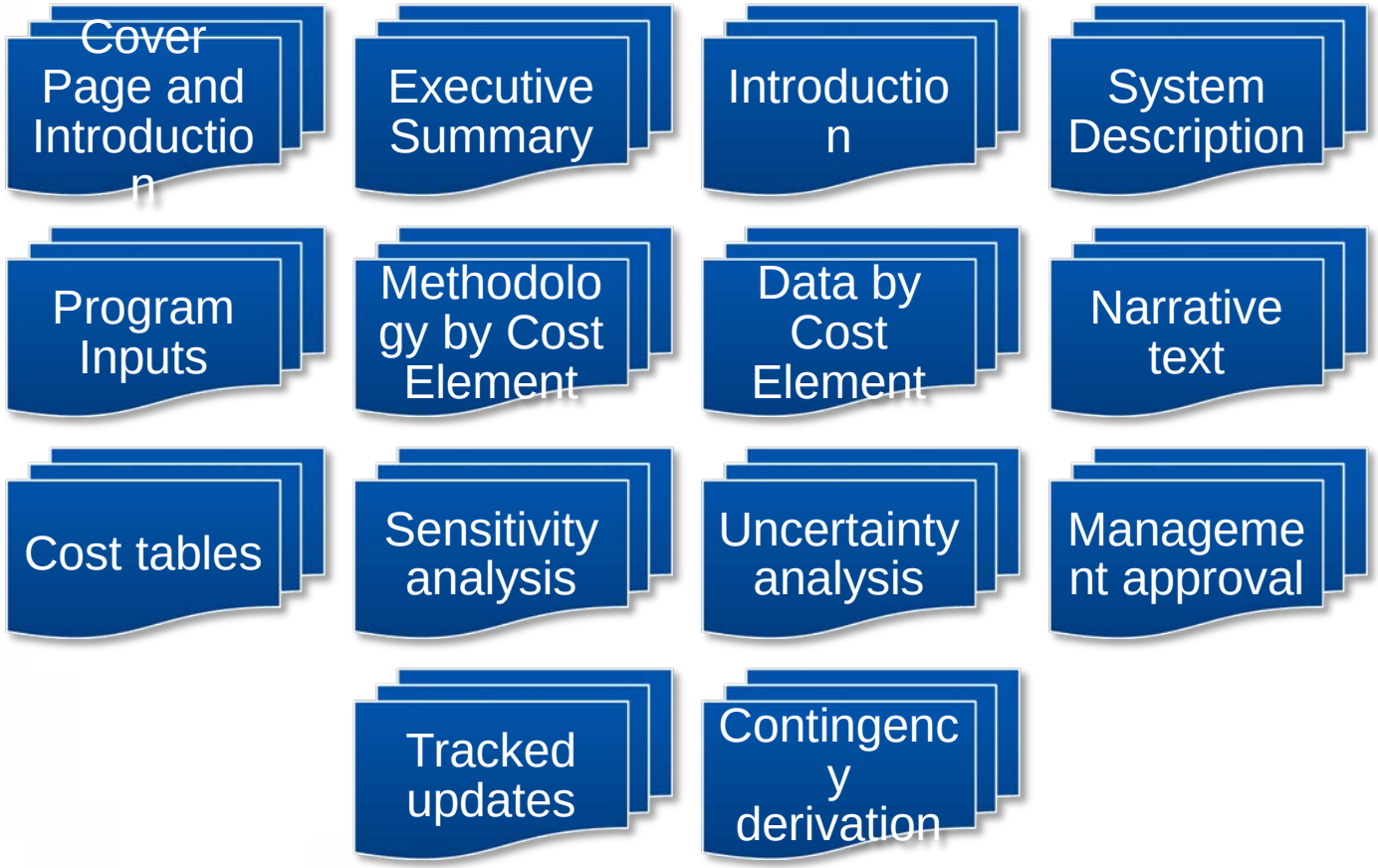
2020 Census: Census Bureau Needs to Improve Its Life-Cycle Cost Estimating Process – GAO-16-628

"We found the Bureau had little planning information among its documents supporting its cost estimate. Early fundamental planning and guidance documents such as general policies and procedures for cost estimation…can contribute to consistent control over the process used to develop a cost estimate and help ensure that desired standards and practices are implemented."

"Eight years later, the absence of guidance to control the cost estimation process persists. Investment in the planning documents to help control and support cost estimation early in the estimation cycle, such as…guidance on key steps and process flows [and] assignment of responsibilities…can help institutionalize practices and ensure that otherwise disparate parties in the process operate consistently."

Step 10: Document the Estimate

Good documentation should describe the cost estimating process, data sources, and methodologies.



Checked Baggage Screening: TSA Has Deployed Optimal Systems at the Majority of TSA-Regulated Airports, but Could Strengthen Cost Estimates – GAO-12-266

> “TSA did not adequately document many assumptions or methodologies underlying its cost model to the extent that would allow someone unfamiliar with the cost estimate, using only the available documentation, to easily re-create the estimate.”

NSF – High Quality CEP & BOE Example – Construction

- Antarctic Infrastructure Modernization for Science (AIMS)
  - Successfully completed Preliminary Design Review (PDR)

AIMS – CEP

4.5.1. Cost Estimating Plan

The baseline cost estimating process takes the project estimate from program mission need through contract closeout, utilizing the Government Accountability Office (GAO) 12-step process for estimate development (Table 8).

Table 8: GAO 12-step estimating process.

Step	Description
1	Define estimate's purpose
2	Develop estimating plan
3	Define program characteristics
4	Determine estimating structure
5	Identify ground rules and assumptions
6	Obtain data
7	Develc
8	Condu
9	Condu
10	Docun
11	Preser
12	Update

4.5.2. Methodology

The estimate for CDR was a parametric estimate based on facility-bloc diagrams from Master Plans, knowledge from subject matter experts w USAP, and historical records. The intent was to provide a cost range f purposes. The estimate for PDR is based upon greater levels of detail below. The primary estimating tools are 1) RSMeans - an industry-wic construction estimation database; 2) ASC's estimating subcontractor - proprietary estimating data developed by the contractor; 3) Sage Timb estimating software; and 4) Excel spreadsheets used to capture items s ancillary costs and consolidate estimating sources into a single estimat

4.5.3. Estimate Classification

The accuracy level of the AIMS estimate is based on the Association for the Advancement of Cost Engineering (AACE) International's recommended practice No. 17R-97, *Cost Estimate Classification System*, Rev. November 29, 2011. The AACE classification for the current estimate is Class 3-4, which gives a range of -15% to +30%, based on the maturity levels of the estimate and project documents (Table 9). The estimate will be reclassified as design and specifications mature through the PDR and FDR, with improved accuracy at each phase.

Table 9: AACE International estimate classes

	Primary Characteristic	Secondary characteristic		
Estimate Class	Maturity Level Of Project Definitions Deliverables (as % of complete definition)	End Usage (typical purpose of estimate)	Methodology (typical estimating method)	Expected Accuracy Range (typical variation in low and high range (a))
Class 5	0% to 2%	Functional area or concept screening	SF or M2 factoring, Parametric models, judgment, or analogy	L: -20% to -30% H: +30% to +50%
Class 4	1% to 15%	Schematic design or concept study	Parametric models, assembly driven model	L: -10% to -30% H: +20% to +30%
Class 3	10% to 40%	Design development, budget authorization, feasibility	Semi-detailed unit, costs with assembly level line item	L: -5% to -15% H: +10% to +20%
Class 2	30% to 75%	Control or bid/tender, semi-detailed	Detailed unit cost with forced detailed take-off	L: -5% to -10% H: +5% to +15%
Class 1	65% to 100%	Check estimate or pre-bid/tender, change order	Detailed unit cost with detailed take-off	L: -3% to -5% H: +3% to +10%

AIMS - CEP

Table 1: BOE Cost Estimating Sources

Cost Estimating Source	Rationale
Vendor quotes to Leidos:	
Independent estimating companies:	
Leidos internal subject matter experts (SMEs):	
Industry standards and sources:	
Historical knowledge:	

4. Universal Assumptions

AIMS personnel provided the subcontracted estimating firms with specific assumptions to use in developing their estimates. Some of the assumptions are applicable to narrow aspects of the project and are therefore included only in that specific BOE. Others are applicable to the project across multiple portions of the estimate and therefore are listed here instead of being repeated within multiple BOEs. Not all assumptions are listed here, but Table 3 provides a list of the assumptions that are relevant to multiple BOEs, a reason or justification for inclusion, and a brief description of the impact to the project.

Table 3: BOE Universal Assumptions

5. Universal Exclusions

AIMS provided the subcontracted estimating firms with specific exclusions to use in the development of their estimates. Some of these are applicable to narrow aspects of the project and are therefore included only in those specific BOEs. Others are applicable to the project across multiple portions of the estimate and therefore are listed here instead of being repeated within multiple BOEs. Table 4 below lists the exclusions, provides a reason or justification for including them, and provides a brief description of the impact to the project.

Table 4: BOE Universal Exclusions

*BOE organized per AACE International Recommended Practice No. 34R-05. (2010)

AIMS – BOE* - WBS 5.4.1

BASIS OF ESTIMATE

WBS 5.4.1.03 – Transition

1.0 Transition Basis of Estimate (WBS 5.4.1.03)

1.1 Technical Scope Detail

One of the core tenants of the McMurdo Master Plan is that new McMurdo Station facilities should be designed and constructed in such a way that the station remains operationally functional during

1.1.1 Temporary Facilities (5.4.1.03.01)

SUBCONTRACTOR STAGING FACILITY

The construction subcontractor for the core facility will require

CONTRACTOR STAGING FACILITY

Design (5.4.1.03.01)

This is the estimated cost for the design builder to complete a design

Procure (5.4.1.03.01)

This is the estimated cost for the design builder to procure construction materials

Mobilization (5.4.1.03.01)

This is the estimated cost for the design builder to mobilize equipment and supplies to Port Hueneme, California and McMurdo Station. This is calculated against estimated construction costs. These

Construct (5.4.1.03.01)

This is the estimated cost for the design builder to construct the facility (labor and materials). This is

AIMS – BOE – WBS 5.4.1

2nd Level	3rd Level	4th Level	5th Level	Work Sub-Element	FY	WBS	Units	Unit of Measure	Unit Cost	Labor	
5.4	Management & Support	Transition	Temp Facilities - Person Camp	Design	19			Lot			$
5.4	Management & Support	Transition	Temp Facilities - Person Camp	Design	19			Wks			$
5.4	Management & Support	Transition	Temp Facilities - Person Camp	Procure	20			Lot			$
5.4	Management & Support	Transition	Temp Facilities - Person Camp	Mobilization	21			Lot			$
5.4	Management & Support	Transition	Temp Facilities - Person Camp	Construct	22			Lot			$
5.4	Management & Support	Transition	Temp Facilities - Person Camp	Test, Start-up, Training, and Closeout (Subcontract Labor)	22			Lot			$

Deta Base Item

Rates Current At September 201

Description		Unit	Qty	Rate	Total Cost
195	Trash Removal - Excluded	Note			
196	Snow Removal	Mth			
197	Materials Testing	EA			
198	Commissioning Services	Hr			
199	Safety Equipment & First Aid	Mth			
200	Fall Protection	Mth			
201	Fire Extinguishers - Field Offices	EA			
202	Fire Extinguishers - Job Site	EA			
203	Mock ups	Note			
204	Site progress photos	Mth			
	General Requirements				
	General Requirements				
03	**Concrete**				
	A1010 Standard Foundations				
	B1010 Floor Construction				
517	Pre-cast reinforced floor slab	SF			
522	Tendons bonded and grouted, 6' OC	LF			
	Floor Construction				
	Concrete				
05	**Metals**				
	B1010 Floor Construction				
4	Steel column & beams	T			
5	Steel column base plate	EA			
	Floor Construction				

AIMS – BOE – WBS 5.4.1

Website for international per diem rates:

https://aoprals.state.gov/web920/per_diem

Office of Allowances
- Organization Chart

Per Diem Rates
- Local Versions of Per Diem
- Foreign Per Diem Rates
- Other Per Diem Rates

Allowance Rates
- Allowance Rates (Sec. 925)
- Allowances By Location
- Allowances By Type
- Biweekly Updates

Standardized Regulations (DSSR)
- DSSR Table of Contents
- Search the DSSR

General Information
- Conversions
- Contact Us
- Waiver of Administrative

Select by Location
Select by Allowance Type
Printer Friendly

Foreign Per Diem Rates In U.S. Dollars

NEW ZEALAND: Christchurch
Publication Date: 11/01/2016

Previous Rates: 11/01/2016 Go

Country Name	Post Name	Season Begin	Season End	Maximum Lodging Rate	M & IE Rate	Maximum Per Diem Rate	Footnote	Effective Date
NEW ZEALAND	Christchurch	01/01	12/31	187	132	319	N/A	10/01/2016

Excavator with Rock Breaker
Caterpillar

NSF – High Quality CEP & BOE Example – O&M

- National Ecological Observatory Network (NEON)
  - Some elements under construction
  - Some elements in operation

NEON CEP & BOE Example – O&M

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Chapter 6. Ground Rules and Assumptions

Specific ground rules and assumptions for the cost estimate include the following:

- Operations budget will be developed to include
  - Initial Operations 10/1/2017 through 9/30/2
- Escalation applicable to non-labor other direct c
  practices as detailed in Chapter 7. Battelle doe
- Annual labor escalation applicable to Battelle a
  practices as detailed in Chapter 7.
- Battelle and BEI's hourly rates were calculated
- Annual working hours for Battelle and BEI staff
  (PTO), such as vacation, holiday, etc.
- Battelle will utilize the Contract Research Oper
  tasks required under this effort. Battelle's forwa
  methodologies have been described in Chapte
- BEI's current pricing rates are captured in Chap
- In FY18 BEI's overhead rate of [redacted]% will be
  cost estimate. Beginning in FY19 or earlier Batt
  responsibility for processing all non-labor categ
  excluding travel and purchased equipment. Thi
  standard practice, Battelle applies a Procureme
  these non-labor cost resources, excluding trave
- Modified Total Direct Costs exclude capital exp

Chapter 7. Estimating System and Pricing Methodology

7.1 Estimating System

The estimating and pricing philosophy of Battelle is to support the prime objectives of Battelle and furnish clients with quality products on time at fair and reasonable prices. This philosophy requires that only necessary, allowable, and allocable costs are included in Battelle's proposals and that proposals are prepared in accordance with FAR part 15 and any other applicable rules and regulations. Battelle's method of preparing and reporting its cost estimate for the proposed program is consistent with its accounting system, which has been fully disclosed to the Defense Contract Management Agency in Dayton, Ohio, and the Defense Contract Audit Agency (DCAA).

7.2 Pricing Methodology

Battelle achieves cost realism by using catalogs, vendor quotations, roundtable professional estimates, and historical data to prepare estimates for certain line items in the cost estimate. We also compare cost elements with identical or similar work performed in the past. In preparing and reviewing our cost estimates, we involve knowledgeable staff to verify proposed costs for completeness and accuracy. The review and approval chain from top to bottom includes (1) a Battelle contracts manager, (2) the responsible line manager, (3) a pricing lead trained in the Battelle cost accounting system, and (4) the designated program manager and key personnel. Each review level serves as a check of lower levels.

Battelle's method of preparing and reporting the cost estimate for the proposed program is consistent with our accounting system, which has been fully disclosed to the Defense Contract Management Agency (DCMA) in Dayton, OH, and the Defense Contract Audit Agency (DCAA).

Battelle operates in compliance with FAR Part 9.104-1 (General Standards).

The remaining sections of this Cost Narrative describe the bases and methodologies Battelle uses to estimate major cost elements in this proposal. In addition to our description of these cost elements

NEON CEP & BOE Example – O&M *(continued)*

Basis of Estimate Form

Proposal Title	Opportunity ID	Date 12/12/2016
Task/WBS Name Training Delivery	Task/WBS No. 11.03.01.02	
Prepared by (print name)	Phone No.	

Pre-season training seminar:
For each TOS protocol, the protocol author (SCI staff) meets with the Field Opera
and reviews both the training materials and the protocol with the technician, to er
accurately reflects the protocol (4 h per protocol; hours include preparation for ar
expertise and complexity of training requirements determines the person assigne
of hours allocated per SCI staff is determined by the number of protocols for whic

- Total SCI staff hours: 4 h per protocol batch per year x 12 protocol bat
  - Some protocols / SOPs can be batched together for efficien
    and Productivity and Agricultural Biomass SOP training mat

TOS Training Palooza:
The TOS Training Palooza takes place over one week, typically in February or M
including 5 TOS SCI staff, selected to provide training expertise over the broad s
assumed that the duration of the TOS Training Palooza is one week (40 h per SC
prepare presentation materials (8 h per SCI staff per year; attending manager is
not require training materials to be prepped).

- SCI staff hours: 48 h per staff per year x 4 staff x 2 years
- SCI manager hours: 40 h per year x 2 years

The TOS Curriculum Designer engages in:

- Pre-event development logistics: 40 h per year x 2 years
- Training the trainers: 84 h per year x 2 years
- Trainer support and logistics: 60 h per year x 2 years
- Domain-specific trainer support: 96 h per year x 2 years
- Domain-specific trainer evaluation: 88 h per year x 2 years

	Prior Similar W (Proje
2. Other Direct Costs (i.e. use rates, service centers, PMP, instrument lab rentals, BTSO direct cost, etc.)	

Other Direct Costs Assumptions and Rationale for Estimate. State the assu

Proposal:
Opportunity:

Detail Cost Breakdown Report
Lbr Cat Indiv

Page 1 of 3
Calendar: 10 - October to September

Resource-Description	Dept	2018 Hrs/Base	2018 Rate	2018 Cost	2019 Hrs/Base	2019 Rate	2019 Cost	Total Hrs/Base	Total Rate	Total Cost
Proposal Project: 11x03x01										
Activity ID: 11X03X01X02 - Training Delivery										
OP005 - BEI										
Salary Labor										
Associate Scientist Plant Ecology-										
	73010720									
Associate Scientist-	73010720									
Associate Scientist-	73010720									
Associate Scientist-	73010720									
Associate Scientist-	73010720									
Staff Scientist-	73010720									
Staff Scientist-	73010720									
Staff Scientist-	73010720									
Staff Scientist-	73010720									
Hourly Labor										
Senior Science Technician-										
	73010720									
Staff Scientist PRN-	73010720									
Total Regular Labor				28,794			26,049			54,843
Total Labor				28,794			26,049			54,843
Labor Escalation										
Fringe Base (LABOR+ESC)										
Other Fringe Group A										
Salary Fringe Group A										
Total Fringe										
Division OH Base (LBR+FRG)										
BEI Division Overhead										
Total Division Overhead										

Use or disclosure of data co

BEI Cost Element	FY2017	FY2018	FY2019
Regular Full-Time Labor Fringe	XX.X %	XX.X %	XX.X %
Temp Full-Time & Temp Part-Time Labor Fringe	XX.X %	XX.X %	XX.X %
Overhead	XX.X %	XX.X %	XX.X %

NEON CEP & BOE Example – O&M *(continued)*

Basis of Estimate Form

Proposal Title	Opportunity ID	Date
Task/WBS Name AOP Flight Data Collection	Task/WBS No. 11.04.01.01	
Prepared by (print name)	Phone No.	Period of Performance FY18- 19

deployment days, during which day survey flights are not typically conducted. A
days, which includes travel to and from the flight Domain. Furthermore, an ASC
Domain.

For the purposes of budgeting, ASO's were assigned to specific payloads and

For a given month, the total REGULAR labor hours estimate for an ASO is deri
times the number of week days in a 25 day crew rotation period; plus the numb

For a given month, the total OVERTIME labor hours estimate for an ASO is der
hours/day times the number of weekend days in a 25 day crew rotation period.

	Prior Similar (Proj
2. Other Direct Costs (i.e. use rates, service centers, PMP, instrument lab rentals, BTSO direct cost, etc.)	

Other Direct Costs Assumptions and Rationale for Estimate. State the ass

- Payload and hotel kit Teldat communications services for remote acc
  monthly subscriptions at 4 units for each payload/hotel kit combo (1
  only active during months with active flights
- GPS modem cards service for remote access and data exchange between HQ and base stations: monthly subscri
  each for payloads 1-2 (14 total), monthly subscriptions for five GPS units for payload 3
- Garmin InReach service: monthly subscription for one Delorme Explorer two-way satellite text messaging system p
  deploying GPS base stations in remote locations
- FlightAware weather tracking service: 8-month subscriptions, one for three payloads
- Hotel rooms for Hotel Kits: one hotel room per deployment night per payload/hotel kit. Because of the significant no
  kit workstations during data extraction and data QA/QC (requiring >12-15 hours processing per night), a separate h
  the hotel kit workstation. No per diem or commercial flights are required, so this cost is budgeted under ODC instea
- Rental truck for R/T transport of payloads from HQ to hangar: one round-trip per payload installation (pre-campaign
  payload de-installation (post-campaign); each unit includes estimated $50 fuel refill charge
- Annual TSA badge security clearance renewal required by certain FBO's (KBHM, PAFA, PASC, KTYS/KTUS) for a
  (travel for this is budgeted in 11.04.02.03)
- 4x4 / SUV Rental: two rental vehicles per deployment day per payload; one 4x4 required for ground ASO to access
  GPS deployment; SUV required for flight ASOs to transport ground support equipment and travel between airport a
  not included for days when aircraft is flown out of the Boulder airport for calibration, recertification and training flight
- Gas for rental 4x4/SUV: daily rate of $15 per day per vehicle estimated

	Estimating Method	
	Prior Similar Work/Experience (Project/WP #)	Round Table/Engineering Estimate (√)
3. Travel		☐

WBS/Task/ CLIN	Item Description	Catalog/Part #	Full Vendor Name	Backup PDF page #	Sole Source Y/N	Cost Element	Material & Equipment Escalation Codes*	Month/ Year	Sellable Unit	Quantity	Estimated Unit Price	Extended Price	Source of Unit Price	Ship To (City and State)
11.04.05.02	Agilent Pump Tip Seal Replacement Kit	IDP3TS	Agilent Technologies	AOP119	Yes	Material	Lab Supplies	Dec-17	ea	3	$221.00	$663.00		Boulder, CO
11.04.05.02	Agilent Pump Tip Seal Replacement Kit	IDP3TS	Agilent Technologies	AOP119	Yes	Material	Lab Supplies	Dec-18	ea	3	$221.00	$663.00		Boulder, CO
11.11.02.01	Desiccant Canister, for use with SPN1	MX107674	Dynamax	in Source of	Yes	Material	Chemical and Allied Products	Oct-17	1	6	$114.00	$684.00	NEON_PO#:25635	
11.11.02.01	Desiccant Canister, for use with SPN1	MX107674	Dynamax	in Source of	Yes	Material	Chemical and Allied Products	Sep-18	1	6	$114.00	$684.00	NEON_PO#:25635	
11.06.06.05	Desiccant Canister, for use with SPN1	MX107674	Dynamax	in Source of	Yes	Material	Chemical and Allied Products	Oct-17	1	61	$114.00	$6,954.00	NEON_PO#:25635	
11.06.06.05	Desiccant Canister, for use with SPN1	MX107674	Dynamax	in Source of	Yes	Material	Chemical and Allied Products	Sep-18	1	61	$114.00	$6,954.00	NEON_PO#:25635	
11.08.01.03	Georgia TOS Scientific Collection Permit		of Natural Resources	FOP672	Yes	Service	Not Applicable	Mar-18	annual	1	$55.00	$55.00	Permit application	Social Circle, GA
11.07.01.03	Georgia AQU Scientific Collection Permit		of Natural Resources	FOP672	Yes	Service	Not Applicable	Mar-18	annual	1	$55.00	$55.00	Permit application	Social Circle, GA
11.08.01.03	Georgia TOS Scientific Collection Permit		of Natural Resources	FOP672	Yes	Service	Not Applicable	Mar-19	annual	1	$55.00	$55.00	Permit application	Social Circle, GA
11.07.01.03	Georgia AQU Scientific Collection Permit		of Natural Resources	FOP672	Yes	Service	Not Applicable	Mar-19	annual	1	$55.00	$55.00	Permit application	Social Circle, GA
11.07.03.05	1X TE (for extraction)	AM9849	Invitrogen	CL										bus OH
11.07.03.05	1X TE (for extraction)	AM9849	Invitrogen	CL										bus OH
11.08.03.09	1X TE (for extraction)	AM9849	Invitrogen	CL										bus OH
11.08.03.09	1X TE (for extraction)	AM9849	Invitrogen	CL										bus OH
11.07.03.05	1X TE (for qPCR triplicate analysis)	AM9849	Invitrogen	CL										bus OH
11.07.03.05	1X TE (for qPCR triplicate analysis)	AM9849	Invitrogen	CL										bus OH
11.08.03.09	1X TE (for qPCR triplicate analysis)	AM9849	Invitrogen	CL										bus OH
11.08.03.09	1X TE (for qPCR triplicate analysis)	AM9849	Invitrogen	CL										bus OH
11.09.02.01	Nexus		Sonatype	CIT										
11.09.02.01	Nexus		Sonatype	CIT										

Quote 3000000408149.1
NEON INC

Salesperson	Quote Details	Billing Details
Salesperson Name: Loan Vu	Quote Date: 09/22/2016	Company Name: NEON INC
Salesperson Email: Loan_Vu@Dell.com	Quote Validity: 10/22/2016	Customer Number: 91059124
Salesperson Phone: 1(800) 456-3355	Solution ID: -	Phone Number: 1 (720) 7464870
Salesperson Extension: 5130463		Address: 1685 38TH ST STE 100 BOULDER CO 80301-2735 US

Price Summary

Description	Quantity	Unit Price	Subtotal Price
PowerEdge R630	1	$8,852.12	$8,852.12
		Subtotal	$8,852.12
		*Taxable Amount	$0.00
		*Non-Taxable Amount	$8,872.11
		Tax	$0.00
		Shipping and Handling	$19.99
		Environmental Fee	$0.00
		Total	$8,872.11

Sonatype

INVOICE

INVOICE #: 7055
REFERENCE #: ON-0004684
DATE: 11/07/2014
DUE DATE: 12/07/2014

TOTAL AMOUNT: $3,600.00

DESCRIPTION	QTY	MEMO	UNIT TOTAL
Sonatype Nexus Professional	30	12/0	$3,600.00
		SUBTOTAL	$3,600.00
		Tax	$0.00
		1) COLORADO CO STATE TAX (0)	$0.00
		TOTAL	$3,600.00

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NSF - CEP & BOE Examples – Summary Leading Practices/Observation

- Complete BOE document with good project and scope description
- Clear linkages from BOE to Cost Book (via WBS)
- Thorough and well-documented assumptions for cost drivers, cost estimating methods, and data sources
- Integrated cost model which includes build up from lowest to highest levels of the WBS
- Use of a “quality standard” as though cost estimate will be subject to third party review and such that third party can replicate
- Supportable cost escalations; and indirect/fringe/overhead rates
- Sufficient documentation of risk and sensitivity analyses; discussion of cost estimate limitations

NSF - CEP & BOE Example – O&M

- **NSF is not prescriptive – Tailor to your facility!!**
- Academic Research Fleet
  - Ship Operations format established by OCE is both the CEP and the BOE
  - “WBS” elements are the various Level of Effort cost categories defined by OCE
  - Suitable for NSF to conduct a cost analysis (mainly Program)

Can Contingency be used during Operations Stage?

- Yes (per LFM 4.2.6)
  - Must comply with paragraph 200.433 of the Uniform Guidance (Held separately to manage project risk)
  - Must comply with LFM - formal risk assessment, Risk Management Plan, Risk Register, contingency calculation
  - Approved by NSF
  - Generally for major up-grade sub-elements of Ops proposal
- Example?

§ 200.433 Contingency provisions

- (a) Contingency is that part of a budget estimate of future costs (typically of large construction projects, IT systems, or other items as approved by the Federal awarding agency) which is associated with possible events or conditions arising from causes the precise outcome of which is indeterminable at the time of estimate, and that experience shows will likely result, in aggregate, in additional costs for the approved activity or project. Amounts for major project scope changes, unforeseen risks, or extraordinary events may not be included.
- (c) Payments made by the Federal awarding agency to the non-Federal entity's "contingency reserve" or any similar payment made for events the occurrence of which cannot be foretold with certainty as to the time or intensity, or with an assurance of their happening, are unallowable, except as noted in § 200.431 Compensation—fringe benefits regarding self-insurance, pensions, severance and post-retirement health costs and § 200.447 Insurance and indemnification.

*Adapted from AACE International

Do you really mean Allowance not Contingency?

- Allowance*: Resources included in the basis of estimate for baseline cost estimates to cover the cost of known but as-of-yet undefined details or requirements for an individual WBS element. May be used when the level of project definition may not enable certain costs to be estimated definitively or times when it is simply not cost effective to quantify and cost every small item included with the WBS element, but reliable correlations are available.
- Past project experiences, demonstrated statistical correlation → Most likely costs
- Examples:
  - Preliminary Design – design or material take-off allowance
  - Small Items - Bolts, structural steel connections
  - Hand excavation/backfill (vs. machine excavation/backfill)

Questions?

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  - 703-292-7484