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Fontenelle Dam and Outworks Infrastructure Completion Level II Study Executive Summary

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Fontenelle Dam and Outworks Infrastructure Completion Level II Study Executive Summary

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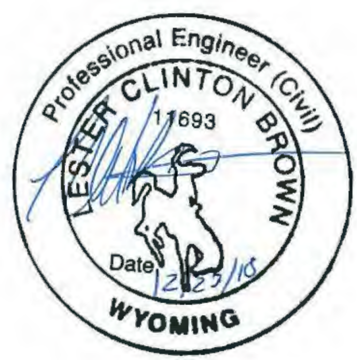


December 2018

1.0 INTRODUCTION AND OVERVIEW

Fontenelle Reservoir is a Bureau of Reclamation facility on the Green River near Kemmerer, Wyoming. The Wyoming Water Development Commission (WWDC) funded this study to evaluate the technical and economic feasibility of armoring the dam face, making available the water currently stored below the active pool elevation. The newly available storage would likely be designated as drought mitigation supply or drought avoidance supply rather than an addition to the overall capacity of Fontenelle. This report was prepared by Engineering Analytics, Inc., Trihydro, and WestWater Resources (referred to as the EA Team) under the direction and assistance of the Wyoming Water Development Office (WWDO) for submission to the WWDC.

The proposed project is intended to increase the usable storage capacity in Fontenelle Reservoir. For this analysis, the water supply benefit of the proposed project is considered to be 80,796 acre-feet of new active storage capacity in Fontenelle Reservoir (Figure 1). This is the volume of storage that is currently stored in the reservoir but is not accessible due to a lack of armoring to protect the lower interior dam face. This Level II Study investigates the following: a comparative analysis of four alternatives to armoring the dam, environmental considerations associated with armoring the Fontenelle Dam face and/or draining the reservoir, and the economic benefits of added usable storage.

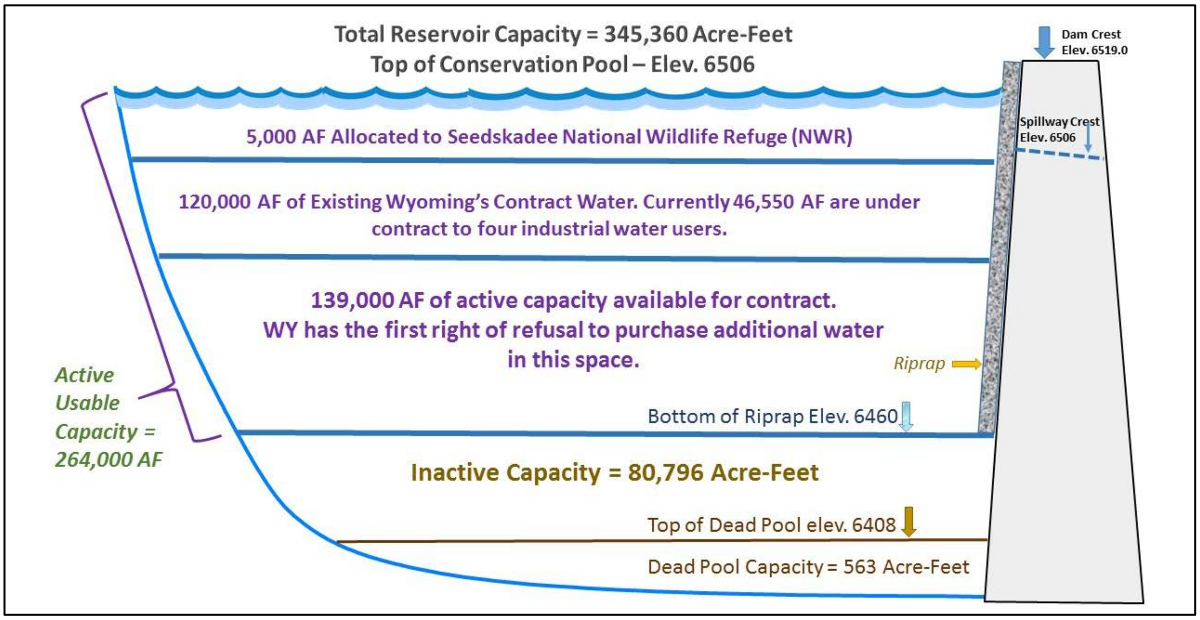


Figure 1. Illustration of Fontenelle Reservoir Storage Pools.
The figure shows the 120,000 AF of space currently contracted for use by the State of Wyoming, the 139,000 AF of active capacity which is currently not contracted and is managed by BOR, and the 80,796 AF which is currently inactive and is the subject storage being evaluated under this project. Figure provided by Wyoming Water Development Office. Note that bottom of existing riprap is now estimated to be at elevation 6,457.

2.0 ALTERNATIVES ANALYSIS

The goal of the alternatives analysis is to develop practical, conceptual alternatives for armoring the upstream face of the dam to access the inactive capacity of the reservoir. Each alternative proposes a different approach to armoring the upstream, unprotected dam face from the bottom of the dam (approximately 6,400) to the bottom of the existing riprap (approximately 6,457). The alternatives were evaluated according to costs, constructability, and environmental impact. In this study, the EA Team has focused on the following four alternatives:

1. Riprap: Riprap consists of large angular boulders placed for erosion protection. Riprap can be placed year round in a drained reservoir and can be placed underwater when the reservoir is not frozen.
    a. Drained Reservoir: If placed in a drained reservoir, the reservoir would be drained down to the dead pool elevation and 52,700 cubic yards (CY) of riprap would be placed on the upstream face of the dam. Riprap would be placed directly on the embankment fill, as was done during the 1985 repair, working along the face in 20-foot-wide strips (or as the contractor determines) running parallel to the dam. As the sections were placed, the reservoir water surface elevation would be raised until the project was completed and the reservoir could operate normally.
    b. Full Reservoir: If placed in a full reservoir, the riprap would be placed by use of barge and crane or “flexible fall-pipe.” The riprap would be lowered using a box-type container and emptied on the dam face. Another option is to dump the rock through the “flexible fall-pipe” that would act as a large tremie pipe. A team of divers would investigate the riprap to ensure adequate placement and coverage of the riprap. The dive team would communicate with the operator regarding locations needing additional riprap.

2. Soil Cement: Soil cement is a mix of sand, Portland cement, and water that is placed and compacted. It can be used as erosion protection on steep slopes (3H:1V and 2H:1V) by using a stair-step placement technique. The reservoir would be drained to the dead pool elevation and 52,100 CY of soil cement would be placed on the upstream face of the dam. Soil cement would be mixed using a mobile twin-shaft mixing plant, placed in 6- to 12-inch lifts, and compacted to acceptable conditions. The project would be divided into 20-foot sections for analysis purposes. As progress was made, the reservoir water surface elevation would be raised until the project was completed and the reservoir could operate normally. Soil cement cannot be placed underwater or during cold weather.

3. Submar Mats: Submar Mats are a type of articulated concrete block mats (ACBMs) that are installed in large sheets (8 feet wide by 20 feet long by about 1 foot thick). This alternative involves placing the Submar Mats in a full reservoir by use of barge and crane. The mats would either be precast/fabricated on site or at a nearby concrete company and delivered to site. The protection would be lowered in sections (8 foot by 20-foot mats) by cables. A team of divers would be underwater to position the mats and tie them into the adjacent mats as needed. Submar Mats can also be placed in dry

conditions, but dry placement was not considered for this project because the cost is much greater than riprap or soil cement.

4. <u>Contech Wave Attack Blocks</u>: Wave Attack Blocks are interlocking concrete blocks that can be used to armor for wave protection. Although they are usually used for marine applications, they can also be used for erosion control on dams. This alternative involves placing the Contech Wave Attack Blocks in a full reservoir by use of barge and crane. The blocks would either be precast/fabricated on site or at a nearby concrete company and delivered to site. The blocks would be lowered in sections (several units in a section) by cable. A team of divers would be underwater to position the sections and tie them into the adjacent blocks as needed. Wave Attack Blocks can also be placed in dry conditions, but dry placement is not considered for this project because the cost is much greater than riprap or soil cement.

The remote location of the project increases material cost of riprap because of the long haul distance. As a result, soil cement becomes a potentially feasible alternative relative to riprap. In the alternatives analysis, it was determined that the dry placement of riprap and soil cement have very similar costs ($8.5 M and $8.2 M, respectively). Wet placement of riprap ($15.3 M) is more expensive than dry placement of riprap or soil cement, and the most expensive alternatives are the Submar mats and Contech wave attack blocks ($37.6 M and $33.5 M, respectively). It is predicted that the alternatives presented are of similar product quality.

3.0 NEPA CONSIDERATIONS

It is the project team's opinion that most National Environmental Policy Act (NEPA) considerations are associated with long-term environmental effects that result from changes in future operations of Fontenelle Reservoir and short-term effects due to construction. The various alternatives discussed in this report have the same result: the Fontenelle Dam will be completely armored and the reservoir's active volume will increase. The alternatives that drain the reservoir will require a more intensive focus on the short-term effects due to construction. The NEPA process will be required for any of the selected alternatives. Following the completion of this project, future operations are not expected to change. However, there is potential for the reservoir to be lowered beyond the current inactive pool elevation of 6,457. As a result of a potential change in management of stored water and potential impacts during construction, it is likely that the project will fall under an EA or an EIS. If there are no major changes to the operation of the Fontenelle Reservoir because of the project, an EA may be acceptable for NEPA documentation. However, it is possible the EA will not result in a FONSI and an EIS would be required, which would cause delay. The documentation approach will be determined by the lead NEPA agency on the Project. These processes and coordination can be arduous, taking several years or more to complete. Investigations, modeling, and analyses completed under this report are developing information that will be used to support the NEPA environmental review.

4.0 HISTORIC AND FUTURE OPERATIONS

To examine potential reservoir levels from various construction drawdown alternatives, three scenarios were examined: spring drawdown (Mar - Jul), fall/winter drawdown (Oct - Mar), and summer drawdown (May - Oct). The fall/winter drawdown scenario is predicted to have the least effect on short-term environmental considerations. The spring and summer drawdown scenarios are also feasible, but the construction operations might need to take special precautions to account for unknown stream flow conditions. Power generation was estimated for each scenario, and Fontenelle should be able to produce and sell its full capacity at any time of the year. Results show that the summer drawdown scenario offers the best opportunity for power production provided that the reservoir can be re-filled in Year 2. If not, spring and fall/winter drawdown scenarios are essentially equivalent.

5.0 COST ESTIMATES AND SCHEDULING

Costs associated with NEPA, design, and construction were estimated for each alternative. The costs range from about $8.2 M to $37.6 M. Table 1 summarizes the construction costs and total costs for each of the alternatives analyzed.

Table 1. Alternatives Cost Estimate Summary.

Alternative	Reservoir	Construction Cost	Total Cost(1)
Riprap	Drained	$6,063,000	$8,510,000
Riprap	Full	$12,080,000	$15,331,000
Soil Cement	Drained	$5,844,000	$8,227,000
Submar	Full	$30,283,000	$37,643,000
Contech	Full	$26,752,000	$33,452,000

(1) Total Cost includes construction costs, NEPA costs (a fixed $1,230,000 assuming EIS), and engineering costs (which vary for each alternative).

The construction schedule for dry placement of armoring includes the drawdown and refill time of Fontenelle Reservoir. The alternative schedules were determined primarily according to the physical ability to place material during the time of year and secondarily according to minimizing effects toward environmental considerations and reduced power generation. Overall, the wet placement of riprap and the placement of soil cement have the shortest construction schedule at 9 months. The dry placement of riprap is predicted to take 12 months. The Submar and Contech alternatives are predicted to take 3.5 years (with multiple phases) and 11 months, respectively. Soil cement has a particularly difficult construction schedule because the placement of soil cement must begin around July (a high flow month) to ensure material placement finishes during the warm months of the year. The dry placement of riprap does not have this concern. The alternatives that utilize a barge and crane for wet placement are restricted to months when the reservoir is not frozen.

6.0 ECONOMIC ANALYSIS

The following three potential benefits of the project were evaluated: direct water supply, drought mitigation supply, and drought avoidance supply. Of these benefits, only drought mitigation supply (net present value of $9,035,784) and drought avoidance supply (net present value of $41,796,970) were considered likely to be utilized. Since the drought avoidance supply has considerable uncertainty, the project net present value is considered to be represented by the drought mitigation supply benefit. Therefore, the project's present value of future project benefits is estimated to be $9,035,784. For the alternative analyzed, the benefit-cost ratio ranges from 0.24 to 1.10. This range of benefit-cost ratios does not include all costs, and the actual benefit-cost ratio would likely be lower, and likely less than 1.00 once all the costs are accounted for. The benefit-cost ratios for the alternatives and benefit scenarios are shown in Table 2.

Table 2. Benefit-Cost Ratio for each Alternative(1).

Alternative	Reservoir	Drought Mitigation Supply Benefit-Cost Ratio(2)	Drought Avoidance Supply Benefit-Cost Ratio(3)
Riprap	Drained	1.06	4.91
Riprap	Full	0.59	2.73
Soil Cement	Drained	1.10	5.08
Submar	Full	0.24	1.11
Contech	Full	0.27	1.25

Notes: 1) The benefit-cost ratios in this table lack the costs associated with capital and annual operating costs, storage contracting costs, and temporary losses in benefits from current hydropower generation and recreational use.
2) This analysis uses the drought mitigation supply benefit of $9,035,784 as the benefit for each alternative. It has been concluded that the drought mitigation supply is the estimated present value of future project benefits and is considered the most likely scenario.
3) This analysis uses the drought avoidance supply benefit of $41,796,970 as the benefit for each alternative. Note that the drought avoidance benefit is considered to be more uncertain and less conservative.

7.0 CONCLUSIONS AND RECOMMENDATIONS

This report was conducted to evaluate the technical and economic feasibility of expanding the active storage in Fontenelle Reservoir by adding armoring to the unprotected portion of the upstream dam face. Our Level II Study conclusions and recommendations are as follows.

The EA Team recommends riprap be placed on the unprotected portion of the upstream dam face using underwater placement methods. Key benefits of underwater placement of riprap include the following:

- Underwater placement of riprap does not require the reservoir to be drained. Draining the reservoir is a primary concern for many of the short-term environmental considerations. Because this alternative does not require the reservoir to be drained, it nearly eliminates the short-term environmental considerations, including flood mitigation issues that could result from drawdown and environmental effects of unregulated stream flow. Also, interruption to power generation is minimized or completely excluded.

- Underwater placement of riprap is more flexible than the dry armor placement alternatives (dry placement of riprap and soil cement). Riprap can be placed underwater during most of the year; the only restriction is a frozen reservoir. Inflows have little to no effect on underwater placement of riprap, but could have a significant effect on dry placement of riprap or soil cement.
- Underwater placement of riprap is relatively low cost compared to the other underwater armoring alternatives (Submar and Contech). The total project present day cost is estimated to cost $15.3 M. The benefit-cost ratio for this alternative is 0.59. The cost for the project for construction starting in 2020, with an inflation factor of 3.0%, is $16,554,000.

8.0 ROADMAP TO IMPLEMENTATION

A detailed Final Design Process flow chart is shown on Figure 2. It summarizes the activities that may be required, starting with the design prework process and continuing through project completion. Though we tried to capture all of the steps in the flow chart, there may be some we are unable to anticipate at this time due to project specifics. It is estimated that the NEPA process will begin at the completion of 60% design and continue until 100% design. Following 100% design, the funding and paperwork will be finalized, and then the project will be issued for bid. The design team will be involved throughout construction and until the completion of the project.

In addition to the roadmap outlined above, the following items should be investigated:

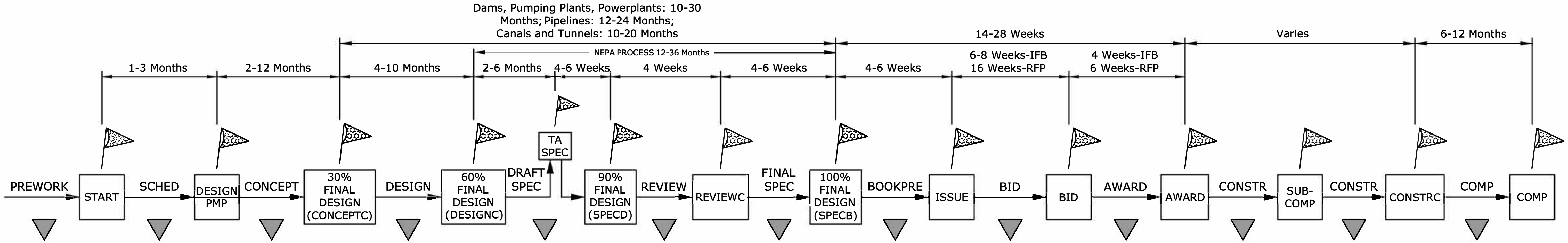
- A geotechnical investigation to look at filter compatibility between the riprap and the use of the embankment as riprap bedding.
- A rapid drawdown analysis of the embankment to assess the safety of drawing down the reservoir in a drought situation.
- Testing of the proposed riprap sources to determine if the sources will meet the durability requirements.

December 2017

FINAL DESIGN PROCESS

GENERAL FLOW CHART

COORDINATION ACTIVITIES



PREWORK

PM ASSIGNED BY ORIGINATING OFFICE

PMT MAY BE ESTABLISHED

PROJECT FEATURES AND SCHEDULES MAY OR MAY NOT BE FIRMLY ESTABLISHED

DESIGN WORK IS FUNDED

DESIGN TEAM LEADER ASSIGNED

PLANNING STUDIES COMPLETED

DSO CORRECTIVE ACTION STUDY COMPLETED

VALUE PLANNING AND DEC REVIEW COMPLETED (IF REQUIRED)

SCHED

DESIGN TEAM FORMED

SCHEDULING ACTIVITIES INITIATED

PMP APPROVED:
- SCOPE OF WORK
- SCHEDULE
- STAFF RESOURCES DEFINED
- BUDGET

DESIGN TEAM:
- DETERMINE NEED FOR:
  - GEOLOGIC FIELD EXPLORATION
  - MATERIAL TESTING
  - HYDRAULIC MODEL
  - PILOT STUDY
- IDENTIFY SPECIAL STUDIES:
  - SEISMOTECTONIC
  - HYDROLOGIC
- IDENTIFY CLIENT GOALS AND REQUIREMENTS

CONCEPT

DEVELOP/REFINE INITIAL CONCEPT

REQUEST DESIGN DATA (DDR)

REQUEST GEOLOGIC DATA (FER)

REQUEST LAB TESTING

EVALUATE DESIGN, LAB, GEOLOGIC DATA FOR COMPLETENESS - REQUEST MORE AS NEEDED

DEVELOP ALTERNATIVE CONCEPTS (IF REQUIRED)

PREPARE 30% FINAL DESIGN COST ESTIMATES (RECOMMENDED)

IDENTIFY PREFERRED DESIGN CONCEPT COST, ADDITIONAL DATA REQUIREMENTS, AND REVISED SCHEDULE/RESOURCES

IDENTIFY ACQUISITION TYPE

PERFORM SECURITY REVIEWS (IF REQUIRED)

IDENTIFY TMs TO BE PREPARED

PREPARE DRAFT BASIS OF DESIGN DOCUMENT

HOLD MILESTONE CONCURRENCE BRIEFING AND SIGN DECISION DOCUMENT

RISK ANALYSIS (TSC)

DESIGN

ALL OUTSTANDING DESIGN DATA IS RECEIVED AND INCORPORATED INTO DESIGNS

COMPLETE LABORATORY TESTING (HYDRAULIC MODELS INCLUDED)

PREPARE DRAFT GEOLOGIC DESIGN REPORT

COMPLETE ANALYSIS OF STRUCTURES, FOUNDATIONS, EQUIPMENT AND SYSTEMS

DESIGN FEATURES AND IDENTIFY BORROW AND DISPOSAL AREAS

IDENTIFY AND COORDINATE DESIGN DETAILS ACROSS TECHNICAL DISCIPLINES

DEVELOP DRAFT SPECIFICATIONS DRAWINGS

COMPLETE VE STUDY (>$1,000,000)

PREPARE DRAFT VE ACCOUNTABILITY REPORT

PREPARE DRAFT CONSTRUCTION SCHEDULE

PERFORM CONSTRUCTABILITY REVIEW

PREPARE DRAFT SPECIFICATIONS TABLE OF CONTENTS, BID SCHEDULE, DIVISION I PARAGRAPHS, AND DRAWING LIST

PREPARE DRAFT TMs AND IDENTIFY ADDITIONAL TMs TO BE PREPARED

UPDATE BASIS OF DESIGN DOCUMENT

COORDINATE WITH PM ON REQUIRED PERMITS AND ENVIRONMENTAL REVIEWS

PREPARE 60% FINAL DESIGN COST ESTIMATE (OPTIONAL)

HOLD MILESTONE CONCURRENCE BRIEFING AND SIGN DECISION DOCUMENT

DRAFT SPEC

SPEC COORDINATOR RECEIVES DRAFT DRAWINGS FROM THOSE DISCIPLINES THAT REQUIRE PARAGRAPH PREPARATION

COMPLETE ALL DRAWINGS THROUGH TECHNICAL APPROVAL REVIEW

COMPLETE DRAFT SPECIFICATIONS - ALL DESIGN GROUPS

SUBMIT DRAFT SPECIFICATIONS AND TECHNICALLY APPROVED DRAWINGS TO SPECIFICATIONS COORDINATOR (TASPEC)

COMPLETE AND APPROVE FINAL TMs

FINALIZE BASIS OF DESIGN DOCUMENT

COMPLETE TASPEC REVIEW OF SPECIFICATIONS PACKAGE

REVISE SPECIFICATIONS

PREPARE 90% FINAL DESIGN COST ESTIMATE (OPTIONAL)

AT 90% FINAL DESIGN:
- DRAFT SPECIFICATIONS PACKAGE SUBMITTED TO CONTRACTING OFFICE
- MEMO SENT TO ALL INVOLVED PARTIES THAT DRAFT SPEC AND DRAWINGS WERE SENT, INFO ON REVIEWC MEETING, AND INSTRUCTIONS ON COORDINATING COMMENTS

NEPA PROCESS

REVIEW

INVOLVED PARTIES REVIEW DRAFT SPEC PACKAGE AND DOCUMENT COMMENTS

DESIGN TEAM REVIEWS DRAFT SPEC TO ENSURE THAT CHANGES/REVISIONS DISCUSSED AT TASPEC REVIEW HAVE BEEN MADE

REVIEW MEETING IS HELD WITH INVOLVED PARTIES AND THE DESIGN TEAM (2-5 DAYS)

PREPARE FINAL REVIEW MEETING NOTES THAT LIST AREAS OF DISCUSSION, SCHEDULES, AND INDIVIDUALS RESPONSIBLE FOR FOLLOW-UP ACTIONS

HOLD REVIEWC CLOSEOUT BRIEFING AND SIGN DECISION DOCUMENT

FINAL SPEC

CHANGES DISCUSSED AND AGREED TO AT REVIEWC ARE MADE TO THE SPEC AND DRAWINGS BY APPROPRIATE DESIGN TEAM MEMBER - ADDITIONAL INFO OR DATA, IF REQUIRED, IS PROVIDED TO THE DESIGN TEAM

FINAL DRAWINGS SIGNED THRU PEER REVIEW ARE SENT TO SPEC COORDINATOR, WHO REVIEWS THE DRAWING LIST WITH THE TITLE BLOCKS, AND PROVIDES PAGE OR SHEET NUMBERS

SPECIFICATIONS SIGNATURE SHEET SIGNED THROUGH TECHNICAL APPROVAL

FINAL SPEC AND DRAWINGS IN PDF FORMAT SENT TO CONTRACTING OFFICE

FOR RFP: DESIGN TEAM AND CE DEVELOPS EVALUATION CRITERIA AND DELIVERS TO CO

FINAL QUANTITIES FURNISHED TO THE ESTIMATOR

PREPARE 100% FINAL DESIGN COST ESTIMATE (OPTIONAL)

START PREVAL COST ESTIMATE (REQUIRED)

AMEND DPR

BOOKPRE

FINALIZE VE ACCOUNTABILITY REPORT (>$1,000,000)

FUNDING REQUIREMENTS (PREVAL ESTIMATE) FURNISHED TO CO BY ESTIMATOR

CONTRACTING OFFICE PREPARES FOR ISSUING THE FINAL SOLICITATION/SPEC

CONTRACTING OFFICE ENTERS PURCHASE REQUEST IN FBMS

CO SUBMITS SOCIO-ECONOMIC SCREENING FORM

CO SUBMITS DRAFT SOLICITATION FOR REVIEW

PRESOLICITATION NOTICE ISSUED BY CONTRACTING OFFICE AT LEAST 15 DAYS BEFORE ISSUE

CO POSTS SOLICITATION ON FBO WEBSITE

BID

IFB

SPECIAL INSPECTION REQUIREMENTS RESOURCED

PRE-BID INFORMATION MEETING CONDUCTED BY CONTRACTING OFFICE

AMENDMENTS PREPARED AND SENT TO CONTRACTING OFFICE

AMENDMENTS ARE ISSUED BY CONTRACTING OFFICE

IGCE PREPARED AND TRANSMITTED TO CO (REQUIRED)

BIDS OPENED BY CONTRACTING OFFICE

RFP

SPECIAL INSPECTION REQUIREMENTS RESOURCED

PRE-PROPOSAL CONFERENCE CONDUCTED BY CONTRACTING OFFICE

AMENDMENTS PREPARED AND SENT TO CONTRACTING OFFICE

AMENDMENTS ARE ISSUED BY CONTRACTING OFFICE

IGCE PREPARED AND TRANSMITTED TO CO

TECHNICAL PROPOSAL EVALUATION COMMITTEE (TPEC) EVALUATE PROPOSALS

TPEC SENDS EVALUATION OF TECHNICAL PROPOSALS MEMORANDUM TO CO

AWARD

IFB

ADDRESS PROTESTS

BIDS EVALUATED

CO DETERMINES CONTRACTOR RESPONSIBILITY

CONTRACT AWARDED

DRAFT DESIGN SUMMARY DISTRIBUTED

RFP

CO PREPARES PRENEGOTIATION MEMORANDUM

CO DETERMINES CONTRACTOR RESPONSIBILITY

CONTRACT AWARDED

DEBRIEF OFFERORS

ADDRESS PROTESTS (IF REQUIRED)

DRAFT DESIGN SUMMARY DISTRIBUTED

CONSTR

CO ISSUES NOTICE TO PROCEED

CONTRACTOR PERFORMS CONSTRUCTION ACTIVITIES

DESIGN TEAM:
- PARTICIPATES IN READINESS REVIEW, PRECONSTRUCTION, AND CONCRETE PREPLACEMENT MEETINGS
- PREPARES REVISIONS AND CORRESPONDING COST ESTIMATES TO MODIFY THE CONTRACT (IF REQUIRED)
- REVIEWS CONTRACTOR'S RSNs AND RFIs
- INSPECTS AND APPROVES FOUNDATIONS
- PROVIDES TECHNICAL ASSISTANCE
- PROVIDES TECHNICAL ANALYSIS OF CLAIMS
- PREPARES FOUNDATION ACCEPTANCE SUMMARY MEMORANDUMS

CE:
- PERFORMS FIELD AND FACTORY INSPECTIONS
- ASSISTS IN DEVELOPING AND IMPLEMENTING ACCEPTANCE TEST PROCEDURES
- TECHNICAL ACCEPTANCE OF FIELD MODIFICATIONS
- MONITORS PROGRESS OF WORK
- LISTS ALL OUTSTANDING PROJECT REQUIREMENTS WHICH HAVE NOT BEEN COMPLETED
- ACCEPTS THE WORK AS SUBSTANTIALLY COMPLETE

CONSTR (SUB-COMP)

REVIEW ALL RSNs FOR COMPLETION

ENSURE AS-BUILTS ARE COMPLETE

ASSIST IN PREPARATION OF PUNCH LIST FOR COMPLETION

ASSIST IN EQUIPMENT CHECKOUT AND STARTUP

PERFORM WARRANTY INSPECTIONS

ASSIST WITH FINAL INSPECTION

ACCEPTANCE OF ALL WORK AS COMPLETE

COMP

ANALYSIS OF CLAIMS

PROVIDE EXPERT TESTIMONY

ASSISTANCE IN STARTUP AND INITIAL O&M

CO ACCEPTS RELEASE OF CLAIMS

FINAL REPORT OF CONSTRUCTION PREPARED

COMPLETE CONTRACT CLOSE OUT

FINALIZE DESIGN SUMMARY AND DOC

HOLD LESSONS LEARNED MEETING

LEGEND

CE:	CONSTRUCTION ENGINEER
CO:	CONTRACTING OFFICER
DDR:	DESIGN DATA REQUEST
DEC:	DESIGN, ESTIMATING, AND CONSTRUCTION
DOC:	DESIGNER'S OPERATING CRITERIA
DSO:	DAM SAFETY OFFICE
FBMS:	FINANCIAL AND BUSINESS MANAGEMENT SYSTEM
FBO:	FEDERAL BUSINESS OPPORTUNITIES
FER:	FIELD EXPLORATION REQUEST
IFB:	INVITATION FOR BID
IGCE:	INDEPENDENT GOVERNMENT COST ESTIMATE
PM:	PROJECT MANAGER
PMP:	PROJECT MANAGEMENT PLAN
PMT:	PROJECT MANAGEMENT TEAM
PREVAL:	PREVALIDATION
RFI:	REQUEST FOR INFORMATION
RFP:	REQUEST FOR PROPOSAL
RSN:	REQUIRED SUBMITTAL NUMBER
TM:	TECHNICAL MEMORANDUM
VE:	VALUE ENGINEERING

FIGURE 2