



REPLY TO  
ATTENTION OF

**DEPARTMENT OF THE ARMY**  
U.S. ARMY CORPS OF ENGINEERS, SOUTH ATLANTIC DIVISION  
60 FORSYTH STREET SW, ROOM 10M15  
ATLANTA, GA 30303-8801

CESAD-RBT

22 March 2018

MEMORANDUM FOR COMMANDER, JACKSONVILLE DISTRICT

SUBJECT: Approval of Review Plan for Civil Works (Design Package 4) of the Caloosahatchee River (C-43) West Basin Storage Reservoir Project, Hendry County, Florida

1. References:

a. Memorandum, CESAJ-EN-Q, 5 March 2018, Subject: Approval of Review Plan for Civil Works of the Caloosahatchee River (C-43) West Basin Storage Reservoir Project, Hendry County, Florida (Encl 1)

b. Memorandum, CEIWR-RMC, 10 Jan 2018, Risk Management Center Endorsement – Civil Works (Design Package 4) of the Caloosahatchee River (C-43) West Basin Storage Reservoir Project, Review Plan (Encl 2)

c. EC 1165-2-214, Civil Works Review, 15 December 2012

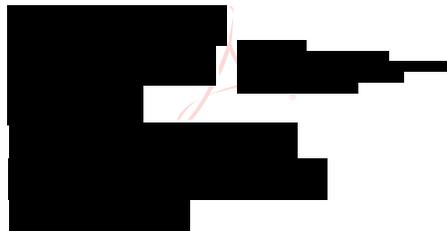
2. The Review Plan (RP) for Civil Works (Design Package 4) of the Caloosahatchee River (C-43) West Basin Storage Reservoir Project submitted by the Jacksonville District via reference 1.a and endorsed by the Risk Management Center (RMC) via reference 1.b has been reviewed by this office and is hereby approved in accordance with reference 1.c.

3. The RMC will serve as the Review Management Organization for the C-43 West Basin Storage Reservoir Project. SAD concurs with the conclusion of the Jacksonville District and the RMC that a Type II Independent External Peer Review (IEPR) is required on the design and construction efforts for this project.

4. The District should take steps to post the approved RP to its web site and provide a link to CESAD-RBT and the RMC Senior Review Manager [REDACTED]. Before posting to the web site, the names of Corps/Army employees should be removed. Subsequent significant changes to this RP, such as scope changes or level of review, should they become necessary, will require new written approval from this office.

5. The SAD point of contact is [REDACTED]

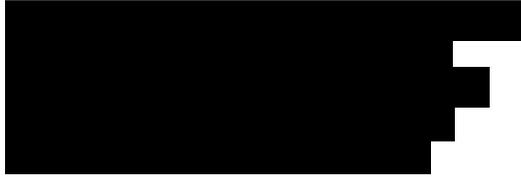
Encl



CESAD-RBT

SUBJECT: Approval of Review Plan for Civil Works (Design Package 4) of the Caloosahatchee River (C-43) West Basin Storage Reservoir Project, Hendry County, Florida

CF:





DEPARTMENT OF THE ARMY  
JACKSONVILLE DISTRICT CORPS OF ENGINEERS  
701 San Marco Blvd.  
JACKSONVILLE, FLORIDA 32207

REPLY TO  
ATTENTION OF

CESAJ-EN-Q

5 MAR 2018

MEMORANDUM FOR Commander, South Atlantic Division (CESAD-RBT), 60 Forsyth Street SW, 10M15, Atlanta, GA 30303

SUBJECT: Approval of Review Plan for Civil Works of the Caloosahatchee River (C-43) West Basin Storage Reservoir Project, Hendry County, Florida

1. References:

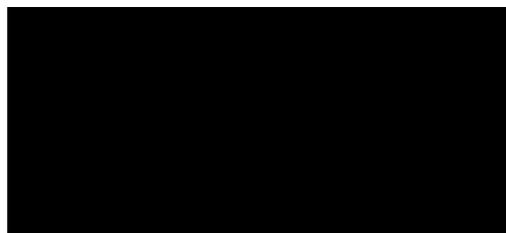
- a. EC 1165-2-214, Civil Works Review, 15 Dec 12
- b. WRRDA 2014; PL 113-121, 10 Jun 14 (Project Authorization)
- c. Risk Management Center Endorsement of Civil Works (Design Package 4) of the Caloosahatchee River (C-43) West Basin Storage Reservoir Project Review Plan, 10 Jan 18

2. I hereby request approval of the enclosed Review Plan and concurrence with the conclusion that a Type II Independent External Peer Review (IEPR) of the subject project is required. The recommendation to perform a Type II IEPR is based on the EC 1165-2-214 Risk Informed Decision Process as presented in the Review Plan. Documents to be reviewed include plans, specifications, and design documentation. The Review Plan complies with applicable policy, provides for technical review, and has been coordinated with CESAD and the Risk Management Center. It is my understanding that non-substantive changes to this Review Plan, should they become necessary, are authorized by CESAD.

3. The district will post the CESAD approved Review Plan to its website and provide a link to the CESAD for its use. Names of Corps/Army employees will be withheld from the posted version, in accordance with guidance.

4. If you have any questions regarding the information in this letter, please feel free to contact me or contact [REDACTED]

Encl





**DEPARTMENT OF THE ARMY**  
U.S. ARMY CORPS OF ENGINEERS  
RISK MANAGEMENT CENTER  
12596 WEST BAYAUD AVE., SUITE 400  
LAKEWOOD, CO 80228

REPLY TO  
ATTENTION OF

CEIWR-RMC

10 Jan 2018

MEMORANDUM FOR: Commander, Jacksonville District, ATTN: CESAJ-EN-Q

SUBJECT: Risk Management Center Endorsement –Civil Works (Design Package 4) of the Caloosahatchee River (C-43) West Basin Storage Reservoir Project, Review Plan

1. The Risk Management Center (RMC) has reviewed the Review Plan (RP) for – Civil Works (Design Package 4) of the Caloosahatchee River (C-43) West Basin Storage Reservoir Project, dated 8 January 2018, and concurs that this RP complies with the current peer review policy requirements outlined in EC 1165-2-214 “Civil Works Review Policy”, dated 15 December, 2012.

2. This review plan was prepared by Jacksonville District, reviewed the RMC, and all RMC review comments have been satisfactorily resolved. For this project a Type II IEPR will be performed.

3. The RMC endorses this document to be approved by the MSC Commander. Upon approval of the RP, please provide a copy of the approved RP, a copy of the MSC Commander’s approval memorandum to the RMC Senior Review Manager

[REDACTED]

4. Thank you for the opportunity to assist in the preparation of this RP. Please coordinate all aspects of the Agency Technical Review and the Independent External Peer Review (as appropriate) efforts defined in the RP. For further information, please contact me at [REDACTED]

[REDACTED]

CF:

[REDACTED]

**Review Plan  
U.S. Army Corps of Engineers  
SAD Division  
SAJ District**

**Civil Works (Design Package 4) of the  
Caloosahatchee River (C-43) West Basin  
Storage Reservoir Project**

**MSC Approval Date:** ('Pending')

**Last Revision Date:** ('none')

THE INFORMATION CONTAINED IN THIS REVIEW PLAN IS DISTRIBUTED SOLELY FOR THE PURPOSE OF PREDISSEMINATION PEER REVIEW UNDER APPLICABLE INFORMATION QUALITY GUIDELINES. IT HAS NOT BEEN FORMALLY DISSEMINATED BY THE U.S. ARMY CORPS OF ENGINEERS. IT DOES NOT REPRESENT AND SHOULD NOT BE CONSTRUED TO REPRESENT ANY AGENCY DETERMINATION OR POLICY.



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## **1. Purpose and Requirements**

### **a. Purpose**

This Review Plan is intended to ensure a quality-engineering project is developed by the Corps of Engineers. This Review Plan has been developed for the Civil Works (Design Package 4) of the Caloosahatchee River (C-43) West Basin Storage Reservoir Project, Hendry County, Florida, hereafter called the Project. The Preloading and Demolition Feature (Design Package 1), Pump Station S-476 (Design Package 2), and Pump Station S-470 and Inflow Works (Design Package 3) are each covered in separate review plans. Design Package 4 is currently in the Pre-Construction, Engineering, and Design (PED) Phase. Design and construction of Design Packages 1 through 4 of the C-43 project are being performed by the non-federal sponsor, the South Florida Water Management District (SFWMD). This Review Plan was prepared in accordance with EC 1165-2-214, "Civil Works Review Policy". The Review Plan describes the scope of review for the current phase of work and shall layout a process that assures the correctness of the information shown. Upon approval, this review plan will be included into the Project Management Plan (PMP) for this project (P2 # 114458) as an appendix to the Quality Management Plan (QMP).

### **b. Guidance and Policy References**

- EC 1165-2-214, Civil Works Review Policy, 15 December 2012
- ER 1110-1-12, Quality Management, 31 Mar 2011
- ER 1110-2-1156, Safety of Dams – Policy and Procedure, 31 Mar 2014
- ER 1110-2-1150, "Engineering and Design for Civil Works Projects", 31 August 1999
- ER 10-1-51, "Organizations and Function, Roles and Responsibilities – Dam Safety Modification Mandatory Center of Expertise", 29 June 2012.
- SAJ EN QMS 02612, "SAJ EN Quality Assurance of Outside Resource Products: Civil Works", 4 December 2017
- Enterprise Standard (ES) 08025, "Government Construction Quality Assurance Plan and Project/Contract Supplements"
- Enterprise Standard (ES) 08026, "Three Phase Quality Control System"

### **c. Requirements**

This review plan was developed in accordance with EC 1165-2-214, which establishes an accountable, comprehensive, life-cycle review strategy for Civil Works products by providing a seamless process for review of all Civil Works projects from initial planning through design, construction, and operation, maintenance, repair, replacement and rehabilitation (OMRR&R). The EC outlines four levels of review: District Quality Control (DQC), Agency Technical Review (ATR), an Independent External Peer Review (IEPR), and a Policy and Legal Review. The RP identifies the most important skill sets needed in the reviews and the objective of the review and the specific advice sought, thus

setting the appropriate scale and scope of review for the individual project. This Review Plan should be provided to the PDT, DQC, ATR, and IEPR Teams.

#### **d. Review Management Organization**

The USACE Risk Management Center (RMC) is the Review Management Organization (RMO) for the project. Contents of this review plan have been coordinated with the RMC and the SAD Division, the Major Subordinate Command (MSC). In-Progress Review (IPR) team meetings with the RMC, SAD, and HQ will be scheduled on an “as needed” basis to discuss programmatic, policy, and technical matters. The SAD Dam Safety Program Manager will be the POC for vertical team coordination. This review plan will be updated for each new project phase. The Jacksonville District will assist the RMC with management of the ATR and IEPR reviews and development of the draft ATR and IEPR “charges”.

## **2. Project Description and Information**

### **a. Project Description**

The Caloosahatchee River (C-43) West Basin Storage Reservoir (CRWBSR) Project is located on approximately 10,480 acres of land in Hendry County, Florida, on the Berry Groves parcel of property under SFWMD ownership. It is situated south of the C-43 canal and east of the S-79 spillway (See Figure 1: Project Location Map).

### **b. Project Authorization**

The Caloosahatchee River (C-43) West Basin Storage Reservoir Project was authorized for construction in the Water Resources Development Act of 2014.

### **c. Current Project Description**

The purpose of the Caloosahatchee River (C-43) West Basin Storage Reservoir Project is to improve the ecological function of the Caloosahatchee Estuary by capturing and storing excess surface water runoff from the Caloosahatchee River (C-43 Canal) basin and excess releases from Lake Okeechobee, and then releasing the stored water to augment inadequate flows during the dry season to the Caloosahatchee Estuary. The Comprehensive Everglades Restoration Plan (CERP) identifies restoration of the Caloosahatchee Estuary as an integral step in achieving system-wide benefits in the south Florida ecosystem.

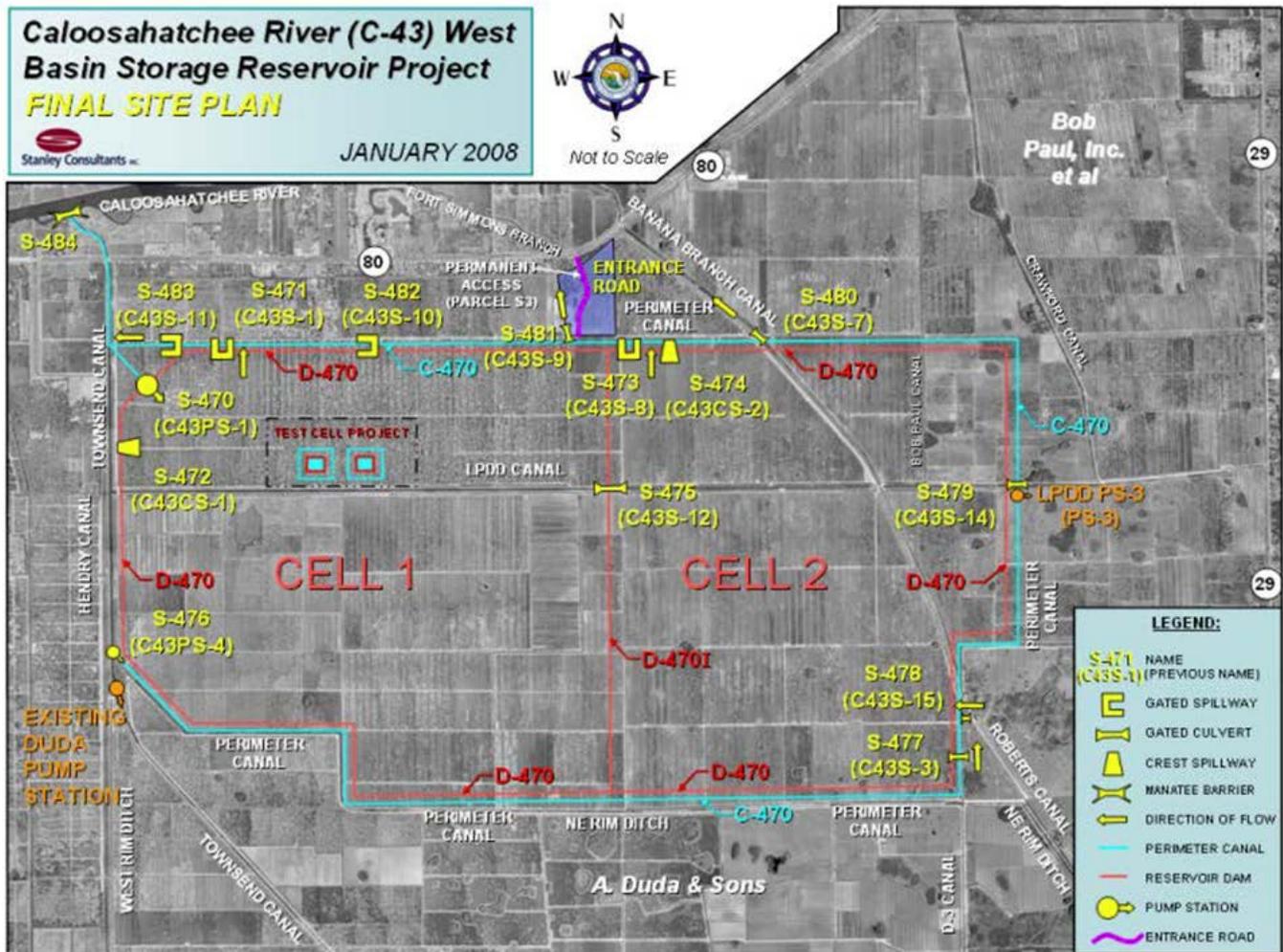


Figure 1: Project Location Map

The C-43 project will construct a dam (D-470) creating a two cell reservoir covering approximately 9,000 acres with a total storage capacity of approximately 170,000 acre-feet. The reservoir will be filled with a 1,500 cubic feet per second (CFS) pump station (S-470) drawing water from the Caloosahatchee River (C-43 Canal) via the Townsend Canal during periods of discharge in the C-43 Canal. The reservoir will be bounded with a perimeter canal providing irrigation water supply and drainage to surrounding land owners who currently have water supply and drainage through pump stations and canals passing through the reservoir footprint.

#### d. Project Background

The Caloosahatchee River (C-43) West Basin Storage Reservoir project design was completed to the Final design level by Stanley Consultants in 2008 under contract with the SFWMD. The design was subjected to technical reviews following the SFWMD Project Quality Control Plan (Attachment 4), which included participation by Jacksonville

District Corps of Engineers (CESAJ). Each design submittal was reviewed according to Stanley Consultant's Quality Control Plan accompanied by a signed Quality Certificate of Compliance. Each phase of the design was reviewed with all review comments captured in DrChecks. All comments were evaluated and closed in backchecks. Technical Review Briefings were conducted at the Preliminary and Final design phases, where SFWMD Management authorized the design to be advanced to the next phase. Comments, evaluations, and backchecks for these reviews can be provided by SFWMD upon request to the review teams covered by this review plan.

Following the State of Florida decision to suspend funding for the project in 2008, the design contract was terminated, and the project was shelved. At that time, the final design was complete, and all permits associated with the project had been obtained. The Project Delivery Team continued work to produce the Final Integrated Project Implementation Report (PIR) and Final Environmental Impact Statement (EIS) in March 2010 with the Record of Decision in April 2011. In addition, a Pre-Partnership Credit Agreement was executed in August 2009, which allowed for the preparation of lands for project purposes, investigations to identify the existence and extent of hazardous substances, clean-up of hazardous materials associated with historic application of fertilizers or pesticides for restoration purposes if necessary, and investigations to determine the presence of cultural or historical resources.

In 2014 following large releases from Lake Okeechobee to the Caloosahatchee Estuary, the SFWMD received funding from the Florida legislature for an "Early Start" project intended to store water in a shallow impoundment on the southwest quadrant of the project site by constructing a berm approximately 10 miles in length along with the S-476 Pump Station. The SFWMD began design efforts in the fall of 2014 and awarded the first construction contract for the berm in January 2015.

Prior to execution of the Early Start berm contract, the Governor issued a statement committing to fully fund the State's share of the project. The SFWMD withheld execution of the Early Start Berm construction contract and prepared a plan for finalizing the design and proceeding to construction of the C-43 Reservoir project.

With the Florida legislature being the funding source for the project rather than ad valorem revenues, the SFWMD broke the project into smaller phases for release of construction contracts consistent with an annual appropriation. The phasing plan, while sequencing the construction differently than originally planned in 2008, was determined necessary to begin showing progress to encourage continuing legislative appropriations while still targeting an aggressive project completion date. SFWMD elected to break the project into 4 separate bid packages as follows. Package 4 is covered by this review plan, while Packages 1, 2, and 3 are each covered in separate review plans.

## **e. Design Packages**

### Design Package 1: Preloading and Site Demolition – Under Construction

Design Package 1 includes the preloading of the locations for structures S-470, S-471, S-472, S-473, S-474, S-475, and a segment of the dam D-470 adjacent to the Townsend Canal. Site Demolition associated with Design Package 1 will consist of removal of all above ground agricultural buildings, irrigation system components, and culverts within the project area, as well as demolition of the test cells.

Construction of this package was awarded in August 2015, and the Notice to Proceed was issued on 10 November 2015 with completion in 2017.

### Design Package 2: Pump Station S-476 – Under Construction

This package will deliver the updated design for irrigation water supply pump station S-476. With the currently planned construction schedule, a recirculation pipeline will be included to allow commissioning, operational testing, and routine exercising of the pumps until the perimeter canal is ready to receive irrigation supply water.

Construction of this package was awarded in March 2015, and the Notice to Proceed was issued on 3 June 2016 with completion scheduled for 2018.

### Design Package 3: Pump Station S-470 and Inflow Works

The S-470 pump station design package will include the pumps and all associated equipment. However, it will not include the discharge pipes and stilling basin, which will be included in the Package 4: Civil Works. The scope of Package 3 is the pump station, the SR80 bridge protection features, and the Townsend Canal widening from SR80 north to the confluence with the Caloosahatchee River. This package originally included the intake canal and the Townsend Canal widening north to SR80, but questions about seepage management and slope stability needed more time to resolved than allowed by the schedule, and the potential overlap with Package 4 resulted in the decision to move these project features to Package 4.

The 2008 plans included a Manatee Barrier at the confluence of the Townsend Canal with the C43 Canal, but US Fish and Wildlife and the Florida Conservation Commission have agreed to hold off on construction of this feature if operations of the reservoir can demonstrate that the barrier is not needed to prevent manatees from seeking refuge in the Townsend Canal during the winter months.

The planned schedule for construction of the pump station is to award a construction contract in 2018 with construction completion planned for 2022. Commissioning, operational testing, and scheduled exercising of the pumps will require design of temporary facilities to circulate water back to the Townsend Canal. The microwave tower and communication building will be included in this package for on-site SCADA communications as well as communication with the SFWMD Operations Control room in

West Palm Beach with a redundant path to be defined. The communication package includes GOES communication for relay of dam safety data to the Corps Jacksonville District.

#### Design Package 4: Civil Works

The Civil Works design package will include removal of the preload mounds constructed in Package 1, excavation of the perimeter canal, construction of the perimeter canal control structures, construction of the dam D-470 and all associated water control structures, widening of the Townsend Canal, pump station S-470 discharge works, and public recreation facilities. It will also include detailed construction phasing, access and sequencing for excavations and filling while maintaining irrigation supply and storm water management for the adjacent agricultural operations and landowners.

The 2008 design included several water control and conveyance structures in the dam and perimeter canal. A workshop was conducted between the SFWMD, the USACE and the Consultant to review the basis of design for the structures and found that significant modifications to the structures are required. A revised basis of design Hydraulic Report will be provided as a separate review document as part of the Preliminary design phase.

In Design Package 3, pump station S-470 will be designed with temporary facilities to recirculate water back to the Townsend Canal for commissioning, operational testing, and routine exercising of the pumps. Therefore, Design Package 4 will include demolition and abandonment of the temporary facilities and include the S-470 discharge pipes into the reservoir.

The design shall also include facilities and sequencing in the specifications and schedule to continue water supply and storm water management during construction to the agricultural producers to the north and east of the project boundary who are currently receiving water from the LPDD pump stations through the Header Canal and other ditches throughout the site. Commissioning of Pump Station S-476 from Package 2 will be completed prior to completion of the perimeter canal. The Package 4 design shall include requirements for completing connection of S-476 to the perimeter canal, including the discharge structure and water level monitoring station, and abandonment of the S-476 bypass facilities. The design shall provide for sequencing the perimeter canal and water control structures to be tested, commissioned and operable prior to demolition of the existing LPDD Pump Stations 1, 2 and 3 as well as plugging of the Header Canal or other ditches and drainage features throughout the site. Removal of the FPL feeder electrical service and poles shall not be allowed until the LPDD pump stations are removed from service and the S-476 rerouting of water supply deliveries has been completed.

SFWMD currently plans to construct both Cells 1 and 2. However, if legislative negotiations indicate that appropriations will be insufficient to meet the construction cash flow needs, the design may be modified at a later date to construct the cells in two phases.

This review plan is for construction of the entire project, including both cells. In the event funding or any other reason alters the construction to only one cell, the review plan will be revised and undergo additional reviews from USACE.

Production of the Dam Breach analysis, development of consequence zones, and preparation of the Emergency Action Plan (EAP) will be performed after Package 4 is in construction, excepting performance of a breach analysis to determine the rate of drawdown resulting from a breach for design and analysis of the soil cement armoring and drainage blanket.

#### **f. IEPR of 2008 Design**

To support the redesign effort, SFWMD contracted with Gannett Fleming in 2016 to perform an IEPR of the 2008 design. The 2016 IEPR of the 2008 Design Review Final Report produced recommendations that shall be considered by the Consultant in producing the Package 4 design, with exception of the dam breach analysis. As discussed in Section 5, the work order with Gannett Fleming also includes an IEPR of the future planned design of Package 4 including the DDR Addendum, the Intermediate Design, and the Final Design. The Safety Assurance Reviews are to be conducted concurrently with the SFWMD and Agency Technical Reviews. See paragraph 7.a for the Schedule of Reviews.

#### **g. Value Engineering**

According to ER 11-1-321 Value Engineering, USACE will verify that the required value analysis has been performed by the project sponsor. Due to the fact that the design had previously been completed in 2008 with the subsequent recognition of design changes to the stair step soil cement protection, SFWMD issued a Work Order to Gannett Fleming to perform a VE Study of the 2008 design.

The design team will consider the recommendations of the VE study in the development of the Package 4 Typical Sections Design Package during the preliminary design phase. Revisions to the design based on the recommendations included in the VE study shall be supported by the appropriate engineering and cost analysis. These analyses shall be sufficiently evaluated and optimized for cost effectiveness and meeting the design standards for the project.

#### **h. DDR Addendum**

A DDR Addendum has been produced at the preliminary design phase and contains technical memoranda based on the results of the Value Engineering Study and the 2016 IEPR of the 2008 design.

Upon completion of the evaluations the design of the dam and its primary components, a Typical Section Design Package has been incorporated into a memorandum for the recommended alternative. This package includes the design of the embankment as necessary to adequately define the primary features (design details for construction/installation are not included) for geometry, material composition, seawall

location and configuration and embankment protection. This document has been presented to a SFWMD Technical Review Briefing and has been approved as the basis of intermediate and final construction document production during subsequent design phases. Design typical sections includes sections associated with the perimeter and separator dams, transition areas, and features to address wildlife entrapment.

The DDR Addendum contains the following Technical Memoranda:

1. The IEPR of the 2008 Design recommended expanding the identification of the Potential Failure Modes (PFM) to ensure that the dam is designed for Resilience, Robustness, and Redundancy (3R's). In an effort to address this recommendation the design team identified the PFMs that apply to the dam, the dam segments where individual PFMs are most significant, and the design features to provide PFM mitigation. The dam components and conditions to be evaluated for PFM consists of locations where structures pass through or over the dam, where the dam crosses existing canal features, overtopping and over wash, rapid drawdown, internal erosion (i.e. piping) through the embankment and/or foundation soils, relief wells, limitations on future dredging of the Townsend Canal, reservoir inside corners, a defect in the soil-bentonite wall, the undetected presence of pre-existing irrigation and/or drainage piping, soil erosion at conduit joints, and animal burrows or ruts. The rapid drawdown analyses will be completed for the operational drawdown rate, the sudden drawdown associated with a dam breach, and the drawdown rate associated with setup and set-down in connection with the passage of a major wind event. ADICPR V4 will be used to model the breach analysis/reservoir drawdown. Discharges and erosion from water control structures and potential structure failure/misoperation resulting in perimeter canal draw down will also be evaluated. In all, 39 PFMs were identified and discussed in the Technical Memorandum.
2. The VE Study recommended a clay core within the embankment rather than a soil bentonite wall. The design team shall evaluate the feasibility of a bentonite amended soil vs. the soil bentonite wall within the embankment, or some combination thereof, including an analysis of constructability and cost. A Clay Core Technical Memorandum has been prepared. The embankment seepage and stability evaluation will be made for a single typical embankment section with four potential (elevations) for transition from soil bentonite wall to clay core materials.
3. A Technical Memorandum was prepared in June 2016 that updated the freeboard analysis and associated design options. The Civil Works package VE Study provided an additional option for a hydraulically engineered "seawall" allowing for potential reduction in the dam crest elevation. The sponsor's design team evaluated a number of options based upon the VE recommendation and a design recommendation regarding this alternative. A Wave Wall ("Seawall") Technical Memorandum has been prepared summarizing the findings of

incorporating a hydraulically engineered seawall into the design. The selection of the wall height was based upon discussions with the SFWMD project management team. The selected wave wall option will limit overwash to a rate demonstrated to not present a risk to the integrity of the dam. The wall layout shall prevent wildlife entrapment. The selected Typical Section (s) defines the final detailed configuration of the embankment and design of the integrated seawall.

The separator dam earthwork will be modeled using 3:1 side slopes. The analysis will consider keeping the crest of the separator dam consistent with the crest of the perimeter dam provided that it does not have a negative impact upon fetch.

The Technical Memorandum will include the design approach, supporting calculations and figures to depict the typical section(s) of the recommendation. Earthwork, slope protection and seawall volumes will be developed for the evaluation.

4. The VE Study recommended inclusion of a drainage blanket beneath the soil cement. The thickness and composition of the drainage blanket, and related drainage features for the slope protection will be evaluated. Pursuant to an IEPR request, documentation related to the selection of the thickness of the soil cement slope protection system will be included. A Soil Cement Technical Memorandum has been prepared which develops the design and details of implementation.
5. The IEPR recommended a parametric analysis of the shear strength and the permeability values utilized in the embankment seepage and stability analyses in order to ensure that the design meets the requirements of ER 1110-2-1156, Safety of Dams – Policy and Procedures, 31 March 2014. The design team completed a Shear Strength and Permeability Technical Memorandum that provided a parametric analysis of the shear strengths and permeability values for various embankment materials and foundation soil/rock strata to evaluate the sensitivity of the analyses results to the potential variation of material properties. This incorporated a statistical distribution of the field and laboratory test results for major strata, and rationale for selection of the range of values to be used in the parametric analysis. The parametric analysis demonstrated the variation in seepage and stability results for the range of values used.

Based upon the above evaluations, the design of the dam and its primary components a Typical Section Design Package has been incorporated into the memorandum for the recommended alternative. This package includes the design of the embankment as necessary to adequately define the primary features (design details for construction/installation are not included) for geometry, material composition, seawall location and configuration and embankment protection. This approved Typical Section Package will be the

basis of intermediate and final construction document production during subsequent design phases of work.

### **3. Quality Control by Non-Federal Sponsor**

The design will be subjected to quality control reviews by the non-federal sponsor and their consultant, Carollo Engineers, as outlined in the SFWMD Quality Control Plan (Attachment 4), SFWMD Design and Engineering Review Process (Attachment 5), and Carollo Engineers Quality Control Plan (Attachment 6).

## **4. Agency Technical Review**

### **a. Requirements**

ATR is mandatory for all implementation documents (including supporting data, analyses, environmental compliance documents, etc.). This project will include a DDR Addendum ATR, an Intermediate Design Phase ATR, and a Final Design Phase ATR.

The objective of ATR is to ensure consistency with established criteria, guidance, procedures, and policy. The ATR will assess whether the analyses presented are technically correct, went through robust DQC, and comply with published USACE guidance, and that the document explains the analyses and results in a reasonably clear manner for the public and decision makers. Value added Lessons Learned from the ATR team should be shared early on to have the best chance of being adopted by the PDT. Most of the ATR effort should be accomplished midway through the design effort; after completion of design the ATR effort will check that the effort agreed to at mid-point was accomplished. This is consistent with the requirement that the ATR members shall not be involved in the day-to-day production of the project/product. A site visit will be scheduled for the ATR Team. If necessary, scanned copies of check prints for critical drawings will be provided to the ATR Team upon request to confirm that quality control was performed by the non-federal sponsor.

### **b. Documentation of ATR**

DrChecks review software will be used to document all ATR comments, responses and associated resolutions accomplished throughout the review process. Comments will be limited to those that are required to ensure adequacy of the product. The four key parts of a quality review comment will normally include:

- (1) The review concern – identify the product's information deficiency or incorrect application of policy, guidance, or procedures;
- (2) The basis for the concern – cite the appropriate law, policy, guidance, or procedure that has not been properly followed;
- (3) The significance of the concern – indicate the importance of the concern with regard to its potential impact on the plan selection, recommended plan components, efficiency (cost), effectiveness (function/outputs), implementation responsibilities, safety, Federal interest, or public acceptability; and

- (4) The probable specific action needed to resolve the concern – identify the action(s) that the reporting officers must take to resolve the concern.

**c. Comment Resolution**

In some situations, especially addressing incomplete or unclear information, comments may seek clarification in order to then assess whether further specific concerns may exist. The ATR documentation in DrChecks<sup>sm</sup> includes the text of each ATR concern, the PDT response, a brief summary of the pertinent points in any discussion, including any vertical team coordination (the vertical team includes the district, RMO, MSC, and HQUSACE), and the agreed upon resolution. If an ATR concern cannot be satisfactorily resolved between the ATR team and the PDT, it will be elevated to the vertical team for further resolution in accordance with the policy issue resolution process described in either ER 1110-1-12 or ER 1105-2-100, Appendix H, as appropriate. Unresolved concerns can be closed in DrChecks<sup>sm</sup> with a notation that the concern has been elevated to the vertical team for resolution. All supporting documentation containing the red/blue calculation markups as described in the guidelines of Attachment 6 shall be included whenever a submittal is made.

**d. Products to Undergo ATR**

Products scheduled to undergo ATR shall include a preliminary DDR Addendum and Intermediate and Final Design Phase project drawings, specifications, and design documentation reports. A Hydraulic Design Report will also be reviewed by USACE Hydrology and Hydraulics review team members.

**e. Required ATR Team Expertise and Requirements**

As stipulated ER 1110-1-12, ATR members will be sought from the following sources: regional technical specialists (RTS); subject matter experts (SME) certified in CERCAP; senior level experts from other districts; Center of Expertise staff; experts from other USACE commands; contractors; academic or other technical experts; or a combination of the above. The ATR Team will be comprised of the following disciplines; knowledge, skills and abilities; and experience levels.

Discipline	Package 4 Experience
ATR Team Leader	10
Civil	15
Structural	15
Mechanical	15
Electrical	15
Hydrogeology and Geology	15
Hydrology and Hydraulics	15
Geotechnical	15
NEPA Compliance	7



- ATR Team Leader. The ATR Team Leader must have performed ATR Team Leader duties on complex civil works projects and have experience with the Dam Safety Program. ATR Team Leader can also serve as one of the review disciplines. Registered professional engineer registration is a requirement for the ATR leader.
- Civil Engineering. The team member should be a registered professional engineer and experienced with civil/site work projects to include embankments, roads and highways, relocations, paving and drainage.
- Structural Engineering. The team member shall be a registered professional engineer with experience in structural design of flood risk management project features such as pump stations, conveyance culverts, and spillways. Experience with the Dam Safety Program is desired.
- Mechanical Engineering. The team member shall be registered professional engineer experienced in design of flood risk management project features such as pump stations, related systems, components and instrumentation and control. Experience with the Dam Safety Program is desired.
- Electrical Engineering. The team member shall be registered professional engineer experienced in design of flood risk management project features such as pump stations, related systems, components and instrumentation and control. Experience with the Dam Safety Program is desired.
- Hydrogeology and Geology. The team member will review subsurface geologic data and interpretations to support embankment and foundation design and integrity. The team member also will review hydrogeologic data and interpretations to support hydrologic and seepage modeling, and an evaluation of characteristics of the surficial aquifer at the site. The team member should possess Professional Geologist certification. Profession experience, especially focused in South Florida applications is required. Experience with the Dam Safety Program is required.
- Hydrology and Hydraulics. The team member will be required to review the hydraulic design, hydrologic-hydraulic modeling, and wind/wave analyses. The team member shall be registered professional engineers with experience in conducting and evaluating hydrologic and hydraulic analyses for flood risk management projects. Experience with flood routing methodologies in reservoirs and channels, seepage flow processes, hydrologic-hydraulic modeling, surface water-groundwater interaction modeling, wind/wave analysis, and performance of risk assessments is required. Knowledge on hydrologic and hydraulic analyses in terms of water quantity and quality in a water resources system is expected. Experience with the Dam Safety Program is required.
- Geotechnical Engineering. The team member shall be a registered professional engineer experienced in geotechnical engineering including geotechnical evaluation of flood risk management structures. Experience needs to encompass static and

dynamic slope stability evaluation; evaluation of the seepage through earthen embankments and under seepage through the foundation of the flood risk management structures, including dams, levee embankments, floodwalls, closure structures and other pertinent features; and settlement evaluations. Experience with the Dam Safety Program is required.

- NEPA Compliance. The team member should have 7 or more years of experience in NEPA compliance activities and preparation of Environmental Assessments and Environmental Impact Statements for complex civil/site work projects.

#### **f. Completion and Certification of the ATR**

At the conclusion of the ATR effort, the ATR team will prepare a Review Report summarizing the review. Review Reports will be considered an integral part of the ATR documentation and shall:

- (1) Identify the document(s) reviewed and the purpose of the review;
- (2) Disclose the names of the reviewers, their organizational affiliations, and include a short paragraph on both the credentials and relevant experiences of each reviewer;
- (3) Include the charge to the reviewers;
- (4) Describe the nature of their review and their findings and conclusions;
- (5) Identify and summarize each unresolved issue (if any); and
- (6) Include a verbatim copy of each reviewer's comments (either with or without specific attributions), or represent the views of the group as a whole, including any disparate and dissenting views.

ATR may be certified when all ATR concerns are either resolved or referred to the vertical team for resolution and the ATR documentation is complete. The ATR lead will prepare a completion of ATR and Certification of ATR. The Certification will certify that the issues raised by the ATR team have been resolved (or elevated to the vertical team). The completion and certification should be completed based on the work reviewed to date for the project. A Sample Completion of ATR and Certification of ATR are included in Attachment 1.

## **5. Independent External Peer Review /Safety Assurance Review**

### **a. Requirements**

An IEPR may be required for implementation documents under certain circumstances. IEPR is the most independent level of review, and is applied in cases that meet certain criteria where the risk and magnitude of the proposed project are such that a critical examination by a qualified team outside of USACE is warranted. A risk-informed decision, as described in EC 1165-2-214, is made as to whether IEPR is appropriate.

IEPR panels will consist of independent, recognized experts from outside of the USACE in the appropriate disciplines, representing a balance of areas of expertise suitable for the review being conducted.

Type II IEPR, or Safety Assurance Review (SAR), are managed outside the USACE and are conducted on design and construction activities for hurricane, storm, and flood risk management projects or other projects where existing and potential hazards pose a significant threat to human life. Type II IEPR panels will conduct reviews of the design and construction activities prior to initiation of physical construction and, until construction activities are completed, periodically thereafter on a regular schedule. The reviews shall consider the adequacy, appropriateness, and acceptability of the design and construction activities in assuring public health safety and welfare.

### **b. Type I Independent External Peer Review Determination**

Type I IEPR is generally for decision documents. No decision documents or other applicable Section 2034 products are addressed by this Review Plan. Therefore, Type I IEPR is not applicable to the implementation documents addressed by this Review Plan.

### **c. Type II Independent External Peer Review Determination**

The project features included in Design Package 4 are sufficient to trigger the WRDA 2014 Section 2035 factors for Safety Assurance Review (termed Type II IEPR in EC 1165-2-214). Therefore, a review under Section 2035 is warranted for Design Package 4. The factors in determining whether a Type II IEPR review of design and construction activities of a project is necessary are based on the EC 1165-2-214 Type II IEPR Risk Informed Decision Process. The following EC 1165-2-214 risk decision criteria are followed by a statement that forms the basis for the Type II IEPR determination for Design Package 4.

1. The Federal action is justified by life safety or the failure of the project would pose a significant threat to human life.

*The C-43 Reservoir is immediately adjacent to occupied residences, the Hendry County Emergency Operations Center, and is approximately 1/2 mile south of State Road 80, a major cross state highway and emergency evacuation route. A failure of the C-43 Reservoir would present a significant threat to human life.*

2. The project involves the use of innovative materials or techniques where the engineering is based on novel methods, presents complex challenges for interpretations, contains precedent-setting methods or models, or presents conclusions that are likely to change prevailing practices.

*The potential use of a hydraulic seawall to reduce the crest elevation of the dam is an innovative application of coastal engineering methods, and while not entirely precedent setting, is a relatively recent application of this practice.*

3. The project design lacks redundancy, resiliency, and robustness.

*The C-43 Reservoir is being designed to all applicable Corps guidance to provide sufficient redundancy, resiliency, and robustness.*

4. The project has unique construction sequencing or a reduced or overlapping design construction schedule; for example, significant project features accomplished using the Design-Build or Early Contractor Involvement (ECI) delivery systems.

*This project does not currently contain any unique construction sequencing or delivery systems, however the SFWMD is evaluating options to reduce the construction schedule to obtain an earlier beneficial use of the facility.*

Based on the discussion above, a Type II IEPR Safety Assurance Review will be performed on the P&S and DDR for Package 4: Civil Works. A site visit by the IEPR team has already been performed in addition to a peer review of the 2008 design documents as a mean to provide insight into potential areas of concern as the design is updated. A site visit may be required for IEPR team members that have not yet visited the site.

#### **d. Products to Undergo Type II IEPR**

Products scheduled to undergo ATR shall include a preliminary DDR Addendum and Intermediate and Final Design Phase project drawings, specifications, and design documentation reports. Reference paragraph 8.c.

#### **e. Required Type II IEPR Panel Expertise**

The following provides an estimate of the Type II IEPR panel members and the types of expertise that should be represented on the review panel. All panel members shall be recognized experts in their field and have specialized experience pertaining to the work being performed on this project. In addition, all panel members should have an advanced degree and be professionally registered.

For all disciplines required for the IEPR described below, the following experience level requirements apply:

- Level 1 reviewers shall have a minimum of 7 years of general experience in their field;
- Level 2 reviewers shall have a minimum of 10 years of specialized experience in their field;
- Level 3 reviewers shall have a minimum of 15 years of specialized experience and are considered to be a recognized expert in their field.
- Level 2 and Level 3 reviewers shall also have relevant dam and levee experience and experience in failure mode analysis and risk assessment of large complex systems with emphasis on dam and levee safety issues.
- Geotechnical Engineer (Level 3) Independent Expert shall be a registered professional geotechnical engineer from academia, a public agency, an Architect-Engineer or consulting firm with 20 or more years of experience in the field of geotechnical engineering for flood risk management infrastructure and dam safety evaluations; analysis, design, and construction of embankment dams and levees,



with a minimum MS degree or higher in engineering. The Geotechnical panel member shall have experience in subsurface investigations; soil mechanics; seepage and piping; slope stability evaluations; analysis of earthquake-induced embankment/structural deformation; dewatering and excavation in an active stream channels; soil compaction; earthwork construction; design and construction of foundations; retaining wall design; erosion protection design; levee and stream bank protection including sheet piling; soil cement; grouted riprap and stone protection; preparing plans and specifications for USACE projects, and knowledge of USACE design and construction procedures and policies. Experience with the Federal Dam Safety program is desired.

- Engineering Geologist (Level 3) Independent Expert shall be a registered professional geologist from academia, a public agency, an Architect-Engineer or consulting firm with 15 or more years of experience; and should have extensive experience in the types of work being performed. The Engineering Geology panel member should be proficient in assessing seepage and piping through and beneath dams constructed on or within various geologic environments, including but not limited to karstic and solution prone rock formations, and fractured & faulted rock. The Engineering Geology panel member should be familiar with identification of geological hazards, exploration techniques, field & laboratory testing, and instrumentation. The Engineering Geology panel member should be experienced in the design of grout curtains & cutoff walls and must be knowledgeable in grout rheology, concrete mix designs, and other materials used in foundation seepage barriers.
- Structural Engineer (Level 3) Independent Expert shall be a registered professional civil engineer from academia, a public agency, or an Architect-Engineer or consulting firm with 20 or more years of experience in engineering. The Structural Engineering Panel member should be a registered professional engineer from academia, a public agency, or an Architect-Engineer or consulting firm with 20 years of experience in conducting and evaluating structural analyses for project features such as pumping stations, conveyance culverts, spillways, shall have demonstrated knowledge regarding hydraulic structures, erosion control, earthwork, concrete placement, design of access roads, and relocation of underground utilities. Panel member should be familiar with similar projects across US. This panel member will be familiar with construction engineering and sequencing. Active participation in related professional societies is encouraged.
- Hydrology and Hydraulics (Level 3) Independent Expert shall be a registered professional from academia, a public agency, or an Architect-Engineer or consulting firm with 15 or more years of experience in conducting and evaluating hydrologic and hydraulic analyses for flood risk management projects. Experience with flood routing methodologies in reservoirs and channels, seepage flow processes, hydrologic-hydraulic modeling analyses, surface water-groundwater interaction modeling analysis, wind/wave analysis, and performance of risk assessments is required. Knowledge on hydrologic and hydraulic analyses in terms of water quantity and

quality in a water resources system is expected. Experience with the Dam Safety Program is desired. Active participation in related professional societies is encouraged.

- The Hydrogeology & Geology (Level 3) Independent Expert shall be a registered professional geologist from academia, a public agency, or an Architect-Engineer or consulting firm with 15 or more years of experience in conducting and interpreting hydrogeologic data from aquifer performance tests, ground water monitoring projects, and similar studies and analyses in confined and unconfined aquifers.
- Civil/Construction Engineering (Level 3) Independent Expert shall be a registered professional from academia, a public agency, or an Architect- Engineer or consulting firm with 15 or more years of experience in the design, layout, and construction of flood control structures including dams. The Civil/Construction Engineer shall have demonstrated knowledge regarding hydraulic structures, erosion control, earthwork, concrete placement, design of access roads, and relocation of underground utilities. Panel member should be familiar with similar projects across US. Experience with Federal Dam Safety Programs and participation in related professional societies are desired.
- Mechanical and Electrical Engineering (Level 3) Independent Expert shall be a registered professional from academia, a public agency, or an Architect- Engineer or consulting firm with 15 or more years of experience in mechanical and electrical engineering. Experience needs to include engineering and design of flood risk management project features such as pump stations, related systems, components and instrumentation and control. Experience with the Dam Safety Program is desired.
- IEPR Lead. The IEPR Lead is the liaison for the panel and shall be a registered engineer with the following qualifications:
  - i. Experience establishing and administering design, engineering, and construction independent external peer reviews,
  - ii. Free from conflicts of interest with the C43 West Storage Basin Reservoir and any related projects that will undergo IEPR, and
  - iii. Proven ability to deliver under significant time constraints.

#### **f. Documentation of Type II IEPR**

The Type II IEPR will be managed by an A-E firm which meets the criteria set forth in EC 1165-2-214. DrChecks<sup>sm</sup> review software may be used to document the Type II IEPR comments and aid in the preparation of the Review Report but is not required. The Final Review Report will be prepared by the A-E at the conclusion of the Final Design Phase IEPR.

This review report, including reviewer comments and a recommendation letter will be provided to the RMC as soon as they become available. Written responses to the IEPR Review Report will be prepared to explain the agreement or disagreement with the views

expressed in the report, the actions undertaken or to be undertaken in response to the report, and the reasons those actions are believed to satisfy the key concerns stated in the report (if applicable). These comment responses will be provided to the RMC for concurrence. The revised submittal will be provided to the RMO with the USACE response and all other materials related to the review.

## 6. Policy and Legal Compliance Review

These reviews culminate in determinations that the recommendations in the reports and the supporting analyses and coordination comply with law and policy, and warrant approval or further recommendation to higher authority by the home MSC Commander. Quality Control Reviews augment and complement the policy review processes by addressing compliance with pertinent published Army policies.

## 7. Review Schedule and Costs

### a. Schedule of Reviews

To the extent practical, reviews shall not extend the design schedule but shall be embedded in the design process. Reviewers shall be involved at key decision points and are encouraged to provide timely over the shoulder comments. An overall review schedule that shows timing and sequence of all reviews is provided below.

#### Package 4: Civil Works

<b>Activity</b>	<b>Start</b>	<b>Finish</b>
<b>Type II IEPR of 2008 Design</b>	01/08/16	02/06/16
<b>DDR Addendum</b>		
SFWMD Quality Control Review	03/15/17	04/05/17
USACE Agency Technical Review	03/15/17	04/05/17
Design Type II IEPR	03/15/17	04/05/17
Evaluate Comments	04/06/17	04/27/17
Backcheck/Close/Incorporate Comments	04/28/17	07/24/17
SFWMD Technical Review Briefing (TRB)	07/26/17	07/26/17
<b>Hydraulic Design Report</b>		
SFWMD Quality Control Review	01/03/18	01/24/18
USACE Agency Technical Review	01/03/18	01/24/18
Evaluate Comments	01/25/18	02/15/18
Backcheck/Close/Incorporate Comments	02/16/18	03/01/18
SFWMD Technical Review Briefing (TRB)	03/07/18	03/07/18
<b>Intermediate Plans and Specifications</b>		
SFWMD Quality Control Review	04/03/18	04/23/18
USACE Agency Technical Review	04/03/18	04/23/18
Design Type II IEPR	04/03/18	04/23/18
Evaluate Comments	04/24/18	05/09/18
Backcheck/Close/Incorporate Comments	05/11/18	05/25/18
SFWMD Technical Review Briefing (TRB)	06/06/18	06/06/18
<b>Draft Final Plans and Specifications</b>		



SFWMD Quality Control Review	08/03/18	08/23/18
USACE Agency Technical Review	08/03/18	08/23/18
Design Type II IEPR	08/03/18	08/23/18
Evaluate Comments	08/24/18	09/10/18
Backcheck/Close/Incorporate Comments	09/11/18	09/24/18
SFWMD Technical Review Briefing (TRB)	10/3/18	10/3/18
<b>Final Quality Control Review by SFWMD</b>	10/17/18	10/31/18

**b. Review Costs**

The review schedule is listed in the provided in the table in paragraph (a.) of this section. The total cost for the ATR activities at each level of design is approximately \$70,000 to \$80,000. The total cost for the Type II IEPR is in the range of approximately \$80,000 to \$150,000. The cost of the IEPR will be the responsibility of the non-Federal sponsor since it is responsible for the design and construction of Contract 4.

**c. Future Reviews**

The IEPR Type II contractor will be involved with the project through the construction phase and into the OMRR&R phase. More specific milestone dates will be added in the future during the construction phase, but it can be assumed to occur near the mid-point of construction and near the end of construction.

The SFWMD will also hire an A-E to review the Project Operations Manual (POM), the Initial Filling Plan, the full suite of Breach Routing, and the Emergency Action Plan (EAP). More specific milestone dates for these reviews will be added in the future updates to the review plan.

**8. Public Participation of Review Plan**

As required by EC 1165-2-214, the approved Review Plan will be posted on the District public website (<http://www.saj.usace.army.mil/Missions/CivilWorks/ReviewPlans.aspx>). The public will have 30 days to provide comments on the documents; after all comments have been submitted, the comments will be provided to the technical reviewers. This is not a formal comment period and there is no set timeframe for the opportunity for public comment. If and when comments are received, the PDT will consider them and decide if revisions to the review plan are necessary. This engagement will ensure that the peer review approach is responsive to the wide array of stakeholders and customers, both within and outside the federal government.

**9. Review Plan Approval and Updates**

The MSC for this Review Plan is SAD. The MSC Commander is responsible for approving this Review Plan. The Commander’s approval reflects vertical team input (involving the SAJ District, MSC, and RMC) as to the appropriate scope and level of review for the study and endorsement by the RMC. Like the PMP, the Review Plan is a living document and may change as the study progresses, the District is responsible for keeping the Review



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## ***Jacksonville District***

Plan up to date. Minor changes to the review plan since the last MSC Commander approval will be documented in Attachment 7 to this plan. Significant changes to the Review Plan (such as changes to the scope and/or level of review) should be re-endorsed by the RMC and re-approved by the MSC Commander following the process used for initially approving the plan. The latest version of the Review Plan, along with the Commanders' approval memorandum, will be posted on the District's webpage and linked to the HQUSACE webpage. The latest Review Plan should also be provided to the RMO and home MSC.

## ATTACHMENT 1: COMPLETION OF AGENCY TECHNICAL REVIEW

The Agency Technical Review (ATR) has been completed for the plans, specifications, and Design Documentation Report for Civil Works (Design Package 4) of the Caloosahatchee River (C-43) West Basin Storage Reservoir Project. The ATR was conducted as defined in the project's Review Plan to comply with the requirements of EC 1165-2-214. During the ATR, compliance with established policy principles and procedures, utilizing justified and valid assumptions, was verified. This included review of: assumptions, methods, procedures, and material used in analyses, alternatives evaluated, the appropriateness of data used and level obtained, and reasonableness of the results, including whether the product meets the customer's needs consistent with law and existing US Army Corps of Engineers policy. The ATR also assessed the District Quality Control (DQC) documentation and made the determination that the DQC activities employed appear to be appropriate and effective. All comments resulting from the ATR have been resolved and the comments have been closed in DrChecks<sup>sm</sup>.

SIGNATURE

Name

ATR Team Leader

Office Symbol/Company

Date

SIGNATURE

Name

Project Manager (home district)

Office Symbol

Date

SIGNATURE

Name

Architect Engineer Project Manager<sup>1</sup>

Company, location

Date

SIGNATURE



Date

### CERTIFICATION OF AGENCY TECHNICAL REVIEW

Significant concerns and the explanation of the resolution are as follows: Describe the major technical concerns and their resolution. As noted above, all concerns resulting from the ATR of the project have been fully resolved.

SIGNATURE

Name

Chief, Engineering Division (home district)

Office Symbol

Date

SIGNATURE

Name

Dam or Levee Safety Officer<sup>2</sup> (home district)

Office Symbol

Date

<sup>1</sup> Only needed if some portion of the ATR was contracted

<sup>2</sup> Only needed if different from the Chief, Engineering Division.

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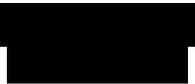
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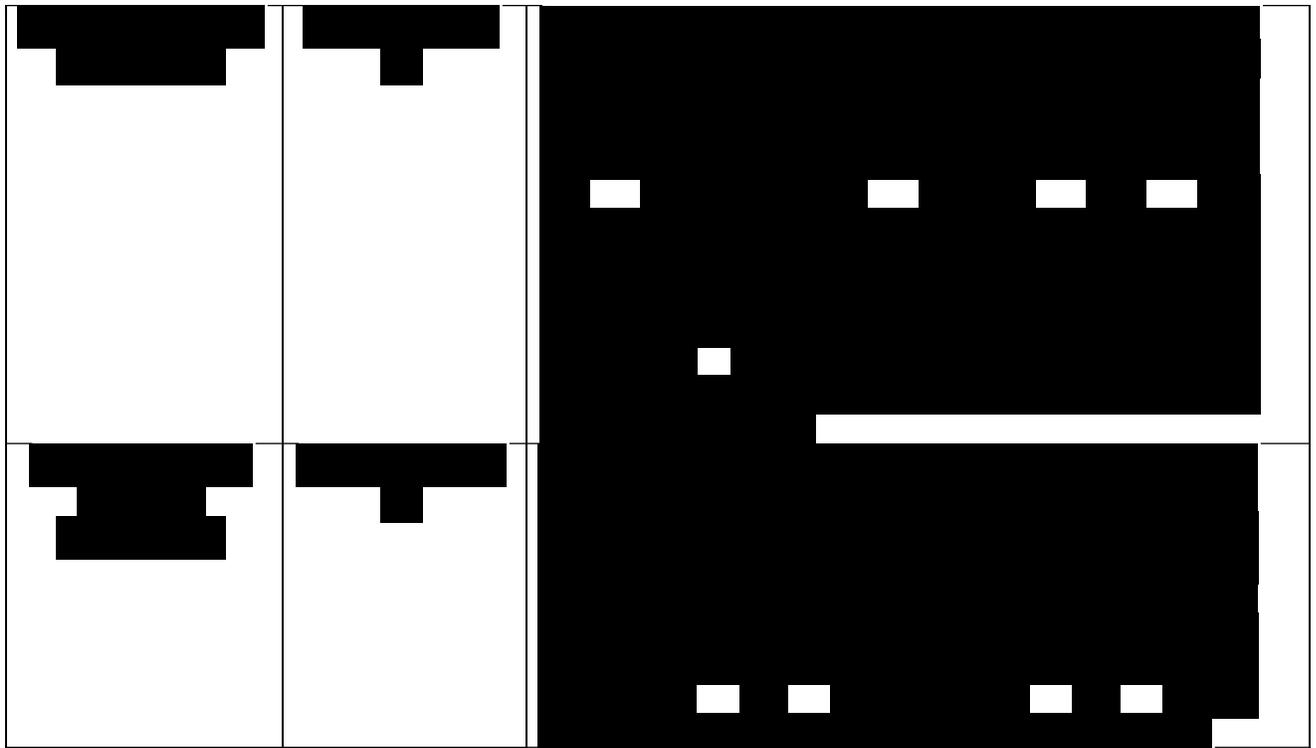


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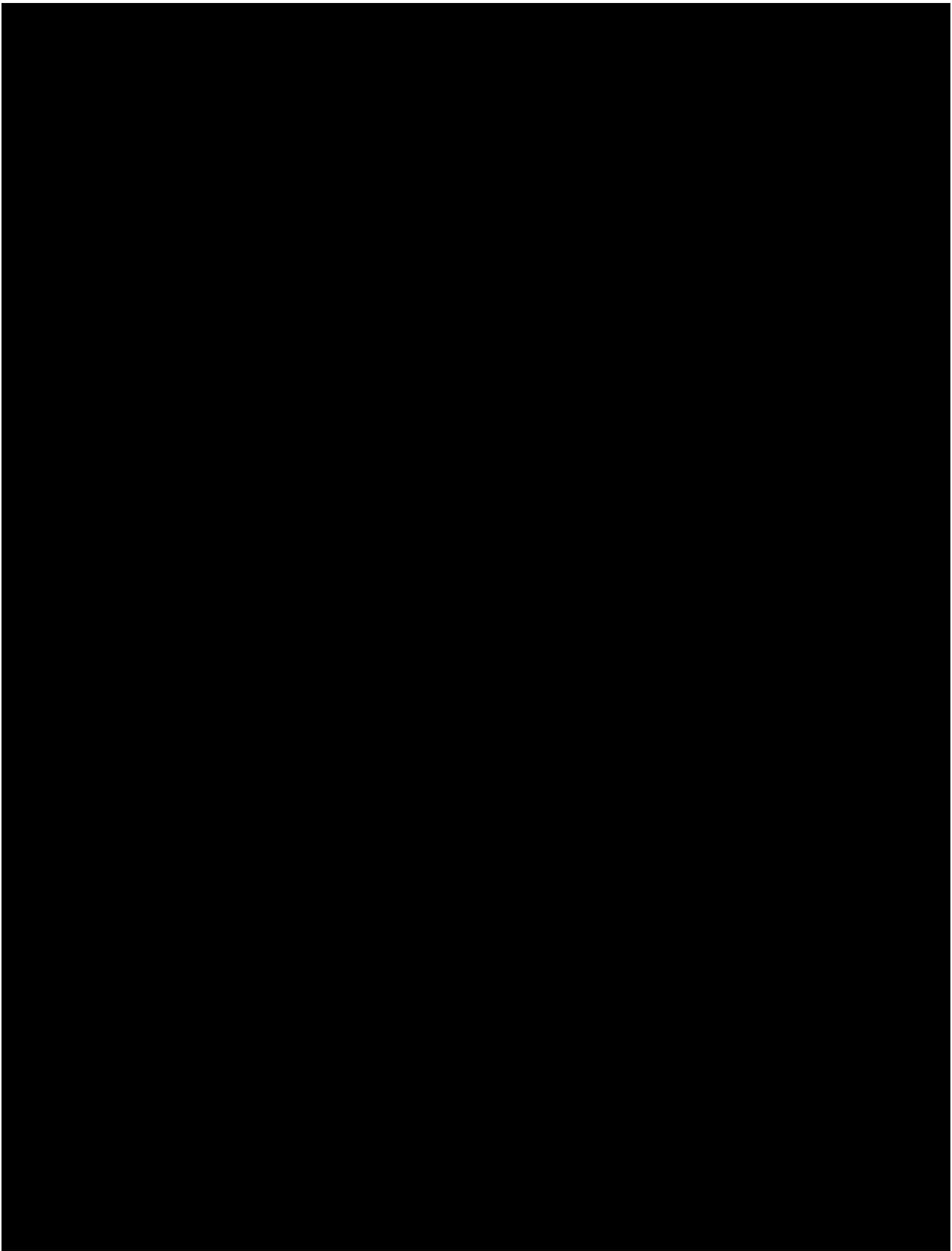
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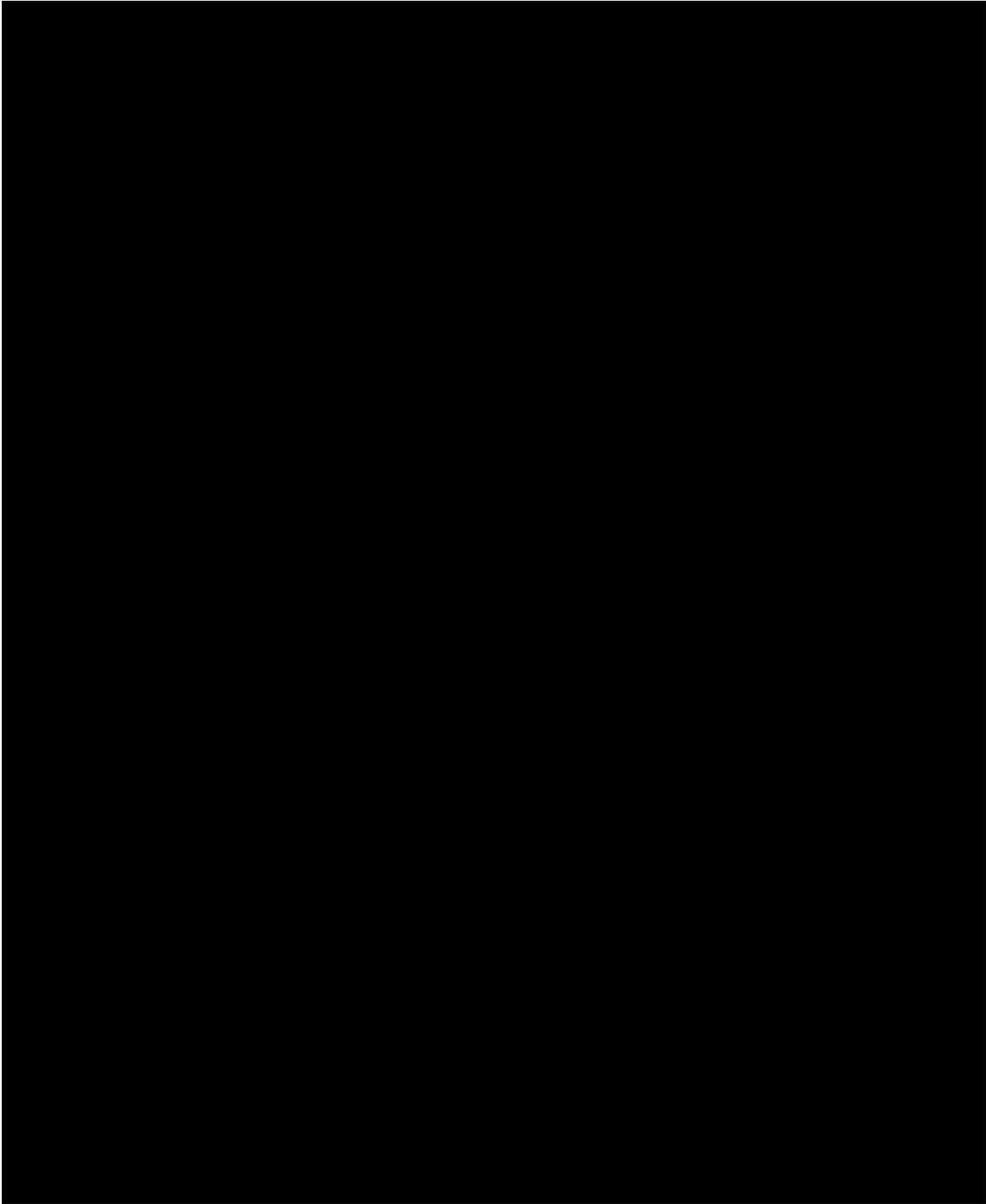


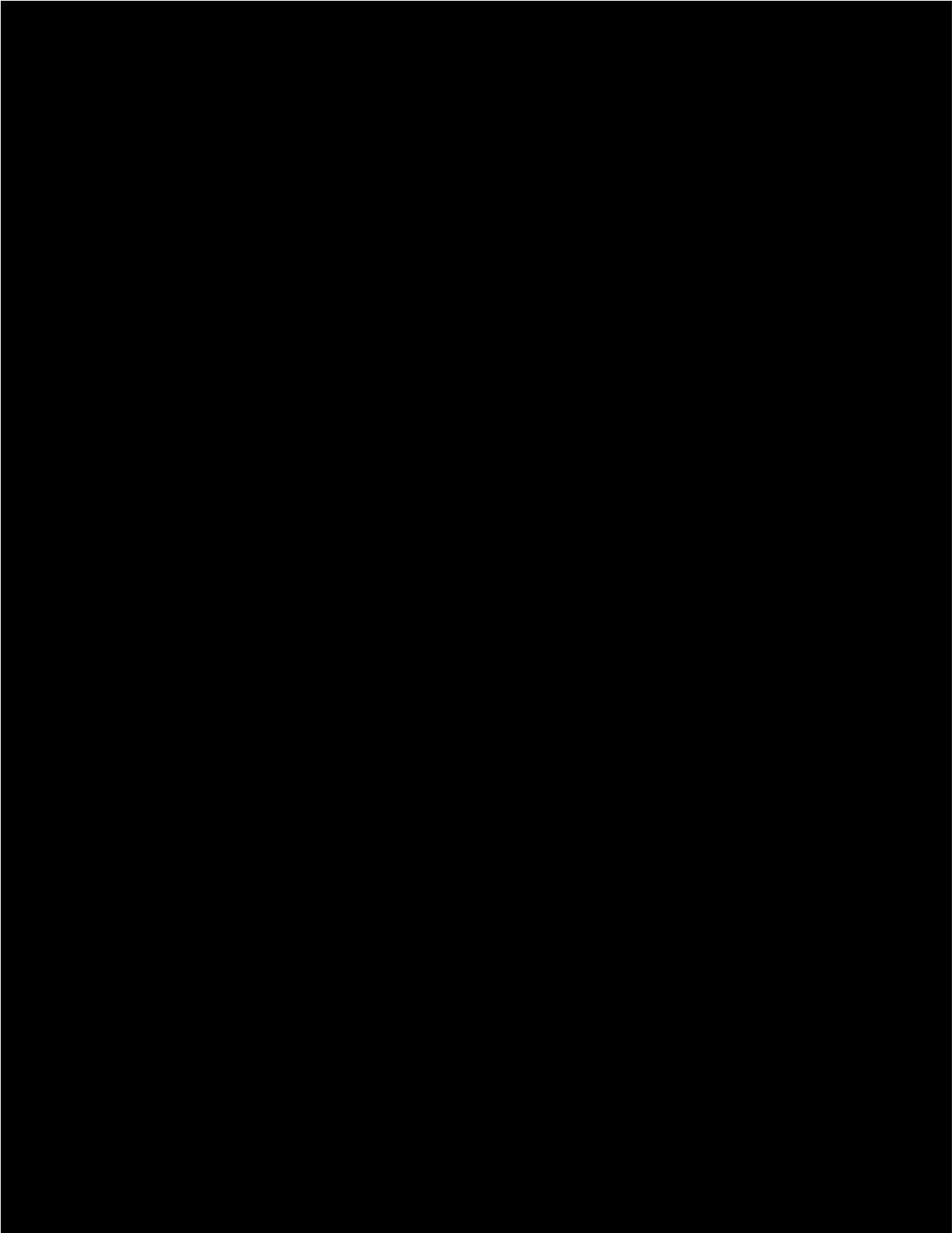
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## ATTACHMENT 4: SFWMD PROJECT QUALITY CONTROL PLAN

The SFWMD currently implements a rigorous Design Review process utilizing the DrChecks system to capture all comments from various disciplines and enable proper closure of technical issues. At the beginning of the project planning or design phase, the SFWMD Project Manager will either establish or reconfirm with the SFWMD's Project Development Section what will be the composition of the Design Review Team (DRT) for the project. The DRT may consist of representatives from the SFWMD, USACE, Florida Department of Environmental Protection (FDEP), US Fish and Wildlife Service (USFWS), Florida Fish and Wildlife Conservation Commission (FFWCC), local agencies and in many cases, independent consultants to supplement SFWMD staff.

As part of the Design Work Orders to outside consultants or in accordance with internal Design Section policy, each deliverable shall be reviewed by the Designer's Quality Control (QC) Officer prior to submittal for the DRT review. The QC officer shall be someone not directly involved in the preparation of the plans and specifications nor the project management responsibilities. The Consultant or SFWMD Project QC officer shall be charged with the responsibility of the Plan's implementation and documentation of current QC activities. The Design Submittal shall include a signed copy of the SFWMD's Quality Certificate of Compliance (see example on next page) with each Deliverable signifying that the internal QC was followed.

For this project, SFWMD will utilize internal staff for design and technical review. SFWMD staff performs review activities associated with electrical, instrumentation and control (I&C), geotechnical, hydraulics, hydrology, HVAC, plumbing, fire, mechanical, and structural disciplines, checking deliverables for compliance with SFWMD engineering guidelines, level of risk associated with the work, and operations and maintenance considerations. Project modeling tasks and deliverables will be reviewed and coordinated by the SFWMD's Project Development Section and the Hydrologic and Environmental Systems Modeling Section. The primary objectives of the DRT are to confirm that:

1. The engineering concepts are valid.
2. The recommended plan is feasible and will be safe and functional.
3. A reasonable opinion of probable construction cost estimate has been developed in accordance with Operation, Maintenance and Construction Engineering Bureau Procedures for Development of Opinions of Construction Costs (see Design Criteria Memorandum 7).
4. The approach to the engineering analysis is sound.
5. The submittal complies with SFWMD engineering submittal requirements.
6. The submittal complies with accepted engineering practice within the SFWMD and applicable Operation, Maintenance and Construction Engineering Bureau Design Criteria Memoranda (DCM) and Comprehensive Everglades Restoration Plan (CERP) Guidance Memoranda (CGM).



**SOUTH FLORIDA WATER MANAGEMENT DISTRICT**  
**Quality Certificate of Compliance**

Project Name	Contract No./Work Order No.	Date
Deliverable Description		

\_\_\_\_\_ has completed preparation of the above referenced  
 Consultant Name

deliverable and herein submits it to the South Florida Water Management District (SFWMD) in accordance with the requirements of the referenced Work Order. It has been verified that this submittal includes all required components of the deliverable. Where required components are not submitted, an explanation and schedule for submitting the missing component(s) has been provided. Notice is hereby given that all quality control activities, appropriate to the level of risk and complexity inherent in the Project, have been completed. Compliance with established procedures as documented in the Project's Quality Control Plan submitted to the SFWMD has been verified.

**This certification in no way relieves/replaces/changes/impacts/mitigates the contractual requirements to follow the consultant's own Quality Assurance/Quality Control (QA/QC) processes and procedures.**

Consultant Quality Manager (Print)	Consultant Quality Manager (Signature)	Date
Consultant Project Manager (Print)	Consultant Project Manager (Signature)	Date

The reviews performed by the DRT shall be based on:

- SFWMD Standards for Construction of Water Resource Facilities – Design Details and Design Guidelines
- SFWMD Major Pumping Station Engineering Guidelines
- Operation, Maintenance and Construction Engineering Bureau Design Criteria Memoranda
- Operation, Maintenance and Construction Engineering Bureau Submittal Requirements
- CERP Guidance Memoranda
- Applicable US Army Corps of Engineers requirements
- Applicable Florida Department of Transportation (FDOT) Standards
- Other Applicable National and Industry Design Codes

The intent of each Technical Review is to identify fatal flaws to the design or items that are in conflict with SFWMD or other applicable standards and guidelines. The DRT members are discouraged from commenting on items that are “designer preference” in nature. The Technical Review shall include an evaluation of the level of completion for the respective submittal according to the Detailed Description of Plan Submittal Requirements (see Operation, Maintenance and Construction Engineering Bureau Submittal Requirements).

Following completion of the Technical Review process, a Technical Review Briefing (TRB) is conducted where the project submittal is summarized to SFWMD Management staff. The SFWMD Project Manager presents the project, including any changes from the previous submittal, results of the Technical Review and how issues were resolved, cost estimate and estimated construction schedule, procurement strategy and planned path forward. Once all reviews TRBs are completed, a Certificate of Technical Review Completion form is prepared and signed by the appropriate parties signifying that the reviews were done appropriate to the level of risk and complexity inherent in the Project. During the Technical Review, compliance with established policy, principles and procedures, utilizing justified and valid assumptions, were verified including a review of assumptions; methods, procedures, and material used in analyses; alternatives evaluated; the appropriateness of data used and level of data obtained; constructability and operability; reasonableness of the results, including whether the product meets the customer’s needs; and consistency with law and existing SFWMD and USACE policies. The Certificate includes a statement that the Technical Review was accomplished by an independent team made up of personnel from the SFWMD, USACE, other agencies and/or external consultant staff.

## **ATTACHMENT 5: SFWMD ENGINEERING AND CONSTRUCTION DESIGN REVIEW PROCESS**

This section summarizes the Engineering and Construction review process, review phases, and timeframes for review by the Design Review Team (DRT) which may include participants from a Full Service Engineering Consultant for large project engineering activities. Each project may have one planning and one or more design phases associated with project plan and technical specification development. The Technical Review process begins with the submittal of each planning or design phase deliverable as presented below, including Engineering During Construction.

### **Establishment of Project Design Technical Review Team**

At the beginning of the project planning or design phase, the Project Manager will either establish or reconfirm with the Project Development Section Representative the composition of the Design Review Team (DRT) for the project. The DRT may consist of representatives from the South Florida Water Management District (District), US Army Corps of Engineers (USACE) (member for all USACE projects), Florida Department of Environmental Protection (FDEP), US Fish and Wildlife Service (USFWS), Florida Fish and Wildlife Conservation Commission (FFWCC), local agencies and in many cases, independent consultants to supplement District staff.

The District has utilized full service consulting firms to provide engineering discipline expertise to augment the District staff review efforts for technical design deliverables. These services are typically specific to the fields of architecture, electrical, instrumentation and control (I&C), geology, geotechnical, hydraulics, hydrology, HVAC, plumbing, fire, mechanical, and structures and involve reviewing the design for conformance to industry standards, checking the calculations, etc. District staff performs review activities associated with checking deliverables for compliance with District engineering guidelines, risk analysis and operations and maintenance considerations. Project modeling tasks and deliverables will be reviewed and coordinated by Project Development and the Hydrologic and Environmental Systems Modeling Section. A modeling request form should be filled out by the Project Manager to request reviews of modeling tasks and these types of deliverables.

The District has established Points of Contact within each Bureau for the various resource areas who provide membership on the Project Design Review Teams. These Points of Contact are able to provide staff members who will represent their Bureau during review of the project deliverables. The Project Development Section Representative will utilize the District Points of Contact to request membership on each Project Design Review Team. Replacement team members will be requested for ineffective team member participation.

The Project Development Section Representative will manage all aspects of the DRT from contract management of auxiliary staff, to logistics involved with delivery of copies of each deliverable to be reviewed, to issue resolution of lingering, unresolved review comments. As services are difficult to actually predict, general budgetary guidelines have been developed based on deliverable type, scale of project, and review time duration for both external (\$) and internal (hours) review assistance. This guidance is updated periodically. The Project Manager should utilize these guidelines in development of the project budget to ensure that sufficient funds are available to perform the expected deliverable reviews. Project schedule should also be discussed with the Project Development Section Representative. The Project Manager is encouraged to

schedule the project deliverables as soon as the expected delivery dates are known. The Project Development Section will make every effort to schedule reviews to avoid impacting project schedules. There may be instances, however, when District priorities may require adjustment of review schedules.

The primary objectives of the DRT are to confirm that:

7. The engineering concepts are valid.
8. The recommended plan is feasible and will be safe and functional.
9. A reasonable opinion of probable construction cost estimate has been developed in accordance with Engineering and Construction Bureau *Procedures for Development of Opinions of Construction Costs* (see Design Criteria Memorandum 7).
10. The approach to the engineering analysis is sound.
11. The submittal complies with District engineering submittal requirements.
12. The submittal complies with accepted engineering practice within the District and applicable Engineering and Construction Bureau Design Criteria Memoranda (DCM) and Comprehensive Everglades Restoration Plan (CERP) Guidance Memoranda (CGM).

### **Technical Review Documents**

The type of documents intended to be reviewed under the Technical Review process includes but is not limited to the following:

- Feasibility Study
- Reconnaissance Study
- Conceptual Design Study
- Project Implementation Report (PIR)
- Geotechnical Report
- Hydraulic and Hydrologic Report
- Water Budget Report
- Survey
- Design Documentation Report (DDR)
- Preliminary Design
- Intermediate Design
- Final Design
- Corrected Final Design (Issued for Bid)
- Technical Memorandum
- Opinion of Probable Construction Cost (OPCC)
- Construction Schedule
- Project Operations Manual (POM)
- Water Control Plan (WCP)
- Operation, Maintenance, Repair, Rehabilitation and Replacement (OMRR&R) Manual
- Monitoring Plan
- Permit Supporting Documentation
- Response to Construction Submittal

For federal projects that the SFWMD is designing, it is especially important to have the USACE – Jacksonville District participate in the technical review of the design deliverables in order to provide feedback on the following:

- Technical design is in conformance with federal guidelines (e.g. Engineering Manuals, Engineering Regulations, etc.)

- The project is in accordance with the Project Implementation Report (PIR)
- Obvious areas that may not qualify for work-in-kind crediting are identified

Prior to submittal of a project deliverable to Project Development, the Project Manager is requested to complete the Technical Review Release form. By completing the Review Release form, the Project Manager certifies that the project deliverable meets the task requirements, is complete, has the correct number of copies, is in the correct format, identifies the Documentum location of stored project files, identifies the project charge codes, includes the designers quality assurance/quality certification form, explains any unusual circumstances, and is ready to be sent to the DRT.

### **Technical Review Summary**

The reviews performed by the DRT shall be based on:

- District Standards for Construction of Water Resource Facilities – Design Details and Design Guidelines
- District Major Pumping Station Engineering Guidelines
- Engineering and Construction Bureau Design Criteria Memoranda
- Engineering and Construction Bureau Submittal Requirements
- CERP Guidance Memoranda
- Applicable US Army Corps of Engineers requirements
- Applicable Florida Department of Transportation (FDOT) Standards
- Other Applicable National and Industry Design Codes

The intent of each Technical Review is to identify fatal flaws to the design or items that are in conflict with District or other applicable standards and guidelines. The DRT members are discouraged from commenting on items that are “designer preference” in nature. The Technical Review shall include an evaluation of the level of completion for the respective submittal according to the Detailed Description of Plan Submittal Requirements (see Engineering and Construction Bureau Submittal Requirements). The comment and response forum for each Technical Review shall be through the Design Review and Checking System (DrChecks). DrChecks is available through PROject extraNet (ProjNet) which is a web based service that allows the secure exchange of design and construction information among authorized business partners in the context of specific business processes. Comments from the Technical Reviews shall be made available to other review teams, including the USACE Technical Review teams and the Independent External Peer Review (IEPR) teams.

### **Technical Review Process**

In general, the Design Engineer will submit a deliverable to the District. The District will send copies of the deliverable to the DRT as well as a link to the District’s Documentum database site where the information can be found electronically. Depending on the deliverable, the DRT will have either ten (10) or fifteen (15) business days from the time the link is transmitted to perform the review. The Project Manager and Design Engineer will have ten (10) or fifteen (15) business days to respond to the comments in DrChecks. The DRT shall backcheck the responses and assist the District in resolving non-concurred issues within another ten (10) business days. The DRT shall adhere to the review and backcheck times given for each deliverable. In the event of extenuating circumstances, the DRT shall notify the District Project Development Section Representative for resolution.

The District will provide all DRT members with a 3-month look ahead schedule each month to assist the DRT with planning of staff availability. This schedule is a continuously changing document. As such, it is intended as a guide only and the DRT members should be prepared for any last minute changes that may arise due to circumstances beyond the District's control.

As each deliverable is submitted by the Design Engineer, the District will have a predetermined time to review the submittal and provide comments back to the Design Team using the DrChecks review tool. The DRT shall participate in the reviews and assist the District as needed. The DRT may be required to perform, but not be limited to, the following general functions:

- Attend meetings with the District and Design Engineer to review the Project and establish criteria
- Perform a technical review of the project plans, technical specifications, reports and calculations by senior level engineering staff with the appropriate experience in the fields required for the project
- Review and become familiar with District Standards, including updates, and other applicable design standards

The DRT is responsible for obtaining updates of, and keeping current with the following documents:

- District Standards for Construction of Water Resource Facilities – Design Details and Design Guidelines (latest edition, including updates),
- District Major Pumping Station Engineering Guidelines (latest edition, including updates),
- Engineering and Construction Bureau Design Criteria Memoranda (latest edition, including updates),
- Engineering and Construction Bureau Submittal Requirements (latest edition, including updates),
- CERP Guidance Memorandums (latest edition, including updates), and
- Other guidelines and standards as applicable.

### **DDR Technical Review**

Following submittal of the DDR by the Design Engineer, the District will provide the DRT with electronic and hard copies of the DDR as agreed upon by each member. The District will also provide a link to the Documentum site containing the DDR. The DRT shall provide review comments in DrChecks on the DDR within ten (10) business days following receipt of the Documentum link. The review of the DDR shall look for and identify conflicts with design standards or fatal flaws, if any, to the approach, calculations, evaluations, conceptual plans, and any other design information provided in the DDR. Typically, the review performed by the Consultant DRT will not include the Opinion of Probable Construction Costs (OPCC), operations plan, modeling, or survey. These items will typically be reviewed by District members of the DRT.

Development of the Basis of Design Report will generally consist of the following activities:

1. Site Investigations.
2. Design Criteria Development.
3. Hydrology and Hydraulic Analysis.
4. Project Layout and Evaluation of Options.
5. Project Feature Design Development.
6. Opinion of Probable Construction Cost Based on Conceptual Designs.
7. Engineering Analyses to Support Designs.

A more detailed description of the DDR requirements for the Design Engineer can be found in the Engineering and Construction Bureau Submittal Requirements.

Once the comment period is closed, the Design Engineer will have ten (10) business days to respond to the comments generated by the DRT. During this time, the DRT shall be available to answer any questions from the Design Engineer regarding the comments and work closely with the District to resolve outstanding issues. At the completion of the ten (10) day response period, the DRT members shall backcheck the responses provided by the Design Engineer in DrChecks. If the Design Engineer properly addressed the comment, the DRT member shall close the comment. If the comment was not properly addressed, the DRT member shall work with the Design Engineer through the District Project Manager to resolve the issue within ten (10) business days. The District reserves the right to close a comment on behalf of the DRT if the comment is not closed in a timely fashion. Upon closure of all comments, the Project Manager shall conduct a Technical Review Briefing for District Management to discuss the Project Features, issues resolved during the review and path forward.

Following the end of the backcheck period, the Consultant DRT Manager shall submit to the District within five (5) business days a brief summary of the main issues encountered and resulting resolution.

### **Preliminary Design Technical Review**

This project differs from the typical project delivery process in that the design was previously advanced to the Final phase in 2008. In updating the design for construction award in 2018, the SFWMD has determined that delivery of a new Preliminary design is unnecessary and that updating the DDR, based upon review comments by the IEPR and recommendations of the VE team, is sufficient. Therefore, the design update will be advanced directly to the Intermediate Design phase.

### **Intermediate Design Technical Review**

Following submittal of the Intermediate Design by the Design Engineer, the District will provide the DRT with electronic and hard copies of the Intermediate Design Report as agreed upon by each member. The Intermediate Design Report will include a narrative, design calculations, plans, list of proposed specifications, opinion of construction costs and construction schedule for the project and related work prepared by the Design Engineer and submitted to the District for review. The District will also provide a link to the Documentum site containing the Intermediate Design Report. The DRT shall provide review comments in Dr Checks on the Intermediate Design Report within fifteen (15) business days following receipt of the Documentum link. The review of the Intermediate Design Report shall look for and identify conflicts with design standards or fatal flaws, if any, to the approach, calculations, evaluations, conceptual plans, and any other design information provided in the Intermediate Design Report. Typically, the review performed by the Consultant DRT will not include the Opinion of Probable Construction Costs (OPCC), operations plan, modeling, or survey. These items will typically be reviewed by District members of the DRT. The DRT shall not comment on items that are “designer preference” in nature.

The Intermediate Design Plans and Specifications shall generally consist of the following activities:

1. Finalize Site Investigations

2. Finalize Project Layout and Features
3. Detailed Design of Project Features
4. Updated Draft Project Operations Manual
5. Draft Geotechnical and Hydro-meteorologic Monitoring Plan Template
6. Summary of DCM Compliance and Results
7. Preparation of Plans and Specifications for Bidding/Construction
8. Updated Opinion of Probable Construction Cost
9. Updated Construction Schedule
10. Design Calculations (civil, electrical, mechanical, structural)
11. Updated Engineering Report to reflect Intermediate Design

A more detailed description of the Intermediate Design Report requirements for the Design Engineer can be found in the Engineering and Construction Bureau Submittal Requirements. The response and backcheck process will follow the same procedures as identified in the DDR Technical Review above except the time allowed for both providing comments and responding to comments is fifteen (15) business days. Additionally, the Design Engineer will receive from the District five (5) business days after the comment period has closed a set of consolidated, red line marked up Plans and Specifications from the Project Development Quality Control Engineer as described previously in the Preliminary Design Phase. These mark ups will be returned by the Design Engineer during the backcheck period with indications of how each mark up was addressed.

Following the end of the backcheck period, the Consultant DRT Manager shall submit to the District within five (5) business days a brief summary of the main issues encountered and resulting resolution.

### **Final Design Technical Review**

Following submittal of the Final Design by the Design Engineer, the District will provide the DRT with electronic and hard copies of the Final Design Report as agreed upon by each member. The Final Design Report will include a narrative, design calculations, plans, list of proposed specifications, opinion of construction costs and construction schedule for the Project and related work prepared by the Design Engineer and submitted to the District for review. The District will also provide a link to the Documentum site containing the Final Design Report. The DRT shall provide review comments on the Final Design Report within fifteen (15) business days following receipt of the Documentum link. The review of the Final Design Report shall look for and identify conflicts with design standards or fatal flaws, if any, to the approach, calculations, evaluations, conceptual plans, and any other design information provided in the Final Design Report. Typically the review performed by the Consultant DRT will not include the Opinion of Probable Construction Costs (OPCC), operations plan, modeling, or survey. These items will typically be reviewed by District members of the DRT. The DRT shall not comment on items that are “designer preference” in nature.

The Final Plans and Specifications shall generally consist of the following activities:

1. Final Design of Project Features
2. Updated Engineering report to reflect Final Design
3. Completed Draft Project Operating Manual
4. Final Geotechnical and Hydro-meteorological Monitoring Plan Template
5. Final Design Calculations
6. Final Plans and Specifications for Bidding/Construction, subject to Technical Review comments

7. Final Opinion of Probable Construction Cost
8. Final Construction Schedule

A more detailed description of the Final Design Report requirements for the Design Engineer can be found in the Engineering and Construction Bureau Submittal Requirements. The response and backcheck process will follow the same procedures as identified in the DDR Technical Review above except the time allowed for both providing comments and responding to comments is fifteen (15) business days. Additionally, the Design Engineer will receive from the District five (5) business days after the comment period has closed a set of consolidated red line marked up Plans and Specifications from the Project Development Quality Control Engineer as described previously in the Intermediate Design Phase. These mark ups will be returned by the Design Engineer during the backcheck period with indications of how each mark up was addressed. Upon closure of all comments, the Project Manager shall conduct a Technical Review Briefing for District Management to discuss the Project Features, issues resolved during the review and path forward.

Following the end of the backcheck period, the Consultant DRT Manager shall submit a brief summary to the District within five (5) business days of the main issues encountered and resulting resolution.

#### **Corrected Final Design Technical Review**

Prior to submittal of the Corrected Final Design Report, the Design Engineer will submit complete sets of plans and technical specifications for review by the DRT. The District may hold a review workshop to verify that the Corrected Final Plans and Technical Specifications have been properly addressed based on the Final comments. The review workshop may be one day or multiple days depending on the size of the project and volume of the deliverables. Two or three key members of the Consultant DRT team (i.e. Structural, Geotechnical, and/or Site/Civil) shall attend the final review workshop. Following the workshop and resolution of all outstanding issues, the Consultant DRT Manager shall submit to the District within five (5) business days a brief statement that all comments have been addressed.

#### **Miscellaneous Deliverables Technical Review**

Following submittal of any other deliverables by the Design Engineer as identified in the Technical Review Documents section above and not already addressed, the District will provide the DRT with electronic and hardcopies of the deliverable. The deliverable may include a narrative, design calculations, plans, list of proposed specifications, opinion of construction costs and construction schedule, study findings, recommendations, modeling results or other engineering related data for the Project and related work prepared by the Design Engineer and submitted to the District for review. The District will also provide a link to the Documentum site containing the deliverable. The DRT shall provide review comments on the deliverable within ten (10) business days following receipt of the Documentum link. The review of the deliverable shall look for and identify conflicts with design standards, applicable codes, standard practice, or fatal flaws, if any, to the approach, findings, calculations, evaluations, conceptual plans, and any other information provided in the deliverable. The DRT shall not comment on items that are “designer preference” in nature.

The response and backcheck process will follow the same procedures as identified in the DDR Technical Review above.

Following the end of the backcheck period, the Consultant DRT Manager shall submit a brief summary to the District within five (5) business days of the main issues encountered and resulting resolution.

### **Continuity of Design Review Team Members**

It is imperative that there be continuity in all of the Design Review Team members for both Consultant and District DRT members. Once assigned to a project, the same Design Review Team shall be utilized throughout the length of the project. If there needs to be a change in the staff involved, the District Point of Contact for that resource area or Consultant DRT Manager shall contact the District Project Development Section Representative for resolution.

### **Conclusion of Design Phase and Transfer to Procurement and Construction**

At the conclusion of the Design Phase for the Project, one last Technical Review Briefing will be held. The Project Development Section Representative will prepare and sign the Completion of and the Certification of Independent Technical Review forms and provide them to the Project Manager for inclusion in the project file.

**ATTACHMENT 6: CAROLLO ENGINEERS QUALITY CONTROL PLAN**



**C-43 West Basin Storage Reservoir Design Update**

**CORRECTED FINAL/READY TO ADVERTISE DESIGN**

**Work Order No. 4600003016 WO011**

**BID PACKAGE 4 TECHNICAL MEMORANDUM**

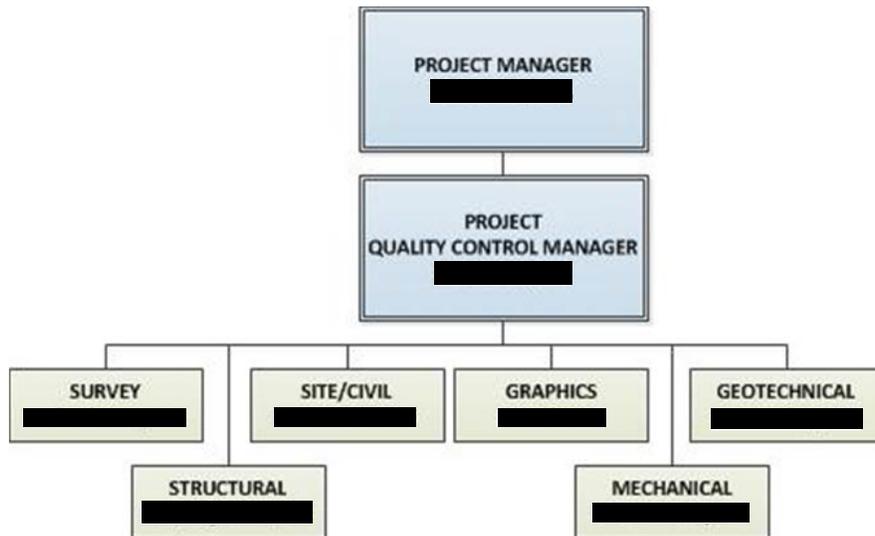
**QUALITY MANAGEMENT PLAN**



**C-43 West Basin Storage Reservoir Design Update  
CORRECTED FINAL/READY TO ADVERTISE DESIGN  
Work Order No. 4600003016 WO011  
BID PACKAGE 4 TECHNICAL MEMORANDUM  
QUALITY MANAGEMENT PLAN**

The Carollo Team has an unwavering commitment to producing work products that are of consistently high quality, and meet or exceed the expectations of the South Florida Water Management District (SFWMD) and other stakeholders. Quality Management (QM) is the systematic approach used to ensure that quality goals are met in each area of a project, including quality control. Quality control is the application of procedures and checks to identify and resolve errors and deficiencies in a product.

The purpose of this plan is to facilitate the preparation of accurate and complete high quality drawings, specifications, calculations, and related documents furnished as part of this scope of work by establishing and implementing procedures, responsibilities, and relationships for members of the Project Team. The Project Team has responsibility for the accuracy and completeness of the contract documents prepared for this project and shall check all materials accordingly. Team members shall take responsibility for items they are qualified to handle and refer to the next higher level those items which exceed their qualifications or for which higher level review is required. All QM shall meet the standard established by SFWMD, other stakeholders, and the consultant client lead, Carollo Engineers. In addition to the Team members quality control measures, overall QM and consistency shall be verified by the QM manager. The Project Consultant Quality Control Manager is [REDACTED]. In this role [REDACTED] is responsible to see that all QM work has taken place before issuing any work packages for District Review. The following organizational chart identifies the Quality Management Team.



## Quality Management Approach

Quality is an integral component of the work required to complete the project. QM is based on the following approach:

- Identification of the key components that are necessary to prepare a quality product, including procedures, specifications, standards, and acceptance criteria.
- Development and maintenance of the key QM components identified above.
- Confirming compliance of the key components using checklists that identify the acceptance criteria.
- Providing a formal method of improving the process when deficiencies are found.

QM is invaluable in ensuring a quality product, improving stakeholder satisfaction, and improving efficiency by reducing rework. A QM program develops and evolves over time by determining the cause of quality deficiencies and correcting the cause so mistakes are not repeated. An integral part of an effective QM program is the training and development of personnel with the ability to think and act creatively to anticipate problems and find solutions.

## Computations

### Scope

Neat, systematic, and complete calculations shall be checked for each project task. Special attention shall be given to documenting design references, sketches, and notes. Procedures and guidelines for preparing, checking and approving computations, including manually-produced calculations, calculation aid programs, spreadsheets, database and programmed applications are described as follows.

### Procedures

#### Preparation

- Complete the heading information including Preparer's Name and Date, Project Number, Subject, and "Sheet-of-Number." Computer-generated computational printouts shall also include the application program name and version, filenames, file locations (i.e. diskette ID and path name), and spaces for Project No., Page No., Preparer, Checker and Approver names, and dates.
- Computer application programs:
- Computer programs when appropriate are recommended for use.
- Other computer programs must have Project Manager approval, and require additional checking and verification.

- Provide complete references including sources of data, methods used in computations, design aids and standards when used, and computer programs when used.
- When a formula is first used in a computation, write out complete formula and identify all parameters and units. If formula is reduced or modified for subsequent use, show development of reduced or modified form. Spreadsheets and calculation aid programs must meet this requirement.
- Identify all input data and sources.
- Indicate final answers or results actually used by underlining or boxing. When alternative results are shown, place the word “USE” or “USED” adjacent to the results actually used. For computations involving several design conditions, provide final summary tabulation of results of the computation.
- Unusual or complex computations require three separate individuals, qualified to exercise independent judgment, for the preparation, checking, and approval functions. Other computations may be prepared, checked, and approved by members qualified to exercise independent judgment for the work, where the preparation/approval functions or the checking/approval functions are by the same individual, as indicated by separate signatures for both functions. Preparer's signature may be computer generated; others are handwritten on record copy of computation.\
- Deleted computations, that are to be retained, shall be marked “SUPERSEDED,” with void date, and shall reference the revised computation.

### *Checking*

- Check for accuracy and applicability of fundamental data, assumptions, and methods.
- Check for completeness of computations.
- Check input data for computer programs and for spreadsheet programs which have been independently checked.
- Check all data (input and output) for computer programs and for spreadsheet programs which have not been independently checked.

- Check for reasonableness of results.
- Preparer “back-checks” corrections and changes, and reconciles differences between original and corrected computations.
- Complete the check of computations prior to release.
- Checker places handwritten signature and date on record copy of computation.

### *Quality Control Manager*

- Quality Control Manager is responsible for determining that checking procedures have been followed, and verifies that points listed under "checking" above are satisfied.
- Quality Control Manager makes critical examination of quality of work and methods used.
- Quality Control Manager documents compliance with procedures.

### *Indexing and Binding*

- Index and bind the originals of all computations upon completion of the project. The Discipline Lead is responsible for proper processing and filing.
- Use covers for binding sets of computations; make appropriate entries as to project number, project description, client name, location of the project, and type of computation on bound volume cover.
- Save computations to a pdf.

### **Guidelines**

Use of standard forms, calculation sheets or macros prepared is encouraged.

Prepare and maintain neat, well-organized computations to facilitate checking and approval.

Computations should be prepared, checked and approved so they are suitable for reproduction.

Evidence of step-by-step checking and approval should be used. The following colors are suggested:

- Checking: Red
- Approving: Blue

## Drawings

### Scope

Procedures and guidelines for checking, approving, and signing drawings are described as follows.

### Procedures

Assignments of responsibility for checking shall be made by each Discipline Lead early-on in organizing the work tasks of the project. The drawing checker may be the designer if the technical input is checked by someone else. If the technical input is not checked by someone else, the design and drawing checking functions are assigned to two individuals to provide an independent check.

### Definitions

- Work Print: A print made in the developmental stages of a drawing. It is to be used to develop, expand, and coordinate the design. Work prints do not form the basis for a complete drawing check.
- Check Print: A print on which a complete, detailed, and final check of every line and figure is made.

### Work Print Procedures

- Work prints are identified and numbered in consecutive order by the Graphics Lead using the appropriate work print symbol.
- When a work print is initiated, the Graphics Lead initials and enters the work print number and date and examines the drawing for adherence to graphics standards. The work print is then forwarded to the designer.
- The designer reviews the drawing and places appropriate comments, changes and/or additions on the current work print. After the review is completed, the designer initials and enters the date on the "Comments By" line. The work print is returned to the Graphics Lead who sends it to the appropriate Graphics Technician.
- The Graphics Technician makes the changes/additions and initials and enters the date on the next "Drafted By" line.

- If the drawing has significant changes/additions, a new work print is made at this point and the work print cycle is repeated.
- When, in the opinion of the designer, the drawing is substantially complete, a check print is initiated.

### Check Print Procedures

- When a check print is initiated, a duplicate print (not a check print) is forwarded to the appropriate Discipline Approver for review and comment. These comments are then forwarded to the Discipline Lead for consideration and incorporation into the check print as appropriate.
- Check prints are identified using the appropriate check print symbol.
- When the check print is initiated, the Graphics Lead initials and enters the check print number and date; examines the drawing for adherence to graphics standards and makes appropriate notations. The check print is then forwarded to the checker.
- The checker checks the drawing for technical and dimensional accuracy, for clarity and for adherence to applicable standards, using light blue to highlight items which are correct. The checker initials and enters the date on the "Checked By" line. The check print is returned to the Graphics Lead who sends it to the appropriate Graphics Technician.
- The Graphics Technician makes the changes/additions and initials and enters the date on the "Drafted By" line.
- If the drawing has significant changes or additions, a new check print is made and the check print cycle is repeated. If changes or additions are minor, the "back checking" may be performed from the original or from a computer screen. After the "back checking" is completed, the checker initials and enters the date on the "Back Checked By" line.
- At the conclusion of the check print procedure, there should be check prints on which all items are highlighted to indicate that a complete check has been performed. All Discipline Approver comments should be resolved at this point.
- Check prints for a revision shall utilize the same check print procedure.

## Disposition of Work Prints and Check Prints

Work prints and check prints are to be placed together in order. The Graphics Lead maintains the prints until the drawings are approved, signed, copies distributed, and the contract is awarded or the report is accepted. Final disposition is then determined by the Project Manager.

## Guidelines

Different colors shall be used in the work print/check print process to facilitate review. The following colors are suggested:

- Green: Used by the Graphics Lead to indicate changes or additions required.
- Light Blue: Used by the checker to highlight those portions of the drawing which are correct and complete.
- Red: Used by the checker to indicate those changes/additions required.
- Dark Blue or Black: Used by the Graphics Technician to indicate that changes/additions have been drafted and to make notations to the checker. Information that is removed or moved must be noted. Each change or addition to a drawing is circled on the print as it is completed.
- Brown: Used by the Discipline Approver to indicate those changes/additions required.

## Approval and Signature Procedures

Assignments of responsibility for approvals and signatures shall be made at the time the project team organization is established for the project.

## Definitions

- Designed: The member who developed the design to meet project requirements.
- Drawn: The Graphics Technician who created the drawing.
- Checked: The member who checked the drawing using the previously-described check print procedures.

- **Technical Approval:** The Discipline Approver approves the design for technical adequacy, making an independent review to determine that drawing information is coordinated, clear, and accurate.
- **Overall Project Approval:** The Project Quality Control Manager approves the overall content and quality of the information provided on the drawings; assumes responsibility for interdisciplinary coordination and that SFWMD and project requirements are met; makes an independent review of the work, and obtains assistance from others as necessary to confirm this approval.
- **Additional Approvals:** Additional approving members may be assigned to satisfy all project requirements. Such additional approvers in no way relieve the responsibilities of those performing the normal functions listed in the preceding paragraphs.

### Plotting & Printing

The Graphics Technician shall exercise care in plotting computer generated drawings for final signatures and approvals, making certain that appropriate CADD level schemes, reference files, etc., are incorporated in the final plots. All prints shall be examined prior to submittal to ensure that prints are consistent with required quality standards.

### Drawing Signature Procedures

- All written signatures and typed names shall consist of the signer's initial(s) and full last name.
- **Preliminary Issue of Drawing:** Typed names are to be indicated for the members who have done the designing, graphics work and drawing checking. The date blank in the signature block is not completed. The drawing is identified PRELIMINARY ISSUE FOR REVIEW – NOT FOR CONSTRUCTION with the issue date noted.
- **Final Issue of Drawing:** Typed names are to be indicated for the members who have done the designing, graphics work and drawing checking. The date blocks should be completed.
- **Drawing Revisions:** The drawing revision block contains four spaces; date; drawn; revision no. and revision description. All blocks shall be completed for each revision. Revision numbers shall also appear on the plans near the revision to assist the viewer in locating the revision.

## Reports

### Scope

Report projects include condition assessments, asset management reports, master plans, facility plans, O&M manuals, permitting reports, routing studies, preliminary design reports, project memos, research reports, rate studies, technical memos, and feasibility studies.

### Procedures

- Report projects should have a detailed outline created before beginning the writing and content development. An independent review of the outline should be made by a senior engineer identified for this purpose. Review and approval of the outline by the Client is included.
- Technical Memoranda should provide a listing of all appropriate USACE Engineering Manuals, SFWMD Design Criteria Memoranda and related guidelines utilized in the development of the specific Technical Memorandum.
- Project team should review planning ideas, modeling results, and documents for accuracy and coordination with contract requirements.
- Where a design concept is included in the report, the design concept should be reviewed during the report development by a senior engineer with specific expertise in the area.
- Word processing standards and CAD standards for figures should be used for all reports.
- Drafts for the narratives, tables, and figures of the report should be reviewed by an independent engineer for content correctness and conformance to quality standards before being delivered.

## ATTACHMENT 7: REVIEW PLAN REVISIONS

<b>Revision Date</b>	<b>Description of Change</b>	<b>Page / Paragraph Number</b>