

DEPARTMENT OF THE ARMY SOUTH PACIFIC DIVISION, US ARMY CORPS OF ENGINEERS 1455 MARKET STREET SAN FRANCISCO, CALIFORNIA 94103-1399

REPLY TO ATTENTION OF

2 1 MAR 2018

CESPD-RBT

MEMORANDUM FOR Commander, US Army Corps of Engineers, Los Angeles District, ATTN: Ms. Kathy Anderson, CESPL-PM-C, 915 Wilshire Blvd, Los Angeles, CA, 90017

SUBJECT: Whittier Narrows Dam, Los Angeles, CA, Dam Safety Modification, Automatic Gate Control System Review Plan Approval

1. Reference memorandum, CEIWR-RMC, 8 Feb 2018, Risk Management Center Endorsement –Whittier Narrows Dam, Interim Risk Reduction Measure, Review Plan (Encl 1).

2. Whittier Narrows Dam, Los Angeles, CA, Dam Safety Modification, Automatic Gate Control System Review Plan that is enclosed (Encl 2) is in accordance with Engineering Circular (EC) 1165-2-214, Review of Decision Documents, dated 05 April 2013. The South Pacific Division, Regional Business Technical Division, and Los Angeles District Support Team have reviewed the Review Plan that has been submitted.

3. With MSC approval the Review Plan will be made available for public comment via the internet and the comments received will be incorporated into future revisions of the Review Plan. The Review Plan includes Independent External Peer Review Type II Safety Assurance Review (SAR).

4. I hereby approve the Review Plan which is subject to change as study circumstances require. This is consistent with study development under the Project Management Business Process. Subsequent revisions to the Review Plan after public comment or during project execution will require new written approval from this office.

5. Point of contact for this action is Mr. Richard Britzman, CESPD-RBT, 916-557-6607, richard.a.britzman@usace.army.mil.

BUILDING STRONG!

D. PETER HELMLINGER, P.E. Brigadier General, USA Commanding

Encls



REPLY TO ATTENTION OF

CEIWR-RMC

8 February 2018

MEMORANDUM FOR: Commander, Los Angeles District, ATTN: CESPL-ED-GL

SUBJECT: Risk Management Center Endorsement –Whittier Narrows Dam, Interim Risk Reduction Measure, Review Plan

1. The Risk Management Center (RMC) has reviewed the Review Plan (RP) for – Whittier Narrows Dam, Interim Risk Reduction Measure, dated 8 February 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 Los Angeles District, reviewed by the RMC, and all of RMC's 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 (rmc.review@usace.army.mil).

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 601-631-5896

Sincerely, HERR.DUSTIN.CHA RLES.1384614082 DH cuts and Comment, carobol, RLES.1384614082

Dustin C. Herr, P.E. Review Manager Risk Management Center

CF: CEIWR-RMC (Mr. Snorteland) CESPD-DQM (Division Quality Manager)

U.S. Army Corps of Engineers Los Angeles District South Pacific Division

Interim Risk Reduction Measure Review Plan Whittier Narrows Dam



US Army Corps of Engineers_®

08 FEB 2018

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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 Interim Risk Reduction Measure (IRRM) to prevent premature opening of spillway gates at Whittier Narrows Dam. The IRRM effort consists primarily of design and construction documents: design documentation report, plans and specifications and an independent government estimate (IGE). The Review Plan shall layout a value added process that assures the correctness of the information shown. This Review Plan describes the scope of review for the current phase of work, and is included in the Project Management Plan (P2 #447903). The District Chief of Engineering has assessed that risk of the project is significant; therefore a Safety Assurance Review (SAR) will be required

b. Guidance and Policy References

- ER 5-1-11, USACE Business Process
- EC 1165-2-214, Civil Works Review Policy, 15 December 2012
- ER 1110-2-1156, Safety of Dams Policy and Procedure, 31 Mar 2014
- ER 1110-1-12, Quality Management, 31 Mar 2011

c. Requirements.

EC 1165-2-214 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 general levels of review: DQC, ATR, IEPR, and Policy and Legal Compliance Review. All four levels of review will be required for this project. 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 PDT, DQC, ATR and IEPR Teams.

d. Review Management Organization

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

2. Project Description and Information

a. Project Description and Background

Whittier Narrows Dam is a 3-mile long earthen flood risk management dam owned, operated, and maintained by the US Army Corps of Engineers, Los Angeles District. Located 11 miles east of downtown Los Angeles on the San Gabriel River (8 miles downstream of Santa Fe Dam) and the Rio Hondo, the dam protects a population at risk of approximately 1.25 million persons who reside in 25 communities between the dam and the Pacific Ocean, a distance of roughly 20 miles.

There are two controlled outlet structures at Whittier Narrows Dam. The Rio Hondo outlet works is the main outlet structure located in the west embankment and has an invert at 184 feet NGVD. The spillway structure, located on the San Gabriel River near the east end of the dam, is the second controlled outlet and has an invert at 200 feet NGVD. The dam is typically dry, and with the large discharge capacity at the Rio Hondo outlet works, pool impoundment duration is typically measured in hours or days rather than weeks. Releases to the San Gabriel River, as necessary, can be regulated to safely discharge up to 5,000 cfs while inflow into the dam are shunted to the Rio Hondo side and discharged through the outlet gates. The current water control plan also allows releases of up to 12,000 cfs to the San Gabriel River which is below the estimated downstream capacity of 13,100 cfs. When the pool reaches 228.5 feet NGVD, the existing automatic hydraulically actuated system opens all spillway gates and initiates discharge.

In May 2016, Whittier Narrows Dam was reclassified from DSAC (Dam Safety Action Classification) 2 to a DSAC 1 dam. The risk-driving potential failure modes are: backward erosion piping of the west and central embankment, overtopping, and premature automatic opening of the spillway gates. The backward erosion piping failure modes (three different locations) exceed the societal tolerable risk guidelines (TRG) by up to two orders of magnitude. Overtopping is a confirmed risk driver and exceeds the TRG. Plans are being developed to mitigate. However, approximately 95 percent of the life safety risk is as a result of the potential premature automatic opening of the spillway gates. This PFM exceeds the TRG by more than 3 orders of magnitude and was the reason for the DSAC reclassification.

A Dam Safety Modification Study is in progress. Since the estimated completion of the full dam modification is 2024, interim measures are required to reduce the risk of premature spillway gate opening to below tolerable risk guidelines. The tentatively selected plan assumes that the proposed spillway IRRM will be made permanent. A white paper was developed by SPL that describes the process used to arrive at the selected IRRM that addresses the premature spillway gate opening. Measure 3 was chosen as the IRRM for this effort.

b. Project Scope

Measure 3 is a float well manipulation by valved inlet (programmable). This measure will require mechanical and electrical engineering design and analyses. The mechanical scope includes all design activities necessary to install a new automatic gate control system as described as well as the demolition and removal of the existing components that will no longer be needed. The Whittier Narrows spillway automatic mechanical control system that operates the spillway gates will be removed and replaced with a modern electrical control system. This work will involve removing the mechanical controls in place and installing a motor actuated valve which will be controlled by a programmable logic controller (PLC). The new motor actuated valve will mimic the control characteristics of the existing plug valve. Sensors for water surface level and gate opening will be designed to operate the valve to obtain the desired gate opening per the water control manual characteristic gate opening curves. A more detailed scope is provided in Attachment 4 for reference.

The products to be delivered for this project include:

- 1) Design Documentation Report (DDR)
- 2) Design Plans & Specifications (including a demolition plan)
- 3) Construction Cost Estimate/IGE
- 4) O&M Plan Update

c. Sponsor Peer Review of In-Kind Contributions

There will not be in-kind contributions for this effort.

3. Project Delivery Team (PDT) and District Quality Control (DQC) Reviews

a. Requirements

All implementation documents (including supporting data, analyses, environmental compliance documents, etc.) shall undergo DQC. DQC is an internal review process of basic science and engineering work products focused on fulfilling the project quality requirements. Basic quality control tools include a Quality Management Plan providing for seamless review, quality checks and reviews, supervisory reviews, PDT reviews, etc. Quality checks may be performed by staff responsible for the work, such as supervisors, work leaders, team leaders, designated individuals from the senior staff, or other qualified personnel. However, they should not be performed by the same people who performed the original work, including managing/reviewing the work in the case of contracted efforts. Additionally, the PDT is responsible to ensure consistency and effective coordination across all project disciplines during project design and construction management. See Attachment 2 for PDT and DQC members and disciplines. Huntington (LRH) District will be the lead designer and will be responsible for DQC, with SPL providing a PDT level of review. All three products (DDR, Plans & Specs, and IGE) will be reviewed by the PDT and the LRH DQC team.

b. Documentation

Documentation of DQC activities is required and should be in accordance with the Quality Manual of the District and the home MSC. LRH will document DQC comments and resolution in MS Word using tracked changes. The compiled comments will be included in each version (draft, draft final and final) and archived permanently on ProjectWise in the project file.

c. Products to Undergo DQC

Products that are anticipated to undergo PDT and DQC Reviews include: 1) 90% plans & specifications for preferred alternative (Measure 3: Float well manipulation by valved inlet (programmable), 2) design documentation report, 3) IGE for the preferred alternative and 4) O&M Plan Update.

4. Agency Technical Review (ATR)

a. Requirements

ATR is mandatory for all implementation documents (including supporting data, analyses, environmental compliance documents, etc.). 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 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. Management of ATR reviews is dependent upon the phase of work and the reviews are conducted by a gualified team from outside the home district that is not involved in the day-to-day production of the project/product. The PDT should obtain an ATR agreement on key data such as hydraulic and geotechnical parameters early in the design process. The goal is to have early involvement of the ATR team, especially when key decisions are made. The ATR Lead should be invited to all PDT meetings in order to understand the design efforts and to know when to engage other ATR members for key decisions. 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 team 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 dayto-day production of the project/product. ATR teams will be comprised of senior USACE personnel and may be supplemented by outside experts as appropriate. The ATR team lead will be from outside the home MSC. A site visit will not be scheduled for the ATR Team. See Attachment 2 for ATR members and disciplines. The DDR, Plans & Specs, and the O&M Plan Update will be reviewed by the ATR team and they will be invited to PDT meetings and 30% submittal reviews. SPL will manage the ATR with support from RMC and LRH, with the ATR team being brought in early.

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 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 with a notation that the concern has been elevated to the vertical team for resolution.

d. Products to Undergo ATR

Products that are anticipated to undergo ATR include: 1) 90% plans & specifications for preferred alternative (Measure 3: Float well manipulation by valved inlet (programmable), 2) design documentation report and 3) O&M Plan Update.

e. Completion and Certification of the ATR

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

- Identify the document(s) reviewed and the purpose of the review;
- Disclose the names of the reviewers, their organizational affiliations, and include a short paragraph on both the credentials and relevant experiences of each reviewer;
- Include the charge to the reviewers;
- Describe the nature of their review and their findings and conclusions;
- Identify and summarize each unresolved issue (if any); and

 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 Statement of Technical Review certifying that the issues raised by the ATR team have been resolved (or elevated to the vertical team). Certification of ATR should be completed, based on work reviewed to date, for the final report. A draft certification is included in Attachment 1.

f. Required ATR Team Expertise

ATR teams will be comprised of senior USACE personnel and may be supplemented by outside experts as appropriate. The ATR team lead will be from outside the home MSC. The ATR team will be chosen based on each individual's qualifications and experience with similar projects. All reviewers will be certified in CERCAP: <u>https://team.usace.army.mil/sites/ERDC-CRREL/PDT/atr_certification/default.aspx</u>. See Attachment 2 for ATR members.

The ATR team will be chosen based on each individual's qualifications and experience with similar projects.

ATR Lead: The ATR team is a senior professional with extensive experience in preparing Civil Works documents and conducting ATRs. The lead has the necessary skills and experience to lead a virtual team through the ATR process. The ATR lead may also serve as a reviewer for a specific discipline, in this case, mechanical or electrical engineering with specific expertise on radial gates.

Mechanical -- shall have experience in machine design, machine rehabilitation and familiarity with design of mechanical gates and controls for flood risk management dams.

Electrical Engineer – shall have experience in electrical design, programming and familiarity with design of mechanical gates and controls for flood risk management dams.

5. Independent External Peer Review (IEPR)

a. Requirements

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.

b. Decision on Type II IEPR

A Type II IEPR (Safety Assurance Review) will be performed during the Implementation Phase on the design and construction activities associated with the IRRM selected Measure 3. A risk-informed decision was made as to whether IEPR is appropriate based on the factors to consider for conducting a Type II IEPR review that are outlined in EC 1165-2-214, Appendix E, Section 2 (a) thru (c). A risk informed decision was made that this project does pose a significant threat to human life (public safety) since it involves the conversion of spillway gate position control/actuation from a hydraulically controlled system to an electrically controlled system and will require structural modifications. Significant life loss could occur if the current or new system malfunctions and allows the spillway gates to open prematurely during or after construction. The SPL Chief of Engineering will be the Engineer-In-Responsible-Charge, ensuring the Type II IEPR is conducted in accordance with EC 1110-2-214 and will fully coordinate with the Chief of Construction, the Chief of Operations, and the project manager through the design and construction phases.

c. Required Type II IEPR Panel Expertise

For a Type II IEPR, the selection of IEPR review panel members will be made up of independent, recognized experts from outside of the USACE in the appropriate disciplines, representing a balance of expertise suitable for the review being conducted. The RMC will be the Review Management Organization for this project and is responsible for the selection of panel members. For a Type II IEPR, the selection of IEPR review panel members will be selected using the National Academy of Science (NAS) Policy which sets the standard for "independence" in the review process.

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 in this project. In addition all panel members should have an advanced degree and be professionally registered.

Mechanical Engineer – shall be a registered professional with demonstrated experience in upgrade/retrofit of mechanical control systems of radial gates at flood risk management projects.

Electrical Engineer – shall be a registered professional with demonstrated experience in upgrade/retrofit of electrical control systems of radial gates at flood risk management projects.

Construction Engineer – Reviewer should be a senior level, professionally registered engineer with extensive experience in the engineering construction field with particular emphasis on radial gates and dam safety projects. The Construction reviewer should have a minimum of 15 years of experience.

d. Documentation of Type II IEPR

The Type II IEPR will be managed by an A-E firm or Government entity which meets the criteria set forth in EC 1165-2-214. DrChecks review software will be used to document the Type II IEPR comments and aid in the preparation of the Review Report. Specific documentation procedures will be determined at time of contract award for the Safety Assurance Review (SAR).

The SAR contractor shall prepare a Final Review Report to include the panel review of the 1) the 90% design and specifications for preferred alternative (Measure 3: Float well manipulation by valved inlet (programmable), 2) design documentation report and 3) construction phase. The District will post the final Type II IEPR Review Report, USACE response, and related materials to the District website

(http://www.spl.usace.army.mil/Missions/Civil-Works/Review-Plans/). DrChecks review software will be used to document the Type II IEPR comments and aid in the preparation of the Review Report. Comments should address the adequacy and acceptability of the economic, engineering and environmental methods, models, and analyses used. Type II IEPR comments should generally include the same four key parts as described for ATR comments in Section 5 as well as the questions identified in Appendix E of EC 1110-2-214. An A-E contractor will be responsible for compiling and entering comments into DrChecks.

No later than 60 days following each milestone, the Type II IEPR panel will prepare the Review Report that will accompany the publication of the final report for the project and shall:

 Disclose the names of the reviewers, their organizational affiliations, and include a short paragraph on both the credentials and relevant experiences of each reviewer;

- Include the charge to the reviewers prepared by the RMC;
- Describe the nature of their review and their findings and conclusions; and
- 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.

For this project, ATR and Type II IEPR can occur concurrently in order to expedite the review schedule and have the construction completed by the 2018-19 flood season. 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

All implementation documents will be reviewed throughout the project for their compliance with law and policy. Guidance for policy and legal compliance reviews is addressed in Appendix H, ER 1105-2-100. 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. DQC and ATR augment and complement the policy review processes by addressing compliance with pertinent published Army policies.

7. Review Schedules and Costs

To the extent practical, reviews should not extend the implementation schedule but should be embedded in the design process. Reviewers should be involved at key decision points and are encouraged to provide timely over the shoulder comments.

Project Phase / Submittal	Product	Review Start	Review Complete
*PDT Review	30%/DDR	FEB 2018	FEB 2018
*DQC Review	90%/DDR	APR 2018	APR 2018
Address comments and back check	90%/DDR	APR 2018	APR 2018
DQC Review	IGE	APR 2018	MAY2018
ATR Review	90%/DDR	APR 2018	MAY 2018
IEPR (Type II/SAR)	90%/DDR	MAY 2018	MAY 2018
Address comments and back check	90%/DDR	MAY 2018	MAY 2018
DQC/ATR Review	O&M Plan	End of Construction (2019)	(2019)

30% = 30% design for retrofit

90% = 90% design for retrofit

DDR = Design Documentation Report

IGE = Independent Government Estimate

O&M = Operation & Maintenance Plan Update

*The ATR team will be engaged throughout the PDT and DQC reviews.

The preliminary review schedule is listed in the table above. The IEPR Type II contractor will be involved with the project through the construction phase and possibly into the OMRRR phase. More specific milestone dates will be added in the future during the construction phase, but can be assumed to occur near the mid-point of construction and near the end of construction.

8. Public Participation

As required by EC 1165-2-214, the approved Review Plan will be posted on the District public website (http://www.spl.usace.army.mil/Missions/Civil-Works/Review-Plans/). Information will be conveyed to the public through the use of press releases and media interviews, as necessary, and through the use of posting information to the Los Angeles District's website. The public can provide comments on the documents; after all comments have been submitted, the comments will be provided to the technical reviewers and responses will be given to the public.

9. Models

The use of certified or approved models for all activities to ensure the models are technically and theoretically sound, compliant with USACE policy, computationally accurate, and based on reasonable assumptions. The responsible use of well-known and proven USACE developed and commercial engineering software will continue and the professional practice of documenting the application of the software and modeling results will be followed. The selection and application of the model and the input and output data is still the responsibility of the users and is subject to DQC, ATR, and IEPR (if required). No engineering models are anticipated to be used for this project.

10. Review Plan Approval and Updates

The MSC for these implementation documents is the South Pacific Division. The MSC Commander is responsible for approving this Review Plan. The Commander's approval reflects vertical team input (involving the Los Angeles District, MSC, RMC and HQUSACE members) as to the appropriate scope and level of review for the study and endorsement by the RMC. The Review Plan is a living document and may change as the study progresses. The District is responsible for keeping the Review Plan up to date. Minor changes to the review plan since the last MSC Commander approval will be documented in an Attachment 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

(http://www.spl.usace.army.mil/Missions/Civil-Works/Review-Plans/) 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 *Interim Risk Reduction Measures Implementation Plan* for *Whittier Narrows Dam, San Gabriel Spillway Gates*. 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 DrCheckssm.

ATR Team Leader CENWP-EC-DS	Date
SPL Project Manager (home district) CESPL-EDG-L	Date
CELRH-EC-DE	Date
CEIWR-RMC-E	Date

CERTIFICATION OF AGENCY TECHNICAL REVIEW

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

SPL Chief, Engineer	ring Division (home district)
CESPL-ED	

Date



ATTACHMENT 2: TEAM ROSTERS

The PDT consists of:



PDT Lead, Mechanical Electrical Cost Mechanical Reservoir Operations Operations Electrical Cost Engineer Spec Writer Project Manager/DSPM

The DQC Team consists of:



Electrical & Mechanical Design Section Chief Electrical DSMS Lead Engineer Dam & Levee Section Chief Cost & Specs Section Chief Geotechnical Branch Chief Engineering Chief / Dam Safety Officer

The ATR Team consists of:



ATR Lead / Dam Safety / Gate Specialist Mechanical Engineer Electrical Engineer

The SAR Team will be determined and contracted in coordination with the RMO in the future.

Revision Date	Description of Change	Page / Paragraph Number

ATTACHMENT 3: REVIEW PLAN REVISIONS

ATTACHMENT 4: SPILLWAY GATE IRRM DESIGN SCOPE

1/10/18 Rev. A

1. Objective

This document defines the scope of work that is to be performed by the Huntington District Office in support of the Interim Risk Reduction Measure that is to be implemented on the Whittier Narrows Dam, which is located in the Los Angeles District of the Corp of Engineers. This dam was recently classified as a Dam Safety Action Classification (DSAC) 1 Dam and the work that is to be completed is intended to reduce the overall risk of the project. This modification specifically targets the issue of the premature opening of the spillway Tainter gates. All mechanical and electrical design activities as well as all cost estimating and engineering construction activities to be performed by LRH are described below. The work will be performed by the Electrical/Mechanical Design and Cost Sections of LRH for the Dam and Safety Levee Section of SPL.

The documents that are to be generated include construction plans and specifications, a Design Documentation Report (DDR), and a construction estimate. The plans and specifications will be of sufficient detail to fully describe all work activities that are to be performed by a Contractor. The DDR will present design assumptions, any computations, and rationale for the design decisions. The specifications will also require that all vendor information required for the completion of an O&M manual for the upgraded automatic control system be provided. LRH will author a detailed O&M manual which will include all provided vendor information as well as detailed information regarding the operation sequences and maintenance schedules for the new system. The new O&M manual will be written as an addendum to the existing Whittier Narrows O&M Manual. SPL will provide LRH with a copy of the existing Project O&M manual.

2. Mechanical Scope

The mechanical scope includes all design activities necessary to install a new automatic gate control system as described as well as the demolition and removal of the existing components that will no longer be needed.

Demolition

All items that are deemed unnecessary for the upgraded automatic system will be removed from the project. Upon completion of a preliminary review of the existing design and a site visit, it has been determined that the items identified below will not be needed following the upgrade. The list represents items to be removed from each of the nine control float wells. Items to be removed include:

- (1) Control Float and all associated 3/16" Wire Rope
- (3) 7" Control Sheave Assemblies including Pillow Block Bearings and Shafts
- (1) Regulating Cam and Sprocket Assembly including Pillow Block Bearings and Shafts
- (1) Control Weight including housing and all associated chain.
- (1) Control Weight Sprocket Assembly
- (1) Plug Valve Connecting Rod Sheave
- (1) Plug Valve

1/10/18 Rev. A



Figure 1 - Existing Automatic System



Figure 2 - Top of Control Well

1/10/18 Rev. A



Figure 3 – Top of Control Well



Figure 4 – Existing Control Weight



Figure 5 - Existing Plug Valve

2.1. Mechanical Upgrade

New control valves (9 total) will be installed in place of the removed plug valves utilizing the existing flanges at Elevation 223.0 for installation. The valves will be of the modulating type and will be operated by an electric actuator. A manual actuator will also be installed, if possible, to allow emergency, manual valve operation. The electric motor will be either mounted directly to the valve, in which case it will need to be of the submersible type, or it will be installed just below the access covers at elevation 239.5. The existing steel structure, to which all of the sheaves and sprockets are currently installed, could possibly be used to mount both the electric motor, and the hand operator. If installed at the higher elevation, the motor will not need to be of the submersible type.

Additionally, a manual valve will be installed downstream of the motorized valve. This valve will provide a means of emergency isolation should the automatic valve fail in the open position.

The availability of the control valves will dictate both the location of the electric motor and also the implementation of the manual operator option. In the event that either valve availability or delivery becomes an issue, SPL will be notified. Such issues may affect the project completion schedule.

Some of the previous reports regarding this upgrade made mention of additional debris protection at the control chamber inlet. During the site visit this feature was viewed and appeared to be of adequate construction. This item was also discussed during the meeting on 10/31/17 and the SPL

consensus was that the debris protection was adequate and that no further work was required. Debris protection enhancement at the control wells intake is not included in the LRH work scope.

Similarly, there have been some discussions regarding the replacement of the 1-3/8" gate cables and also remediation of gate racking issues. Neither of these items are included in this scope of work.



Figure 6- Upgraded Automatic System

3. Electrical/Controls

The Whittier Narrows spillway automatic mechanical control system that operates the spillway gates will be removed and replaced with a modern electrical control system. This work will involve removing the mechanical controls in place and installing a motor actuated valve which will be controlled by a programmable logic controller (PLC). The PLC logic for the new motor actuated valve automatic operation will mimic the water control characteristics of the existing plug valve. Sensors for water surface level and gate opening will be designed to operate the valve to obtain the desired gate opening per the water control manual characteristic gate opening curves.

The spillway gates will be operated by a master PLC located in the control house with a redundant PLC installed to take control automatically in case the master PLC fails. The layout of the PLC electrical equipment in the control house may be dependent on the Electrical Modernization contract

being awarded concurrently with the IRRM contract. Locations of cabinets will be left to the contracting officer. Input/Output (I/O) cables will be run in conduit under the bridge to each pier to read reservoir water surface level, gate opening, valve opening, and to control the valve opening.

A human-machine interface (HMI) will be installed in the control house for monitoring and manual PLC control. Personnel will be able to switch between automatic and manual control, operate the actuated valve, view gate opening, view reservoir level, and view alarms.

The designer will determine where the sensors will be placed for consistent, accurate indication of the reservoir water level and gate position. The reservoir level sensors will most likely be located in the individual gate control floatwells. A predetermined deviation between average control floatwell level and reservoir level will result in an alarm on the monitoring station in the control house. To account for failed sensors or any condition resulting in aberrant control floatwell water level indications, it is anticipated to employ a voting scheme where if a programmed number of control floatwells indicated the trigger level, then all valves would begin to open. Individual water level sensors indicating out of the expected range will alarm at the monitoring station.

There will be no connection to an outside network and there will be no remote operation or monitoring capabilities. Since the district does not use many PLC systems for dam gate operations, the PLC will not be sole-sourced.

The electric motors for the new valve will either be directly coupled submersible type or a remote motor located near the top of the control well with a control shaft to operate the valve.

4. Performance

The new system will be designed to meet the original design intent as presented in the Water Control Manual, dated October 1, 1957. The gate performance curve has been included below and shows the relationship between the measured pool level and the feet of opening at the spillway crest gates. It is denoted as "Automatic Operation" on the image below.

1/10/18 Rev. A





Figure 7 - Gate Performance Curve

Additionally, the Figure below was taken from the "Analysis of Design, Whittier Narrows Flood Control Basin, Addendum D, Tainter Gates and Accessories", dated January 1953. This graph shows the relationship between the float rise and the opening of the gate and will be used to assist in the development of the PLC control algorithm.

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Figure 8 - Gate Opening vs. Float Rise

5. Cost/Estimating

LRH Cost Section will be responsible for the preparation of the construction cost estimate, which will form the basis of the Independent Government Estimate (IGE) which will be assembled by SPL. SPL will be responsible for reviewing the Mii file, providing feedback to LRH, creating any pertinent reports, and final assembly of the IGE. LRH will sign as the preparer of the final IGE, SPL will sign as the reviewer, and the SPL ED Chief will sign as the approver.

LRH will be responsible for providing a construction estimate for both the 30% and 90% Design packages according to the presented schedule.

6. <u>Reviews</u>

The IRRM Design shall be reviewed in accordance with the "Review Plan" that is to be issued by SPL for this specific project. A draft of this document was given to LRH and discussed briefly during the meetings in Los Angeles on October 31 and November 1 of 2017. Revisions were to be made to this document and the final version should be provided to LRH as soon as possible.

At the 30% phase, the entire design is to undergo an internal District Quality Control (DQC) review and is to also be reviewed concurrently by the SPL District Office. The 90% package will also be reviewed concurrently by the LA District with LRH also performing a DQC review.

Once the DQC has been completed, the Agency Technical Review (ATR) and the Independent External Peer Review will commence. The SPL district office will be responsible for coordination with RMC for selection of both the ATR and the IEPR. LA District will be responsible for BCOES (Biddability, Constructability, Operability, Environmental, and Sustainability) Review.

7. Contracting/Construction

SPL will be responsible for all Contracting actions. SPL will also be responsible for all Construction Engineering activities. These activities include, but are not limited to, monitoring/controlling Contractor's work schedule, planning of Contractor's work, and distribution of Contractor submittals to the appropriate Design Authorities at LRH.

8. Engineering During Construction

8.1. Submittal Reviews

LRH will oversee all required Design Engineering activities during the construction phase of the project. SPL will be responsible for managing the day to day operations of the construction contractors and will be responsible for ensuring that the construction submittals are routed to the LRH office for review. This will include review of all construction submittals, responding to construction RFIs, and amending or changing of any of the design documents.

8.2. Site Visits

The LRH Lead Engineer will be available to make two (2) trips to the Project with each trip duration being no more than one week. One of the visits will be for the pre-final inspection. The Lead Electrical Engineer will be available to make three (3) trips to the project with each trip duration being no more than one week. The primary purpose of the electrical engineer's visits will be to provide oversight during the programming of the PLCs and also during testing.

SPL will be responsible for coordination of all LRH site visits to ensure concurrence with appropriate contractor work activities. LRH should be given at least a 2 week notice prior to scheduled site visits.

9. Schedule

The following is the schedule for the IRRM Activities:

- 09 Nov 2017 Scope and cost estimate from LRH
- 01 Feb 2018 30% Design Completion
- 01 Apr 2018 90% Design Completion, DQC Start
- 15 Apr 2018 DQC Completion, ATR and IEPR start
- 15 May 2018 ATR Completion
- 01 Jun 2018 IEPR completion, Contracting start
- 01 Sep 2018 Contract Award
- 01 Nov 2018 Construction start
- 01 Feb 2019 Construction completion
- 01 April 2019 O&M Manual Complete

10. LRH Deliverables

- 30% Design Package
- 30% Construction Estimate
- 90% Design Package
- 90% Construction Estimate
- Final Design Package (Following ATR/IEPR)
- Final Construction Estimate (Following ATR/IEPR)
- Engineering Support During Construction and Final Testing/Commissioning
- O&M Manual for Updated System