



US Army Corps
of Engineers®

Prepared by:

**South Pacific Division
San Francisco District**

Pajaro River and Tributaries Flood Risk Management Project

**(Preconstruction, Engineering and Design Phase) Implementation
(Levee System ID #5305000024/5305000025/5305000026)**

Review Plan

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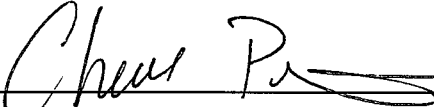
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MSC Approval Date: Pending

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Last Revision Date: *None*

Section 1

Introduction

1.1 Purpose

This Review Plan (RP) for the Pajaro River and Tributaries Flood Risk Management Project (P2 490035), will help ensure a quality-engineering project is developed by the Corps of Engineers in accordance with Engineer Regulation (ER) 1165-2-217, “Civil Works Review Policy” and ensures quality measurement in the Plan-Do-Check-Act delivery business process as prescribed by Engineer Regulation (ER) 5-1-11. As part of the Project Management Plan this RP establishes an accountable, comprehensive, life-cycle review strategy for Civil Works products and lays out a value-added process and describes the scope of review for the current phase of work. The EC outlines general levels of review: District Quality Control/Quality Assurance (DQC/DQA), Agency Technical Review (ATR), Biddability, Constructability, Operability, Environmental, and Sustainability (BCOES) Review, and Policy and Legal Compliance Review. This RP will be provided to Project Delivery Team (PDT), DQC, ATR, BCOES, and SAR Teams. The District Chief of Engineering has assessed that the life safety risk of this project is significant; therefore a Safety Assurance Review (SAR) will be required, see Paragraph 8.1.

1.2 Key References

- ER 5-1-11, USACE Business Process, 21 Jul 2019
- ER 1165-2-217, Civil Works Review Policy, 1 May 2021
- ECB 2019-15, Interim Approach for Risk-Informed Designs for Dam and Levee Projects, 08 October 2019
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- ER 415-1-11, Biddability, Constructability, Operability, Environmental and Sustainability (BCOES) Reviews, 1 January 2013
- EM 1110-2-1913, Design, Construction, and Evaluation of Levees, 30 April 2000
- ER 1110-1-8159, Engineering and Design, DrCheckssm, 10 May 2011
- ER 1110-2-1150, Engineering and Design for Civil Works Projects, 31 August 1999
- RMC-AD-2019-03 Standard Operating Procedure for Type II Independent External Peer Reviews (Safety Assurance Reviews), 28 January 2019
- Project Management Plan (PMP)
 1. Clickable Link: [_PMP](#)
 2. Address: pw:\PWINT-WPC.EIS.DS.USACE.ARMY.MIL:CESPN - San Francisco District\Documents\Civil_Works\Pajaro_River_CA_490035\1.0 Project Info and Mgt_PMP\

- 08506-SPD, District Control/Quality Assurance (DQC) of Engineering Products ([Link: SPD DQC](#)). The file is located on SPD's ProjectWise drive, pw:\PWINT-WPC.EIS.DS.USACE.ARMY.MIL:CESPD - South Pacific Division\Documents\SPD_Team_Data\CESPD-RBT\Quality Management\.
- Standard Operating Procedure – Project Execution, Design Through Construction Contract Award (In House Designed Projects) ([Link: SPN SOP](#)). The file is located on the District's ProjectWise drive, pw:\PWINT-WPC.EIS.DS.USACE.ARMY.MIL:CESPN – San Francisco District\Documents\SPN_Team_Data\Orgs\CESPN-ET\CESPN-ET-E\CESPN-ET_E_Staff\TL_Guidance\.
- Pajaro River Flood Risk Management General Reevaluation Report & Integrated Environmental Assessment ([Link: Pajaro River Final GRR EA Feb 2019 Revised Dec 2019.pdf](#)). The file is located on the District's ProjectWise drive, pw:\PWINT-WPC.EIS.DS.USACE.ARMY.MIL:CESPN - San Francisco District\Documents\Civil_Works\Pajaro_River_CA_104552\2.0_Planning\Planning_Report\3_Final\Final Report - HQ Approved Dec 2019\Pajaro River Final GRR EA Feb 2019 Revised Dec 2019.pdf.

1.3 Review Management Organization

The USACE Risk Management Center (RMC) is the Review Management Organization (RMO) for this project. This RP will be updated for additional project phases and for the construction phase.

Section 2

Project Description

2.1 Project Description

2.1.1 Introduction and Purpose

The Pajaro River watershed is located on the central coast of California about 75 miles south of San Francisco and includes portions of Santa Clara, San Benito, Santa Cruz, and Monterey Counties (Figure 1). The watershed, which is approximately 88 miles long and 30 miles wide, drains an area of approximately 1,300 square miles of the southern section of the California Coastal Ranges, emptying into the Pacific Ocean six river miles southwest of the City of Watsonville.

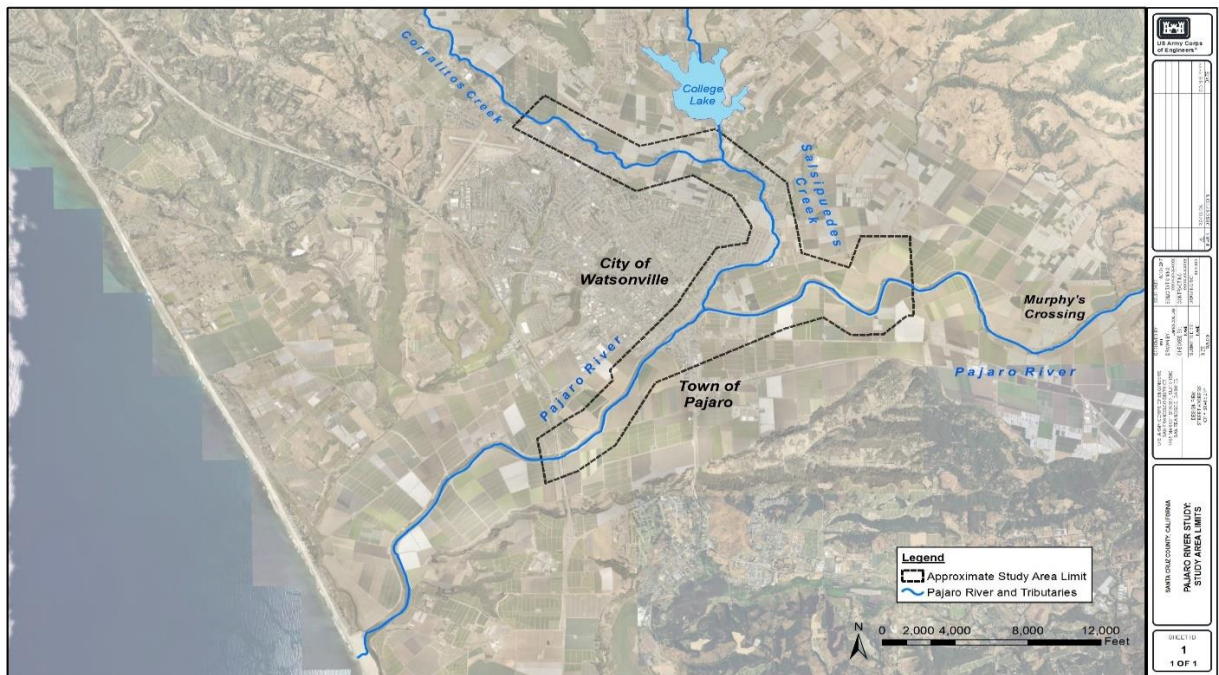


Figure 1. Pajaro River and Tributaries Project Area Map

The project area is located within the lower Pajaro River watershed. It encompasses an area of approximately 10,000 acres, which includes the stream channels, active floodplains, and terraces along the Pajaro River and the Salsipuedes and Corralitos Creeks. The area is divided by the Pajaro River, which serves as a border for two counties. Santa Cruz County lies to the north of the Pajaro River, and Monterey County lies to the south. The Salsipuedes and Corralitos Creeks, which join just north of the Pajaro River in Santa Cruz County, are tributaries of the Pajaro River.

The City of Watsonville, north of the Pajaro River, and the unincorporated Town of Pajaro, south of the Pajaro River, are the two urban areas within the project area. The project area includes both widespread agricultural land devoted to high-value crops (e.g. strawberries, raspberries, and lettuce) and extensive residential, commercial, and industrial structures within the two urban areas.

There is significant risk to public health, safety, and property in the project area associated with flooding. The existing levee system within the project area provides flood risk management benefits to over 10,000 acres of mixed-use land with an estimated \$1.2 billion in damageable property. Further, as the floodplain habitat has been altered, native functional habitats have been lost causing impacts to endangered and threatened species.

The overall project goal is to reduce flood risk to the City of Watsonville, the Town of Pajaro, and surrounding agricultural lands. Specific project objectives include:

- Reduce the risk of flooding on human life and safety
- Reduce the risk of flood damages, including critical infrastructure
- Improve natural geomorphic processes and ecological functions in conjunction with other flood risk management features
- Include environmentally sustainable designs and construction methodologies and to minimize environmental impacts from future operation and maintenance for the recommended plan in conjunction with other flood risk management features
- Increase recreational opportunities in conjunction with flood risk management features

2.1.2 Recommended Plan

The Pajaro Recommended Plan presented below is based on a 2017 Hydrology and Hydraulic (H&H) model developed by the Sacramento District. The model was developed utilizing outdated hydrologic data from 1997. A new H&H model is currently being developed by the Sponsor's AE consultant using new hydrologic data from 2018. The updated H&H model is scheduled for completion in November 2021. This Review Plan will be updated upon completion of the H&H reevaluation. The plan presented below is a combination of alternatives evaluated for the main stem of the Pajaro River as well alternatives evaluated for its tributaries, the Salsipuedes Creek and the Corralitos Creek. The Recommended Plan is summarized below and is illustrated in Figures 2 & 3.

Mainstem Alternative 1

This alternative includes improvements on both banks of the Pajaro River in Reaches 2 and 3, as well as on the left bank of Reach 4. Improvements in Reach 2 include demolition of the existing levee and construction of a new 100-foot setback levee. In Reach 3, the existing levee would be improved in place with a floodwall. In Reach 4 on the left bank the existing levee would be removed and a new 100-foot setback levee would be constructed that ties into high ground on the east end. These levees would be constructed to provide flood risk management (FRM) up to the 1% Annual Chance Exceedance (ACE) event with a 90% assurance target. There would be no improvements to the right bank of Reach 4 since this reach was determined to not be economically justified based on engineering and economic analysis. The levees/floodwalls would range from approximately 3-15 feet in height. Erosion protection riprap would be placed on approximately 700 feet of Reach 2, 2,000 feet of Reach 3, and 10,000 feet of Reach 4 left bank.

Tributary Alternative 6

The levee design for the Pajaro project reaches along the Salsipuedes and Corralitos Creeks is economically optimized at a 1% ACE with a 90% assurance target for the Watsonville urban area which is on the right bank of the streams. Incremental economic analysis indicated that improvements to levees on the left bank of the tributaries were not economically justified if designed to provide FRM for the 1% (100-year) ACE. Further analysis determined that features providing FRM to the urbanized areas along the left bank, the upper portion of Reach 5 above Lakeview Road and Reach 6, were economically justified to provide FRM for the 4% (25 year) ACE event, consistent with the existing levee located further downstream in Reach 5.

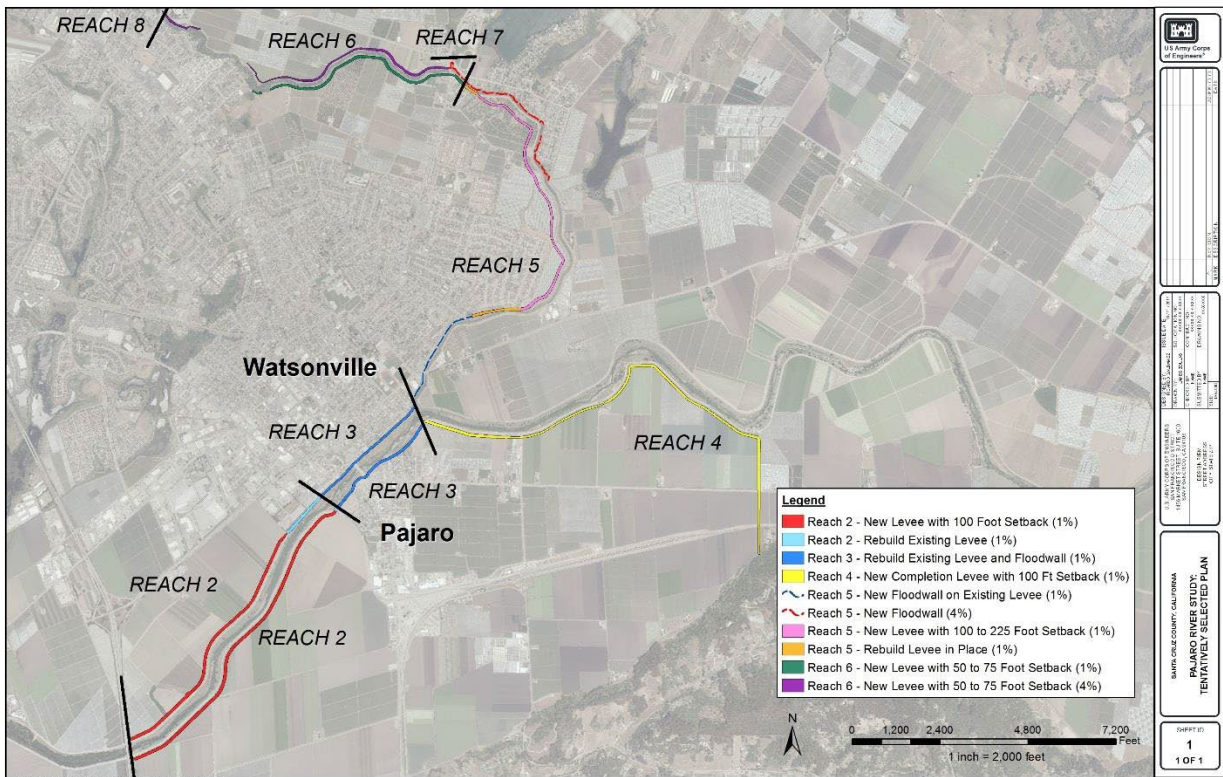


Figure 2. Pajaro River and Tributaries Recommended Plan based on 2017 H&H model that is currently being updated.

For Reach 5 right bank, above the confluence with the Pajaro River, approximately 5,300 lineal feet of floodwalls or a combination levee with a floodwall on top would be constructed where urban development prevents raising existing levees. A 4,500-foot levee setback between 100 to 225 feet would be constructed upstream of the floodwall section. Then an approximately 500-foot long section of the existing levee would be rebuilt in place. For Reach 5 left bank, beginning 8,800 feet upstream from the confluence with Pajaro River, a floodwall or a combination levee with a floodwall on top would be constructed between Lakeview Road and College Road—a distance of approximately 5,000 feet. Erosion protection riprap would be placed on approximately 4,100 feet of Reach 5 right bank.

Reach 6, both right and left bank, includes construction of a new levee, approximately 5,900 feet in length, constructed 50 to 75 feet from the edge of the Corralitos Creek channel. Erosion protection riprap would be placed on approximately 3,000 feet of Reach 6 right and left banks.

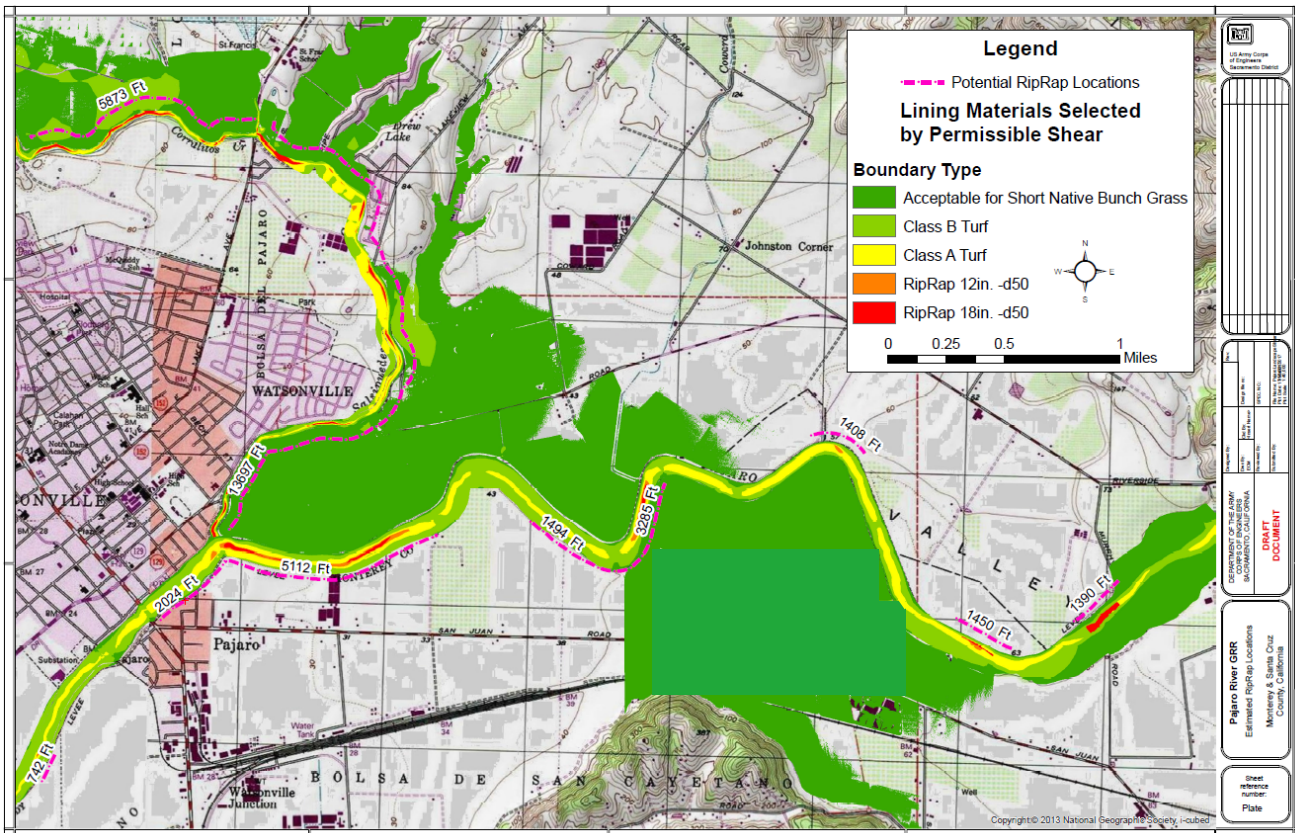


Figure 3. Pajaro River and Tributaries Channel Lining Materials and Estimated Erosion Protection.

The levees/floodwalls along Salsipuedes and Corralitos Creeks would range from approximately 10-11 feet in height. During the PED phase, the hydraulic analysis will be re-examined to ensure it reflects current conditions. If necessary, additional refinements to the levees along Salsipuedes Creek near the confluence with the Pajaro River will be considered including:

1. Further raising the levees about two to five feet with the same or lower channel roughness; or
2. Setting back the left bank as much as 100 feet with the same or lower channel roughness

2.1.3 Project Current Design Status

The Pajaro project reaches are all at the preliminary stage of development. The H&H model is currently being updated by the Sponsor's AE consultant with completion schedule for November 2021. A geotechnical analysis needs to be conducted for a large portion of the project. Additionally, an Engineering Documentation Report and appropriate National Environmental Policy Act (NEPA) updates will be produced to capture completion of the coordination and consultation required pursuant to the Endangered Species Act. These products will also capture the results of all cost and engineering refinement and will be provided to the vertical team prior to any construction budget request. Finally, since the team will be revisiting the findings of our original NEPA analysis and supplementing as necessary, the team will share either an amended Environmental Assessment/Finding of No Significant Impact or Environmental Impact Statement/Record of Decision with the vertical team prior to the funding request.

After those major project design elements are completed, individual reach designs will be prepared. The Design Agreement (DA) is anticipated to be signed in February 2021 – this will signify the beginning of the Preconstruction, Engineering, and Design (PED) phase. At this time, project reaches are scheduled to be completed in series, however future decisions could lead to multiple reaches being designed together. The Pajaro River project is currently slated to be completed as a Design-Bid-Build (D-B-B) construction project. USACE will design the project reaches, use the contracting process to advertise the resulting Plans & Specifications (P&S), and accept bids from construction contractors for the contract award(s) and construction of the project.

The estimated cost for the total project ranges from \$350 Million to \$400 Million at the FY2020 price level. The total PED costs are estimated at \$33 Million with an estimated duration of 4 to 12 years. The current assumption has each project reach designed in sequence – funding, personnel availability, and NFS in-kind contributions could result in a shorter design duration with multiple reaches being designed concurrently. The estimated population at risk located in the floodplain is 12,600 residents (approximately 3,000 residents in Pajaro and 9,600 in Watsonville); this estimate will be updated as refinements are made during future risk assessment efforts. More information on the project and risk associated with the project is provided in Attachment 2.

2.2 Project Sponsor

Products and analyses provided by non-Federal sponsors as in-kind services are subject to DQC, ATR, Policy and Legal Compliance, BCOES, and SAR reviews. Sponsor Peer Review of In-Kind Contributions - There will be in-kind contributions for this effort. The non-Federal Sponsors (NFS) for the Pajaro River project are Monterey and Santa Cruz Counties. This section of the Review Plan will be updated when the exact extent of NFS in-kind contributions are determined and finalized.

Section 3

Risk Assessment During Design

Risk assessments during design will be performed in accordance with ECB 2019-15. The reviews of the risk assessments are included in this RP. Once the risk assessment during design is completed, this RP will be revisited by the District, MSC, and RMC to determine if the review requirements need to be revised. Additional information on the risk assessment is available in Attachment 2. The design risk assessment will be reviewed by a small team composed of subject matter experts as deemed appropriate for the project, to determine if there will likely be a design deviation request, if there is a controversial process being used, or if there is a major risk concern. The district LSO will be part of the District Quality Control team for risk assessments. The RMC will coordinate with the LSOG as needed for decisions when appropriate. LSOG members from the relevant disciplines may participate as members of the vertical team, technical review or policy review teams as necessary.

The risk assessment completed near the end of construction will be reviewed by the full risk assessment review team, the review team will be composed of an ATR Lead, Geotechnical Engineer, Hydraulics and Hydrology Engineer, Structural Engineer, and Consequence specialist; the same review team will be used for the risk assessment, design, and construction documents to the maximum extent possible. The final risk assessment products and decision documents will be presented to LSOG as deemed necessary, the timing of this submission to LSOG will be coordinated with the RMC.

Section 4

Project Delivery Team Reviews

PDT Reviews are in addition to the independent DQC Reviews described in Section 5. The PDT Reviews are to ensure consistency and effective coordination across all project disciplines for the work product. For example, the PDT will perform a complete reading of any reports and accompanying appendices prepared by the PDT to assure the overall coherence and integrity of the report, technical appendices, and the recommendations before approval. The PDT will normally include a variety of stakeholders, each with his/her own important project requirements and a different, but interlocking, review responsibility. The PDT Review may also include a plans-in-hand review at the end of development. PDT Reviews, as an extension of the DQC, will be conducted as directed in the MSC/District QMS processes.

Section 5

District Quality Control

5.1 Requirements

All implementation documents (including supporting data, analyses, reports, environmental compliance documents, water control manuals, etc.) and risk assessment reports shall undergo DQC/DQA in accordance with ER 1165-2-217. Additionally, the South Pacific Division's (SPD) and the San Francisco District (SPN) have quality control/quality assurance procedures to follow for DQC respectively. SPD has 08506 – SPD DQC for Engineering Products (Link: [SPD DQC](#)) and SPN's DQC procedures are the Quality Management section of the District's Standard Operating Procedure (Link: [SPN SOP](#)) – Project Execution, Design Through Construction Contract Award (In House Designed Projects). The SOP was approved and published by SPN in September, 2005.

DQC/DQA will be performed on all early release decision information (i.e., hydraulic conditions, geotechnical parameters, loading conditions, etc.) and certified complete down to the component or sub-component level prior to incorporation into the design. The District shall perform these minimum required reviews (see Chapter 4 and Appendix F, 2. Sample DQC Certification in ER 1165-2-217).

The reviews of project document in the SOP include IDRs, ITRs, and BCOES reviews which are in conformance with the requirements in ER 1165-2-217. Additionally, the SOP includes management reviews which are normally performed at monthly In-Progress Review (IPR) by the Branch Chiefs and at monthly Project Review Board (PRB) by the Division Chiefs. The management reviews will include discussion and resolution of the issues and tracking the project milestones.

Inter-discipline Reviews (IDR) are the District's quality control procedures performed by those producing the design. They include the reviews by various disciplines, by construction branch and by Safety Officer. IDRs must be carried out at 30%, 60% and 90% completion levels as a routine management practice in each of the functional elements. These reviews are essential to the production of a quality product and must be carried out diligently to avoid issues and problems during ITR and BCOES reviews. The Chiefs of the PDT members will certify the interdisciplinary reviews at 90% completion level.

Independent Technical Reviews (ITR) is a quality assurance procedure performed by those not directly involved in the production of the design. A project ITR is triggered when the document to be reviewed is at 90% completion level. After the acceptance of project document, the ITR team and ITR Chair will sign the ITR certification.

Quality Control (IDR) and Quality Assurance (ITR) are the processes that employ operational techniques and activities to assure the performance of a project in accordance with the requirements. DrChecksSM (<https://www.projnet.org/projnet/>) is the software system used to track review comments, responses to comments, back checks and acceptance of the corrections or responses. The technical lead will facilitate the creation of a project portfolio in the system which allows PDT and DQC/QA member access. An electronic version of the document or products for review (design drawings, specification, and DDR) will be posted on DrChecksSM or another file-sharing system to the team at least one business day prior to the comment period.

See Attachment 1, Table 9 for the DQC Lead, reviewers, and reviewer's disciplines.

5.2 Products to Undergo DQC

Work products that will undergo DQC include:

- Hydrology and Hydraulic Analysis
- Plans & Specifications
- Design Documentation Report (DDR) – including Geotechnical, Civil, Structural, Hydrology & Hydraulic, and Environmental reports and analyses
- Cost Estimates
- Risk Assessment
- Specifications + Contracting Front-End Documentation
- Engineering Considerations and Instructions to Field Personnel
- Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R) Manual

5.3 Schedule and Estimated Cost of DQC

Although DQC is always seamless, Table 1 reflects milestone reviews that are tentatively scheduled for the first design reach. Subsequent reaches would follow a similar schedule. The cost for DQC for each project reach is approximately \$95,000. Under the current approach, DQC will not occur concurrently with ATR.

Project Phase/Submittal	Review Start Date	Review End Date
DQC H&H Analysis	AUG 2021	SEP 2021
DQC/DQA 30% Review	JUL 2022	JUL 2022
Design Risk Assessment Report	AUG 2022	SEP 2022
DQC/DQA 60% P&S & DDR Review	NOV 2022	DEC 2022
DQC/DQA 90% P&S Review	APR 2023	MAY 2023
Final Risk Assessment Report	AUG 2023	SEP 2023

Project Phase/Submittal	Review Start Date	Review End Date
DQC/DQA 100% P&S Review	AUG 2023	SEP 2023
Cost Estimates	SEP 2023	SEP 2023
DQC OMRR&R Manual	TBD	TBD

Table 1 DQC Schedule

Section 6

Agency Technical Review

6.1 Requirements

All implementation documents (including supporting data, analyses, reports, environmental compliance documents, water control manuals, etc.) and risk assessment reports shall undergo ATR in accordance with ER 1165-2-217. ATR reviews will occur seamlessly, including early involvement of the ATR team for validation of key design decisions, and at the scheduled milestones as shown in Section 6.5. A site visit will be scheduled for the ATR Team. The default position for life safety projects is that a site visit is required early in design and periodically in a risk-informed manner during construction, especially for those disciplines that assess life safety risk (Geotech, Hydraulic, Structural, and Consequences). Documentation of ATR will occur using the four-part comment structure and the use of DrChecksSM.

6.2 Products to Undergo ATR

Work products that will undergo ATR include:

- Hydrology and Hydraulic Analysis
- Plans & Specifications
- Design Documentation Report (DDR) – including Geotechnical, Civil, Structural, Hydrology & Hydraulics, and Environmental reports and analyses
- Cost Estimates
- Risk Assessment
- Operation, Maintenance, Repair, Replacement and Rehabilitation (OMRR&R) Manual

6.3 Required Team Expertise and Requirements

The following disciplines will be required for ATR of this project. Table 2 summarizes the involvement of ATR team member at each PED milestone.

ATR Lead: The ATR team lead is a senior professional outside the home MSC 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, since a SAR is required, the ATR Lead will be an engineer/geologist with a strong levee safety background.

Civil Engineer – Reviewer should be a senior level professional, with specific experience in the civil layout, design, and execution of horizontal civil works projects including experience with sequencing levee construction. The Civil reviewer should have a minimum of 10 years of experience.

Structural Engineer – shall have experience and be proficient in performing stability analysis, finite element analysis, seismic time history studies, and external stability analysis including foundations on floodwall, levee closure, and bridge. The structural engineer shall have specialized experience in the design, construction and analysis of concrete floodwall, levee closure, and bridge.

Geotechnical Engineer - shall have experience in the field of geotechnical engineering, analysis, design, and construction of levees and floodwalls. The geotechnical engineer shall have experience in subsurface investigations, rock and soil mechanics, internal erosion (seepage and piping), slope stability evaluations, erosion protection design, and earthwork construction.

Hydraulic Engineer – shall have experience in the analysis and design of hydraulic structures related to levees including the design of hydraulic structures (e.g., spillways, outlet works, and stilling basins). The hydraulic engineer shall be knowledgeable and experienced with the routing of inflow hydrographs through channels, Corps application of risk and uncertainty analyses in flood damage reduction studies, and standard Corps hydrologic and hydraulic computer models used in hydrologic modeling and analysis for levee designs.

Biologist – Reviewer should be senior level professional, with specific experience in federal and California laws/regulations as they relate to environmental compliance for construction permitting. The Biologist should have experience with the implementation of best management practices for care of water and wildlife exclusion in environmental sensitive areas. The Biologist should have a minimum of 10 years of experience.

Construction Engineer – Reviewer should be a senior level, professionally registered engineer with extensive experience in the engineering construction field with particular emphasis on levee projects. The Construction reviewer should have a minimum of 10 years of experience.

Cost Engineering – The reviewer for cost estimating shall be a registered or certified cost engineer with a BS degree or higher in engineering or construction management, and should have experience estimating complex, phased multi-year civil works construction projects and levee systems. The reviewer shall have extensive knowledge of MII software and the Total Project Cost Summary (TPCS) as required during ATR. A certification from the Cost Directorate of Expertise (DX) in Walla Walla District may be required.

Consequences (Economist) – The economist (or consequence specialist) will have experience evaluating flood risk management projects in accordance with ER 1105-2-100 and USACE models and techniques to estimate population at risk, life loss, and economic damages for dam safety risk analysis.

Operations – The reviewer should understand how a flood risk management system performs and how it reduces the risk of flooding. The reviewer should have a working knowledge of appropriate maintenance measures necessary to keep systems in optimal condition for continued performance and have a clear understanding of dangers or safety concerns that could develop due to lack of appropriate maintenance. It is also important for the reviewer to be familiar with structural and levee safety measures that may be incorporated into flood risk management systems.

Milestone Reviews	Civil	Geotech	H&H	Structural	Biologist	Construction	Cost	Consequence	Operations
H & H Analysis			X						
Design Risk Assessment Report	X	X	X	X				X	
ATR 60% P&S Review	X	X	X	X	X	X	X		
ATR 90% P&S Review	X	X	X	X	X	X			
ATR 100% P&S Review							X		
ATR During Construction	X	X		X	X	X			
Final Risk Assessment Report	X	X	X	X				X	
OMRR&R Manual	X			X		X			X

Table 2. ATR Teams for Milestone Reviews

6.4 Statement of Technical Review Report

At the conclusion of each ATR effort, the ATR team will prepare a review report using the RMC template with a completion and certification memo.

6.5 Schedule and Estimated Cost of ATR

Although ATR is always seamless, the preliminary ATR milestone schedule is listed in Table 3. The cost for the ATR for each design reach is approximately \$125,000. Under the current approach, ATR will not occur concurrently with DQC.

Project Phase/Submittal	Review Start Date	Review End Date	Site Visit
H&H Analysis	AUG 2021	SEP 2021	
Design Risk Assessment Report	MAR 2022	APR 2022	
ATR 60% P&S Review	APR 2022	MAY 2022	X
ATR 90% P&S Review	TBD	TBD	
ATR During Construction	NOV 2022	DEC 2022	
Final Risk Assessment Report	TBD	TBD	
ATR OMRR&R Manual	TBD	TBD	

Table 3 ATR Schedule

Section 7

BCOES Review

7.1 Requirements

All implementation documents (including supporting data, analyses, reports, environmental compliance documents, water control manuals, etc.) shall undergo BCOES review in accordance ER 415-1-11 and ER 1110-1-12. BCOES reviews are done during design for a project using the design-bid-build (D-B-B) method or during development of the request for proposal (RFP) for a design-build (D-B) project. The BCOES review results are to be incorporated into the procurement documents for all construction projects. The BCOES review will be documented in DrChecksSM. The BCOES reviewers are encouraged to include local sponsors' facility operators and maintenance staff. The BCOES roster is provided in Attachment 1, Table 12.

Section 8

Safety Assurance Review

8.1 Decision on SAR

The District Chief of Engineering has made a risk-informed-decision that this project poses a significant threat to human life (public safety) and therefore a SAR will be performed. Upon completion of the design risk assessment, the District Chief of Engineering will reassess the determination of SAR requirement.

An SAR is appropriate for the Pajaro River project since failure and/or insufficient operation of the project features poses a significant threat to life safety, and to critical infrastructure. The city of Watsonville and Town of Pajaro continue to grow with current total population of about 56,000 residents. Agricultural areas downstream from these municipalities contain approximately 8,500 acres of high-value crops that are extremely susceptible to flooding. The Watsonville and Pajaro economies and residential incomes are critically dependent on the agriculture industry. In addition to the critical agricultural and municipal infrastructure at risk, there are more than 200 water wells within the project area that are at risk for contamination during flood events.

8.2 Products to Undergo SAR

Work products that will undergo SAR include:

- Plans & Specifications
- Design Documentation Report (DDR) – including Geotechnical, Civil, Structural, Hydrology & Hydraulic, and Environmental reports and analyses

8.3 Required SAR Panel Expertise

The following disciplines will be required for SAR of this project:

Geotechnical Engineer - The Geotechnical Engineering panel member should be a senior-level geotechnical engineer with experience in the field of geotechnical engineering, analysis, design, and construction of embankment dams and levees. The Panel Member should have knowledge and experience in the forensic investigation and evaluation of seepage and piping, settlement, slope stability, and deformations problems associated with embankments constructed on weathered and jointed rock and alluvial soils. The Panel Member should have experience in the design and construction of seepage barriers or cutoff walls.

Hydraulic Engineer – The Panel Member should have experience with engineering analysis related to flood risk management and dam safety projects. The Panel member will hold a degree in Civil Engineering, or Hydrology and Hydraulics Engineering. The Panel Member should have experience with unsteady flow dam failure analysis modeling. The Panel Member must demonstrate knowledge and experience with the routing of inflow hydrographs through multipurpose flood control reservoirs. Experience should emphasize modeling spillways and outlet works related to flood control reservoirs, particularly for large dams. Demonstrate experience in dealing with discharge being utilized at the individual flood control reservoir during a large flood event such as the Probable Maximum Flood (PMF).

Structural Engineer – shall have experience and be proficient in performing stability analysis, finite element analysis, seismic time history studies, and external stability analysis including foundations on floodwalls. The structural engineer shall have specialized experience in the design, construction and analysis of floodwalls and floodgates.

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

Documentation of SAR will be prepared in accordance with ER 1165-2-217.

8.4 Scope, Schedule, and Estimated Cost of SAR's

The SAR's will be performed in accordance with ER 1165-2-217. Documentation of SAR will use the RMC SAR Report template. SAR reviews will occur at the milestones shown in Table 4. The estimated costs for the SAR's of this project are in the range of \$165,000 to \$330,000. This estimate will be refined when the Scope of Work for the SAR task order is completed.

Milestone Reviews	Geotech	H&H	Structural	Construction	Site Visit or Conference Call Duration (days)	Review Start Date	Review End Date
35% Design	X	X	X	X	1.5		
65% Design	O	O	O		0.5		
95% Design	O	O	O		0.5		
P&S	O	O	O		0.5		
35% of Construction or	X			X	1		

Milestone Reviews	Geotech	H&H	Structural	Construction	Site Visit or Conference Call Duration (days)	Review Start Date	Review End Date
Completion of Foundation Prep							
65% of Construction or 50% Embankment Placement	X			X	1		
35% of Flood Wall Construction			X	X	1		
65% of Flood Wall Construction			X	X	1		
End of Construction	X	O	X	X	1		

Table 4 Scheduled Milestone Reviews with Required Reviewers and Site Visit Duration

(X - Indicates attendance at the site visit. O - Indicates participation via conference call.)

Section 9

Review Plan Approval and Updates

The MSC Commander, or delegated official, is responsible for approving this RP. The Commander’s approval reflects vertical team input (involving the District, MSC, and RMC) as to the appropriate scope, level of review, and endorsement by the RMC. The RP is a living document and should be updated in accordance with 1165-2-217. All changes made to the approved RP will be documented in Attachment 3, Table 14 RP Revisions. The latest version of the RP, along with the Commanders’ approval memorandum, will be provided to the RMO.

Section 10

Engineering Models

The use of certified, validated, or agency approved engineering models is required 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, BCOES, Policy and Legal

Compliance review, and SAR (if required). Where such approvals have not been completed, appropriate independent checks of critical calculations will be performed and documented. The following engineering models, software, and tools are anticipated to be used:

Model Name	Version	Approved/Certified
GeoStudio 2020 suite (Slope/W)	10.2.1.19666	Certified
GeoStudio 2020 suite (Seep/W)	10.2.1.19666	Certified
HEC-RAS	6.0	Approved

Table 5 Engineering Models and Status

Section 11

Review Plan Points of Contact

	Title	Organization	Phone
Tutashinda Salaam	Project Manager	CESPN-PM-A	415-503-6579
Jimmy Chen	Lead Engineer	CESPN-ETE-D	415-503-6843
John Clarkson	Senior Reviewer	CEWR-RMC	304-399-5217

Table 6 RP POC's

Attachment 1

Team Rosters (CUI)

(To be Removed Prior to Posting on District Website)

Discipline/Role	Name	Phone / Email
Project Manager	Tutashinda Salaam	Tutashinda.Salaam@usace.army.mil
Lead Engineer (DSPC Approved) & SPN RP POC	Jimmy Chen	Jimmy.C.Chen@usace.army.mil
RMC Senior Reviewer	John Clarkson	304-399-5217

Table 7 RP POCs

Discipline/Role	Name	Description of Credentials
Facilitator		
During Design		
Geologist	John Conway	John Conway, DSPM/LSPM, San Francisco District - Dam and Levee Safety have been the focus on Mr. Conway's 37-year professional career in the US Army Corps of Engineers (USACE). Initial 30 years he had the opportunity to work in the construction of major flood control projects as Project Geologist or Lead Geologist. He served the Dam Safety Production Center as the Construction Liaison. The nationwide position required inspecting ongoing and reviewing large dam construction projects. He is currently Dam and Levee Safety Program Manager of the San Francisco District and for close to 3 years. He has been managing the dam and levee portfolio for USACE San Francisco District.
Geotechnical Engineer	TBD	
Hydraulic Engineer	Patrick Sing	P.E., San Francisco District - Received Bachelor of Science degree in Civil Engineering from the University of California, Davis, in 2008. Licensed

Discipline/Role	Name	Description of Credentials
		professional engineer in the State of California. Served as hydraulic engineering team member on various flood risk management feasibility studies from 2010 to the present time where he was responsible for conducting hydraulic analyses of existing and proposed project conditions via the HEC-RAS program. Served as the District's water manager (regulator of reservoir releases) from 2015 to present time.
Structural Engineer	Jimmy Chen	P.E., Civil Engineer (Structural), San Francisco District – Mr. Chen has MSCE degree from University of California, Berkeley in 1994. He has been a registered Professional Civil Engineer in California since 1994. Mr. Chen have worked for consulting firms to do structural analysis and design of Reinforced Concrete and Structural Steel structures. Mr. Chen has completed flood control projects for several land development project. Since 2003, he started to work for several local public agencies in managing wastewater projects. He joined the San Francisco District in September 2020.
Consequence Specialist	TBD	
Near End of Construction Site Visit		
ATR Lead	Andy Hill	See Table 11 ATR Team
Geotechnical Engineer	John Conway	See above
Hydraulic Engineer	Patrick Sing	See above
Structural Engineer	Jimmy Chen	See above
Consequence Specialist	TBD	

Table 8 Risk Assessment Team (See Attachment 4 for detailed credentials)

Discipline/Role	Name	Description of Credentials
DQC Review Lead	TBD	
DSO/LSO	TBD	
Geotechnical Engineer	TBD	
Civil Engineer	TBD	

Discipline/Role	Name	Description of Credentials
Structural Engineer	TBD	
Hydraulic Engineer	TBD	
Environmental Specialist	TBD	
Cost Engineer	TBD	
Legal Counselor	TBD	
Resident Engineer	TBD	
Operations Representative	TBD	

Table 9 DQC Reviewers

Discipline/Role	Name	Description of Credentials
RMC Senior Design-Construction Advisor	Greg Batchelder Adams Mike Miller	
RMC Senior Advisor	TBD	
RMC/DSMMCX/LSC Technical Advisor	TBD	
Construction Advisor	TBD	
Cost Advisor	TBD	

Table 10 Advisors

Discipline	Name	Description of Credentials
ATR Lead	Andy Hill	Mr. Hill is a Registered Professional Civil Engineer currently working as a Senior Geotechnical Engineer for USACE's Risk Management Center (RMC). Mr. Hill has 16 years of experience and has been with the USACE for 13 years, 10 of those with the RMC. He has a Bachelor of Civil Engineering from University of Cincinnati and a Master's Degree from Virginia Tech in Geotechnical Engineering. As a designer with the Hurricane Protection Office (HPO) in New Orleans, LA, Mr. Hill has been involved in the design of multiple of levee projects and flood risk management structures. Since joining the RMC in 2011, he has served on multiple dam and levee safety risk cadres facilitating, advising, and co-authoring over 20 Issue Evaluation Study (IES) or Semi-Quantitative Risk Assessments

Discipline	Name	Description of Credentials
		(SQRA) on dam and levee safety structures. He has been a Consistency Review Lead, ATR Lead, or Lead Facilitator of many multi-disciplinary teams for over 40 risk assessments and performed ATR on numerous flood risk reduction systems.
Geotechnical Engineering	Andy Hill	See above
Civil Engineering	Adam R. Smith	P.E., LEED AP BD+C - Civil/Construction (CESWT-DS-D) - Adam is a Registered Professional Civil Engineer in the State of Oklahoma. He has over 17 years of civil and construction engineering experience with the US Army Corps of Engineers. Adam has a Bachelor of Science in Civil Engineering from Oklahoma State University. He has served as Senior Civil Engineer for multiple high risk portfolio dam and levee modification/repair projects, as ATR lead for multiple reaches in the New Orleans to Venice levee repair program for MVN, and as ATR participant for multiple dam and levee repairs in New Orleans District, Memphis District, and Little Rock District, as well as civil/military site development.
Structural Engineering	Terry M. Sullivan	P.E., RMC - Terry is a Civil Engineer for the U.S. Army Corps of Engineers' Risk Management Center. He is a national specialist in structural engineering, geotechnical engineering, specializing in construction and assessment for both navigation structures and levee systems. His risk management work focuses on the Corps' inventory of levees and dams. Terry has over 30 years of experience working on a variety of national civil works projects. He earned a Bachelor of Science Degree in Civil Engineering from the University of Kentucky and a Master of Science Degree in Geotechnical Engineering, from Purdue University. Terry is a registered professional engineer in the states of Kentucky and California.
Hydrology & Hydraulic	Roger Kay	Roger Kay, P.E., Supervisory Hydraulic Engineer, CENWO-EDH-D. Mr. Kay is a hydraulic engineer with over 30 years of experience in hydraulics, hydrology, and water management with USACE, and currently serves as Chief, Hydraulics Section. He received a B.S. and M.S.

Discipline	Name	Description of Credentials
		<p>from Iowa State University in Agricultural Engineering with an emphasis on Soil and Water. As a civil engineer with USACE, he has worked on numerous FRM and ecosystem restoration feasibility studies, as well as numerous dam safety related studies including SPRA, IES, and DSMS. He has also been an ATR reviewer on a number of IES and DSMS reports and a consistency reviewer for PA and SQRA reports, as well as an ATR reviewer on multiple FRM and ecosystem restoration projects for hydrology, hydraulics, risk management and ice engineering. Mr. Kay previously served as a technical specialist in hydrology with USACE and has authored several publications.</p>
<p>Biologist</p>	<p>Charles (Chip) Hall</p>	<p>Regional Technical Specialist for Environmental Analysis and Compliance for the Great Lakes and Ohio River Division (LRD) - Mr. Hall has worked for the Corps for 19 years. He has a Bachelor of Science degree from the University of Tennessee, Knoxville in Wildlife and Fisheries Science. As a biologist, he has worked on many different types of projects including section 14, 205, 202, 206 authorities, General Investigations, Operations, and Dam Safety Modifications (Wolf Creek Dam Seepage Rehab and Center Hill Dam Seepage Rehab). He has performed Agency Technical Reviews (ATR) and served as Lead on numerous projects including section 14, 1135, 729, 205, 206, and 531 authorities, as well as, General Investigations, Dam Safety Modifications, and many other unique authorities. Mr. Hall is certified for ATR in Environmental Compliance and Ecosystem Restoration.</p>
<p>Construction Engineering</p>	<p>William (Bill) DeBryn</p>	<p>Construction Liaison at the DSMMCX in Huntington, WV. - Bill has worked most of his 29+ year career in Construction. Bill attended the U.S. Naval Academy from 1983 to 1987. He received his B.S. in Civil Engineering in Tennessee Technological University in 1990. He maintains a Professional Engineer license in the State of Tennessee.</p>

Discipline	Name	Description of Credentials
		<p>Bill has been in several construction positions domestically and internationally. He has hands on experiences in major dam and levee construction projects.</p> <p>Since his assignment to the DSMMCX, he has participated in Construction Evaluations for Proctor, Prado, Jadwin and Garrison dams, J.H. Kerr Right Wing Dike, Lake Pontchartrain/West Bank Levees, and Magnolia Levee; participated in Cost and Schedule Risk Analyses for Proctor, Prado, and Garrison dams and Magnolia Levee; and performed various ATR reviews for Moose Creek, Whittier Narrows and Addicks & Barker dams, the Foster Fish Ladder Improvements, and Herbert Hoover Dike (C-8 and C-13).</p>
Cost Engineering	Gary Smith	<p>Senior Cost Engineer, CENWW - Mr. Smith is a Certified Cost Engineer with the USACE Cost MCX in Walla Walla District, has 18 years Structural Engineering experience and 26 years Cost Engineering experience with the Corps of Engineers. Retired in 2007, Mr. Smith is a rehired annuitant focusing on Cost and Schedule ATR's and mentoring cost engineers in other districts. Mr. Smith has prepared more than 200 Cost and Schedule ATR's.</p>
Consequence (Economist)	Vongmony Var	<p>Regional Economist and Consequence Specialist, CESAM-PD-FE - Mr. Var graduated from the University of South Alabama with a B.S. in Business Administration in 2002 and a Master of Business Administration in 2005. His accomplishments include completing Economic Analysis for numerous Planning Feasibility Studies. Since 2009, he has served as a Consequence Specialist for Dam and Levee Safety related matters and has served as the Consequence team member on many Dam Safety related studies including Period Assessments, Semi-Quantitative Risk Assessments, Issue Evaluation Studies, and Dam Safety Modification Studies. He is certified as a Dam and Levee Safety, Coastal Storm Risk Management, and Flood Risk Management Agency Technical Reviewer.</p>

Discipline	Name	Description of Credentials
		He is serving as a Consequence Specialist on a Risk Cadre in support of the RMC.
Operations	TBD	

Table 11 ATR Team (See Attachment 4 for detailed credentials)

Review	Name	Description of Credentials
Biddability	TBD	
Constructability	TBD	
Operability	TBD	
Environmental	TBD	
Sustainability	TBD	

Table 12 BCOES Team

Discipline	Name	Description of Credentials
Hydrology and Hydraulics	TBD	
Geotechnical Engineering	TBD	
Civil/Structural Engineering	TBD	
Construction Engineering	TBD	

Table 13 SAR Panel

Role	Name	Email
SPN RP POC	Jimmy Chen	Jimmy.C.Chen@usace.army.mil
Project Manager	Tutashinda Salaam	Tutashinda.Salaam@usace.army.mil
Lead Engineer	Jimmy Chen	Jimmy.C.Chen@usace.army.mil
RMC Review Inbox	N/A	RMC.Review@usace.army.mil
RMC	Nate Snorteland Dave Carlson John Clarkson	Nathan.J.Snorteland@usace.army.mil David.E.Carlson@usace.army.mil John.D.Clarkson@usace.army.mil
Dam & Levee Safety QM	Amy Jo Riffie Emily Calla	Amy.J.Riffie@usace.army.mil Emily.K.Calla@usace.army.mil
FRM-PCX	Eric Thaut	Eric.W.Thaut@usace.army.mil
LSC Director	Noah Vroman	Noah.D.Vroman@usace.army.mil

Role	Name	Email
ATR Lead	Andy Hill	Andrew.D.Hill@usace.army.mil
MSC RBT-Chief	LTC David Kaufers	David.A.Kaufers@usace.army.mil
MSC LSO	John Moreno	John.D.Moreno@usace.army.mil
MSC LSPM	Boni Bigornia	Boniface.G.Bigornia@usace.army.mil
District E&C Chief	Susan Kelly	Susan.J.Kelly@usace.army.mil
District LSO	Susan Kelly	Susan.J.Kelly@usace.army.mil
District LSPM	John Conway	John.M.Conway@usace.army.mil
RP Awareness	Marc Goodhue	Marc.J.Goodhue@usace.army.mil

Table 14. Review Plan Distribution

Attachment 2

Project Risk Information (CUI)

(To be Removed Prior to Posting on District Website)

Pajaro River Downstream – Right Bank

The system was tested during flood flows in 1955, 1958, 1982, 1986, 1993, 1995, 1997, and 1998. In most cases (1955, 1958, 1982, 1986, 1993, and 1997) flood waters were contained by the project levees but significant bank erosion was observed. During these events, flooding in Watsonville generally resulted from insufficient channel capacity upstream of the project levees (along Corralitos Creek). In 1998, a segment of the Pajaro River right bank levee overtopped just downstream of Watsonville and completely eroded the levee. It should be noted that flood fighting was used to prevent seepage (water leaking through the levee) and erosion-related breaches prior to the levee overtopping. Seepage and stability distress were observed along the Salsipuedes Creek right bank levee between the Riverside Drive crossing and the confluence with the Pajaro River. The Sponsor and owner/operator is the, Zone 7 Flood Control and Water Conservation District. Santa Cruz County, Zone 7, and the City of Watsonville have an Emergency Action Plan. The County can monitor stream gages and when a critical water level is reached, alert the public through a reverse 911 system.

A population of 7,600 to 11,300 people are located within the floodplain with the greater population at night. The downstream right bank system protects the community of Watsonville. Within the protected area are major streets, highways, residential, agricultural, commercial and industrial properties. Critical infrastructure behind the levee includes electric generating units and substations, fire stations, hazmat locations, law enforcement, oil and gas pipelines and facilities, and schools. Approximately 50% of the land in the levee area is agricultural. There is potential for high economic damages if a levee breach occurs with potentially over 3,000 structures being inundated. There is potential for loss of life from the levee overtopping or breaching.

The US Army Corps of Engineers completed the latest screening risk assessment in 2012. One major risk for the levee is risk of breach before overtopping, which is associated with seepage (water leaking through the levee) and erosion. The other major risk is from overtopping (water flowing over the levee) causing erosion with a subsequent breach. Water could flood the City of Watsonville and surrounding agricultural lands rapidly, leading to significant economic damage and potential loss of life. While these conditions are possible, they are not certain to take place during a flood event. The community awareness of potential flooding is important to prevent major consequences by means such as early evacuation. The downstream right bank has a Levee Safety Action Classification (LSAC) of Moderate (3).

Pajaro River Upstream – Right Bank

The system was tested during flood flows in 1955, 1958, 1982, 1986, 1993, 1995, 1997, and 1998. In all of the above events except for 1995, flood waters were contained by the project levees but with significant levee slope erosion. In 1995, the system experienced water leaking through the levee embankment (seepage) as well as levee slope erosion, which was caused by water flowing over the top of the levee (overtopping). In 1998 and 2017, seepage occurred again at several locations along the levee resulting installation of a seepage berm and levee damages.

The Sponsor and owner/operator of the Pajaro River Right Bank Upstream levee system is the Santa Cruz County Flood Control and Water Conservation District – Zone 7. Santa Cruz County, Zone 7, and the City of Watsonville have an Emergency Action Plan. The County can monitor stream gages and when a critical water level is reached, alert the public through a reverse 911 system. The County also has an evacuation plan that covers a range of disasters. The community also has an ALERT Storm System.

The population behind the levee varies between 220 and 290, with a higher amount of population at night. However, because the population data does not include the migrant farm workers that work in the fields adjacent to the river during the daytime, the population at risk during the day has the potential to be higher. Within the protected area are major street, residential, agricultural, commercial and industrial properties. There are roughly 100 structures that could be inundated from levee failure.

The US Army Corps of Engineers completed the latest screening risk assessment in 2012. One major performance risk factor for the levee breaching is bank erosion. Another significant risk of breach is seepage (water flowing through the levee). While levee slope erosion and seepage are possible, they are not certain to take place during a flood event. Overall, the community is highly aware of the levees, and possible breaching and overtopping impacts. The notification and evacuation plans are excellent prevention measures for life loss during flood events. The upstream right bank's LSAC is Low (4).

Pajaro River– Left Bank

The LSOG considers the risk associated with the Pajaro River - LB Levee (LST ID 1241) to be Moderate (LSAC 3) for both Prior to Overtopping breach and Overtopping with breach scenarios. Prior to overtopping risk is associated with underseepage and piping and erosion performance. Past flood loading during the 1998 event resulted in significant erosion requiring floodfighting and evidence of seepage distress. Encroachments, animal burrowing activity, and deteriorated culverts contribute to the likelihood of a seepage and piping induced failure. Overtopping risk is considered moderate (LSAC 3) with a high likelihood of overtopping of approximately 1/25 ACE with low to moderate associated life loss potential. Evacuation planning identifies critical river stages for action, the flood warning system is effective, and past evacuations during the 1998 flood has increased community awareness.

The Salsipuedes Creeks and The Corralitos Creeks Tributaries

There were no levee screening done nor reports available on the tributaries, the Salsipuedes Creeks and the Corralitos Creeks. The PDT will make a risk informed decision whether to conduct risk assessments of the tributaries.

This RP will be updated with additional project risk information once the risk assessment during design is completed; these updates will be tracked in table in Attachment 3 and coordinated with the RMC and MSC.

The decision to present the design risk assessment to the LSOG will be based on factors such as higher risk systems, design deviations, projects with existing risk assessments for which the baseline risk appears to change, and controversial or politically sensitive decisions. The determination of if a design risk assessment needs to be presented to LSOG will be coordinated through the Risk-Informed Design Group lead by the Risk Management Center.

Attachment 3

Review Plan Revisions

Revision Date	Description of Change	Page/Paragraph Number

Table 14 RP Revisions

Attachment 4

Detailed Biographies

The following project participants' biographies are in alphabetical order.

Adam R. Smith, P.E., LEED AP BD+C - Civil/Construction (CESWT-DS-D) - Adam is a Registered Professional Civil Engineer in the State of Oklahoma currently working in the Southwestern Division Dam Safety Production Center. He has over 17 years of civil and construction engineering experience with the US Army Corps of Engineers. Adam has a Bachelor of Science in Civil Engineering from Oklahoma State University. He has served as Senior Civil Engineer for multiple high risk portfolio dam and levee modification/repair projects, as ATR lead for multiple reaches in the New Orleans to Venice levee repair program for MVN, and as ATR participant for multiple dam and levee repairs in New Orleans District, Memphis District, and Little Rock District, as well as civil/military site development.

Andrew D Hill, PE - CEIWR-RMC-WD - Mr. Hill is a Registered Professional Civil Engineer currently working as a Senior Geotechnical Engineer for USACE's Risk Management Center (RMC). Mr. Hill has 16 years of experience and has been with the USACE for 13 years, 10 of those with the RMC. He has a Bachelor of Civil Engineering from University of Cincinnati and a Master's Degree from Virginia Tech in Geotechnical Engineering. As a designer with the Hurricane Protection Office (HPO) in New Orleans, LA, Mr. Hill has been involved in the design of multiple of levee projects and flood risk management structures including the IHNC Barrier, Orleans Avenue Canal levees, Seabrook Sector Gate Complex, and the St Bernard T-walls. Since joining the RMC in 2011, he has served as a Geotechnical Engineer and then Senior Geotechnical Engineer on multiple dam and levee safety risk cadres facilitating, advising, and co-authoring over 20 Issue Evaluation Study (IES) or Semi-Quantitative Risk Assessments (SQRA) on dam and levee safety structures. He has been a Consistency Review Lead, ATR Lead, or Lead Facilitator of many multi-disciplinary teams for over 40 risk assessments and performed ATR on numerous flood risk reduction systems. He has participated in dam and levee safety and flood risk management projects for Seattle, Portland, Omaha, Kansas City, Sacramento, Los Angeles, Albuquerque, Tulsa, Ft Worth, Galveston, St Paul, St. Louis, Memphis, Vicksburg, New Orleans, Detroit, Pittsburgh, Huntington, Louisville, Nashville, New England, New York, Norfolk, Jacksonville, and the Middle East (Iraq) Districts.

Bill DeBruyn, Construction Liaison at the DSMMCX in Huntington, WV. - He transferred to this position in May of 2020 from the Nashville District where he was the Resident Engineer at the Middle Tennessee Resident Office. Bill started his career in the Nashville District as a DA Intern in 1991. He has worked most of his 29+ year career in Construction, initially as a Project Engineer until January 2006 when he was selected for a Resident Engineer position. Bill attended the U.S. Naval Academy from 1983 to 1987. He received his B.S. in Civil Engineering in Tennessee Technological University in 1990. He maintains a Professional Engineer license in the State of Tennessee.

As a Resident Engineer and Administrative Contracting Officer (ACO), Bill was responsible for the contract administration, quality assurance and safety for several large contracts. These included: completion of the upstream cofferdam at Kentucky Lock, construction of the upstream monoliths at Kentucky Lock, construction of the segmental at Chickamauga Lock, the Wolf Creek Dam Rehab barrier wall (DSAC 1), the Center Hill Dam Rehab barrier wall (DSAC 1), the Center Hill RCC Berm, and hydropower unit rehabilitations at Center Hill and Old Hickory dams. These projects covered a wide variety of construction activities such as: excavation, rock blasting, foundation grouting, post-tension anchoring, large diameter drilled shafts, secant piles walls, panel walls, sheet pile installation, mass concrete placement, instrumentation, and mechanical and electrical systems.

He served as the Resident Engineer on the Mosul Dam Task Force in northern Iraq between February and August 2017. The work consisted of construction of infrastructure (living quarters, dining facilities, administrative offices, maintenance facilities, central grout plants, etc.) to support the contract operations, deep

foundation drilling and grouting of Mosul Dam (DSAC 1), repair of the emergency stop gate for the outlet works, stabilization of the outlet structures and rehabilitation of support equipment to operate the dam. His office provided recommendations to the owner (Government of Iraq) on the direction of the work as well as the Quality and Safety oversight of the operations.

During his assignments as a Project Engineer and COR (1991-2006), Bill worked on a variety of construction projects which included: grouting the right abutment and left rim at Center Hill, construction of the Center Hill saddle dam fuse plug, multi-strand anchoring of several locks and dam structures, an EPA Superfund contract to clean up coal tar in Chattanooga Creek, the Critical Project Security Program for Nashville District, and numerous grouting projects (both cement and chemical) for foundations and structures. During his career, Bill has administered three cost reimbursement contracts, chaired a Source Selection Board, was a voting member on three Source Selections, helped to draft source selection criteria for several contracts, and provided numerous designs and BCOES reviews.

Since his assignment to the DSMMCX, he has participated in Construction Evaluations for Proctor, Prado, Jadwin and Garrison dams, J.H. Kerr Right Wing Dike, Lake Pontchartrain/West Bank Levees, and Magnolia Levee; participated in Cost and Schedule Risk Analyses for Proctor, Prado, and Garrison dams and Magnolia Levee; and performed various ATR reviews for Moose Creek, Whittier Narrows and Addicks & Barker dams, the Foster Fish Ladder Improvements, and Herbert Hoover Dike (C-8 and C-13).

Charles (Chip) W. Hall, Regional Technical Specialist for Environmental Analysis and Compliance for the Great Lakes and Ohio River Division (LRD), Account Manager to the North Atlantic Division for the Ecosystem Planning Center of Expertise - Mr. Hall has worked for the Corps for 19 years. He has a Bachelor of Science degree from the University of Tennessee, Knoxville in Wildlife and Fisheries Science. As a biologist, he has worked on many different types of projects including section 14, 205, 202, 206 authorities, General Investigations, Operations, and Dam Safety Modifications (Wolf Creek Dam Seepage Rehab and Center Hill Dam Seepage Rehab). He was a PDT member for LRP Upper Ohio Navigation Study and developed ecosystem restoration alternatives. He has served assignments in both the Great Lakes and Ohio River Division Office and Corps HQ on the LRD Regional Integration Team coordinating reviews and other tasks. He has performed Agency Technical Reviews (ATR) and served as Lead on numerous projects including section 14, 1135, 729, 205, 206, and 531 authorities, as well as, General Investigations, Dam Safety Modifications, and many other unique authorities. He currently serves as a Board representative for ERDCs Environmental Restoration Research Area Review Group. Mr. Hall is certified for ATR in Environmental Compliance and Ecosystem Restoration.

Gary R. Smith, Cost Engineering – CENWW - Mr. Smith, Senior Cost Engineer and Certified Cost Engineer with the USACE Cost MCX in Walla Walla District, has 18 years Structural Engineering experience and 26 years Cost Engineering experience with the Corps of Engineers. Retired in 2007, Mr. Smith is a rehired annuitant focusing on Cost and Schedule ATR's and mentoring cost engineers in other districts. Mr. Smith has prepared more than 200 Cost and Schedule ATR's.

Jimmy Chen, P.E., Civil Engineer (Structural), San Francisco District – Mr. Chen has MSCE degree from University of California, Berkeley in 1994. He has been a registered Professional Civil Engineer in California since 1994. Mr. Chen have worked for consulting firms to do structural analysis and design of Reinforced Concrete and Structural Steel structures. Mr. Chen has completed flood control projects for several land development project. Since 2003, he started to work for several local public agencies in managing wastewater projects. He joined the San Francisco District in September 2020.

John Conway, DSPM/LSPM, San Francisco District - Dam and Levee Safety have been the focus on his 37-year professional career in the US Army Corps of Engineers (USACE). Initial 30 years he had the opportunity to work in the construction of major flood control projects. The first project was Cerrillos Dam a 330 ft high, 1600 ft along the axis earth and rock fill dam with a clay core and a 1450 ft rock cut diversion tunnel. He started as assistant geologist and eventually was designated the project geologist. The next mayor project was Portugues Dams. This is a 220 ft high and 1300 ft along the axis roller compacted concrete dam. He was the project geologist for the construction. In addition, He provided geological expertise during the construction of multiple miles of levees for the construction office.

Next, He worked for Dam Safety Production Center as the Construction Liaison. The nationwide position required inspecting ongoing and reviewing large dam construction projects. After a year, moved to the C-44 Reservoir construction project in Florida. He was the lead geology and geotechnical for this 10-mile-long 32 ft high earthen embankment. After 2.5 years Mr. Conway transferred to San Francisco District to work as the Dam and Levee Safety Program Manager. Presently and for close to 3 years He have been managing the dam and levee portfolio for USACE San Francisco District.

Patrick Sing, P.E., San Francisco District - Received Bachelor of Science degree in Civil Engineering from the University of California, Davis, in 2008. Employed by USACE, San Francisco District from 2008 to the present time. Employed as hydraulic engineer in the Water Resources Section from 2010 to the present time. Licensed professional engineer in the State of California. Served as hydraulic engineering team member on various flood risk management feasibility studies from 2010 to the present time where I was responsible for conducting hydraulic analyses of existing and proposed project conditions via the HEC-RAS program. Served as the District's water manager (regulator of reservoir releases) from 2015 to present time.

Terry M. Sullivan, P.E., RMC - Terry is a Civil Engineer for the U.S. Army Corps of Engineers' Risk Management Center. He is a national specialist in structural engineering, geotechnical engineering, specializing in construction and assessment for both navigation structures and levee systems. His risk management work focuses on the Corps' inventory of levees and dams. Terry has over 30 years of experience working on a variety of national civil works projects. He earned a Bachelor of Science Degree in Civil Engineering from the University of Kentucky and a Master of Science Degree in Geotechnical Engineering, from Purdue University. Terry is a registered professional engineer in the states of Kentucky and California.

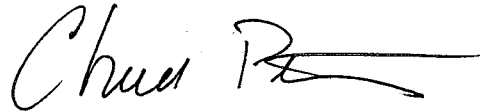
Vongmony Var, Regional Economist and Consequence Specialist, CESAM-PD-FE - Mr. Var is a Regional Economist with over 18 years of experience working in Planning Division for the USACE Mobile District. Graduated from the University of South Alabama with a B.S. in Business Administration in 2002 and a Master of Business Administration in 2005. His accomplishments include completing Economic Analysis for numerous Planning Feasibility Studies: Coastal Storms Risk Management, Flood Risk Management, Ecosystem Restoration, Major Hydropower Rehabilitation, and Navigation. Since 2009, he has served as a Consequence Specialist for Dam and Levee Safety related matters and has served as the Consequence team member on many Dam Safety related studies including Period Assessments, Semi-Quantitative Risk Assessments, Issue Evaluation Studies, and Dam Safety Modification Studies. He is certified as a Dam and Levee Safety, Coastal Storm Risk Management, and Flood Risk Management Agency Technical Reviewer. He currently supports the USACE Mapping, Modeling, and Consequence (MMC) Production Center with Consequence Assessments and is serving as a Consequence Specialist on a Risk Cadre in support of the RMC. And currently holds the title of Supervisory Economist being the Section Chief of the Economic Analysis Team for Mobile District.

CESPD-PD

MEMORANDUM FOR Commander, San Francisco District, ATTN: CESPN-PMN Mr. Patrick McKinley, 450 Golden Gate Avenue, San Francisco, California 94102

5. For additional information, contact Jay Kinberger, District Support Team Lead (415) 503-6556, or Jay.Kinberger@usace.army.mil

Encl

A handwritten signature in black ink, appearing to read "Chere D. Peterson". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

CHEREE D. PETERSON, SES
Programs Director