

Central Services
Joan Araujo, Director

Engineering Services
Christopher Cooper, Director

Roads & Transportation
Christopher Kurgan, Director

Water & Sanitation
Joseph Pope, Director

Watershed Protection
Glenn Shephard, Director

June 8, 2023

AECOM Technical Services, Inc.
1220 Avenida Acaso
Camarillo, CA 93012

Attn: Brian Person;

Subject: Executed Modification Number 010 for Contract:
Matilija Dam Removal 65% Design Planning Project
AE Number: 18-034

Attached is your copy of the executed Modification for subject contract. Your attention is called to any changes made in Exhibits A (Scope of Work), B (Time Schedule) and C (Fees and Payments) throughout this modification. You may contact me with questions at karen.goodman@ventura.org.

Sincerely,



Karen Goodman
Supervising Contract Support
Engineering Services

EXHIBIT 11



MODIFICATION NUMBER 10 TO CONTRACT AE18-034

Contract Title: Matilija Dam Removal 65% Design Planning Project

This modification ("Modification No. 10") is made and entered into by and between the Watershed Protection District, hereinafter referred to as AGENCY, and AECOM, hereinafter referred to as CONSULTANT.

WHEREAS, there now exists a binding contract between AGENCY and CONSULTANT ("CONTRACT") originally entered into on 02/26/2018 for the CONSULTANT to provide engineering services to develop 65% designs to remove Matilija Dam in a manner that would reduce the impact of impounded sediment while minimizing costs and time associated with dam removal with a total contract amount of \$822,302.00, and a contract completion date of 07/11/2019; and

WHEREAS, AGENCY and CONSULTANT entered into a written modification to CONTRACT on 07/25/2018 for the CONSULTANT to provide biological clearance surveys and compliance monitoring in support of field investigations to comply with California Department of Fish and Wildlife (CDFW) requirements for an additional contract amount of \$16,898.00 ("MODIFICATION NO. 1"); and

WHEREAS, AGENCY and CONSULTANT entered into a written modification to CONTRACT on 07/25/2019 to extend the CONTRACT completion date to 11/30/2019 ("MODIFICATION NO. 2") due to a delay initiated from the acquisition for regulatory permits required for the filed investigations; and

WHEREAS, AGENCY and CONSULTANT entered into a written modification to CONTRACT on 12/26/2019 to add additional tasks for the CONSULTANT to review and update the 2004 Real Estate Plan prepared by the USACE for an additional contract amount of \$53,375.00 and to extend the CONTRACT completion date to 06/30/2020 ("MODIFICATION NO. 3"); and

WHEREAS, AGENCY and CONSULTANT entered into a written modification to CONTRACT on 02/27/2020 to add additional tasks to the CONTRACT for the CONSULTANT to assess possible short-term impacts caused by the flushing of fine sediment from the Project on downstream water supply infrastructure and identify and evaluate the potential water supply mitigation alternatives for an additional contract amount of \$32,769.00 ("MODIFICATION NO. 4"); and

WHEREAS, AGENCY and CONSULTANT entered into a written modification to CONTRACT on 07/28/2020 to add additional tasks to the CONTRACT to address concerns regarding the potential long-term impacts to the operation of Casitas Municipal Water District's Robles Diversion Facility caused by increased sediment delivery following the removal of Matilija Dam. CONSULTANT shall review background information, evaluate relevant case studies, formulate alternative options, conduct a workshop and prepare a final report for an additional contract amount of \$79,488.00 and to extend the CONTRACT completion date to 12/31/2020 ("MODIFICATION NO. 5"); and

WHEREAS, AGENCY and CONSULTANT entered into a written modification to CONTRACT on 12/23/2020 to add additional tasks to 1) address concerns regarding downstream impacts from sediment deposition after the dam is removed by completing additional detailed hydraulic modeling and analysis using 2-dimensional (2D) methods and completing a screening level assessment of bank erosion, and 2) advancing the design of the removal of Matilija Dam from 10 percent to 30 percent, and 30 percent to 65 percent for an additional contract amount of \$683,901.00 and to extend the CONTRACT completion date to 03/31/2022 ("MODIFICATION NO. 6"); and

WHEREAS, AGENCY and CONSULTANT entered into a written modification to CONTRACT on 2/8/2022 to 1) expand the limits of the previously completed 2-dimensional (2D) modeling work and to add greater detail to the results for property and infrastructure protection planning prior to dam removal, and; 2) revise the results of analyses completed under several Phase 1 subtasks as informed by the additional 2D modeling for an additional contract amount of \$85,100.00 and to extend the CONTRACT completion date to 06/30/2022 ("MODIFICATION NO. 7"); and

WHEREAS, AGENCY and CONSULTANT entered into a written modification to CONTRACT on 2/8/2022 to 1) coordinate review of potential issues relevant to the public, 2) respond to public comments received during the public review of the draft Supplemental Environmental Impact Report (SEIR), 3) provide minor revisions to the design documents in response to public comments received, 4) participate in public meetings and conduct monthly update meetings remotely, and 5) provide project management and quality assurance/quality control during the execution of these tasks for an additional contract amount of \$37,400.00 and to extend the CONTRACT completion date to 06/30/2023 (MODIFICATION NO. 8"); and

WHEREAS, AGENCY and CONSULTANT entered into a written modification to CONTRACT on 4/13/2023 to perform additional 2D sediment transport modeling and model validation to assess modeling sensitivity to the inclusion of fine grained sands and increasing the rate of sediment evacuation from the reservoir by 30% for an additional contract amount of \$179,000.00 and to extend the CONTRACT completion date to 12/31/2023 (MODIFICATION NO. 9"); and

WHEREAS, AGENCY and CONSULTANT desire to modify the terms of the CONTRACT to 1) advance the structural analyses and structural design for the proposed orifices either by a controlled blasting to remove concrete "plugs" left intact at the upstream end of the orifices, or by opening gates installed at the downstream end of the orifices to the 30 percent level, 2) coordinate design development with the California Department of Safety of Dams review of the project, 3) document the design development and conclusions in a Design Memorandum and 4) provide project management and quality assurance/quality control during the execution of these tasks; and

WHEREAS, AGENCY and CONSULTANT desire to modify the terms of the Contract to increase the maximum fees for Basic Services by \$128,661.00, for a new total contract amount of \$2,118,894;

NOW THEREFORE, the parties hereto agree as follows:

1. All provisions of the Contract, including all previous modifications, shall remain in full force and effect unless expressly modified by this Modification No. 10.
2. Exhibit A (Scope of Work and Services) is modified as follows:
Replace Exhibit A with the attached Modification No. 10 Exhibit A.
3. Exhibit B (Time Schedule) is modified as follows:
Replace Exhibit B with the attached Modification No. 10 Exhibit B.
4. Exhibit C (Fees and Payment) is modified as follows:
Replace Exhibit C with the attached Modification No. 10 Exhibit C.

IN WITNESS WHEREOF, THE PARTIES HERETO HAVE EXECUTED THIS MODIFICATION.

FOR CONSULTANT

Name: Seth Gentzler

6/6/23

Title: Vice President

Date

FOR AGENCY:

Name: [Signature]
Director of Public Works Agency

6/15/23
Date

EXHIBIT A - SCOPE OF WORK AND SERVICES
(Changes in Bold/Italic)

1. Overview of Project and Services

AGENCY has engaged CONSULTANT to provide the following services, which are more specifically described in the Basic Services section below, to assist AGENCY with the following project:

The Matilija Dam Removal 65% Planning Design Project, follows work completed by CONSULTANT in 2016 for the Agency. The CONSULTANT shall provide engineering services to develop 65% designs to remove Matilija Dam in a manner that would reduce the impact of impounded sediment while minimizing costs and time associated with dam removal.

2. Basic Services

The following Basic Services shall be performed by CONSULTANT:

Task 1 – Field Investigations

CONSULTANT shall perform field investigations to collect data needed for the following: 1) further analysis of the fine sediment deposits upstream of the dam, and 2) further characterization of the structural concrete comprising the dam to inform studies and structural analysis for dam removal. Field investigations shall be accomplished under the three subtasks described below.

Subtasks in Field Investigations shall include Project Management and oversight services. The CONSULTANT shall facilitate ongoing coordination and communication among staff and sub-consultants. The CONSULTANT shall coordinate general AGENCY update meetings/calls at monthly intervals, and shall address questions and concerns in a timely manner. The CONSULTANT shall also coordinate, or assist with coordinating, interaction with the California Division of Safety of Dams as necessary.

CONSULTANT services shall include implementation of quality assurance/quality control procedures following standard CONSULTANT processes. Prior to submission to the AGENCY, all deliverables shall undergo detail checks and technical reviews to verify the quality and integrity of the project tasks and written work products, and to verify that the deliverables are in accordance with the scope of work. Each technical review shall be documented using appropriate forms and this documentation shall be maintained in the CONSULTANT's project files. Invoices and project budget tracking reports shall be provided at monthly intervals.

Subtask 1.1 - Geotechnical Field Investigations to Characterize Fine Sediment and Organics

CONSULTANT shall plan the investigation, obtain a County drilling permit, obtain a DSOD permit (if one is needed), obtain and log sediment samples at six locations to an estimated depth of 60-90 feet, and perform laboratory testing. Sampling and testing shall be performed to screen for the presence of contaminants such as heavy metals and pesticides, and the results shall be compared to earlier test findings by the US Army Corps of Engineers. Specific tests to identify the presence of metals include Title 22 (CAM17) and others depending on the target metal types. Specific tests for organics such as pesticides and hydrocarbons will include TPH, OCP, PCB, SVOC, and PAH. The tests shall be conducted in accordance with appropriate EPA sampling protocols and test methods. The borings shall be advanced through the water from a barge.

Previous investigations by the United States Army Corps of Engineers (USACE) identified that the characteristics of the organic materials in the fine sediment upstream of the dam could affect water quality during and following dam removal. Several borings were abandoned after methane gas was detected and as a result, the full depth of the sediment was not penetrated at those locations. The six borings included in this scope of work, as indicted above, will be used to characterize the limits of the organic materials as well as collect other geotechnical information (SPT blowcount, grain size distribution and relative quantities, plasticity, shear strength, etc.) related to the sediment to confirm the transport of fine sediment from the reservoir during initial and subsequent flushing events.

Since sediment within the reservoir basin is known to be partially comprised of decomposed organic material, it is expected that methane gas emissions will occur during the drilling process. The drilling section of the Project Safety Plan shall describe specific measures addressing methane gas emissions, with

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alternate drilling methods that may be employed to eliminate or reduce emissions from low-pressure methane lenses. In some cases, the volume and pressure of methane escaping a penetrated lens may prohibit further advancing that boring and the drilling equipment will be removed when safe to do so. Based on the boring depth completed to that point and other factors, a decision shall be made, in consultation with the AGENCY, whether to characterize the sediment utilizing the data obtained to that depth or to drill in an alternative, representative location. Seven days of onsite drilling effort has been budgeted for this subtask.

Subtask 1.2 - Field Investigations to Characterize Dam Concrete

CONSULTANT shall perform concrete coring and testing to determine the appropriate material properties for use in the structural analyses under Subtask 2.1 and 2.7.

CONSULTANT shall develop a work plan, obtain DSOD approval, and obtain concrete cores from the downstream dam face near the two proposed orifice locations and at 4 to 6 other locations along the upstream face of the dam. The downstream cores shall be obtained from a barge platform in the plunge pool or other means of access. The upstream cores shall be obtained from the same barge platform used for the geotechnical investigations under Task 1.1. The core samples shall be 6 inches in diameter, and continuous samples shall be obtained for the full depth of each boring. The upstream borings shall be approximately 4 feet deep. Two downstream borings near the proposed orifice locations shall be approximately 4 feet deep and the remaining two shall be approximately 20 feet deep. Core samples selected for compressive strength testing will typically be at least 12 inches long. An investigation work plan and application for the concrete coring shall be prepared and submitted to DSOD for review and approval prior to the commencement of field work. The concrete core samples shall be logged and photographed during drilling and then transported to the laboratory for further examination and testing. Selected samples shall be tested for bulk specific gravity, unconfined compressive strength, splitting tensile strength, and elastic modulus properties. Petrographic analysis and gel fluorescence testing shall also be conducted to assess the presence of Alkali Silica Reaction (ASR) in the concrete.

Subtask 1.3 - Field Investigations Memorandum

CONSULTANT shall document the results from the field investigations described under Subtasks 1.1 and 1.2 in a technical memorandum (TM). The TM shall present the results of the investigations, including fine sediment boring logs, concrete core logs, and laboratory test results for both the sediment samples and the concrete core samples. All boring logs shall be photo documented for inclusion as appendices to the TM.

Subtask 1.4 - Biological Support for Field Investigations

CONSULTANT shall conduct pre-construction surveys. To comply with permitting requirements, at least three pre-construction biological surveys, at least three days apart with the last survey within three days of mobilization, shall be conducted by two qualified biologists. CONSULTANT shall mobilize two biologists to conduct biological pre-construction surveys of the perimeter of Matilija Reservoir and the plunge pool at the base of the dam. Surveys shall be conducted in the habitat communities surrounding the water bodies out to 300 feet and does not include protocol-level biological surveys for sensitive species. The biologist shall coordinate with the AGENCY for access and appropriate routes to conduct the surveys. This work assumes three, 8-hour days to allow for travel, coordination, and access to the areas for surveys.

CONSULTANT shall perform geotechnical work monitoring. A qualified biological monitor shall be present periodically during work activities. Geotechnical work is anticipated to begin on July 31, 2018, and continue on weekdays through approximately August 9, 2018, for a total of 8 days of biological monitoring. The monitor shall be responsible for daily clearance surveys prior to work commencing, ensuring compliance with the species protection measures, and documenting BMP practices.

CONSULTANT shall coordinate with the AGENCY to discuss any special-status species findings during the course of the surveys and monitoring. If any sensitive biological resources are identified, the AGENCY shall be notified and applicable species protection measures shall be discussed and implemented. CONSULTANT'S biologist shall participate in conference calls to present interim finding of biological pre-construction surveys and monitoring.

Any non-compliance observations and/or sensitive resource observations shall be immediately reported to the project manager and communicated to the AGENCY. If active bird nests are found within the area potentially affected by the work, which was defined as 300 feet, work shall be redirected or postponed until

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the nest is no longer active or other protection measures are implemented in coordination with the AGENCY. This work assumes 6-hour days to allow for travel, access and a clearance survey prior to the start of each day's work and assumes the geotechnical investigation crews work an 8-hour day.

CONSULTANT shall provide reporting. A biological survey and monitoring report shall be completed (Project Completion Report) as required by the AGENCY, which shall include the following:

- Site conditions / vegetation in or adjacent to project area;
- Distance to adjacent or downstream sensitive biological resources and description of resource;
- Summary/general descriptions of vegetation types within the survey and monitoring area;
- Summary of preconstruction surveys via email documenting any nesting bird or other sensitive resources;
- Cumulative lists of common and special-status wildlife species found at the project site during all surveys (detailed species descriptions are not necessary);
- If special-status species that should be reported to the California Natural Diversity Database are observed, a statement shall be included of when such reports were submitted. Additionally, the completed California Native Species Field Survey Form(s) shall be appended to the project completion report;
- Documentation of BMPs implemented to avoid biological resource impacts; and
- Any problems/examples of non-compliance and how they were resolved.

Task 1 Deliverables:

- Conference calls shall be held at monthly intervals to facilitate coordination, input and provide progress summaries to the AGENCY/Contract Management Team. CONSULTANT shall prepare agendas and meeting minutes for each meeting.
- CONSULTANT shall coordinate quarterly (4) meetings between CONSULTANT/AGENCY/Contract Management Team/Technical Advisory Committee (TAC) in Ventura over the performance period involving CONSULTANT and two other team members.
- CONSULTANT shall coordinate one meeting between CONSULTANT/AGENCY/DSOD in Sacramento over the performance period involving the CONSULTANT and two other team members.
- Project Safety Plan
- Work plan and application for submission to DSOD
- Coordination with DSOD during permit processing as required
- Draft Field Investigations TM characterizing the fine sediment and assessing the concrete condition
- Revised Draft (if necessary) Field Investigations TM, incorporating comments received on Draft TM.
- Final Field Investigations TM, incorporating comments received on Revised Draft TM.
- Invoices, progress reports, meeting minutes, and other documentation as necessary.
- The biological monitor shall complete pre-construction field reports and daily monitoring field reports for inclusion in the Project Completion Report.
- The CONSULTANT'S qualified biologist shall prepare the Project Completion Report within 15 days of project completion and shall address AGENCY comments and return the final version within 7 days of receipt of AGENCY comments.

Task 2 - Dam Removal Feasibility Study

CONSULTANT shall prepare a feasibility study to advance the conceptual design for installing two large diameter orifices in Matilija Dam, implementing fine sediment evacuation by opening the orifices during a flushing storm event, and demolition of the dam following sediment flushing. The feasibility study shall be accomplished under the subtasks described below. Subtasks in the Dam Removal Feasibility Study shall include Project Management and oversight services. CONSULTANT shall facilitate ongoing coordination and communication among staff and sub-consultants. CONSULTANT shall coordinate general AGENCY update meetings/calls at monthly intervals, and shall address questions and concerns in a timely manner. CONSULTANT shall also coordinate, or assist with coordinating, interaction with the California Division of Safety of Dams as necessary.

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Project Management services shall include implementation of quality assurance/quality control procedures following standard CONSULTANT processes. Prior to submission to the AGENCY, all deliverables shall undergo detail checks and technical reviews to verify the quality and integrity of the project tasks and written work products, and to verify that the deliverables are in accordance with the scope of work. Each technical review shall be documented using appropriate forms and this documentation shall be maintained in the CONSULTANT'S project files. Invoices and project budget tracking reports shall be provided at monthly intervals.

Subtask 2.1 - Structural Evaluation of Dam With and Without Orifices

CONSULTANT shall perform analyses to verify that installation of the proposed large diameter orifices into the dam shall not adversely impact the seismic stability or safety of the structure. Using the data obtained from the concrete cores under Subtask 1.2, the current strength of the concrete in the dam shall be estimated and compared with the strength assumed in the previous structural analyses (URS, AE11-06). The three-dimensional linear elastic finite element (ANSYS) model prepared by URS under the previous contract with the AGENCY (AE11-06), shall be modified to include the orifices and the suite of analyses re-run. The results of the runs on the modified model shall be compared to the results from the URS study, with specific focus on the stresses in the vicinity of the proposed orifices to verify that the presence of the orifices is not expected to significantly impact the stability of the dam during static or dynamic loading.

Subtask 2.2 - Detailed Sediment Transport Modeling From Dam to Ocean

CONSULTANT shall review earlier modeling efforts for fine and coarse sediment transport prepared for the Matilija Dam Removal (by Reclamation and CONSULTANT), incorporate information collected in Subtask 1.1, and develop detailed modeling of transport from the dam to the Pacific Ocean using the DREAM-2 model.

The DREAM-2 model is one of the two Dam Removal Express Assessment Models developed at Stillwater Sciences (Cui et al. 2006), which simulate the transport of both coarse and fine sediment following dam removal. The model, its predecessors, and sister models have been applied in more than a dozen large and small scale sedimentation analysis projects, including river sedimentation of a mining project that has released close to 2 billion tons of sediment (to date) into a river corridor (Pickup and Cui 2009), and the removal of Marmot Dam in the Sandy River, Oregon (Cui and Wilcox 2008). Comparisons of simulated and surveyed post-dam removal channel degradation/aggradation in the Sandy River, which has similar geomorphic conditions with Matilija Creek and Ventura River, indicated that the model likely outperformed any previous model simulations of similar magnitude (Cui et al. 2014). The model has also been extensively examined with flume experimental data (Cui et al. 2008) and against a natural landslide (Sutherland et al. 2002) and proven to perform satisfactorily. It is also worth noting that a preliminary DREAM-2 model was developed for the Matilija Dam removal project during the last contract phase completed in 2016 (AE14-033).

The future with project condition shall be modeled with rate of sediment input established in earlier studies and with downstream project components determined in collaboration with the AGENCY and the CONSULTANT. Modeling shall include peak flow and daily average hydrologic analyses under existing conditions, along with select representative years (such as the year that represents the occurrence of 100-yr flood). Two sets of model runs simulating sediment transport following dam removal, each comprised of 5 to 7 runs, are proposed under the most-likely scenario: dam removal during a 4-yr flood event (the minimum flood event required to remove the dam under the previous CONSULTANT study) and dam removal during a 10-yr flood event. In both scenarios a 100-yr flood event shall be inserted into the discharge series, representing it to occur at different years after dam removal. The purpose of the 100-yr flood modeling is to examine the maximum sediment deposition (i.e., worst-case-scenario) that would occur in different downstream river reaches during the 100-yr flood event so as to inform hydraulic modeling in Task 2.3. In addition to runs simulating sediment transport following dam removal described above, a separate model run shall be conducted simulating the terminal effect of dam removal. This run shall be conducted by using the projected post-removal sediment supply as model input, and extended to the future years when a new quasi-equilibrium bed profile is established. The simulated profile shall also be provided to Task 2.3 for evaluation of the long-term effect of dam removal on the 100-yr flood event.

In addition to the modeling runs, a mass conservation analysis similar to that presented in Cui et al (2011)

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for the Slab Creek Reservoir sedimentation process shall be conducted to better approximate the time at which sand and gravel will begin to pass the dam if the structure remains in place. The analysis shall apply basic geomorphic principles and shall utilize reasonable assumptions with regard to the profiles of sand and gravel deposits within the reservoir as the gravel continuously advances downstream and aggrades upward, replacing some of the more mobile sand deposits within the reservoir with coarser sediment. The results of this analysis shall provide a reference condition for the no-project alternative.

Subtask 2.2 Sediment Transport Modeling Summary

Condition	Event Recurrence Interval or Flow Rate	Presumed Number of Model Runs
Baseline (current)	Available Discharge Record	1
Dam Removal	4 year and 10 year event during the year of dam removal, 100-yr peak flow in different years after dam removal	10-14
Long- Term Following Dam Removal	Available discharge record, running repeatedly to achieve a new quasi-equilibrium	1

Subtask 2.3 - Hydraulic Studies to Determine 100-yr Water Surface Elevation Based on Detailed Sediment Transport Analyses

CONSULTANT shall conduct hydraulic modeling along the reaches of Matilija Creek and the Ventura River from the dam to the Pacific Ocean. The purpose of this task is to determine changes in flood elevations along Matilija Creek and the Ventura River resulting from dam removal. The first step of this task is to review the existing conditions in the Reclamation HEC-RAS model to ensure that it is generally accurate and the model is functioning properly. Steady state flood modeling shall then be conducted using 100-year peak flow, as well as 10-year, 25-year, and 50-year flows, applied to the modeled river profiles provided in Task 2.2. The modeling first establishes the existing conditions and future conditions (with dam). Next, post-removal channel geometries shall be imported into the HEC-RAS model based on: 1) detailed sediment transport analyses (i.e., changes in channel bed elevations/geometry based on coarse sediment transport results from Task 2.2) and 2) proposed upgrades of the Robles Diversion Dam and other downstream project components, to be determined in collaboration between CONSULTANT and AGENCY. Post-removal modeling shall be conducted using the same peak flow events as used for existing-conditions modeling. Several post-removal channel profiles shall be selected to conduct hydraulic modeling. The profiles shall be selected based on sediment transport modeling results to represent the highest levels of aggradation in different reaches of the channel as the sediment wave gradually progresses downstream, resulting in the maximum sediment deposit occurring in different reaches in different years following dam removal. Then, the existing and proposed conditions model results shall be compared in profile plots and water surface elevation comparison tables. Additionally, overbank inundation depth comparisons shall be generated for existing and proposed conditions model results based on HEC-RAS water surface elevations and 2005 LiDAR topography. Inundation results shall be presented in a map format. Up to five different post-removal channel geometry conditions shall be evaluated to account for dynamic channel conditions as different reaches experience peak bedload sediment deposition at different times or under different hydrologic scenarios (i.e., peak discharge occurs in different years).

CONSULTANT shall conduct an additional 1D hydraulic modeling run that removes the Casitas Springs and Live Oak Acres Levees, and the levee upstream of Robles Diversion from the model. These levees are not accredited by FEMA and could be breached during a 100-yr storm event. Following the revised model runs with levees removed, revised inundation maps shall be prepared for these three reaches. The results of this additional analysis shall be incorporated into the existing Hydraulic Modeling Report that has been prepared for this sub-task. Draft revisions shall be submitted to the project team for review, and all comments shall be addressed in final report.

Subtask 2.4 - Re-evaluation of Downstream Project Components (Santa Ana and Camino Cielo Bridges, Live Oak Acres and Meiners Oaks Levees, and Robles High Flow Bypass).

CONSULTANT shall re-evaluate the downstream project component designs in light of the results of 100-yr flood routing performed under Subtask 2.3.

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The various downstream project components are currently at varying levels of design, approximately as follows: Santa Ana Bridge – 100%; Camino Cielo Bridge – 5%; Live Oak Acres Levee – 90%; Meiners Oaks Levee – 90%; Casitas Springs Levee – 5%; Robles High Flow Bypass – 90%; and, Foster Park Wells – 100%.

The design of each of the downstream project components is based on 100-yr flood levels that were developed for USACE's Alternative 4b dam removal project. CONSULTANT shall compare the 100-yr flood level used for downstream project component designs to levels required for FEMA certification based on 100-yr water surface elevation determined in Subtask 2.3. CONSULTANT shall develop and recommend alternative design revisions based on the results of the comparison of changes in hydraulics as well as input from the Contract Management Team, and review and update construction costs estimates, as appropriate.

Subtask 2.5 - Predictability Assessment of Flushing Storm Event

CONSULTANT shall collect and review weather forecast data from the National Weather Service from the standpoint of how predictable flushing storm events are, and a model shall be developed to estimate risk associated with under-predicting a minimum flushing storm event.

Predicting that an incoming storm is of sufficient intensity to produce the required minimum flushing storm event is a key component of the feasibility study for the Project. Stream gage data for Matilija Creek and for the Ventura River indicate that storm events with adequate flushing flows have a recurrence interval of approximately three years. Historic storm events to be analysed, include flushing event storms and a range of storm events that result in flows significantly less than the minimum flushing storm event, shall be used to repeat the fine sediment analyses conducted during the previous study contract (URS, AE14-033) to determine the risks of under-predicting the storm event during dam removal. The results of the fine sediment and organics characterization from Subtask 1.1 shall provide updated information with regard to sediment gradation, erodibility, etc. that shall either affirm the previous fine sediment analysis (URS, AE14-033) or allow for updated analysis with the same methodology. The sediment profile, in particular a determination of its composition and erosive tendencies, will help predict the efficacy of each storm event type (peak flow rate, duration, and recurrence interval) in mobilizing the sediment.

Subtask 2.6 - Update Dam Removal Concept To 10 Percent Design

CONSULTANT shall advance the design for the large diameter orifices, excavation of the orifice openings, dam demolition, and restoration of the reservoir area from the current conceptual level to a 10 percent design. Document the updated design on engineering plans.

A list of conceptual drawings anticipated to be included at the 10 percent design level include:

1. Project location and general arrangement plan
2. Dam site area plan
3. Dam and plunge pool plan view
4. Upstream elevation view
5. Downstream elevation view
6. Dam section views
7. Large diameter orifice sections and details
8. Orifice excavation sequencing plan and details
9. Dam demolition sequencing – profile and details
10. Post-flush channel plan, profile, and sections
11. Sediment disposal areas - plan and sections
12. Post-project restoration plan -- reservoir area

Subtask 2.7 – Updated Dam Structural Analysis

CONSULTANT shall review and update as appropriate the 2013 (AE11-06) structural analysis for Matilija Dam to address comments or concerns with the analysis based on the findings of Subtask 2.1. The model geometry shall be updated to reflect the proposed orifices through the structure with the 10 Percent Design from Subtask 2.6. Using updated data on the concrete strength obtained in Subtask 1.2 and refined in Subtask 2.1, the three-dimensional linear elastic finite element (ANSYS) model, modified from the model used in the URS 2013 study, shall be used to evaluate usual (normal), unusual (flood), and extreme

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(seismic) loading conditions on the dam with and without the orifices and with and without sediment behind the dam to assess the safety of the dam.

Subtask 2.8 - Dam Removal Feasibility Study Report

CONSULTANT shall document the results of Subtasks 2.1 through 2.7 in a comprehensive report for comment by the various stakeholders including DSOD. The Feasibility Study Report (Report) shall summarize the results of the data obtained and analysis performed in each subtask, and shall incorporate as appendices or by reference the technical memorandum provided in Subtask 1.3. It is anticipated that the content and format of the Report may evolve as work on the other subtasks progresses and the Report will be structured in response. Further, the Report shall focus in part on addressing specific areas of interest or concern expressed by DSOD or other regulatory entities. Incorporate stakeholder comments, where possible, into the final report and include an appendix of stakeholder comments and responses in the final report.

Draft Feasibility Study Table of Contents:

Executive Summary
1.0 Introduction
2.0 Summary of Field Investigations
3.0 Reservoir Fine Sediment
4.0 Dam Concrete
5.0 Structural Evaluation of Orifice Alternative
6.0 Sediment Transport Modeling
7.0 Hydraulic Studies Based on Sediment Modeling
8.0 Re-evaluation of Downstream Project Components
9.0 Assessment of Flushing Storm Events
10.0 Dam Removal Concept – 10% Level Design
11.0 Updated Structural Analysis of Dam
Appendix 1 – Stakeholder Comments

Subtask 2.9 – Detailed 1D and 2D Hydraulic Analysis

CONSULTANT shall develop a 2D hydraulic model in SRH – 2D to analyze inundation extents for future conditions, with and without dam removal, for flow events including 25-year, 50-year, and 100-year recurrence intervals. The 2D model shall provide a more detailed analysis focusing on river reaches with flood risk potential where the 1D model did not fully capture flow complexities. The 2D model shall be developed for the entire 16-mile project reach, however the assessment of post dam removal conditions shall focus on the following four Ventura River reaches:

- Adjacent to Ventura Water Purification Plant and OVSD's Wastewater Treatment Plant (HEC-RAS Stations 4.73 to 5.49)
- Adjacent to Casitas Vista (HEC-RAS Stations 5.97 to 6.63)
- Downstream from the Santa Ana Bridge (HEC-RAS Stations 8.05 to 9.23)
- From Live Oak Acres to Upstream of Robles Diversion Dam (HEC-RAS Stations 10.13 to 15.15)

This Subtask shall include the following:

Subtask 2.9.1 – Gather New Input Data for SRH-2D Model

CONSULTANT shall compile 2D model inputs from three primary sources, including: 1) hydrologic data obtained from USGS StreamStats; 2) existing infrastructure, comprised of bridge and levee geometry data, and; 3) land cover classifications for the five critical reaches identified above. Manning's n roughness values for the 2D model grid shall be developed using existing aerial imagery to simulate the extent and density of riparian vegetation, channel bed morphology and floodplain cover. Manning's n roughness values for the remainder of the project reach shall be determined through a more generalized distribution of channel and overbank roughness.

Subtask 2.9.2 – Existing Conditions 2D Hydraulic Modeling

CONSULTANT shall develop a hydraulic model in SRH-2D incorporating all the input data gathered in Activity 2.9.1. The 2D model shall have a variable grid size, with the main channel having a denser grid cell spacing and the overbank and floodplain areas having a coarser grid. The 2D model shall be set up to perform steady-state flow routing with a focus on the 100-year peak flow. Results shall be compared to those from the existing conditions 1D HEC-RAS model for validation.

Subtask 2.9.3 – Existing Conditions 2D Hydraulic Modeling Review and Revisions

CONSULTANT shall review the results from the initial existing conditions SRH-2D model and shall provide summarized draft figures for review. CONSULTANT shall then perform one iteration of model revisions based on review comments. Figures depicting final existing conditions model results shall be prepared.

Subtask 2.9.4 – Proposed Conditions 2D Hydraulic and Sediment Transport Modeling

CONSULTANT shall update the existing conditions SRH-2D model to include the: 1) Santa Ana Bridge, 2) Camino Cielo Bridge, 3) Live Oak Acres Levee, and 4) Meiners Oaks Levee. Two scenarios shall be modeled for the Robles Diversion Dam including current conditions and failure of the crib wall during a 100-year storm event.

CONSULTANT shall then update the channel geometry in the four critical sub-reaches to reflect future sediment transport associated with dam removal. Event-based sediment transport modeling shall be conducted in SRH-2D for each of the four critical sub-reaches to assess channel conditions as the sediment pulse generated by dam removal moves through each reach. The proposed modeling approach shall utilize sediment transport rates from DREAM-2 as the upstream boundary condition. The SRH-2D sediment transport model shall be extended a minimum of ½ mile upstream and downstream from the study reach to reduce the impacts of model boundary conditions on the desired results.

CONSULTANT shall conduct Sediment transport within SRH-2D (using a TBD hydrologic time series) with the goal of achieving sediment deposition volumes within each critical sub-reach that are generally consistent with the DREAM-2 simulations. Prior to completing the SRH-2D modeling, the DREAM-2 sediment deposition volumes predicted within each sub-reach shall be analyzed to determine deposition expected to occur during one or several closely spaced hydrologic events, or if deposition is resulting from multiple events over several DREAM-2 model runs. If the latter is the case, the target sediment deposition volume will be adjusted or the sub-reach will be further subdivided. Issues with achieving general continuity in sediment volume between the two modeling approaches are most likely to occur over longer reaches, i.e. the specific study reach downstream from Robles so that reach will be divided into multiple sub-reaches. This sub-task shall result in SRH-2D outputs that predict sediment deposition patterns/volumes within each sub-reach.

CONSULTANT shall model changes in 100-yr water surface elevations (WSE's) resulting from the sediment deposition using two approaches: 1) 100-yr WSE's simulated using steady state 100-yr discharge flowing over the fixed channel bed resulting from the previous sub-task, and 2) maximum 100-yr WSE's analyzed during the sediment transport simulations. These results shall be compared and ultimately reviewed/vetted by the project's technical advisors in Task 2.9.5 to determine the efficacy of outputs generated by each approach. All outputs shall also be compared to the results of the proposed conditions 1D HEC-RAS, DREAM-2, and existing conditions SRH-2D models.

Subtask 2.9.5 – Proposed Conditions 2D Hydraulic and Sediment Transport Modeling Review and Revisions

CONSULTANT shall summarize results from the initial proposed conditions SRH-2D model in draft figures and videos and provide them for review. Based on review comments, CONSULTANT shall conduct one iteration of modeling revisions, after which the CONSULTANT shall prepare final existing conditions figures and videos.

Subtask 2.9.6 - 2D Hydraulic Model Report

CONSULTANT shall prepare a draft report summarizing the modeling approach and results described in earlier sections. This report shall be produced as a stand-alone 2D hydraulics report. CONSULTANT shall submit the draft report for review, then prepare a final report that addresses all reviewer comments.

Subtask 2.10 – Bank Erosion Screening Level Assessment

Due to the likely occurrence of changes in the riverbed elevation following dam removal, altering river flow patterns could result in increased or decreased bank erosion. The hydrology following dam removal is unknown, and thus it is not feasible to predict the impacts of dam removal on flooding, sediment transport, and erosion and deposition with a large degree of accuracy. The analysis provided in this subtask, therefore, shall focus on estimating the range of the potential impacts.

In this study, CONSULTANT shall leverage the existing 1-D hydraulic and sediment modeling for the entire length of the river downstream of Matilija Dam and the 2-D mobile-bed and hydrodynamic model being performed at select locations in sub-task 2.9. The sediment deposition and hydraulic information contained within these models shall be analyzed using relatively simple empirical equations that assess the likelihood of bank erosion given bank properties and hydraulic variables.

CONSULTANT shall use this “spreadsheet” level analysis of the results of the 1D and 2D results at key locations along the river as a screening level analysis of bank erosion. Simplified analysis shall identify areas of the river that have the potential for significant bank erosion in existing and proposed dam removal scenarios. CONSULTANT’s quantification of the amount of potential erosion shall be used to provide a qualitative description of the potential magnitude (e.g. none or little, medium, significant) as well as anticipated qualitative change after dam removal.

Subtask 2.10.1 – Identify Key Locations

CONSULTANT shall identify key locations based on analysis of past flood events, a review of readily available aerial photographs of the river, and discussions with AGENCY staff and the Contract Management Team (CMT). CONSULTANT shall identify locations that are known to have experienced extreme flooding, erosion or deposition, or where the river is braided, and the main channel could move to an alternate location that its current alignment.

CONSULTANT shall identified additional key locations based on the 2D modeling results, where increased in near bank velocities and shear stresses are evident.

Subtask 2.10.2 – Geology Field Reconnaissance

CONSULTANT shall complete field reconnaissance in key areas identified above to confirm assumptions or digital data associated with existing geology, erosion, and ground cover. The reconnaissance results shall be summarized in the draft and final memorandum discussed below.

Subtask 2.10.3 - Spreadsheet Level Calculations

At each key location identified in sub-task 2.10.1, CONSULTANT shall modify the existing topography based on the results of the sediment transport analysis, which is based on either the 1-D or 2-D modeling results, depending upon the location. CONSULTANT shall perform calculations for conditions of changes in bed elevation for a variety of flow rates to determine changes in sediment transport capacity, changes in shear stress, velocity and bank stability, and localized changes in water surface elevation. Bank stability shall be based upon the comparison of estimated shear stress along the riverbank to the critical shear stress of the bank material. The shear stress shall be estimated from hydraulic calculations. If the shear stress exceeds the critical shear stress, then bank erosion is possible. If appropriate, the ARS BSTEM model shall be used to estimate the amount of slope failure. Alternatively, the excess shear stress and estimated soil properties shall be used to estimate the amount of bank erosion.

Subtask 2.10.4 – Bank Erosion Reporting

CONSULTANT shall prepare a draft and final technical memorandum describing the data, methods of analysis and results. The results shall primarily be in table format and text, summarizing the potential for changes in bank erosion and/or stability, both for the existing condition and following dam removal. A list of assumptions and limitations shall also be provided.

Subtask 2.11 – Refine and Extend SRH-2D Modeling

CONSULTANT shall develop a refined mesh model to evaluate sediment transport dynamics and 100-yr WSEs within the four project reaches:

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- 1) HEC-RAS stations 15.06 to 15.67 including the Camino Cielo Bridge site and several critical private properties;
- 2) HEC-RAS stations 13.35 to 14.02 including the proposed Meiners Oaks Flood Protection;
- 3) HEC-RAS stations 9.25 to 10.13 including the proposed Live Oak Acres Levee; and
- 4) HEC-RAS stations 6.53 to 7.58 including the proposed Casitas Springs Levee.

Two separate models shall be used to evaluate the four project reaches and extend the upstream model limits from the North Fork Matilija Creek confluence at HEC-RAS station 15.67 to Matilija Dam at HEC-RAS station 16.29.

CONSULTANT shall prepare a draft Technical Memorandum documenting the modeling approach, analysis, data and sources, results, and update the predicted 100-yr sediment deposition depths and changes in 100-yr WSEs for AGENCY/Contract Management Team/TAC review and comment. After receiving AGENCY/Contract Management Team/TAC review comments, CONSULTANT shall prepare the final Technical Memorandum.

Results from this subtask shall be merged with previous results to provide one value for post-dam removal 100-yr sediment deposition and WSEs at each HEC-RAS cross section with one corresponding set of plan view figures for the entire modeling reach (HEC-RAS station 4.83 to 15.67).

Subtask 2.11.1 –Upstream Model (from Matilija Dam, to downstream of the proposed Meiners Oaks Flood Protection at HEC-RAS station 12.97).

The Upstream Model shall include detailed channel geometry in the main channel and areas of interest using refined mesh to better characterize post dam removal conditions for items 1 and 2 above.

The upstream boundary of the Upstream Model domain shall be extended from the North Fork Matilija Creek confluence upstream to Matilija Dam. The hydrology and sediment supply inputs shall be adjusted to be consistent with the new upstream boundary model domain. CONSULTANT shall develop and model a second hydrologic time series where the impoundment sediment is released and transported at a slower rate during a series of lower intensity storm events to characterize sediment transport for storm events that are forecast to meet the design sediment transport flow conditions but result in less flow than forecast.

Results from this subtask shall be merged with previous results to provide one value for post-dam removal 100-yr sediment deposition and WSEs at each HEC-RAS cross section with one corresponding set of plan view figures for the entire modeling reach (HEC-RAS station 4.83 to 15.67).

Modeling Conditions:

- The channel reach upstream of the North Fork Matilija Creek confluence at HEC-RAS station 15.67 to Matilija Dam shall be the "warm-up reach" for the model.
- Modeling shall assume a non-mobile bed.

Subtask 2.11.2 – Downstream Model (from upstream of the Live Oak Acres Levee at HEC-RAS station 10.61 to downstream of the Casitas Springs Levee at HEC-RAS stations 6.06).

The Downstream Model shall include detailed channel geometry in the main channel and areas of interest using refined mesh to better characterize future conditions.

Hydrology and sediment supply inputs at the upstream extent of the Downstream Model shall be based on outputs from either the coarse model from subtask 2.9 or outputs from subtask 2.11.1 above based on which data is determined to be more applicable/appropriate.

CONSULTANT shall document the modeling approach and results and update the 100-yr sediment deposition depths and predicted changes in 100-yr WSEs. Results from this subtask shall be merged with previous results from Subtask 2.9 to provide one value for post-dam removal 100-yr sediment deposition and WSEs at each HEC-RAS cross section with one corresponding set of plan view figures for the entire modeling reach (HEC-RAS station 4.83 to 15.67).

Modeling Conditions:

- Modeling shall assume a non-mobile bed.

Subtask 2.12 – Phase 1 Task and Subtask Rework

The CONSULTANT shall update the findings, recommendations, and evaluations for the following subtasks to incorporate the results from subtask 2.11 as follows.

- Subtask 2.4: Re-Evaluation of Downstream Project Components (Santa Ana and Camino Cielo Bridges, Live Oak Acres and Miners Oaks Levees, and Robles High Flow Bypass), Submitted April 2020
- Subtask 2.9: 2-D Hydraulic Model Report
- Subtask 3.3: Update Real Estate Plan, Submitted June 2020
- Task 4 Water Supply Mitigation, Submitted November 2020

Subtask 2.12.1 – Review of the Revised Sediment Transport Analysis

The CONSULTANT shall thoroughly review the extended sediment transport analysis completed in Subtask 2.11 in the context of impacts on downstream features. The CONSULTANT shall compare the results to those of the prior reports and identify revisions necessary to the draft technical memoranda produced.

Subtask 2.12.2 – Merge Revised Sediment Transport Data with the Prior Geographic Information System (GIS) Database

The CONSULTANT shall review and modify as necessary the GIS database developed in support of the subtasks listed in Subtask 2.12.

Subtask 2.12.3 –New GIS Maps of the Study Area

The CONSULTANT shall generate new GIS maps of the river corridor based on the output from the refined and extended 2D modeling. The mapping will revise the 100-year recurrence interval flood levels and parcel information. Tables summarizing the parcel information, including the magnitude of and change in inundation levels, will be revised to reflect the refined and extended 2D modeling results including any additions to the list of inundated parcels recommended for further protection.

Subtask 2.12.4 –New Maps Comparison to Prior Studies and Evaluate Resulting Changes

The CONSULTANT shall perform a comparative analysis of the prior and revised GIS mapping to determine differences and specific areas of concern and impacts to the downstream project components listed in Subtask 2.4.

Subtask 2.12.5 - Update Findings and Recommendations in the Prior Reports and Technical Memoranda for Subtasks 2.4, 2.9, 3.3, and Task 4.

The results of all analysis and resulting recommendations provided in the prior draft technical memoranda and reports for all listed subtasks will be reviewed and updated based on the extended 2D modeling performed in subtask 2.11.

Subtask 2.12.6 Draft and Final Reports

The CONSULTANT shall update the following draft reports prepared in conjunction with the previously completed tasks and subtasks as appropriate:

- Subtask 2.4: Re-Evaluate Downstream Project Components (Santa Ana and Camino Cielo Bridges, Live Oak Acres and Miners Oaks Levees, and Robles High Flow Bypass), Submitted April 2020
- Subtask 2.9: 2-D Hydraulic Model Report
- Subtask 3.3: Update Real Estate Plan, Submitted June 2020
- Task 4 Update Water Supply Mitigation, Submitted November 2020

Following review and comment by the District and the Contract Management Team, the CONSULTANT shall incorporate comments into a final version of each of the reports.

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Task 2 Deliverables:

- CONSULTANT/AGENCY/Contract Management Team conference calls shall be held at monthly intervals to facilitate coordination, input and provide progress summaries to the AGENCY/Management Team. CONSULTANT shall prepare agendas and meeting minutes for each meeting.
- CONSULTANT shall coordinate quarterly (4) meetings between CONSULTANT/AGENCY/Contract Management Team/Technical Advisory Team (TAC) in Ventura over the performance period involving CONSULTANT and two other team members.
- CONSULTANT shall coordinate two meetings between CONSULTANT/AGENCY/DSOD in Sacramento over the performance period involving CONSULTANT and two other team members.
- Draft Concrete Structural Strength Comparative Analysis and Stability Evaluation Report for AGENCY/Contract Management Team/TAC review
- Revised Draft Concrete Structural Strength Comparative Analysis and Stability Evaluation Report incorporating AGENCY/Contract Management Team/TAC comments
- Final Concrete Structural Strength Comparative Analysis and Stability Evaluation Report
- Draft Sediment Transport and Hydraulics Modelling Memo for AGENCY/Management Team/TAC Review
- Revised Sediment Transport and Hydraulics Modelling Memo incorporating AGENCY/Management Team/TAC comments
- Final Sediment Transport and Hydraulics Modelling Memo
- All native files for HEC-RAS and any other hydraulic computer modeling programs employed.
- Draft Re-evaluation of Downstream Project Components Designs Summary for AGENCY/Management Team/TAC Review
- Revised Draft Re-evaluation of Downstream Project Components Designs Summary incorporating AGENCY/Management Team/TAC comments
- Final Re-evaluation of Downstream Project Components Designs Summary
- Summary of Recommended Alternative Design Revisions for Downstream Project Components (depending on the outcome of the deliverables described above)
- Draft Summary of Risk Estimate in Under-Predicting a Flushing Storm Event for AGENCY/Management Team/TAC Review
- Revised Draft Summary of Risk Estimate in Under-Predicting a Flushing Storm Event incorporating AGENCY/Management Team/TAC comments
- Final Summary of Risk Estimate in Under-Predicting a Flushing Storm Event
- Draft 10 Percent Level Design package (to include conceptual drawings, preliminary descriptions of boring and demolition requirements and sequencing, a description of the key design elements, a description of restoration requirements and objectives, etc.) for Orifice Boring, Dam Demolition, and Reservoir Area Restoration for Management Team/TAC Review
- Revised Draft 10 Percent Level Design package for Orifice Boring, Dam Demolition, and Reservoir Area Restoration incorporating Management Team/TAC comments
- Final 10 Percent Level Design package for Orifice Boring, Dam Demolition, and Reservoir Area Restoration
- Draft Summary of Matilija Dam Structural Analysis for AGENCY/Contract Management Team/TAC review
- Revised Draft Summary of Matilija Dam Structural Analysis Incorporating AGENCY/Contract Management Team/TAC comments
- Final Summary of Matilija Dam Structural Analysis
- Draft Dam Removal Feasibility Report for AGENCY/Contract Management Team/TAC review
- Revised Draft Dam Removal Feasibility Report incorporating AGENCY/Contract Management Team/TAC comments

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- Final Dam Removal Feasibility Report incorporating Contract Management Team comments
- Invoices, progress reports, meeting minutes, and other documentation as necessary
- Draft Technical Memorandum describing the methods of analysis, data and sources, and analysis results for the 2D Hydraulic Analysis, and the extended and refined 2D model.
- Final Technical Memorandum describing the methods of analysis, data and sources, and analysis results incorporating comments received from the AGENCY and CMT for the 2D Hydraulic Analysis, and the extended and refined model.
- Draft Technical Memorandum describing the methods of analysis, data and sources, and analysis results for the Bank Erosion Analysis
- Final Technical Memorandum describing the methods of analysis, data and sources, and analysis results incorporating comments received from the AGENCY and CMT for the Bank Erosion Analysis

Task 3 - Review and Update Real Estate Plan

Subtask 3.1 Review USACE Real Estate Plan

CONSULTANT shall review the 2004 Plan prepared by USACE to determine previously used methods and outcomes. CONSULTANT shall develop tabular and GIS exhibits to illustrate acquisitions, both extents and type of acquisition, to compare and contrast with the updated Plan.

Subtask 3.2 Development of Real Estate Plan/Downstream Project Component Decision Matrix

CONSULTANT shall, in consultation with AGENCY and Contract Management Team, develop a matrix to guide decisions for the Real Estate Plan and downstream infrastructure project components. The thresholds in the decision matrix will consider the final results of the project sediment transport and hydraulic analyses, Subtasks 2.2 and 2.3, and shall provide, at a minimum, guidance for developing the following recommendations, 1) new downstream infrastructure, 2) upgrades to existing infrastructure, 3) acquisition of properties and removal of habitable structures, and acquisition of inundation easements.

Subtask 3.3 Updated Real Estate Plan

Based on Subtasks 3.1 and 3.2, Consultant shall update the Real Estate Plan for the Project. The plan shall focus on acquisition of properties or improvements to private infrastructure affected by increases in flood elevations but shall not include acquisitions required for construction and maintenance of downstream public infrastructure project components. Property acquisitions required for downstream public infrastructure may be added to this plan as a separate subtask once this information is developed from the design of each component.

CONSULTANT shall collect parcel data, including rights-of-way and easement information, from the County Assessor and other publicly available data. The parcel data shall be used as a basis for the updated Plan. The parcel data ownership and zoning information shall be used to inform the Plan. CONSULTANT shall collect and use the 2005 LIDAR data to determine parcel elevations. Real estate costs based on publicly available published data (for example, Zillow or Realtor) as well as guidance provided by the AGENCY'S Real Estate Section shall be assigned to each parcel.

CONSULTANT shall prepare GIS map exhibits that include 100-yr flood levels and parcel information. CONSULTANT shall prepare tables summarizing all parcel information, including parcel elevations, zoning information, and magnitude of and change of inundation levels. These exhibits and tables will be used to identify parcels, structures and infrastructure of concern.

CONSULTANT shall use the decision matrix developed in Subtask 3.2 to identify inundated parcels recommended for further protection or mitigation measures. These may include public infrastructure or private infrastructure. The infrastructure identified in Subtask 2.4 (Re-evaluation of Downstream Components) shall also be considered in the Plan.

CONSULTANT shall also identify inundated parcels that will be designated for recommended acquisition. The acquisition strategy may differ based on zoning information, level or percentage of inundation, and change in inundation. The acquisition plan may also consider insurance coverage in lieu of land acquisition.

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CONSULTANT shall review changes in inundation levels against parcel elevations, considering the level of accuracy of the hydraulic model.

CONSULTANT shall use the methodology developed in Subtask 3.2 to develop the Real Estate Plan that will include: a description of the strategies and the decision matrix in Subtask 3.2, tabular and graphical representation of the updated Plan, a cost estimate for implementing the Plan based on recommended infrastructure improvements, land acquisition and insurance coverage. The updated Plan shall also include a section that compares the update Plan with the 2004 Plan, and a report summarizing the findings.

Deliverables:

- Draft Decision Matrix
- Final Decision Matrix, incorporating comments received on draft
- Draft Updated Real Estate Plan with map figures and cost data.
- Revised Draft Updated Real Estate Plan (if necessary), incorporating comments received on initial draft
- Final Draft Updated Real Estate Plan

Report deliverables shall be provided in Word and single searchable PDF format. Tables and GIS layers and exhibits shall be provided in native electronic format.

Task 4 – Impacts to Water Supply Infrastructure

Subtask 4.1 Short-Term Alternatives Refinement

CONSULTANT shall assess possible short-term impacts caused by the flushing of fine sediment from the Project on water supplies and infrastructure owned and managed by the Water Supply Agencies listed below, then identify and evaluate potential water supply mitigation alternatives. The objective of the mitigation alternatives is to reduce the severity of any potential impact of the Project or the potential for reduced water supply or reduction in water quality caused primarily by the flushing of fine sediment from the reservoir during and following the initial flushing event. The outcome of this analysis will be a preferred alternative for each Water Supply Agency.

A range of water supply mitigation alternatives was previously developed in the Water Supply Mitigation Options Evaluation Report (AECOM, 2016). The intent of this task is to advance and refine the alternatives identified in the previous report, and further assess any potential new alternatives.

The Water Supply Agencies that will be considered as part of this task are identified as follows:

- Meiners Oaks Water District
- Ventura River Water District
- City of Ventura
- Casitas Municipal Water District

Subtask 4.1.1 - Data Review

CONSULTANT shall review the following reports and background information:

- Matilija Dam Ecosystem Restoration Feasibility Study – Final Report (USACE, September 2004)
- Water Supply Mitigation Options Evaluation Report (AECOM, March 2016)
- Matilija Dam Removal Concepts Evaluation Report (AECOM, March 2016)
- Detailed Sediment Transport Modelling and Hydraulic Studies to Determine 100-yr Water Surface Elevations (Stillwater Sciences, July 2019)
- Other pertinent information, such as groundwater management authority (GMA) reports, consumer confidence reports (CCR), etc.

Subtask 4.1.2 - Analysis of Short-Term Impacts to Water Supply Agencies

CONSULTANT shall review the impacts defined in the previous Water Supply Mitigation Options Evaluation Report (2016). Based on the review of available data, the CONSULTANT shall define the short-term impacts to the Water Supply Agencies. The potential impacts shall be defined based on reduction in water supply volume and potential impacts to water quality.

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CONSULTANT shall update the short-term impacts defined in the previous Water Supply Mitigation Options Evaluation Report (2016) based on new available data, if applicable.

Subtask 4.1.3 - Development of Conceptual Alternatives

CONSULTANT shall review the alternatives in the previous Water Supply Mitigation Options Evaluation Report (2016). Based on the information identified in Subtasks 4.1.1 and 4.1.2, the CONSULTANT shall identify new alternatives that were not considered as part of the previous report.

CONSULTANT shall develop the new alternatives to facilitate discussions with the Water Supply Agencies, the Contract Management Team, and project stakeholders; including development of conceptual drawings, descriptions, etc.

Subtask 4.1.4 - Coordination with Water Supply Agencies

CONSULTANT shall schedule meetings with the Water Supply Agencies to review and discuss results of the analysis in Subtask 4.1.2 and the alternatives defined in Subtask 4.1.3.

Meetings shall be held with the Water Supply Agencies at their preferred locations (up to three separate meetings with each agency over a total of three days) to further refine and agree on the alternatives. The outcome of the meetings shall be a list of alternatives that will be developed for further refinement. Minutes shall be provided to project stakeholders summarizing meeting outcomes.

Subtask 4.1.5 - Refinement of Alternatives

CONSULTANT shall refine the alternatives that were identified for further refinement in the Water Supply Agency meetings, per Subtask 4.1.4.

CONSULTANT shall evaluate any new alternatives based on the four evaluation criteria defined in the previous Water Supply Mitigation Options Evaluation Report. The four evaluation criteria are defined as:

- Cost – Considers the estimated lifecycle cost as well as the potential return on investment.
- Environmental – This criterion considers the potential environmental impacts for each alternative as well as possible environmental permitting requirements.
- Feasibility – The feasibility evaluation represents the general effectiveness of each alternative with regards to mitigating potential water volume losses as well as the constructability and scheduling. Additionally, it considers comments and feedback received from the Water Supply Agencies, Contract Management Team, and project stakeholders.
- Adaptability – The adaptability criterion considers whether the proposed alternative has any future benefits beyond the mitigation needs of the dam removal project.

Based on the alternatives evaluation, the AGENCY will select the preferred alternative for each Water Supply Agency to be carried forward to the feasibility study phase. The preferred alternative will be discussed and agreed to by the Water Supply Agencies and Contract Management Team prior to a decision on final recommendations.

Deliverables:

- **Short-Term Alternatives Refinement:**
 - Draft Water Supply Mitigation Alternatives Report describing the alternatives evaluation process and the preferred alternative.
 - Revised Draft (if necessary) Water Supply Mitigation Alternatives Report, incorporating comments received on initial draft.
 - Final Water Supply Mitigation Alternatives Report, incorporating comments received on draft(s).

Report deliverables shall be provided in Word and single searchable PDF format. Tables and GIS layers and exhibits shall be provided in native electronic format.

Subtask 4.2 – Long-term Alternative Options Study (Robles Diversion)

Subtask 4.2.1 – Background and Operational Review

CONSULTANT shall prepare a data request for CMWD, VCWPD, Bureau of Reclamation (BOR), and NMFS, which shall be presented at a kick-off meeting. CONSULTANT shall review background information available from CMWD, VCWPD, BOR, and NMFS including record drawings, operation and maintenance records, relevant sections of the Biological Opinion, operating permits, and diversion activities to gain an understanding of the fish screen operations, constraints, and diversion impacts.

CONSULTANT shall also meet with the Robles Working Group (RWG), comprising CMWD, VCWPD, NMFS, BOR, and CDFW staff, in a workshop format, followed by a site visit to all relevant facilities, to better understand operation and maintenance concerns and issues.

CONSULTANT shall review the design prepared by Tetra Tech and interview key stakeholders to summarize areas of concerns, recommendations for improvements or modifications.

Subtask 4.2.2 - Case Study Evaluation

CONSULTANT shall prepare a case study of other relevant projects that could have important lessons learned for this project. Four projects shall be reviewed and studied, including:

- Alameda Creek Fish Passage Project (SFPUC)
- Salinas River Diversion Facility (MCWRA)
- Nelson Dam Removal (Yakima, WA)
- One other project to be determined

Subtask 4.2.3 - Alternative Options and Draft Summary Report

CONSULTANT shall formulate alternative options and prepare a draft summary report of the alternative options activities. The report shall include:

- Findings of Tasks 1 and 2 with collected comments addressed.
- Description and discussion of alternative options for potential further analysis shall include:
 - capital improvement descriptions
 - likely ability of alternative to mitigate dam removal impacts
 - O&M requirements
 - order of magnitude cost evaluation
 - qualitative assessment of alternative efficacy
 - site plan with improvement(s) footprint
 - project execution description (constructability, schedule)
- Alternative Options Evaluation Criteria – Preliminary Rating/Ranking Concepts
 - preliminary options decision matrix
 - preliminary options risk assessment
- Robles Diversion Work Plan – scope of work, budget, schedule for the feasibility analysis and design.

Subtask 4.2.4 - Workshop and Final Summary Report

CONSULTANT shall host a workshop with the RWG, to review the preliminary alternative options and gather feedback. CONSULTANT shall also present the findings of the case studies and identify where lessons learned could be incorporated into the project. The objective of the workshop is to identify and confirm the alternative options to carry forward for future further study.

Deliverables:

- Long-Term Alternatives Options:
 - Draft Technical Memorandum of findings shall be prepared for the Background and Operational Review. The TM shall be issued for review and comments. Comments shall be addressed as part of the Summary Report

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- Technical Memorandum of findings and lessons learned shall be prepared for the Case Study Evaluation. The TM shall be issued for review and comments. Comments shall be addressed as part of the Summary Report
- Summary Report. A draft summary report shall be issued for review and comments. After the workshop and receipt of comments from members of the RWG, the final report shall be issued.
- Robles Diversion Work Plan. The work plan shall be issued with a detailed scope of work, budget, and schedule that can be used for future grant proposals.
- For all meetings, draft agenda shall be distributed at least three days prior to each meeting. Minutes shall be prepared and provided within five business days after each meeting. Workshop meetings for the RWG shall be presented with the aid of PowerPoint presentations. Presentations shall be provided to the Agency.
- All deliverables shall be reviewed by a senior technical staff member for technical feasibility, completeness, and presentation prior to submittal to the AGENCY. Report deliverables shall be provided in Word and single searchable PDF format. Tables and GIS layers and exhibits shall be provided in native electronic format.

Task 5 – 30 Percent Design

Subtask 5.1 – 30 Percent Plans

CONSULTANT shall develop construction plans, including sections and details necessary to depict the 30 percent design of the orifices through the dam, optional regulating gates for the orifices, demolition of the dam following sediment flushing, and reservoir area restoration.

A draft 30 percent plan package shall be submitted to the AGENCY and CMT for review and comment. The CONSULTANT shall incorporate comments and submit a revised plan package at the 30 percent completion level. The following technical analyses are required to further the design and associated drawings to the 30 percent level:

- Dam removal approaches & access
- Post-removal reservoir hydraulics to support restoration
- Post-removal restoration approach and plan, which would not include invasive vegetation surveys or removal, erosion control measures, irrigation design or seed collection
- Geomorphology & fish passage initial assessment
- Access and hauling routes.
- Orifice and reservoir drawdown hydraulic analyses and tunnel/gate detailed design are not included in this subtask

A preliminary list of drawings anticipated to be included at the 30 percent design level includes the following:

1. Project location and general arrangement plan
2. Access and Hauling Plan
3. Existing Conditions – Dam/ Reservoir
4. Existing Conditions – Dam/Plunge Pool
5. Existing Conditions – Elevation
6. Existing Conditions – Sections
7. Dam Alteration Site Plan (pre-drawdown)
8. Dam Alteration Grading Plan (pre-drawdown)
9. Dam Alteration profiles & Sections (pre-drawdown)
10. Dam Alteration Details
11. Dam Removal Access Plan (post-drawdown)
12. Dam Removal Site Plan (post-drawdown)
13. Dam Removal Sequencing
14. Post-Removal Grading Plan
15. Post-Removal Profile and Sections
16. Post-Removal disposal Site Grading
17. Post-Removal Reservoir Restoration Plan

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18. Post-Removal Restoration Details

19. Sediment & Concrete Disposal Area Plan and Sections

Subtask 5.2 – Monitoring and Adaptive Management Plan

CONSULTANT shall develop a Monitoring and Adaptive Management Plan to identify appropriate monitoring activities and associated thresholds for management or maintenance activities associated with the design and construction. The plan shall be primarily based on the uncertainties and risks associated with accumulated sediment evacuation and transport, both downstream of the dam down to the Pacific Ocean and within the reservoir area. The plan shall describe how monitoring activities shall be developed commensurate with project objectives and success criteria, as well as considering possible applicable regulatory requirements.

Subtask 5.3 – 30 Percent Design Report

CONSULTANT shall develop a Design Report describing the selected dam removal approach through the 30 percent design level. The report shall summarize the structural and related analyses supporting the dam removal process, beginning with orifice construction and continuing through the removal steps and sequence, as well as restoration measures within the former reservoir basin. In addition to technical analyses listed under Sub-task 5.2, the design report shall summarize the following:

- Key design considerations related to the orifices, plug blasting and gates.
- Design considerations related to hydrology, downstream hydraulics and sediment transport.

Potential risks that are not expected to be addressed through analysis for the 30 percent design include the following:

- Public access road deficiencies for construction traffic/loads
- Reservoir rim stability during drawdown.
- Geology and geotechnical considerations at potential borrow sites (for access berm construction).
- Geology and geotechnical considerations at disposal sites.
- Hazardous materials characterization (Phase I or II) for dam or other facilities.

The table of contents for the Design Report shall include the following:

Executive Summary

- 1.0 Introduction
- 1.1 Background
- 1.2 Project Goals & Objectives
- 1.3 Report Organization
- 2.0 Existing Conditions
- 3.0 Design Criteria
- 4.0 Hydrology, Hydraulics and Sediment Transport
- 5.0 Dam Structural Analysis
- 6.0 Orifice and Gate Design
- 7.0 Reservoir Drawdown
- 8.0 Dam Removal Approach & Sequencing
- 9.0 Geomorphology and Fish Passage
- 10.0 Post-Removal Restoration
- 11.0 References

Deliverables:

- Draft 30 Percent Plans for AGENCY and CMT review
- Revised 30 Percent Plans, incorporating comments received from the AGENCY AND CMT
- Draft Monitoring and Adaptive Management Plan for AGENCY and CMT review
- Final Monitoring and Adaptive Management Plan, incorporating comments received from the AGENCY and CMT
- Draft 30 Percent Design Report for AGENCY and CMT review
- Final 30 Percent Design Report, incorporating comments received from the AGENCY and CMT

Task 6 – 65 Percent Design**Subtask 6.1 – 65 Percent Plans**

CONSULTANT shall develop construction plans, including sections and details necessary to depict the 65 percent design of all project components. The following analyses shall be carried out to help advance the design to the 65 percent level:

- Post-removal reservoir hydraulics to support restoration
- Post-removal restoration approach and plan
- Updated river wide hydraulics and sediment transport shall be summarized, as it pertains to design
- Structural analysis for the orifices, plug blasting and gates is not included, since this is expected to be covered at a later stage of the project.

A draft plan package shall be submitted to the AGENCY and CMT for review and comment. CONSULTANT shall address and incorporate comments as appropriate and submit a revised plan package at the 65 percent level. Any items remaining to be resolved during future phases of detailed design shall be summarized and documented.

The drawing list of the 65 percent design plans expands on the list summarized for the 30 percent design. The level of detail provided per sheet shall increase as appropriate to reach an approximate 65 percent completion level, established based on judgement and experience. At this overall level of completion, some drawing sheets are expected to be levels of completion greater than 65 percent while others shall be less developed.

Subtask 6.2 – Project Cost Estimate and Specification Inventory

CONSULTANT shall develop an engineer's estimate of project construction costs in accordance with the definitions established by the Association for the Advancement of Cost Engineering International (AACE, 1997). Construction pricing shall be developed using logic, methods, and procedures for pricing that are typical for the construction industry. Estimated costs shall utilize crew and equipment work – item analysis to develop unit costs, and then multiply these by the quantity measurement to arrive at work item subtotals. Unit rates shall be established using input from RS Means database, Equipment Watch database and Davis Bacon Wage Determination database. Rates shall be further determined and validated with project data and award bids from similar projects. Equipment costs shall be based on the latest understanding of the equipment required to complete the work. Vendor quotes for materials such as gates shall also be used. Overall prices shall be established by taking location, access and construction operation into consideration.

The project cost estimate shall also include a summary of overall project costs, including cost estimates provided by the other consultants for project components they are contracted to design. The overall project cost estimate shall include contingency and escalation assumptions for further implementation agreed to in consultation with the CMT and AGENCY.

A list and description of the technical specifications shall be included (the technical specifications themselves are not included in this scope). The division 2 (technical) specifications list shall be completed using the latest edition of the Construction Specification institute (CSI) format, however will strive for consistency with County specification protocol, including the Greenbook Standard Specification for Public Works Construction, and examples provided by AGENCY.

Subtask 6.3 – 65 Percent Design Report

CONSULTANT shall develop a 65 Percent Design Report describing the selected dam removal project components and details. The report shall summarize the structural and related analyses supporting all elements of the project design including the orifice construction, dam removal steps and sequence, and restoration measures within the former reservoir basin. The table of contents for the Design Report shall expand upon the subjects listed under the Task 5.3 for the 30 Percent Design Report. Significant additions to the design report at 65 percent include the following:

- Sections shall be added to the report to document the engineer's opinion of probable construction costs, based on the 65 percent design.

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- Structural analysis for the orifices, plug blasting and gates is not included, as this is expected to be completed at a later stage of the project.

Deliverables:

- Draft 65 Percent Plans
- Revised 65 Percent Plans, incorporating comments received from the AGENCY and CMT on Draft 65 Percent Plans
- Draft 65 Percent Design Report for AGENCY and CMT review
- Revised 65 Percent Design Report, incorporating comments received from the AGENCY and CMT

Subtask 6.4 – SEIR Support and Meetings

The CONSULTANT shall coordinate with the AGENCY prior to initial public outreach to help identify potential issues relevant to the public. The CONSULTANT shall describe issues and provide graphics from the existing design documents, as appropriate to support public outreach planning.

The CONSULTANT shall respond to public comments received related to the dam removal design package and associated downstream modeling. CONSULTANT shall compile the full list of public comments received and respond to the comments as appropriate.

The CONSULTANT shall make minor revisions to the 65% design documents to clarify issues raised during public outreach while maintaining the integrity of the 65% design documents.

The CONSULTANT shall participate remotely in up to two public meetings, conduct one public comment debrief and discussion meeting, and conduct six monthly update meetings with the AGENCY including agendas and meeting notes. The CONSULTANT shall coordinate with the AGENCY for meeting preparation.

Deliverables

- List of public questions and written responses.
- Meeting Notes and agendas for all monthly update meetings and the debrief meeting.
- Minor Revisions to the 65 Percent Design Deliverables in response to stakeholder input.

Task 7 – Final Report

CONSULTANT shall develop a summary report of the work performed under the California Department of Fish and Wildlife grant. The report shall summarize the work performed under each task and subtask, along with the findings of the work, and shall reference all the completed deliverables. To ensure a comprehensive document, the deliverables shall be provided as appendices to the report.

Deliverables:

- Draft a Final Report for the AGENCY and CMT review
- Revised Final Report, incorporating comments received from the AGENCY and CMT

Task 8 – Structural Analyses and 30% Structural Design of Orifices

Subtask 8.1 – Review of Previous Structural Evaluations

The CONSULTANT shall review available information on Matilija Dam previously provided by the AGENCY to aid in the orifice analyses and design including:

- **Original design documentation (construction drawings, photographs, design reports, and construction reports.)**
- **Most recent dam monitoring data, and inspections documents describing dam modifications.**
- **Previous dam concrete investigations conducted (i.e., Technical Memorandum for Field Investigations, Matilija Dam Removal 65 Percent Design Planning Study, Appendix B of Draft Feasibility Study Report, Matilija Dam Removal 65 Percent Design Planning Study, AECOM, September 2020)**

- *Previous evaluations of structural stability (i.e., Stability Re-Evaluation of Matilija Dam, Appendix C of Draft Feasibility Study Report, Matilija Dam Removal 65 Percent Design Planning Study, AECOM, September 2020).*

Subtask 8.2 – Structural Assessment of Orifice Tensile Stress Concentrations and Mitigation Option(s)

The CONSULTANT shall review the previous stability study and analysis of Matilija Dam, including the proposed orifices, and perform additional structural analysis focused on the tensile stress concentrations around the orifices under usual and unusual loading combinations (including stresses related to the flushing event). Consultant shall investigate and recommend viable mitigation options to address concerns related to tensile stress concentrations identified through this analysis and in previous work.

Subtask 8.3 – Assessment of Controlled Blasting Approach

The CONSULTANT shall review the controlled blasting method(s) and shall recommend blasting parameters to minimize the potential structural damage to the orifices and to the dam after blasting the temporary concrete plugs. This review shall include description of the approach, types of explosives that can be used, drilling methods and pattern, number of bore holes and distance between them, bore hole diameter and depth, weight/volume of the explosives, and blast parameters.

Subtask 8.4 – Structural Design of Anchors and Regulating Gates

The CONSULTANT shall complete structural design of the anchor connections for the regulating gates under usual and unusual load combinations. The consultant shall provide gate design parameters that can later be incorporated into performance specifications for the slide gates including descriptions of the inputs and assumptions, load combinations, design of the gate anchors based on ACI 318-19, and parameters for future performance specifications.

Subtask 8.5 – Analysis of Hydraulic Conditions During Flushing

The CONSULTANT shall conduct a three-dimensional Computational Fluid Dynamic (CFD) modeling of the hydraulic conditions for the concrete plugs during the flushing event using industry standard CFD computer program such as FLOW-3D developed by FLOW Sciences, Inc of Santa Fe, USA. The modeling shall assume that the sediment and water mixture upstream of the plug is fully liquified and fluid. The mixture shall be modeled as Newtonian or non-Newtonian fluid with the rheological properties such as yield stress and dynamic viscosity estimated from the available geotechnical data and empirical equations in literature.

The modeling shall be conducted for up to three reservoir water/sediment levels to determine the variation of flow characteristics in the plugs under different reservoir conditions. The model domain shall be limited to the orifices and the areas within 100 feet upstream and 50 feet downstream of the dam.

The CFD modeling shall provide results of 3-dimensional distribution of pressure, including potential vacuum conditions, and velocity in the plugs and immediately upstream of the plug to be used in a structural analysis. These outputs shall be used to evaluate the structural adequacy of the orifice, liner, and the liner anchors.

Subtask 8.6 – 30 Percent Design of Concrete Plugs and Orifice Tensile Stress Mitigation Measures

The CONSULTANT shall prepare the 30% design plans and performance criteria for the orifices, including tensile stress mitigation measures, and develop drawing sheets and update existing sheets to be inserted in the drawing set for 65 Percent Design dam removal prepared as part of Task 6. The following shall be performed as part of the design and based on the information and analyses in Subtasks 8.1 through 8.5:

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- *Determine the required thickness of existing concrete plug to withstand sediment and hydrostatic loading.*
- *Design steel lining and encasement (reinforcement, dowels, and grout) for each orifice.*
- *Develop methods to protect upstream portion of steel lining from damage or undermining during blasting and drawdown.*
- *Develop parameters for blasting and selective demolition for the orifice to limit potential damage to the existing structure. Specific parameters shall be added to the design report.*

The CONSULTANT shall develop design drawings and update existing drawings for the orifices, tensile stress mitigation measures, and plugs. The drawings shall be prepared in the version of AutoCAD used for the Matilija Dam Removal 65% design drawings in standard 22-inch by 34-inch size paper and shall meet the District's drafting guidelines. CONSULTANT shall perform a quality control review. Changes in design concepts or construction methods identified during the design shall be communicated directly with the Agency for concurrence. For the design drawings, CONSULTANT shall update or prepare, as necessary, the following drawings from the Draft 65% Matilija Dam Removal design (AECOM, March 14, 2022):

- *Sheet 17: Phase 1 – Downstream Workpad, Access Road, and Orifice Construction Plan*
- *Sheet 19: Phase 1 – Downstream Workpad, Access Road, and Orifice Construction – Section and Details*
- *Sheet 22: Phase 1 – Sluice Gate Details*
- *New Sheet: Orifice Details (Lining, Reinforcement, Dowels, and Grout)*
- *New Sheet: Structural Notes*

Subtask 8.7 – Prepare Draft Technical Memorandum

The CONSULTANT shall prepare a draft technical memorandum documenting the work conducted in Subtasks 8.1 through 8.6 for review and comment by the AGENCY and the Contract Management Team as indicated in Task 8 deliverables. The draft technical memorandum shall include a summary of the reviewed documents, descriptions of the approach, methods, inputs, assumptions, results, conclusions, proposed mitigation options, and recommendations for Task 8.1-8.6.

Subtask 8.8 – Prepare Final Technical Memorandum

Following the review and comment period on the Draft Technical Memorandum in Subtask 8.7 by the Agency and technical management Committee, the CONSULTANT shall prepare a comment response matrix with CONSULTANT's responses to comments received on the draft technical memorandum. The CONSULTANT shall revise the draft technical memorandum, including the drawings, to produce a final technical memorandum incorporating changes as documented in the response to comments.

CONSULTANT shall provide the Report deliverables in Word and as a single searchable PDF format. Drawings shall be provided in AutoCAD and PDF format.

Subtask 8.9 – Coordination With DSOD

Consultant shall coordinate design development with DSOD and respond to comments received from DSOD including a response to DSOD's letter dated 10/29/2020.

Consultant shall provide the developed approaches for Subtasks 8.2 through 8.5 and discuss with DSOD in one virtual workshop before proceeding with the remaining tasks. In addition to the workshop, CONSULTANT shall conduct one additional call with DSOD and AGENCY to discuss comments on the Draft TM.

Subtask 8.10 – Task Management

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CONSULTANT shall include implementation of quality assurance/quality control procedures following standard CONSULTANT processes. Prior to submission to the AGENCY, all deliverables shall undergo detail checks and technical reviews by CONSULTANT to verify the quality and integrity of the project tasks and written work products, and to verify that the deliverables are in accordance with the scope of work. Each technical review shall be documented using appropriate forms and this documentation shall be maintained in the CONSULTANT's project files and provided to the AGENCY. Invoices and project budget tracking reports shall be provided at monthly intervals.

Task 8 Deliverables:

- **Subtask 8.1: a summary of the reviewed documents**
- **Subtask 8.2: descriptions of the approach, methods, inputs, assumptions, results, conclusions, proposed mitigation options, and recommendations from the structural analysis of orifice tensile concentrations**
- **Subtask 8.3: descriptions of the approach, methods, inputs, assumptions, results, conclusions, and recommendations from the analysis of structural effects of controlled blasting**
- **Subtask 8.4: descriptions of the approach, methods, inputs, assumptions, results, conclusions, and recommendations from the structural analysis of regulating gates**
- **Subtask 8.5: descriptions of the approach, methods, inputs, assumptions, results, conclusions, and recommendations from the structural analysis of hydraulic conditions during flushing**
- **Subtask 8.6: descriptions of the design approach, design criteria, orifices and mitigation measures, assumptions, conclusions, and recommendations for the 30% design of tensile stress mitigation measures and the new and updated drawings sheets**

Report deliverables shall be provided in Word and single searchable PDF format. Drawings shall be provided in PDF format.

- **Summary List of Reviewed Documents**
- **Description of Previous Structural Analysis results and Mitigation Options**

3. Extra Services

Extra Services are separate from but related to the Basic Services described above. Extra Services shall be performed by CONSULTANT only after being authorized in writing by the Project Manager for AGENCY. AGENCY's written authorization will include a statement of the Extra Services required and time schedule for completion. CONSULTANT's billing and AGENCY's payment for Extra Services shall occur pursuant to Exhibit C.

4. County Services

AGENCY will provide or accomplish the following:

1. Full information as to the requirements of the services to be provided by CONSULTANT under the contract.
2. Review documents submitted by CONSULTANT and provide comments, direction, or approval as needed in a timely manner.
3. Provide environmental permitting for all field investigations.

End of Exhibit A

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EXHIBIT B - TIME SCHEDULE

1. Schedule

All Work on this contract shall be completed by **6/30/2023**.

CONSULTANT shall complete intermediate tasks as follows:

Task Table

Task	Description	Due Date
1	Field Investigations	
1.1	Geotechnical Field Investigations to Characterize Fine Sediment and Organics	07/07/2018
1.2	Field Investigations to Characterize Dam Concrete	07/07/2018
1.3	Field Investigations Memorandum	08/30/2018
1.4	Biological Support for Field Investigations	09/15/2018
2	Dam Removal Feasibility Study	
2.1	Structural Evaluation of Dam With and Without Orifices	03/13/2020
2.2	Detailed Sediment Transport Modeling From Dam to Ocean	01/31/2020
2.3	Hydraulic Studies to Determine 100-yr Water Surface Elevation Based on Detailed Sediment Transport Analyses	3/31/2021
2.4	Re-evaluation of Downstream Project Components	03/30/2020
2.5	Predictability Assessment of Flushing Storm Event	01/31/2020
2.6	Update Dam Removal Concept To 10 Percent Design	04/24/2020
2.7	Updated Dam Structural Analysis	03/13/2020
2.8	Dam Removal Feasibility Study Report	03/30/2020
2.9	Detailed 1D and 2D Modeling	3/31/2021
2.10	Bank Erosion Screening Level Assessment	4/30/2021
2.11	Refine and Extend SRH-2D Modeling	4/15/2022
2.11.1	Upstream Model	4/15/2022
2.11.2	Downstream Model	4/15/2022
2.12	Phase 1 Task and Subtask Rework	4/15/2022
2.12.1	Review of the Revised Sediment Transport Analysis	4/15/2022
2.12.2	Merge Revised Sediment Transport Data with the Prior Geographic Information System (GIS) Database	4/15/2022
2.12.3	New GIS Maps of the Study Area	4/15/2022
2.12.4	New Maps Comparison to Prior Studies and Evaluate Resulting Changes	4/15/2022
2.12.5	Update Findings and Recommendations in the Prior Reports and Technical Memoranda for Subtasks 2.4, 2.9, 3.3 and Task 4	4/15/2022
2.12.6	Draft and Final Reports	4/15/2022
3	Review and Update Real Estate Plan	
3.1	Review USACE Real Estate Plan	01/01/2020
3.2	Development of Real Estate Plan/Downstream Project Component Decision Matrix	2/29/2020
3.3	Update Real Estate Plan	4/15/2022
4	Impacts to Water Supply Infrastructure	
4.1	Short-Term Impacts Alternatives Refinement	8/31/2020
4.1.1	Data Review	5/31/2020
4.1.2	Analysis of Short-Term Impacts to Water Supply Agencies	6/30/2020
4.1.3	Development of Conceptual Alternatives	7/31/2020
4.1.4	Coordination with Water Supply Agencies	8/31/2020
4.1.5	Refinement of Alternatives	8/31/2020
4.2	Long-term Impacts Alternative Options Study (Robles Diversion)	9/30/2020
4.2.1	Background and Operational Review	7/31/2020

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Task	Description	Due Date
4.2.2	Case Study Evaluation	8/31/2020
4.2.3	Preliminary Evaluation and Draft Summary Report	9/30/2020
4.2.4	Workshop and Final Summary Report	4/15/2022
5	30 Percent Design	
5.1	30 Percent Plans	6/30/2021
5.2	Monitoring and Adaptive Management Plan	7/31/2021
5.3	30 Percent Design Report	6/30/2021
6	65 Percent Design	
6.1	65 Percent Plans	6/30/2023
6.2	Project Cost Estimate and Specifications Inventory	3/15/2022
6.3	65 Percent Design Report	6/30/2023
6.4	SEIR Support and Meetings	6/30/2023
6.5	2D Sediment Model Sensitivity	
6.5.1	Develop New Sediment Supply Rating Curves	4/30/2023
6.5.2	Update SRH-2D Coarse Model and Upstream Fine Model	6/30/2023
6.5.3	Coordination During Model Development and Interpretation	7/31/2023
6.5.4	Conduct Additional Model Runs to Assess the Sensitivity of Sediment Supply Rates	6/30/2023
6.5.5	Draft 2D Sediment Model Sensitivity Report	12/31/2023
6.5.6	Contingency Model Runs and Report	12/31/2023
6.5.6.a	Contingency Model Run No.1	12/31/2023
6.5.6.b	Contingency Model Run No.2	12/31/2023
6.5.6.c	Contingency Model Run No.3	12/31/2023
6.5.7	Final 2D Sediment Model Sensitivity Report	12/31/2023
7	Final Report	12/31/2023
8	Structural Analyses and 30% Structural Design of Orifices	12/31/2023
8.1	Review Previous Structural Evaluations	12/31/2023
8.2	Structural Assessment of Orifice Tensile Stress Concentrations and Mitigation Option(s)	12/31/2023
8.3	Assessment of Controlled Blasting Approach	12/31/2023
8.4	Structural Design of Anchors and Regulating Gates	12/31/2023
8.5	Analysis of Hydraulic Conditions During Flushing	12/31/2023
8.6	30% Design of Concrete Plugs and Orifice Tensile Stress Mitigation Measures	12/31/2023
8.7	Prepare Draft Technical Memorandum	12/31/2023
8.8	Prepare Final Technical Memorandum	12/31/2023
8.9	Coordination With DSOD	12/31/2023
8.10	Task Management	12/31/2023

2. Delays

If Work cannot be completed by the dates specified in Exhibit B through no fault of CONSULTANT, the fee for the Work not then completed may be adjusted to reflect increases in cost which occur, due to delay, from the date that the Work was required to be complete as specified in Exhibit B until the time the Work can actually be completed. Any payment of an additional fee as described in this paragraph must be authorized by AGENCY with a modification to this contract.

End of Exhibit B

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EXHIBIT C – Fees and Payments

1. Compensation Summary

The following summarizes the maximum amount of compensation available to CONSULTANT under this contract. The actual amount of compensation shall be established and paid in accordance with the applicable provisions of the contract including this Exhibit C.

Maximum Fees for Basic Services:	<u>\$ \$2,118,894.00</u>
Maximum Fees for Extra Services:	<u>\$ 0.00</u>
Maximum Reimbursement for Expenses:	<u>\$ 0.00</u>

Total Amount Not to Exceed: \$ \$2,118,894.00

2. Fees For Basic Services

AGENCY agrees to pay CONSULTANT the following fees for Basic Services

☒ an hourly rate compensation, for actual hours of Basic Services performed that is based upon the hourly rates set forth in the following Rate Table, which rates shall remain fixed for the duration of the contract, not to exceed the maximum fee amount of \$37,400.00. The maximum fees for the respective tasks identified in Exhibit A as well as the total maximum fee amount are shown in the below Task Table. In no case shall a fee for a specific task exceed that listed below without prior written approval by AGENCY. Rates to be charged are identified in the Rate Table listed below.

Rate Table

Item	Position/Equipment	Unit	Regular ¹	Prevailing ²	Travel ³
1	Senior Technical Advisor	Hr.	\$ 285.00	n/a	No
2	Project Manager/Principal	Hr.	\$ 270.00	n/a	No
3	Senior Engineer	Hr.	\$ 240.00	n/a	No
4	Engineer IV	Hr.	\$ 200.00	n/a	No
5	Engineer III	Hr.	\$ 180.00	n/a	No
6	Engineer II	Hr.	\$ 150.00	n/a	No
7	Engineer I	Hr.	\$ 120.00	n/a	No
8	Principal Environmental Professional	Hr.	\$ 285.00	n/a	No
9	Sr. Env Professional IV	Hr.	\$ 235.00	n/a	No
10	Sr. Env Professional III	Hr.	\$ 205.00	n/a	No
11	Sr. Env Professional II	Hr.	\$ 180.00	n/a	No
12	Sr. Env Professional I	Hr.	\$ 160.00	n/a	No
13	Project Env Professional III	Hr.	\$ 145.00	n/a	No
14	Project Env Professional II	Hr.	\$ 135.00	n/a	No
15	Project Env Professional I	Hr.	\$ 120.00	n/a	No
16	Staff Env Professional II	Hr.	\$ 110.00	n/a	No
17	Staff Env Professional I	Hr.	\$ 90.00	n/a	No
18	GIS Specialist II	Hr.	\$ 160.00	n/a	No
19	GIS Specialist I	Hr.	\$ 120.00	n/a	No
20	Sr. Technical Editor	Hr.	\$ 150.00	n/a	No
21	Technical Editor	Hr.	\$ 120.00	n/a	No
22	Project Controls / Procurement	Hr.	\$ 120.00	n/a	No
23	Administrative Assistant	Hr.	\$ 100.00	n/a	No

Notes: 1) The Regular rates shown include all routine general and administrative expenses including but not limited to phone calls,

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travel within Ventura County (see note 3), incidental photocopying, and office equipment unless otherwise expressly listed in the Rate Table above.

2) The Prevailing rates shown include all routine general and administrative expenses including but not limited to phone calls, travel within Ventura County (see note 3), incidental photocopying, and office equipment unless otherwise expressly listed in the Rate Table above.

3) The word "Yes" in the Travel column above indicates that reimbursement for travel within Ventura County is authorized for the position described by that item.

Task Table

Task	Description	Maximum Fee
6.4	SEIR Support and Meetings	\$37,400
Total		\$37,400



a **fixed fee** compensation, in the lump sum amount of \$1,773,833.00, for completion of all Basic Services.

Task Table

Task	Description	Lump Sum
1	Field Investigations	
1.1	Geotechnical Field Investigations to Characterize Fine Sediment and Organics	\$137,538.00
1.2	Field Investigations to Characterize Dam Concrete	\$61,612.00
1.3	Field Investigations Memorandum	\$32,034.00
1.4	Biological Support for Field Investigations	\$16,898.00
2	<i>Dam Removal Feasibility Study</i>	
2.1	Structural Evaluation of Dam With and Without Orifices	\$32,992.00
2.2	Detailed Sediment Transport Modeling From Dam to Ocean	\$135,594.00
2.3	Hydraulic Studies to Determine 100-yr Water Surface Elevation Based on Detailed Sediment Transport Analyses	\$43,886.00
2.4	Re-evaluation of Downstream Project Components	\$61,172.00
2.5	Predictability Assessment of Flushing Storm Event	\$42,070.00
2.6	Update Dam Removal Concept To 10 Percent Design	\$102,520.00
2.7	Updated Dam Structural Analysis	\$147,248.00
2.8	Dam Removal Feasibility Study Report	\$25,636.00
2.9	Detailed 1D and 2D Hydraulic Modeling	\$150,000
2.10	Bank Erosion Screening Level Assessment	\$44,500
2.11	Refine and Extend SRH-2D Modeling	
2.11.1	Upstream Model	\$31,000.00
2.11.2	Downstream Model	\$26,500
2.12	Phase 1 Task and Subtask Rework	
2.12.1	Review of the Revised Sediment Transport Analysis	\$2,000.00
2.12.2	Merge Revised Sediment Transport Data with the Prior Geographic Information System (GIS) Database	\$8,000.00
2.12.3	New GIS Maps of the Study Area	\$8,000.00
2.12.4	New Maps Comparison to Prior Studies and Evaluate Resulting Changes	\$3,200.00
2.12.5	Update Findings and Recommendations in the Prior Reports and Technical Memoranda for Subtasks 2.4, 2.9, 3.3 and Task 4	\$3,200.00
2.12.6	Draft and Final Reports	\$3,200.00
3	Review and Update Real Estate Plan	
3.1	Review USACE Real Estate Plan	\$4,787.00

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Task	Description	Lump Sum
3.2	Development of Real Estate Plan/Downstream Project Component Decision Matrix	\$24,991.00
3.3	Update Real Estate Plan	\$23,597.00
4	Impacts to Water Supply Infrastructure	
4.1	Short-Term Impacts Alternatives Refinement	
4.1.1	Data Review	\$2,074.00
4.1.2	Analysis of Short-Term Impacts to Water Supply Agencies	\$4,197.00
4.1.3	Development of Conceptual Alternatives	\$5,821.00
4.1.4	Coordination with Water Supply Agencies	\$7,565.00
4.1.5	Refinement of Alternatives	\$13,112.00
4.2	Long-term Impacts Alternative Options Study (Robles Diversion)	
4.2.1	Background and Operational Review	\$33,588.00
4.2.2	Case Study Evaluation	\$15,660.00
4.2.3	Preliminary Evaluation and Draft Summary Report	\$18,684.00
4.2.4	Workshop and Final Summary Report	\$11,556.00
5	30 Percent Design	
5.1	30 Percent Plans	\$142,032
5.2	Monitoring and Adaptive Management Plan	\$36,100
5.3	30 Percent Design Report	\$54,708
6	65 Percent Design	
6.1	65 Percent Plans	\$138,675
6.2	Project Cost Estimate and Specifications Inventory	\$53,892
6.3	65 Percent Design Report	\$42,403
6.5	2D Sediment Model Sensitivity	
6.5.1	Develop New Sediment Supply Rating Curves	\$16,500
6.5.2	Update SRH-2D Coarse Model and Upstream Fine Model	\$38,500
6.5.3	Coordination During Model Development and Interpretation	\$33,000
6.5.4	Conduct Additional Model Runs to Assess the Sensitivity of Sediment Supply Rates	\$22,000
6.5.5	Draft 2D Sediment Model Sensitivity Report	\$25,000
6.5.6	Contingency Model Runs and Report	
6.5.6.a	Contingency Model Run No.1	\$11,000
6.5.6.b	Contingency Model Run No.2	\$11,000
6.5.6.c	Contingency Model Run No.3	\$11,000
6.5.7	Final 2D Sediment Model Sensitivity Report	\$11,000
7	Final Report	\$21,591
8	Structural Analyses and 30% Structural Design of Orifices	
8.1	Review Previous Structural Evaluations	\$2,791.00
8.2	Structural Assessment of Orifice Tensile Stress Concentrations and Mitigation Option(s)	\$17,244.00
8.3	Assessment of Controlled Blasting Approach	\$8,546.00
8.4	Structural Design of Anchors and Regulating Gates	\$8,546.00
8.5	Analysis of Hydraulic Conditions During Flushing	\$46,529.00
8.6	30% Design of Concrete Plugs and Orifice Stress Mitigation Measures.	\$24,973.00
8.7	Prepare Draft Technical Memorandum	\$7,407.00
8.8	Prepare Final Technical Memorandum	\$3,987.00
8.9	Coordination With DSOD	\$4,652.00
8.10	Task Management	\$3,986.00
	Total	\$2,081,494.00

MODIFICATION NUMBER 10 TO CONTRACT AE18-034

3. Fees For Extra Services

For Extra Services authorized in writing in advance by AGENCY in accordance with Exhibit A, AGENCY agrees to pay CONSULTANT an **hourly rate** compensation for actual hours of Extra Services performed that is based upon the hourly rates set forth in the Rate Table for Basic Services above or, if none, then based upon the hourly rates set forth in the following Rate Table for Extra Services, which rates shall remain fixed for the duration of the contract, not to exceed the **maximum fee amount of \$0.00.**

4. Delays

If Work cannot be completed by the dates specified in Exhibit B through no fault of CONSULTANT, the fees for the Work not then completed may be adjusted to reflect increases in cost which occur, due to delay, from the date that the Work was required to be complete as specified in Exhibit B until the time the Work can actually be completed. Any payment of an additional fee as described in this paragraph must be authorized by AGENCY with a written modification to this contract.

5. Reimbursable Expenses

CONSULTANT shall be reimbursed a sum for the following reasonable out-of-pocket expenses that are incurred and paid for by CONSULTANT in furtherance of performance of its obligations under this contract, but only to the extent that such expenses are directly related to CONSULTANT's services hereunder and do not exceed the **maximum reimbursable amount of \$0.00:**

(i) Outside printing directly related to deliverables but not for internal uses of CONSULTANT or its Subconsultants;

(ii) Reproduction or reprographic costs directly related to deliverables but not for internal uses of CONSULTANT or its Subconsultants. If CONSULTANT provides allowable reprographic services using its own equipment rather than using an outside service, the unit billing rates for such charges must be approved in advance by AGENCY;

(iii) Shipping, overnight mail, postage, messenger, courier and/or delivery services (but not for CONSULTANT's internal communications);

(iv) Only if authorized in writing in advance by AGENCY, reimbursement for business travel for the specific position descriptions so identified in the Rate Tables for Basic Services or Extra Services set forth above. AGENCY shall reimburse CONSULTANT for transportation, lodging, and meal expenses consistent with the policies and amounts approved for County employees as defined by policy number Chapter VII(C)-1, *Reimbursement of Employees County Business Expenses*, in the County's Administrative Policy Manual (latest edition);

(v) Only if authorized in writing in advance by AGENCY, fees and costs for Subconsultant services that are not included in the Rate Tables for Basic Services or Extra Services set forth above.

Exclusive List. The list of reimbursable expenses set forth above is the sole and exclusive list of reimbursable expenses that CONSULTANT is entitled to receive.

Approval Limits. Any reimbursable expense wherein a single item exceeds \$500 in value, whether purchased or leased, must be approved in writing in advance by AGENCY.

No Administrative Charge or Mark-Ups. The reimbursement provided for herein shall not include an administrative charge, multiplier or other mark-up by CONSULTANT unless authorized in writing, in advance, by AGENCY.

No Reimbursement for Specified Basic Services Paid for by a Fixed Fee. Notwithstanding the above, expenses related to Basic Services specified in Exhibit B are not reimbursable if CONSULTANT is compensated for Basic Services by a fixed fee.

6. Payment

AGENCY shall make payments to CONSULTANT under the contract as follows:

MODIFICATION NUMBER 10 TO CONTRACT AE18-034

Requests for Payment

To request payment, CONSULTANT shall complete and submit to AGENCY a Consultant Services Invoice Form that shall include, at a minimum, (i) personnel time records for Basic Services and Extra Services actually performed at the rates specified in this Exhibit C if applicable and (ii) receipts for all authorized reimbursable expense, along with the written AGENCY authorization for any specific reimbursable expenses requested for payment, if required above.

When invoicing for Extra Services, CONSULTANT shall clearly mark on the Invoice Form which services are Extra Services and keep those services separate from or Basic Services, and shall include a copy of the written AGENCY authorization for the Extra Services for which payment is requested.

CONSULTANT shall submit all invoices to:

Public Works Agency
County of Ventura L#1670
800 South Victoria Avenue
Ventura, CA 93009-1670

Payment Schedule

Payments shall be made monthly by AGENCY upon presentation of a properly completed AGENCY Invoice Form as described above. Upon approval of the invoice, AGENCY shall pay CONSULTANT 95% of the maximum fee for the specific task/milestone. Upon completion and acceptance by AGENCY of the task/milestone, AGENCY shall pay CONSULTANT the balance of the fee.

Timely Invoicing

Timely invoicing by CONSULTANT is required. Delays in invoicing for services performed increases the management effort required by AGENCY to ensure accurate payments to CONSULTANT and manage project budgets. Accordingly, CONSULTANT shall submit a properly completed invoice no later than 60 calendar days after the services which are the subject of the invoice were performed. An invoice received by AGENCY more than 60 calendar days after the services were performed shall be reduced by 5% to compensate AGENCY for the additional management costs. Additionally, since increases in administrative costs and budgetary problems caused by late invoicing correlate to the length of delay in invoicing, there will be an additional 5% reduction in compensation for each additional 30-calendar-day period beyond 60 days between the date the services were performed and the submission of the invoice for those services.

CONSULTANT shall submit a final invoice form within 60 days of the earliest of the following events: 1) completion and acceptance by AGENCY of all Work required by the contract; or 2) termination of the contract.

End of Exhibit C