

AMENDMENT No. 6
to
Agreement for Professional Services
between
Monterey County Water Resources Agency and AECOM Technical Services, Inc.

The undersigned parties hereby agree to amend that certain Agreement for Professional Services between the Monterey County Water Resources Agency (hereinafter "Agency") and AECOM Technical Services, Inc., (hereinafter "CONTRACTOR") executed and effective on May 26, 2015 and amended on January 25, 2016, June 27, 2016, July 24, 2017, September 29, 2017, and August 2, 2018 (hereinafter "Agreement").

Section 1 of the Agreement is hereby amended to read as follows:

1. Employment of CONTRACTOR. Agency hereby engages CONTRACTOR and CONTRACTOR hereby agrees to perform the services set forth in Exhibits A, C, E, G, I and K in conformity with the terms of this Agreement.
 - (a) The work to be performed is generally described as follows:

Dam safety surveillance and performance evaluation of San Antonio Dam, development of inundation maps for Nacimiento and San Antonio Dams, Nacimiento Dam spillway plunge pool erosion control initial evaluation work and Nacimiento Dam seismic stability initial evaluation work.
 - (b) The CONTRACTOR shall perform its services under this agreement in accordance with usual and customary care and with generally accepted practices in effect at the time the services are rendered. The CONTRACTOR and its agents and employees performing work hereunder are specially trained, experienced, competent, and appropriately licensed to perform the work and deliver the services required by this Agreement.
 - (c) CONTRACTOR, its agents and employees shall perform all work in a safe and skillful manner and in compliance with all applicable laws and regulations. All work performed under this Agreement that is required by law to be performed or supervised by licensed personnel shall be performed in accordance with such licensing requirements.
 - (d) CONTRACTOR shall furnish, at its own expense, all materials and equipment necessary to carry out the terms of this Agreement, except as otherwise provided herein. CONTRACTOR shall not use Agency premises, property (including equipment, instruments, or supplies) or personnel for any purpose other than in the performance of its obligations hereunder.
 - (e) Agency hereby engages CONTRACTOR and CONTRACTOR hereby agrees to perform the services set forth in Exhibits A, B, C, D, E, F, G H, I, J, K and L in conformity with the terms of this Agreement. CONTRACTOR shall manage and pay for the work of all subCONTRACTORS as required to proceed forward with the work set forth in Exhibits A, C, E, G, I and K.

Section 2 of the Agreement is hereby amended to read as follows:

2. Term of Agreement. The term of this Agreement shall begin upon execution of this Agreement by CONTRACTOR and Agency, and will terminate on August 31, 2019 unless earlier terminated as provided herein.

Section 3 of the Agreement is hereby amended to read as follows:

3. Payment to CONTRACTOR; maximum liability. Subject to the limitations set forth herein, Agency shall pay to CONTRACTOR the amounts provided in Exhibits B, D, F, H, J and L for work completed and/or in progress pursuant this Agreement, summarized below:

Original Agreement: \$ 49,450 for FY 2015-2016
Amendment No. 1: No cost associated with Amendment No.1.
Amendment No. 2: \$ 50,164 for FY 2016-2017
Amendment No. 3: \$ 50,150 for FY 2017-2018
Amendment No. 4: \$ 73,010 for FY 2017-2018 (payable from Fund 130)
Amendment No. 5: \$ 53,830 for FY 2018-2019 (\$3,000 payable from Fund 130 for inundation maps)
Amendment No. 6: \$100,000 for FY 2018-2019
Not to Exceed Total: \$376,604

The maximum amount payable to CONTRACTOR under this Agreement as amended by Amendment No's.: 1, 2, 3, 4, 5, and 6 is \$376,604.

Section 31 of the Agreement is hereby amended to read as follows:

31. Exhibits. The following Exhibits are attached hereto and incorporated by reference:

Exhibit A - Scope of Work and Work Schedule (Original Agreement)
Exhibit B - Payment Provisions (Original Agreement)
Exhibit C - Scope of Work and Work Schedule (Amendment No. 2)
Exhibit D - Payment Provisions (Amendment No. 2)
Exhibit E - Scope of Work and Work Schedule (Amendment No. 3)
Exhibit F - Payment Provisions (Amendment No. 3)
Exhibit G - Scope of Work and Work Schedule (Amendment No. 4)
Exhibit H - Payment Provisions (Amendment No. 4)
Exhibit I - Scope of Work and Work Schedule (Amendment No. 5)
Exhibit J - Payment Provisions (Amendment No. 5)
Exhibit K - Scope of Work and Work Schedule (Amendment No. 6)
Exhibit L - Payment Provisions (Amendment No. 6)

All other provisions of the Agreement remain in full force and effect.

IN WITNESS WHEREOF, Agency and CONTRACTOR have caused this Amendment No. 6 to be executed as follows:

**MONTEREY COUNTY
WATER RESOURCES AGENCY**

AECOM TECHNICAL SERVICES, INC.

David E. Chardavoyne Theodore Feldsher
David E. Chardavoyne, General Manager (signature)

DATED: 18 December 2018 Theodore Feldsher, Associate VP
(print name and title)*

DATED: 12/6/2018

By Derrick Wong
(signature)

DERRICK WONG, AECOM VICE PRES
(print name and title)*

DATED: 12/6/18

* INSTRUCTIONS: If CONTRACTOR is a corporation (including limited liability and nonprofit corporations), the full legal name of the corporation shall be set forth together with the signatures of two specified officers. If CONTRACTOR is a partnership, the name of the partnership shall be set forth together with the signature of a partner with authority to execute this Agreement on behalf of the partnership. If CONTRACTOR is contracting in an individual capacity, the individual shall set forth the name of his or her business, if any, and shall personally sign the Agreement.

Approved as to form:

[Signature]
Deputy County Counsel
DATED: 12/12/18

Approved as to fiscal provisions:

[Signature]
CAO Analyst
DATED: 12/12/18
[Signature]
Auditor/Controller
DATED: 12-12-18

Exhibit K

SCOPE OF WORK and WORK SCHEDULE

Nacimiento Dam

Initial Evaluations of

Updated Seismic Safety Analysis including Liquefaction Potential of Streambed Materials under Dam Shells, and Preliminary Assessment of Spillway Plunge Pool Erosion Conditions under High Flows

TASK 1 - EXISTING DATA REVIEW

This task includes performing a review of available existing information on the investigation, design, construction, and subsequent evaluations of the Nacimiento Dam embankment and spillway. Applicable data and pertinent information will be identified from the review to support assessment of the need for new or supplemental investigations, and to guide the direction and focus of investigation and analysis for the dam embankment seismic evaluation and spillway plunge pool erosion mitigation.

The project documents anticipated for review include the following:

- Site topography and bathymetry
- Geotechnical and geologic investigation reports
- Hydraulic / modeling reports
- Design reports
- Construction plans, specifications, reports
- Photos and videos
- Stability reports
- FERC and DSOD reports and records

TASK 2 - SITE VISIT

Following the data review, a site reconnaissance visit will be performed by key lead staff to observe existing conditions, including geotechnical, geologic, and hydraulic aspects. The site visit will ideally be conducted with knowledgeable MCWRA personnel familiar with the site conditions and history, subsequent field activity logistics and limitations, and questions generated to date.

The site reconnaissance for the dam seismic stability assessment will focus on the following:

- Geologic site conditions
- General dam embankment layout and geometry
- Access logistics for field investigation drilling equipment
- Drill hole location to intercept dam foundation alluvium
- Drill hole location to accommodate new piezometer installation
- Requirements / limitations for adequate field activity safety

The site reconnaissance for the spillway plunge pool evaluation will focus on the following:

- General plunge pool geometric, topographic, and bathymetric conditions

- Geologic site conditions
- Observed and perceived spillway discharge hydraulics behavior
- Erosion resistance materials characteristics
- Proximity to and vulnerability of downstream structures

TASK 3 - ASSESS NEED FOR FIELD / LAB INVESTIGATIONS AND PERMITS

Following the existing data review and site reconnaissance visit, an assessment will be made of the need for field and laboratory investigations to support the dam embankment seismic stability evaluation and development of spillway plunge pool erosion control measures. The assessment will be supported and directed by consideration of the following factors:

- Topographic and bathymetric data needs
- Geologic and geotechnical parameter needs
- Criteria for analysis input
- Comparison of needs and criteria against existing data and information
- Establishment of data and information gaps

Based on preliminary review of the available project background materials, it appears likely that new field and laboratory investigations will be necessary to develop a reliable evaluation of the dam embankment and alluvial foundation materials.

In addition to the assessment of new field and laboratory investigation needs, this task also includes assistance with identification of permits expected to be needed for the field investigation activities for the embankment as well as for potential future construction activities in the spillway plunge pool area.

To supplement assessment and obtain additional input prior to developing project work plans, AECOM will coordinate a meeting with MCWRA and DSOD to involve the assigned DSOD project staff, discuss DSOD initial input to a geotechnical investigation work plan, and to provide DSOD with an opportunity to discuss any concerns they may have about Nacimiento Dam and the project as a whole. This would include discussion of both the seismic stability and plunge pool erosion issues. We assume this meeting will be held at the DSOD office in Sacramento.

The results of the data review, site visit, field / lab investigation needs assessment, and initial permit identification will be provided in a technical memorandum deliverable for Tasks 1 through 3.

TASK 4 - SEISMIC STABILITY - INITIAL WORK

The 2014 Sixth FERC Part 12D Report for Nacimiento Dam states that further seismic stability analysis and determination of the liquefaction potential of streambed gravels beneath the dam are needed (PFM Nos. 5 and 6). The initial phase of dam embankment seismic stability evaluation work includes development of a geotechnical investigation work plan, submittal to MCWRA for review and comment, and incorporation of MCWRA comments. The deliverable for the initial phase will be a draft geotechnical investigation work plan, incorporating MCWRA comments, to be subsequently submitted for regulatory review. Subsequent phases of work are expected to

include submittal of the work plan to DSOD and FERC, review meetings as necessary, and incorporation of any changes needed to address their comments and reach final approval of the investigation plan. Completion of the work plan for regulatory submittal is a logical break point for the initial phase of work, because the level of effort and duration needed to reach final review and acceptance by FERC and DSOD is difficult to estimate.

Task 4.1 - Preliminary Draft Geotechnical Investigation Work Plan

A geotechnical investigation work plan will be developed to include the following items:

- Description of background and purpose of the project
- Summary of understanding of site conditions from review of existing information
- Selection of field investigation equipment and methodology
- Description of proposed exploratory borings with illustrated site plan
- Discussion of field drilling, testing, and sampling procedures
- Discussion of geophysical surveys and other in-situ testing
- Description of laboratory testing program
- Details of instrumentation installation plans
- Summary of relevant experience of proposed field personnel
- Risk identification and mitigation plan
- Communication plan
- Schedule/duration of field activities

An initial laboratory testing program will be developed as part of the work plan. The testing program will be refined and finalized later during subsequent phases of work involving the actual subsurface field exploration activities, after the soil and bedrock samples have been obtained and inspected in the laboratory. Undrained shear strength for compacted clayey soils (considered non-liquefiable) will be measured using consolidated undrained triaxial tests with pore pressure measurements. For sandy soils, residual strength will be estimated using the results of standard penetration test (SPT) measurements and correlations with published charts. If the results of index tests indicate expected behavior falling between clay-like and sand-like, cyclic triaxial tests may be performed to help assess the potential for build-up of pore pressure and loss of strength for these soils. If performed, cyclic tests will be followed by monotonic loading to assess the potential for undrained strength loss due to cyclic loading.

Typical types of laboratory tests anticipated include but are not limited to the following:

- Index properties tests (moisture, density, gradation, Atterberg limits)
- Shear strength tests for soils
- Unconfined compressive strength for bedrock materials

The geotechnical investigation work plan will include the items required by FERC for approval of a Drilling Program Plan (the FERC designation for a geotechnical investigation work plan). AECOM will submit an internal preliminary draft of the work plan for MCWRA review.

Task 4.2 - Draft Geotechnical Investigation Work Plan

AECOM will incorporate MCWRA review comments received on the *preliminary draft* geotechnical investigation work plan into a *draft* geotechnical investigation work plan for submittal to FERC and DSOD.

TASK 5 - PLUNGE POOL EROSION CONTROL - INITIAL WORK

The initial phase of the spillway plunge pool erosion control evaluation work includes preliminary hydraulic modeling and preliminary erodibility assessment to support development of erosion control improvement concepts for the plunge pool. The deliverable for this task will be a technical memorandum, incorporating the initial hydraulic modeling results and erodibility assessment, and presenting initial plunge pool improvement concepts. Detailed evaluation and comparison of alternatives, detailed hydraulic modeling, further field and laboratory investigations, and selection of a preferred concept for design will occur in future phases of work.

Task 5.1 - Initial Hydraulic Modeling

An evaluation will be conducted to assess the hydraulics of the spillway plunge pool for the existing conditions and the causes of the scour and erosion around the plunge pool. The initial analysis will include the following:

- Spreadsheet level calculations to determine trajectories of spillway discharge flow into the plunge pool under various flow rate conditions and associated evaluation of how the current bedrock outcrop at the center of the plunge pool might impact the trajectories or flow conditions.
- Preliminary three-dimensional Computational Fluid Dynamics (CFD) modeling of up to two spillway flow scenarios for existing topographic and bathymetric conditions to allow evaluation of a range of scour potential around the plunge pool. One scenario would be for the maximum historic spillway discharge, since the latest spillway modifications and improvements, in 2011 and 2017 of about 8,000 cfs. To encompass a range of hydraulic behavior for existing conditions, the second scenario would be run at a significantly higher spillway discharge flow rate, up to potentially the Inflow Design Flow (IDF). To facilitate the CFD modeling, a one-dimensional hydraulic model based on HEC-RAS will be developed for the downstream exit channel to provide tailwater levels to be used in the CFD models. The CFD model will provide estimated velocity, shear stress, and stream power at the bottom and sides of the pool that can then be used to evaluate scour potential.

An important aspect to support the plunge pool hydraulic modeling is accurate topographic and bathymetric geometry of the ground surface in and around the plunge pool. Rough bathymetry of the plunge pool area surface has been provided, which should be updated and refined to properly support the CFD modeling. This scope assumes that MCWRA will obtain and provide to AECOM refined plunge pool bathymetry to support the modeling work planned herein.

CFD modeling will be developed using the FLOW-3D computer program developed by FLOW Science, Inc. of Santa Fe, USA. The program is designed for the treatment of time-dependent

(transient) problems in one, two, and three dimensions, and is based on a finite difference solution of the complete Navier-Stokes equations. Because the program is based on the fundamental laws of mass, momentum, and energy conservation, it can be applied to almost any type of flow process.

One of the major strengths of FLOW-3D for hydraulic analysis is its ability to accurately model problems involving free surface flow. In FLOW-3D, free surfaces are modelled using the Volume of Fluid (VOF) technique. The VOF method consists of three components: a scheme to locate the surface, an algorithm to track the surface as a sharp interface moving through a computational grid, and a means of applying boundary conditions at the surface. It handles transitions between sub-critical and super-critical flow within a single model set up.

The proposed CFD modeling for the plunge pool will start from upstream of the spillway (reservoir) and end at an appropriate distance downstream from the plunge pool. The downstream boundary of the CFD model will be established by the tailwater elevation calculated from the HEC-RAS model.

Task 5.2 - Erosion Resistance Assessment

The results of the initial CFD modeling, in particular stream power, will be compared to the erodibility of the materials comprising the bottom and sides of the plunge pool for scour and erosion assessment of the pool. The erosion resistance assessment of the plunge pool materials will initially be based on site specific geologic and geotechnical conditions from prior studies and current information obtained from our site reconnaissance visit. Further refined site material characterization and properties from added subsurface investigations may be required to support refined CFD modeling in subsequent phases of work including preliminary design and evaluation of plunge pool improvement alternatives.

Task 5.3 - Mitigation Alternatives Development

Based on results of initial hydraulic modeling and erosion resistance assessment, conceptual alternatives for plunge pool improvement will be identified and evaluated with additional CFD modeling as appropriate. Potential concepts for erosion control improvement and mitigation may include but are not limited to the following:

- Removal of the bedrock outcrop in the middle of the existing plunge pool
- Riprap installation around the pool with properly designed sizing and gradation
- Construction of a more resistant plunge pool with a concrete or RCC base slab and vertical or sloping side walls.
- Modification of the existing spillway chute terminal flip-bucket into a straight or curved chute terminal connected to a conventional stilling basin.

The initial plunge pool evaluation work will culminate in submittal of a technical memorandum documenting the tasks described above.

DELIVERABLES

Deliverables planned as part of this work scope are as follows:

- Technical memorandum summarizing results of data review, site reconnaissance visit, field

- / lab investigation needs, and initial permit identification (Tasks 1 through 3).
- Preliminary Draft Geotechnical Investigation Work Plan (Task 4.1).
- Draft Geotechnical Investigation Work Plan (Task 4.2).
- Technical memorandum summarizing results of initial spillway plunge pool erosion control evaluation, including initial hydraulic modeling, erosion resistance assessment, and development of conceptual mitigation alternatives (Task 5).

WORK SCHEDULE

A six month duration from receipt of Notice to Proceed is needed to complete the work outlined herein. For elements of work where review and interaction with DSOD and/or FERC are required, a longer duration may be necessary due to factors beyond AECOM's control.

It is understood that Notice to Proceed is planned to be provided by December 31, 2018.

ADDITIONAL WORK NEEDED

Additional work not included in this scope is needed to reach completion of an updated seismic safety analysis and plans and specifications for spillway plunge pool erosion control measures. Deliverables produced from this scope of work are intended to allow further planning and budgeting for completion of an updated seismic safety analysis and plans and specifications for spillway plunge pool erosion control measures. The Agency may award any future work to a party(ies) of the Agency's choosing.

Exhibit L

Payment Provisions
Nacimiento Dam
Initial Evaluations of
Updated Seismic Safety Analysis including Liquefaction Potential of Streambed
Materials under Dam Shells, and Preliminary Assessment of Spillway Plunge Pool
Erosion Conditions under High Flows

For the scope of work defined in Exhibit K, Agency shall pay Contractor on a time and expense basis an amount not to exceed \$100,000. Payable costs shall be the sum of direct labor costs, other direct costs and sub-consultant mark-up as defined below. If Contractor time and expense costs necessary to complete the Scope of Work defined in Exhibit K, are less than \$100,000 the Agency enjoys the savings. If Contractor requires time and expense to complete the Scope of Work defined in Exhibit K, are over and above \$100,000 the maximum amount payable to Contractor remains \$100,000. Budget detail is shown in Table 2.

Table 1. Amendment 6 Direct Labor Rate Schedule

<u>LABOR CATEGORY</u>	<u>RATE / HOUR</u>
Principal Engineer	\$ 250
Senior Technical Lead	\$ 220
Project Manager	\$ 210
Senior Engineer	\$ 180
Project Engineer / Geologist	\$ 150
Senior Staff Engineer	\$ 135
Staff Engineer	\$ 120
Support GIS	\$ 140
Support CAD	\$ 120
Support Administrative	\$ 100

Direct Labor Costs: Are the hourly billing rate, per the Direct Labor Rate Schedule (Table 1 herein), times the number of hours worked by the personnel.

Other Direct Costs: are identifiable costs necessarily incurred by Contractor to complete the Scope of Work defined in Exhibit K. Other Direct Costs include, but are not limited to, travel and subsistence expenses, document reproduction costs, and postal costs. Other Direct Costs shall be accounted for in each invoice by submittal of receipts for such costs and description of their necessity. Contractor is entitled to mark-up their Other Direct Costs by a multiplier of 1.10 (10%). Automobile mileage will be reimbursable at the IRS approved rate.

Sub-Contractor Mark-up: is the percentage multiplier designated for each sub-Contractor times the sum of sub-Contractor direct labor and other direct charges. All sub-Contractor mark-up multipliers shall not exceed 1.10 (10% mark-up).

DIRECT LABOR RATE SCHEDULE:

The Direct Labor Rate Schedule for Amendment 6 work (Table 1 herein) shall be valid for a twelve-month period, beginning January 1, 2019. The hourly billing rate schedule and other direct costs chargeable to the project may be modified as agreed by Agency and Contractor after said period of time. The parties shall agree to such modifications in writing as an Amendment to the Agreement.

Project-related expenses are charged as follows:

1. Travel-related expenses (hotels, rental vehicles, parking, etc.): cost plus 10 percent.
2. Subcontractors (drilling, trenching, surveying, laboratory testing, etc.): cost plus 10 percent.
3. Project direct expenses for reprographics, aerial photos, publications, overnight shipping, project-expendable materials and supplies, and rental equipment and instrumentation: cost plus 10 percent.
4. Mileage: Per U.S. government rates.

INVOICES:

Invoices may be submitted monthly. Invoices shall include the direct labor costs by individual and task, showing the individual's hours charged, hourly rate and total amount charged to each task. Other direct charges shall be added to the sum of the direct labor costs by task. Other direct charges shall be accounted for in each invoice by submittal of receipts for such costs and description of their necessity. Percent of task completion shall be included on each invoice.

NOTIFICATION:

When, during performance of the work, Contractor incurs 75 percent of the total task cost allotted to a task, Contractor shall so notify the Agency to that effect. If Consultant has reason to believe that the costs which it expects to incur to finish the task, when added to the costs previously incurred, will exceed the total task cost, Contractor shall so notify the Agency to that effect. The notice shall state: (1) the estimated amount of additional funds required to complete the task; (2) justification for the need for additional funds; and (3) the estimated date Contractor expects its total costs incurred to meet the total task cost.

Table 2															AECOM Labor Costs	ODC	Total Costs
Budget Detail																	
QA/QC		Manage	Geotechnical		Geology		Hydraulics		Support				Total Labor Hours				
Senior Reviewer/ PIC	Project Manager	Senior Geotech Lead	Project Geotech Engineer	Senior Geology Lead	Project Engineering Geologist	Senior Hydraulics Lead	Project Hydraulic Engineer	Staff Engineer	GIS	CAD	Admin						
Rate:	\$250.00	\$210.00	\$220.00	\$150.00	\$220.00	\$150.00	\$220.00	\$150.00	\$120.00	\$140.00	\$120.00	\$100.00					
Discipline:																	
Role:																	
Task 1 - Existing Data Review		6	12	12	12	8	8	6							64	\$ 12,200	\$ 12,200
Task 2 - Site Visit		10	10		20		10								50	\$ 10,900	\$ 11,900
Task 3 - Field/Lab/Permit Needs		8	12	12	12										44	\$ 9,800	\$ 10,200
Task 4 - Seismic Stability - Initial Work		8	16	22	18	32	0	0	18	20	24	8			188	\$ 31,180	\$ 31,580
4.1 - Pre Draft Geotechnical Work Plan		4	8	16	12	14	20		10	16	16	4			120	\$ 19,840	\$ 20,040
4.2 - Draft Geotechnical Work Plan		4	8	6	6	8	12		8	4	8	4			68	\$ 11,340	\$ 11,540
Task 5 - Plunge Pool - Initial Work		4	16	4	0	0	82	24	12	0	36	4			186	\$ 33,920	\$ 34,120
5.1 - Initial Hydraulic Modeling			4					16	12		24				96	\$ 16,360	\$ 16,360
5.2 - Erosion Resistance Assessment			4	4	4		8								20	\$ 4,360	\$ 4,360
5.3 - Mitigation Alternatives Development		4	8				34	8			12	4			70	\$ 13,200	\$ 13,400
Total Hours		20	60	60	30	70	40	100	30	20	60	12			532		
Total Labor Costs		\$5,000	\$12,600	\$13,200	\$4,500	\$15,400	\$6,000	\$22,000	\$4,500	\$2,800	\$7,200	\$1,200				\$ 98,000	\$ 100,000