REQUEST FOR STATEMENT OF INTEREST
CALIFORNIAN CESU
NUMBER W912HZ-16-SOI-0028
PROJECT TO BE INITIATED IN 2016

Project Title: Evaluating Potential Environmental Impacts from Channel Morphology and Habitat Changes to the Santa Ana River Downstream of Prado Dam.

Project Area: Santa Ana River Watershed; San Bernardino, Riverside and Orange Counties, California.

Responses to this Request for Statements of Interest will be used to identify potential researchers for a project to be a funded by the Engineer Research and Development Center (ERDC) and the U.S Army Corps of Engineers (USACE) Los Angeles District (LAD). The project entails the review of existing models and reports to analyze potential degradation of stream resources downstream of the Prado Dam within Reach 9 of the Santa Ana River. Approximately $75,000 is expected to be available to support this project for the base period of performance. Additional funding may be available for follow on work in subsequent fiscal years up to four (4) years with annual funding of up to $100,000/yr for a total potential award of up to $475,000 over the 5-yr duration for this study.

Background: Historical changes in the Santa Ana River basin due to urbanization, regulation, and pollution have caused a decrease in natural habitat for several threatened and endangered species, including the Santa Ana sucker (*Castostomus sanatannae*) and least Bell's vireo (*Vireo bellii pusillus*). Habitat loss has been the primary reason for the decline in the Santa Ana sucker and least Bell's vireo populations and continues to be a significant threat to their recovery. The U.S. Army Corps of Engineers (Corps) has determined that additional study is required to better understand existing (baseline) conditions in terms of sediment movement, hydrology, geomorphology, and habitat suitability; future "without-project" conditions (assuming no further flood control construction or operational changes); and future "with-project" conditions that would occur if the Corps moved forward with additional water conservation and other proposed water control manual modifications.

Reach 9 of the Santa Ana River is located in a natural canyon, immediately downstream of Prado Dam. Prado Dam was completed in 1941 and is an earthfill dam located in Riverside County near the City of Corona, approximately 30.5 miles upstream of the Pacific Ocean. Its purpose is to provide flood control and water conservation storage for Orange County by collecting runoff from upstream areas. Recent modifications to the Prado Dam outlet have tripled its discharge capability from 10,000 cfs to 30,000 cfs. Several downstream bank protection and utility relocation efforts have either been completed or are underway to safely accommodate these higher flows. The dam's Water Control Manual will be updated in the near future to implement a proposed change in operations to utilize the increased outlet works and downstream channel capacity.

Substantial bed degradation has occurred in Reach 9 over the last several decades, which has led to changes in river and floodplain characteristics, water quality and habitat suitability for listed species. Continued degradation is anticipated, with or without the proposed modifications to the Water Control Manual. The Corps is interested in obtaining additional information about the historic and predicted future changes ("with" or "without" modifications to the Water Control Manual) in geomorphology, floodplain vegetation, bed and bank characteristics, etc., identifying any variability in aggradation and degradation patterns throughout Reach 9, and assessing potential ramifications to continued (or declining) habitat suitability for Santa Ana sucker, least Bell's vireo and other listed species attributed to the operation of the dam.

The Corps contracted with West Consultants (2014) to develop the Santa Ana River Sediment and Geomorphology Plan of Action (POA) (West 2014). The POA identified several existing models and reports that can be synthesized, along with independent literature reviews, to answer sediment transport study related questions within Reach 9 of the Santa Ana River. Models and reports that were located by West (2014) are referenced in the Existing Models and Reports section (below).

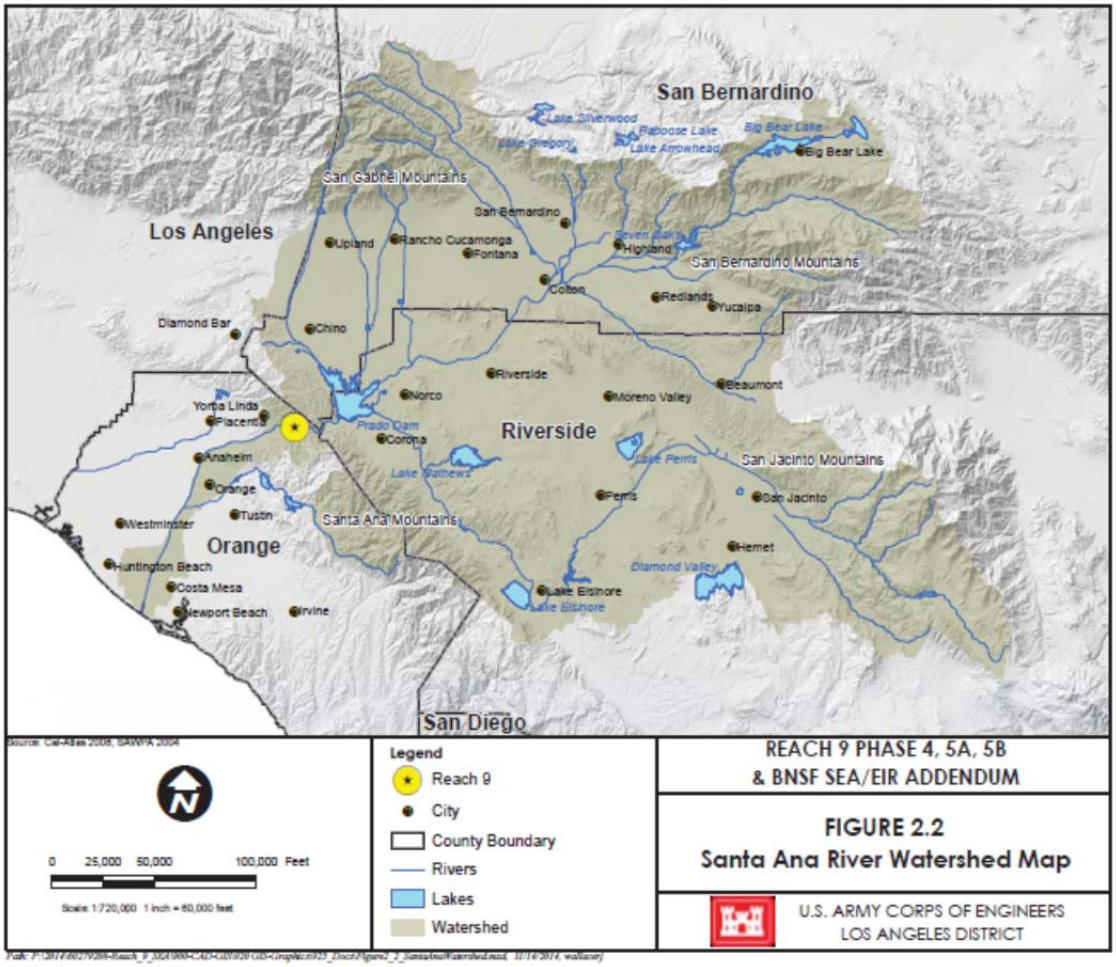
Public Benefits: The primary goal of this study would be to determine whether currently restored habitats are sustainable and are not likely to be significantly degraded due to anticipated changes in hydrology and riverbed characteristics. These habitats are critical to numerous threatened and endangered species; i.e., Santa Ana Sucker and Least Bell's Vireo, and other native aquatic and terrestrial species. If existing habitat values are sustainable, this will ensure that future generations will be able to enjoy the natural aesthetic and environmental functions provided by these systems.

Project Objectives: While the Corps' area of interest extends along a 45-mile stretch of the Santa Ana River mainstem and tributaries from Seven Oaks Dam in San Bernardino County through "Reach 9" (an approximately 8 mile reach of the Santa Ana River below Prado Dam) in Riverside and Orange Counties, the focus of this request is on Reach 9. A separate or amended scope may be provided in the future with additional study parameters.

The scope of work should include reviewing historic and recent aerial photos, topographic surveys, previous sediment transport model results and other existing information; becoming familiar with Santa Ana sucker and least Bell's vireo habitat requirements throughout their stages of development; and conducting additional geomorphological, hydraulic and hydrologic analyses as necessary to answer the following questions:

- What are the implications of continued bed degradation for riparian and aquatic habitat within Reach 9?
- How will the shape and appearance (bed and bank characteristics, including slope and sediment types) of the low-flow channel change over the next 50 years?
- Will the river's ability to meander across the floodplain be affected?
- Will existing gravel beds be lost (eroded, buried)?

- How will the amount and quality of riparian habitat change over the next 50 years, and what changes have occurred since Prado Dam was constructed?
- Based on the above, what are the implications for continued, increased or decreased presence of and suitability for Santa Ana sucker and least Bell's vireo?



Schedule for Deliverables: The scope of work will require that the analyses be completed and a draft and final report prepared within four months of contract award.

Meetings & Coordination

A minimum of two in-person meetings will be scheduled for major participants in this project:

1. Kickoff – overview of background, objectives, existing reports, and report deliverables;
    a. Kickoff meeting to include site visit of Reach 9.
2. Conclusion – discussion of results from the draft report.
3. Ad hoc coordination with Los Angeles District Representatives throughout the duration of the project via email and telephone.

Reports & Deliverables – A draft report will be submitted in electronic format (email and CD/DVD) within three-months of contract award, followed by a one-week review and comment period performed by the Corps and its partners. The vendor will create a minimum of three maps via ARCMAP: (1) mapped areas of potential habitat degradation, (2) mapped areas of potential low-flow channel changes, and (3) map of overall study area. After the Corps' one-week review, the vendor would edit the draft per Corps comments, and a final report would be provided within four-months of contract award. A copy of the draft report, final report, and any new reference materials will be provided to the Corps via CD/DVD.

Vendor Requirements

Vendor must be a non-federal partner of the California CESU Unit willing to accept the negotiated CESU indirect cost rate of 17.5%. Successful applicants should have expert knowledge with related work experience in hydraulics and hydrological modelling, interpreting model results, reviewing reports, and synthesizing information for decision making.

Candidates should have demonstrated knowledge and expertise in semi-arid stream systems; to include sediment transport, riparian habitat within southern California, and fluvial geomorphological processes. Applicants should have a working knowledge of the habitat requirements and life history of the Federally listed Santa Ana sucker and least Bell's vireo. Applicants should also have a working knowledge of ARCMAP and Geographic Information Systems (GIS) to provide finished map products.

Vendor should be available for two on-site meetings with the Corps, draft-report review coordination with the Corps via telephone/email, and ad hoc coordination with the USACE Los Angeles District via telephone or email throughout the duration of the project.

Government Participation

The USACE, Los Angeles District Representatives will participate in project planning, providing existing reports, models, and data required by the selected Vendor. The USACE, Los Angeles District Representatives will participate in the kick-off meeting to brief the vendor, be available for ad hoc coordination with the vendor throughout the project, and participate in the vendor's briefing to the Corps to discuss the final results. The USACE, Los Angeles District Representatives will provide technical review of the draft-report.

Materials Requested for Statement of Interest/Qualifications:

Please provide the following via e-mail to:
Deberay.R.Carmichael@usace.army.mil
(maximum length 2 pages, single spaced 12 pt. font)

1) Name, Organization and Contact Information
2) Brief Statement of Qualifications including:
    a. Brief biographical sketch
    b. Relevant past research, projects, and clients with brief description of project
    c. Staff, faculty and students available including area of expertise

d. Brief description of capabilities to successfully complete this project

Note: a proposed budget is NOT requested at this time.

Additionally, the evaluation method and selection criteria for research and development awards must be:
1) The technical merits of the proposed research and development; and
2) Potential relationship of the proposed research and development to the Department of Defense missions.

Please send responses or direct questions to:

Vincent Durman II
U.S. Army Engineer Research and Development Center (ERDC)
ERDC Contracting Office (ECO)
3909 Halls Ferry Rd.
Vicksburg, MS 39180
Vincent.Durman@usace.army.mil

Timeline for Review of Statements of Interest: Review of Statements of Interest will begin after the SOI has been posted on the CESU website for 10 working days.

Several references of available models, data, and reports are described in the table that follows. Additional survey data and reports are described in the *Santa Ana River Sediment and Geomorphology Analysis Plan of Action* (West, 2015), which identified several available models and reports with information that support the study questions posed within this request for a statement of interest (rSOI). The West (2015) report is available from Justin.denelsbeck@usace.army.mil (Los Angeles District).

	Model	Location	Description	Source
Description of Several Relevant Models & Reports	HEC-RAS	Prado Dam to Pacific Ocean	- combined two existing USACE HEC-RAS model geometries to create a continuous model from Prado Dam to the Pacific Ocean - results of the model showed that at the project design flow rate of 500 cfs a total of 43 days of re-entrainment will be needed to re-entrain 500,000 cubic yards of sediment	Golder (2014)
	MIKE21C	Prado Basin	- A MIKE21C model was developed to assess hydraulic conditions within the basin with and without the SAR Only dredging alignment. - Evaluated augmentation of the sediment load in the SAR by removing deposited sediment from the Prado Basin and introducing it into the SAR.	Golder (2010a)
	MIKE21C	Prado Basin	- hydraulic conditions and sediment deposition patterns within the basin and estimated sediment yield from the catchment - Included 6 discharges were modeled ranging from 250 cfs to 5,000 cfs, and a maximum flood magnitude at 47,800 cfs - Sediment yield from the Santa Ana River catchment upstream of Prado Dam was estimated by comparing the most recent 2009 LiDAR and 1988 bathymetric survey data	Golder (2010b)
	HEC-RAS	SAR Recharge Reach below Reach 9 Study Area	Analyzed: - (1) sediment sizes that will be transported during high discharges from Prado Dam - (2) sediment grain size distributions that may eventually result from high flows - (3) future trends in geomorphology based on historical aerial photography and current field observations	Golder (2009)
	SIAM	Prado Dam to Pacific Ocean	- Annualized flow distribution curves - Developed existing conditions HEC-RAS model, using SIAM (Sediment Impact Assessment Method) - Developed annual sediment budget	WEST (2011)

	HEC-6T	Prado Dam and Weir Canyon Road	- Analysis of historical geomorphic data - LiDAR survey 2007 - Topographic survey 1996 - Aerial photographs for the following years, 1929, 1968, 1970, 1979, 1981, 1990/91, 2004, 2007 - As-built drawings of existing SARI pipeline 1975 - 1978 thalweg profile - 2007 thalweg profile Sediment gradation (Engineering & Hydrosystems, 2009)	Tetra Tech & HDR (2010)
			- SSURGO geographic soil coverage data for California (April 2009) - Precipitation data from the Los Angeles Telemetry System (LATS) and USGS Geostationary Operational Environmental Satellite Server (GOES) - 19 streamflow gage station data and 5 reservoir level station data - Reservoir elevation-storage-discharge curves	West (2010)
		Lower SAR	- Preliminary conclusions from sediment sampling suggested that sediment gradations are coarsening in comparison to historic gradations in the Santa Ana Canyon Reach and the Santa Ana River Recharge Reach - Geomorphology map was also created based on field observations. For each reach, the channel was classified with three geomorphic descriptions (1) Flow duration: perennial, intermittent, or ephemeral, (2) Regime: aggrading, graded (stable), or degrading, and (3) Bedforms: cascade, step-pool, plane bed, pool-riffle, or dune-ripple	Engineering and Hydrosystems (2009)

			- Historic information including:
			  - USGS gage records
			  - Aerial photos (1997, 1986, 1978, 1967, 1952)
			  - Sediment gradation data/curves
			  - Sediment transport analysis
			  - Geotechnical
			USGS suspended sediment data
				Engineering & Hydrosystems (2007)

	FLUVIAL-12	SARI pipeline (Prado Dam to Weir Canyon Road)	-Sediment transport modelling includes 30,000 cfs flow event	Chang (2003)

	HEC-6	Upper SAR	- (1) hydrologic changes due to Seven Oaks Dam and urbanization - (2) watershed sediment yield changes due to Seven Oaks Dam; and - (3) downstream SAR channel changes in sediment transport and bed material changes resulting from (1) and (2). - Identifies Santa Ana sucker critical habitat, areas most suitable for the sucker - Identifies the principal tributaries contributing sediment to the SAR. - Daily flow-duration curves were developed using data from three USGS gages on the SAR mainstem. - Sediment yield was reported. HEC-6 was used to assess sediment transport.	Humphrey et al. (2004)
	HEC-6	Weir Canyon Road to Pacific Ocean	- Corps General Design Memorandum	USACE (1988a and 1988b)

REFERENCES:

Chang, H. H. 2003. Scour Study of the Santa Ana River for the Interceptor Pipeline, Prepared for Brown & Caldwell. March 2003.

Engineering & Hydrosystems 2009. Santa Ana River Bed Sediment Gradation Characterization Study: Phase II, Submitted to Orange County Water District by Engineering & Hydrosystems, January 2009.

Engineering & Hydrosystems 2007. Santa Ana River Bed Sediment Gradation Characterization, Phase I, Engineering & Hydrosystems, Inc. (E&H), Littleton, CO. Prepared for OCWD, Fountain Valley, CA, October 2007.

Golder 2014. Appendix B HEC-RAS Sediment Transport Modeling Santa Ana River, submitted to Orange County Water District, Fountain Valley, CA, July 2014.

Golder 2010a. Appendix B HEC-RAS Sediment Transport Modeling Santa Ana River, submitted to Orange County Water District, Fountain Valley, CA, Project 093-81947, November 2010.

Golder 2010b. Appendix A Assessment of Water and Sediment Patterns within Prado Basin, submitted to Orange County Water District, Fountain Valley, CA, November 2010. (Original report: Draft Environmental Impact Report, Orange County Water District Prado Basin Sediment Management Demonstration Project, March 2014, Appendix D-1.

Golder 2009. Santa Ana River Bed Sediment Gradation Characterization Study: Phase III, Submitted to Orange County Water District by Golder Associates, Inc, Lakewood, CO, November 2009.

Humphrey, J.H., W.H. Blood, and R. Leidy. 2004. Assessment of the Influence of Hydrology and Sediment Transport in the Santa Ana River on Santa Ana Sucker Habitat, Prepared for Best Best & Krieger LLP, April 2004.

OCFCD 2009. Santa Ana River Canyon Habitat Management Plan, Volumes I-III. Prepared by Orange County Flood Control District for the U.S. Army Corps of Engineers, Los Angeles District. January 2009.

Tetra Tech and HDR. 2010. Scour Study of Santa Ana River Below Prado Dam – Final Report, Prepared by Tetra Tech and HDR for the County of Orange. January 2010.

Tetra Tech. 2012. Lower Santa Ana River, Reach 9 – Design Documentation Report: Hydrology, Hydraulics, & Sedimentation Appendix. Prepared for the U.S. Army Corps of Engineers, Los Angeles District. April 2012

USACE 1988a Santa Ana River Design Memorandum No. 1: Phase II GDM on the Santa Ana River Mainstem including Santiago Creek, Volume 7 Hydrology, U.S. Army Corps of Engineers, Los Angeles District, August 1988.

USACE 1988b. Santa Ana River Design Memorandum No. 1: Phase II GDM on the Santa Ana River Mainstem including Santiago Creek, Volume 3: Lower Santa Ana River (Prado Dam to Pacific Ocean), U.S. Army Corps of Engineers, Los Angeles District, August 1988.

USACE 2012. Santa Ana River Mainstem Project, Reach 9, Phase 2B, Perennial Stream Mitigation Project Report, U.S. Army Corps of Engineers, Los Angeles District, January 2012.

West Consultants, Inc. 2015. Santa Ana River Sediment and Geomorphology Analysis Plan of Action. Prepared for the U.S. Army Corps of Engineers, Los Angeles District. April 2015.

West Consultants, Inc. 2011. Lower Santa Ana River Baseline Hydraulic and Sediment Modeling – Final Report, Prepared by WEST Consultants, Inc. for the Los Angeles District U.S. Army Corps of Engineers, March 2011.

West Consultants, Inc. 2010. Accelerated Corps Water Management System Deployment Campaign, Appendix 6: Santa Ana River Basin, Prepared by WEST Consultants, Inc. for the U.S. Army Corps of Engineers Hydraulic Engineering Center, October 2010.