

STANDARD AGREEMENT - AMENDMENT

STD 213A (Rev. 4/2020)

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AGREEMENT NUMBER

20-022-270

AMENDMENT NUMBER

1

Purchasing Authority Number

1. This Agreement is entered into between the Contracting Agency and the Contractor named below:

CONTRACTING AGENCY NAME

State Water Resources Control Board

CONTRACTOR NAME

Aquatic Science Center

2. The term of this Agreement is:

START DATE

July 1, 2020

THROUGH END DATE

December 31, 2024

3. The maximum amount of this Agreement after this Amendment is:

\$1,577,685.31

One Million Five Hundred Seventy-Seven Thousand Six Hundred Eighty-Five Dollars and Thirty-One Cents

4. The parties mutually agree to this amendment as follows. All actions noted below are by this reference made a part of the Agreement and incorporated herein:

A. This Amendment increases the original Agreement amount payable by \$574,717.72. The total maximum amount payable is amended from \$1,002,967.59 to \$1,577,685.31.

This Amendment extends the original Agreement term end date for twelve (12) months from December 31, 2023 to December 31, 2024.

B. Amendment Effective Date: Upon DGS Approval

C. Changes made in this Amendment are shown as: Text additions are displayed in bold and underline. Text deletions are displayed as strike through text.

D. Exhibit A, Scope of Work ; Exhibit A,1, Resumes; Exhibit B, Budget Detail and Payment Provisions; Exhibit B,1, Budget; Exhibit D, Special Terms and Conditions have been revised and are attached and replaced in their entirety.

All other terms and conditions shall remain the same.

IN WITNESS WHEREOF, THIS AGREEMENT HAS BEEN EXECUTED BY THE PARTIES HERETO.

CONTRACTOR

CONTRACTOR NAME (if other than an individual, state whether a corporation, partnership, etc.)

Aquatic Science Center

CONTRACTOR BUSINESS ADDRESS

4911 Central Avenue

CITY

Richmond

STATE

CA

ZIP

94804

PRINTED NAME OF PERSON SIGNING

Warner Chabot

TITLE

Executive Director

CONTRACTOR AUTHORIZED SIGNATURE

warner chabot[warner chabot \(May 13, 2022 16:49 PDT\)](#)

DATE SIGNED

May 13, 2022

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Purchasing Authority Number

STATE OF CALIFORNIA

CONTRACTING AGENCY NAME

State Water Resources Control Board

CONTRACTING AGENCY ADDRESS

1001 I Street, 18th Floor

CITY

Sacramento

STATE

CA

ZIP

95814

PRINTED NAME OF PERSON SIGNING

John Russell

TITLE

Deputy Director, Division of Admin. Services

CONTRACTING AGENCY AUTHORIZED SIGNATURE



DATE SIGNED

May 23, 2022

CALIFORNIA DEPARTMENT OF GENERAL SERVICES APPROVAL



EXEMPTION (If Applicable)

EXHIBIT A SCOPE OF WORK

1. WORK TO PERFORMED SERVICES OVERVIEW:

- A. The Aquatic Science Center (hereinafter referred to as the Contractor), agrees to provide to the State Water Resources Control Board (State Water Board), along with the Regional Water Quality Control Boards (Regional Water Boards), collectively referred to as Water Boards, with services as described herein:

The Contractor shall provide the Water Boards' Surface Water Ambient Monitoring Program (SWAMP) with technical expertise to support SWAMP's Statewide Bioaccumulation Monitoring Program.

- B. The services shall be performed at the Contractor's office located at the following address:
 4911 Central Avenue, Richmond, California 94804
- C. The Contractor shall provide the services during the Contractor's normal business hours (8:00 a.m. to 5:00 p.m.), Monday through Friday (weather permitting), unless additional time is required, excluding State and Federal holidays. The Contractor shall ensure staff assigned to this Agreement do not accrue overtime.
- D. The Project Representatives during the term of this Agreement will be:

State Water Resources Control Board	Aquatic Science Center
<i>Office of Management and Analysis</i>	
Name/Title: Chad Fearing Devan Burke , Contract Manager Address: 1001 I Street, 19 th Floor, MS 19B Sacramento, CA 95814 Phone: (916) 341-5546 (916) 327-1278 Email: chad.fearing@waterboards.ca.gov Devan.burke@waterboards.ca.gov	Name/Title: Patrick Walsh, Director of Finance and Contracts Address: 4911 Central Avenue Richmond, CA 94804 Phone: (510) 746-7356 Fax: (510) 746-7300 Email: patrickw@sfei.org
Name/Title: Melissa Morris, Technical Project Manager Phone: (916) 341-5868 Email: melissa.morris@waterboards.ca.gov	Name/Title: Jay Davis, Principal Scientist Phone: (510) 746-7368 Fax: (540) 746-7300 Email: jay@sfei.org
Name/Title: Tessa Fojut, SWAMP Quality Assurance (QA) Officer Phone: (916) 341-5220 Email: tessa.fojut@waterboards.ca.gov	
Name/Title: Andrew Hamilton, State Board Quality Assurance (QA) Officer Phone: (916) 341 - 5583 Email: andrew.hamilton@waterboards.ca.gov	

EXHIBIT A SCOPE OF WORK

The Project Leads during the term of this Agreement will be:

Task #	State Water Resources Control Board Project Leads	Aquatic Science Center Project Leads
1	Name/Title: Ali Dunn, Senior Environmental Scientist Phone: (916) 319-8458 Email: ali.dunn@waterboards.ca.gov	Name/Title: Jay A. Davis, Program Director/Senior Scientist Phone: (510) 746-7368 Email: jay@sfei.org
	Name/Title: Tessa Fojut, Senior Environmental Scientist Phone: (916) 341-5220 Email: tessa.fojut@waterboards.ca.gov	
2	Name/Title: Marisa Van Dyke, Environmental Scientist Senior Environmental Scientist Phone: (916) 322-8431 Email: marisa.vandyke@waterboards.ca.gov	Name/Title: Randy Turner, Associate Environmental Scientist Phone: (707) 499-5521 Email: randyt@sfei.org
	Keith Bouma Gregson, Environmental Scientist Carly Nilson, Senior Environmental Scientist Phone: (916) 322-8430 Email: keith.bouma-gregson@waterboards.ca.gov carly.nilson@waterboards.ca.gov	
3	Name/Title: Ali Dunn, Senior Environmental Scientist Phone: (916) 319-8458 Email: ali.dunn@waterboards.ca.gov	Name/Title: Cristina Grosso, Program Manager Phone: (510) 746-7371 Email: cristina@sfei.org
4	Name/Title: Melissa Morris, Assistant Deputy Director Phone: (916) 341-5868 Email: melissa.morris@waterboards.ca.gov	NA
	Name/Title: Greg Gearheart, Deputy Director Phone: (916) 341-5892 Email: greg.gearheart@waterboards.ca.gov	
5	Name/Title: Melissa Morris, Assistant Deputy Director Phone: (916) 341-5868 Email: melissa.morris@waterboards.ca.gov	NA
	Name/Title: Greg Gearheart, Deputy Director Phone: (916) 341-5892	

**EXHIBIT A
 SCOPE OF WORK**

	Email: greg.gearheart@waterboards.ca.gov	
6	Name/Title: Kelly Huck, Environmental Scientist Phone: (530) 542-5458 Email: kelly.huck@waterboards.ca.gov	Name/Title: Sarah Lowe, Environmental Scientist Phone: (510) 746-7384 Emails: sarahl@sfei.org
	Name/Title: Dan Sussman, Senior Environmental Scientist Phone: (530) 542-5466 Email: daniel.sussman@waterboards.ca.gov	
7	Name/Title: Kelsey Gody, Environmental Scientist <u>Rich Fadness,</u> Phone: (707) 576-2347 (707) 567-6718 Email: kelsey.gody@waterboards.ca.gov rich.fadness@waterboards.ca.gov	Name/Title: Joshua Collins <u>Alison Whipple</u> Phone: (510) 384-0740 (510) 746-7318 Email: josh@sfei.org alison@sfei.org
	Name/Title: Lisa Bernard, Senior Environmental Scientist Phone: (707) 576-2677 Email: lisa.bernard@waterboards.ca.gov	Name/Title: Sarah Lowe Phone: (510) 746-7384 Email: sarahl@sfei.org
8	Name/Title: Christina Toms, Senior Environmental Scientist (Specialist) Phone: (510) 622-2506 Email: christina.toms@waterboards.ca.gov	Name/Title: Julie Beagle, Deputy Program Director/Environmental Scientist Phone: (510) 764-7312 Email: julieb@sfei.org <u>Scott Dusterhoff, Senior Scientist and Lead Geomorphologist</u> Phone: (510) 746-7350 Email: scottd@sfei.org
9	Name/Title: Clayton Creager, Environmental Program Manager Phone: 707-576-2666 Email: clayton.creager@waterboards.ca.gov	Name/Title: Randy Turner, Environmental Scientist Phone: 707-499-5521 Email: randyt@sfei.org
<u>10</u>	<u>Name/Title:</u> <u>Setenay Bozkurt Frucht</u> <u>Water Resource Control Engineer</u> Phone: (510) 622-2388 Email: Setenay.frucht@waterboards.ca.gov	<u>Name/Title:</u> <u>Scott Dusterhoff, Senior Scientist and Lead Geomorphologist</u> Phone: (510) 746-7350 Email: scottd@sfei.org
<u>11</u>	<u>Name/Title:</u>	<u>Name/Title:</u>

**EXHIBIT A
 SCOPE OF WORK**

	<u>Kevin Lunde</u> <u>Senior Environmental Scientist</u> <u>Phone: (510) 622-2431</u> <u>Email: Kevin.Lunde@waterboards.ca.gov</u>	<u>Jay Davis, Principal Scientist</u> <u>Phone: (510) 746-7368</u> <u>Fax: (540) 746-7300</u> <u>Email: jay@sfei.org</u>
12	<u>Name/Title:</u> <u>Chad Loflen</u> <u>Senior Environmental Scientist</u> <u>Phone: (619) 521-3370</u> <u>Email: Chad.Loflen@waterboards.ca.gov</u>	<u>Name/Title:</u> <u>Cristina Grosso, Program</u> <u>Manager</u> <u>Phone: (510) 746-7371</u> <u>Email: cristina@sfei.org</u>

The parties may change their Project Representative upon providing ten (10) days written notice to the other party. Said changes shall not require an Amendment to this Agreement.

2. BACKGROUND AND GOALS:

- A. The objective of the SWAMP is to implement comprehensive environmental monitoring, assessment and reporting. The overall program goals of the SWAMP are to:
- 1) Conduct an ambient monitoring program that addresses all hydrologic units of the State using consistent and objective monitoring, sampling, and analytical methods; consistent data quality assurance protocols; and centralized data management. This program shall be the umbrella program that shall monitor and interpret the data for each hydrologic unit.
 - 2) Document ambient water quality conditions in potentially clean and polluted areas. The scale for these assessments' ranges from the site specific to statewide.
 - 3) Identify specific water quality problems preventing the Water Boards, and the public, from realizing beneficial uses of water in targeted watersheds.
 - 4) Provide the data to evaluate the overall effectiveness of water quality regulatory programs in protecting beneficial uses of waters of the state.

3. WORK TO BE PERFORMED

Task 1: ~~Bioaccumulation Monitoring Program~~ Safe to Eat Workgroup (STEW) Implementation (SWRCB-SWAMP)

SWAMP's Bioaccumulation Monitoring Program addresses whether fish and shellfish consumption and aquatic life-support beneficial uses are impaired by measuring contaminant concentrations in species from California's lakes and reservoirs, rivers and streams, and coastal waters. ~~The Bioaccumulation Oversight Group (BOG)~~ Safe to Eat Workgroup (STEW) serves as an advisory body for this program. The Contractor, in consultation with the Water Boards Project Lead, shall implement strategies for coordinated monitoring, assessment, and communication of information on bioaccumulation of contaminants in fish and shellfish tissue, consistent with Water Boards program priorities. The Contractor's duties shall include the following elements, in consultation with the Water Boards SWAMP Project Manager:

Task 1.1 ~~Bioaccumulation Oversight Group~~ Safe to Eat Workgroup (BOGSTEW)
Coordination

The Contractor shall coordinate the ~~BOG~~-STEW (a group of technical experts and stakeholders in the field of bioaccumulation and safe fish consumption). The

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BOGSTEW is a sub-committee of the SWAMP Roundtable, and a workgroup of the California Water Quality Monitoring Council. The Contractor, in consultation with the Water Boards Project Lead, shall solicit community engagement for public stakeholder participation within the group. The Contractor, in consultation with the Water Boards Project Lead, shall include additional Water Boards Program participation and solicit local agency and state agency partners outside of the Water Boards. The Contractor shall ensure that meeting notes and action items and decision points are recorded and shall submit these documents to the Water Boards Project Lead and the Water Boards Contract Manager.

Task 1.2 Quality Assurance Project Plan (QAPP) and Monitoring Plan

The Contractor shall advise and participate in the development and revision of bioaccumulation QAPP and monitoring plan annually. The Contractor shall compile and present on current data gaps in state-wide tissue bioaccumulative contaminant data to both the **BOGSTEW** and to the SWAMP Roundtable, in order to develop an agreed upon Monitoring Plan as part of the QAPP. The Contractor shall update and submit the QAPP for approval by the SWAMP and the designated Water Boards SWAMP and State Board QA Officers on an annual basis, prior to commencing new data collection under a new sampling and analysis plan.

Task 1.3 Kickoff Meetings

The Contractor shall ensure that the planning kickoff meetings occur at least one (1) month prior to commencement of sampling. The Contractor shall ensure that kickoff meeting attendees include representatives from the SWAMP Information Management and Quality Assurance Center (SWAMP IQ) at the Water Boards, field crew representatives, laboratory representatives, and the tissue coordinator. The Contractor shall ensure that kickoff meeting topics include field sampling methodology, sample collection, handling and transport, Quality Assurance/Quality Control (QA/QC) procedures, laboratory analyses, holding times, and any other topics required to ensure successful project management. In addition, the Contractor shall prepare meeting notes, and a meeting summary, and submit these documents to the Water Boards Contract Manager.

Task 1.4 Bioaccumulation Project Management

The Contractor shall participate in the SWAMP ~~Bioaccumulation Monitoring Program~~ **Safe to Eat Workgroup** budget planning activities and submit the program planning budgets annually. The Contractor shall oversee the implementation of the project and completion of project activities, to ensure adherence to the Monitoring Plan and QAPP (See Task 1.2), and to ensure that corrective actions are employed when necessary and when requested by the SWAMP QA Officer. The Contractor shall coordinate and ensure the completion of data completeness tasks on a minimum quarterly basis and participate in and provide updates to the SWAMP Roundtable. The Contractor shall also participate in and provide updates to the California Water Quality Monitoring Council.

Task 1.5 Data Interpretation, Reporting, and Technical Assistance

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Upon request of the Water Boards, the Contractor shall analyze and interpret data generated by annual bioaccumulation surveys and summarize their analysis and interpretation(s) in reports and fact sheets. The Contractor shall provide Water Boards staff with technical assistance to address bioaccumulation questions and/or issues.

Task 1 Summary Deliverables:

- 1.1 **BOG-STEW** Meeting Notes/Summary
- 1.2 Quality Assurance Project Plan and Monitoring Plan
- 1.3 Kickoff Meeting Notes/Summary
- 1.4 Program Planning Budget
- 1.5 Data reports, technical reports, and fact sheets

Task 2: Remote Sensing to Monitor Cyanobacterial Harmful Algal Blooms (SWRCB-SWAMP)

The Contractor shall operate the Satellite Analysis Tool (tool) to process and display remote sensing data and, in close coordination with the Water Board Project Leads, develop a workplan and incorporate additional features in the tool that will help characterize the seasonality, spatial distribution, and development of harmful algal blooms (HABs) in 255 of the state's largest water bodies. Additionally, the Contractor shall assist the State by assessing satellite data to respond to HAB events and assist with strategic planning and other state-wide or regional efforts.

Task 2.1 Satellite Imaging Data

The Contractor shall process satellite-imaging data from the National Oceanic and Atmospheric Administration's (NOAA) file transfer protocol (ftp) site and upload this data to the ArcGIS geodatabase daily. The Contractor shall also provide SWAMP with written documentation for the satellite data processing steps, including all application code and data processing scripts, and processed data. As the tool is modified based on direction from the Water Boards Project Leads, this protocol document will be updated and shared with SWAMP on a quarterly basis.

Task 2.2 Application Programming Interface (API) Development

The Contractor shall develop an API for the tool to provide modular, extendable access to the underlying data (e.g., downloadable text files, Geographic Tagged Image File Format (geoTIFFs), data summaries, raw pixel values), which will simplify application maintenance and the addition of future tool functionality, and make it easier for users to download data for external use.

Task 2.3 Facilitate Data and Information Follow-up Requests

The Contractor shall respond to or facilitate data and information requests by Water Boards staff and based on guidance from the Water Boards Project Leads, provide follow-up data analytics to assist with high priority lake monitoring, incident response, special projects and decision-support activities.

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Task 2.4 Incorporate Features and Data for Tool Functionality

The Contractor shall incorporate additional features and data into the tool to improve the functionality for users within and beyond the tool to support Water Boards program priorities, at the direction of the Water Boards Project Leads. This may include: adding query capability to display data for posted waterbodies from California's HAB Incident Reports Map to integrate this complementary public health data into the tool; adding additional data imagery or indices from other satellite sensors (e.g., Planet Labs, Sentinel 2); displaying links to external data that users can use to perform Landscape Risk Characterizations; and creating customizable tables and charts so users can more easily evaluate existing waterbody-wide statistics and better understand the status and trends of HABs.

Task 2.5 HAB Strategic Planning and Collaborations

The Contractor shall participate in ongoing meetings and collaborations related to HABs in support of SWAMP efforts and California's Freshwater HAB Monitoring Strategy. This would include serving on the HAB Technical Advisory Committee, attending California Cyanobacteria and Harmful Algal Bloom (CCHAB) meetings, and other meetings as appropriate in consultation with SWAMP.

Task 2.6 Develop Remote Sensing to Detect Cyanobacterial Harmful Algal Blooms (HABs) Workplan,

The Contractor shall develop a workplan for tasks 2.1 - 2.5 describing the specific projects within the task that will be prioritized by the Water Boards Project Leads, including timelines for task completion.

- a. The Contractor shall submit a draft workplan for review and comment by the Water Boards Project Leads. The Water Boards shall submit final comments to the Contractor within 4 (four) weeks of receiving a draft plan.
- b. The Contractor shall submit a final workplan within 6 (six) weeks of receiving draft comments from the Water Boards Project Leads. Revisions to the final workplan will be made in consultation with the Water Boards Project Leads to ensure consistency with California's Freshwater HAB Monitoring Strategy, legislative requirements, and other Water Boards priorities related to harmful algal blooms.

Task 2.7 Participation in Quarterly Status and Coordination Meetings

The Contractor shall participate in quarterly status and coordination meetings via teleconference to provide updates to the Water Boards Project Leads that includes a summary of activities undertaken to implement Tasks 2.1- 2.6. The Contractor shall provide a brief meeting summary that includes record of the meeting date, duration, items discussed, action items and key personnel in attendance.

Task 2 Summary Deliverables:

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- 2.1 Code and Data Processing Scripts and share updates with SWAMP
- 2.2 Application Programming Interface (API)
- 2.3 Data and Information Requests
- 2.4 Tool Feature and Data Functionality Additions
- 2.6 (a) Draft Workplan
- 2.6 (b) Final Workplan
- 2.7 Quarterly Status and Coordination Meeting Summaries

Task 3: Bioaccumulation Data Visualization (SWRCB-SWAMP)

The Contractor shall provide the following technical support to train Water Boards staff to interpret and analyze bioaccumulation data presented on the [Safe to Eat Portal](#):

Task 3.1 Documentation for the Safe to Eat Portal

The Contractor shall provide the Water Boards Project Lead with electronic documentation for the Safe to Eat portal data processing steps, including all application and source code, data processing scripts, and processed data.

Task 3.2 Safe to Eat Portal Training and Technical Support

Safe to Eat Portal training and technical support shall be provided to Water Boards staff through a series of web meetings, at the request of the Water Boards Project Lead. The Contractor shall provide a brief meeting summary that includes: record of the meeting date, duration, items discussed, action items and key personnel in attendance.

Task 3.3 Data Visualizations

After the Contractor has fully trained the Water Boards staff to produce data visualization products and has shared the source code and documentation of data processing, the Contractor shall work collaboratively with Water Boards staff to prepare data visualizations that effectively communicate bioaccumulation data and information.

Task 3 Summary Deliverables:

- 3.1 Written documentation for Safe to Eat Portal
- 3.2 Training and technical support meeting summary notes

Task 4: Water Boards Special Project Support (SWRCB – OIMA)

At the request of the Water Boards Project Lead, the Contractor shall provide technical and administrative assistance to Water Boards staff for special projects including the following tasks:

Task 4.1 Technical and Administrative Assistance

The Contractor shall be responsible for the formation of technical advisory groups, event coordination and logistics, and outreach meetings. Activities may include utilizing the contractor's academic, industry, and community networks to

EXHIBIT A SCOPE OF WORK

solicit expert speakers, demonstrations, and event engagement; technical assistance with coordination and administration of the event; and follow-up activities including satisfaction and engagement surveys. The Contractor shall provide a summary report of activities completed per request/event.

Task 4 Summary Deliverable:

4.1 Summary Report of Activities

Task 5: Community Outreach and Support (SWRCB – OIMA)

At the request of the Water Boards Project Lead, the Contractor shall perform outreach and support activities, **and honorariums may be provided** for community engagement on behalf of the Water Boards as a neutral third-party. Communities shall encompass the general public but include a focus on creating and improving Water Boards engagement and public trust with vulnerable and underserved communities.

Task 5.1 Community Outreach and Support

Community engagement opportunities shall include invitation and support to attend and participate in events and meetings and welcome and support community review and feedback of documents, websites, tools, etc. Outreach and support activities shall include soliciting community participation through localized outreach mechanisms, network building, and providing support for travel and participation in Water Boards community engagement opportunities. The Contractor shall provide a summary report including, as applicable: number of community participants supported; community engagement surveys completed by participants; participant presentation slides or notes; meeting notes; copies of community member written feedback or notes of verbal feedback, etc.

Task 5 Summary Deliverable:

5.1 Summary Report of Community Outreach Support Activities

Task 6: Water Quality Status and Trends Report and Future Monitoring Recommendations - (Region 6 - DISCR)

The Contractor shall assist the Lahontan Regional Water Quality Control Board (Region 6) with summarizing an approximate of 20-years of SWAMP water quality monitoring data, and other data as available, with input from a project workgroup, to achieve the following objectives:

- Assess status and trends;
- Identify data or information gaps;
- Identify potential changes to the monitoring design;
- Extract other information from the datasets as needed;
- Report findings and recommendations.

Task 6.1 Data Compilation

The Contractor shall work with the Water Boards Project Lead to compile ~20 years of SWAMP data, and other publicly available data from the California Environmental Data Exchange Network (CEDEN) and/or the United States Geological Survey (USGS) as appropriate within time and budget constraints, prioritizing the program's existing nine (9), long-term, permanent sampling sites

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(637SUS001, 635TRK002, 633WFCB02, 632ECR005, 631WWK001, 630EWK001, 603MAM006, 628MOJ001, and 628MOJ002). If needed, the Water Boards staff may provide a list of additional sites of interest. The Contractor shall provide a summary list of the compiled data.

Task 6.2 Data Analysis

The Contractor shall analyze the data to characterize the overall status and trends of the following water quality parameters measured by SWAMP across the Lahontan region: nutrients, bacteria, trace elements, organic contaminants, and water toxicity (if available). Data shall be compared to relevant Basin Plan guidelines wherever possible, and correlated or normalized for flow, temperature, and other environmental factors as possible and appropriate.

The analyses shall summarize trends over time, identify when/if water quality exceedances occurred, and compare sites to each other and region-wide. The Contractor shall review the Perennial Stream Assessment's (PSA's) stream bioassessment regional summary report (that will be developed in advance of this water quality report) and consider key findings in the water quality report to support interpretation of overall water quality conditions of streams in the Lahontan region. The goal of this analysis is to evaluate the historical monitoring data and allow the Water Boards to establish a statistical framework to forecast possible effects of climate change, land use change on water quality. The task is not intended to identify the causes of any trends, but to inform of future monitoring efforts. The Contractor shall present preliminary findings to the project workgroup (see Task 6.3), draft an outline for the status and trends report, and provide a final R data analysis code (submitted as a text file).

Task 6.3 Project Workgroup

The Contractor shall coordinate with the Water Boards Project Lead to convene a small workgroup of regional experts to review project deliverables and advise on future SWAMP Program monitoring recommendations. More specifically, the workgroup shall:

- Review the list of data to be compiled to ensure their suitability and importance;
- Identify the topics to prioritize in the report;
- Review the draft status and trends analysis;
- Discuss potential monitoring or data gaps (e.g. sampling locations, sampling frequency, or parameters measured); and
- Discuss potential changes to the future monitoring program based on the status and trends findings and future environmental management/stewardship needs.

The Contractor will facilitate four **(4)** workgroup meetings. The meetings shall be online webinar sessions. The Contractor shall provide meeting agendas, supporting materials, and meeting notes.

Task 6.4 Reporting

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The Contractor shall work with the Water Boards Project Lead to develop an outline for a summary of the status and trends report, as advised by the project workgroup from Task 6.3. Based on the approved outline, the Contractor shall develop a draft and final report. The draft report shall be developed in Microsoft Word. The final report shall be in compliance with [AB 434 and the Web Content Accessibility Guidelines](#). Once finalized, the final report shall be converted to an Americans with Disabilities Act (ADA) compliant portable document format (.pdf) that can be posted on the Water Boards' website.

Task 6.5 Project Management

The Contractor shall provide internal management of the project, science support, and coordination with the Water Boards Project Lead and the Water Boards Contract Manager and shall provide quarterly progress reports.

Task 6 Summary Deliverables:

- 6.1 Summary List of Compiled Data
- 6.2(a) Presentation of Preliminary Findings
- 6.2(b) Draft Outline for the Status and Trends Report
- 6.2(c) Final R Data Analysis Code
- 6.3 Meeting Agendas, Supporting Materials, Meeting Notes
- 6.4(a) Draft Report
- 6.4(b) Final Report
- 6.5 Project Progress Reports

Task 7: Phase 2: Russian River R3MP (Region 1 - DISCR)

The purpose of Phase 2 of the R3MP (Program) is to set the stage for initial implementation of the Program during 2022-3, followed by a report on the health of the Russian River watershed in 2024-5. This Phase 2 scope of work reflects this ambitious schedule. The likelihood of meeting this schedule is dependent on the Technical Advisory Committee (TAC) and Steering Committee (SC) process and may take up to two and a half years to complete. By applying developmental methods and technical tools proven by other Regional Monitoring Programs (RMPs), the Phase 2 schedule outlined here (see the "Task and Deliverable Schedule Timeline" Table for Task 7) comprises an ambitious shorter 19 month timeline.

Each Phase 2 Task consists of two (2) or more subtasks. The subtasks within a Task generate discrete deliverables that build on each other but tend to be iterative. Some Tasks generate draft products that are finalized in later Tasks (see the Deliverables Table). The Task schedule is generally aligned with quarterly meetings of the SC. The schedule therefore enables the SC to review interim or draft products and approve their final versions during the course of regularly scheduled SC meetings.

Each technical Task involves advice and review by the TAC of draft products prepared by the Contractor, with input from the R3MP project coordination Core Team (CT). The products of each Task will represent the consensus recommendations or advice of the TAC. When warranted, as decided by the TAC Chair, dissenting or minority opinions will be documented.

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The TAC shall meet monthly through web-conferencing with the occasional in-person meeting held at the North Coast Regional Water Quality Control Board. The first meeting of the TAC will be in-person and may also be attended by CT members.

Task 7.1 Project Management

This task supports the Contractor's administrative and project management staff in administering this Agreement, including setting up the project account and project plan within the Contractor's accounting and project tracking system, and managing project expenditures, and invoicing and project progress reports. Invoices and progress reports will be submitted not less than quarterly and not more than monthly depending on the amount of accrued billing. The final project progress report will be submitted according to contractual guidelines.

Task 7.2 Establish a Technical Advisory Committee (TAC)

This is a non-technical, administrative task completed by the SC with help from the Contractor. The Contractor shall provide the CT with a standalone TAC Charge Statement based on the R3MP Charter, and a draft set of TAC membership criteria and other membership considerations. The Contractor shall revise these materials based on the CT review, and then present them to the SC prior to the first SC meeting. During that meeting, the SC will recommend any changes to these materials, and also identify initial TAC members. Based on this input, the Contractor shall develop the initial TAC roster and prepare for the first TAC meeting.

Task 7.3 Develop a Science Framework

The TAC will develop the scientific framework in three **(3)** major parts detailed below that will guide all of its subsequent Phase 2 work. Each part may be revised during subsequent tasks, such that the framework reflects the increased understanding of the scientific underpinning, constraints, and opportunities of the R3MP. The Contractor shall develop draft products that the TAC will review and revise.

- *Part 1:*
The Contractor shall develop and prioritize the set of monitoring questions that frame the management questions in terms of measurable indicators of watershed health. Broad management questions may be translated into multiple monitoring questions.
- *Part 2:*
The Contractor shall develop a Master Monitoring Matrix of management questions, their corresponding monitoring questions, and associated indicators. Development of the Master Matrix will enable the TAC to begin to see how some indicators may be used to address multiple management questions. The monitoring questions may be revised during the development of the Master Matrix to clarify their inter-relationships, and to assure that the indicators will adequately address the management questions. Over the course of the subsequent tasks, the Matrix shall be

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revised and expanded to include the specifics of data collection for each indicator.

- *Part 3:*
The Contractor shall create a memorandum that explains the functional interrelation among the indicators in time and space, and how the interrelations will be evaluated in terms of watershed health. This part of the framework will involve assembling existing conceptual models of cause and effect and analyzing how the indicators fit into the models. The outcome will be a shared understanding by all TAC members of how the watershed is assumed to function as a physical and ecological system, what indicators should be used to evaluate the key functions and thereby assess the health of the watershed, and what analytical procedures will be used in the assessment. The Science Framework will evolve over the lifetime of the Program, with the ultimate goal to identify and forecast thresholds or tipping points in the status of functions that will guide watershed management actions.

Task 7.4 Analysis of Data Availability and Information Gaps

This task examines existing watershed health data and information through the lens of the Science Framework originating in Task 7.2. The TAC shall complete a questionnaire co-developed by the TAC and the Contractor for the TAC to use in identifying data sets, their sources and other essential metadata for the indicators listed in the Master Matrix. This will reveal spatial and temporal gaps in relevant data and information. The TAC shall advise the Contractor on the relative importance of these gaps. Based on this analysis, the TAC shall help the Contractor revise the Master Matrix by prioritizing indicators and data sets for assessing watershed health. This prioritization will help determine the geographic scope and suite of indicators for Program implementation.

Task 7.5 Data Collection and Analysis Documentation

The Contractor, with support from the TAC, shall assemble a catalogue of existing field and laboratory methods or standard operating procedures (SOPs) for data collection for the indicators prioritized in Task 7.3. The indicators may be further prioritized, based on the readiness of the methods. The Master Matrix may be further revised to include the recommended frequency and spatial distribution of data collection for the prioritized indicators. The Contractor shall prepare a draft of the 5-year monitoring plan that shall include these recommendations; suggesting what would be measured, where, and how often to address the management questions. It is anticipated that the usual costs of data collection can also be assembled for these indicators. An approach to cost analysis will be developed by the Contractor with input from the CT and SC. It is likely that a range in unit-cost for each indicator will be estimated, such that cost ranges can be scaled, based on the frequency and geographic scope of data collection.

Task 7.6 Design Data Management Processes

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Once SC understands the recommended geographic and technical scope of the initial Program, including the anticipated analyses of monitoring data, the necessary supporting processes of data management should be planned. These processes will cover data QAQC, publication and upload, management, visualization, access and download, and compilation. A set of guiding principles will be developed to address transparency, security, privacy, open source engineering, compatibility across platforms, minimizing unnecessary redundancy, maximizing data value, and other aspects of data integrity and usability. Phase 2 will not develop a system of data and information management, but rather it will provide a plan for utilizing existing tools and systems. For example, it is anticipated that many useful datasets will be sourced through public agencies via web services. In some cases, original data may be managed through the state-wide California Environmental Data Exchange Network (CEDEN). It is also anticipated that the Program will be able to utilize a variety of existing data access and visualization tools. The Contractor shall work with the TAC, CT, SC, California Office of Technology, Workgroups of the California Water Quality Monitoring Council, the Biogeographic Information and Observation System (BIOS) of California Department of Fish and Wildlife (CDFW), and other sources of relevant Information Technology to identify tools that will be demonstrated to the TAC and SC during a dedicated SC workshop, co-planned by the CT and the Contractor.

Task 7.7 Identify Implementing Entity for Phase 3 and Beyond

The R3MP Charter calls for one or more organizations to serve as an Implementing Entity (IE) that administers the Program by serving as its fiduciary agent; managing the monitoring program and its contractors; managing the SC, TAC, and its Workgroups; managing data and information; and managing outreach and communication. The Contractor and the TAC shall assist the SC in identifying the IE by helping to develop a set of criteria or other guidance for deciding how these support services might best be provided. For example, utilizing one or more existing organizations might be considered, or establishing a new stand-alone organization. The Contractor and the TAC shall also provide draft criteria and assemble information for identifying and evaluating existing candidate organizations.

Task 7.8 Determine Initial Program Costs

The purpose of this task is to provide the SC with reasonable estimates of the net annual new costs of monitoring watershed functions, above and beyond existing costs that might be allocated to the Program, given all efforts to maximize the use of existing technical and financial resources. All cost estimates will be reported as ranges, and the sources of uncertainty in the estimates will be reported.

The estimated total costs of the Program will consider Program start-up costs separately from ongoing operation and maintenance (OM). The OM costs will be estimated for the first five to ten years of Program implementation. These costs may vary over these time periods due to the different schedules of data collection, analysis, and reporting for different indicators. The frequency and

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complexity of watershed health reports may also vary over these periods. The Contractor shall attempt to outline these temporal cycles in OM costs, based on the Master Monitoring Matrix. Using the financial records provided by the managers of other RMPs, The Contractor shall include the likely annual costs for Program administration in the OM cost estimates for the Program. The likely cost for special studies that might be needed by the Program may be provided separately as a range in percentage of overall Program costs. These cost estimates are likely to be very speculative, since the nature of the special studies is unknown. However, special studies are an important component of an RMP, and their possible costs should not be ignored.

The SC has recommended an assessment of existing costs for monitoring that is relevant to the R3MP. The purpose of this assessment is to assess the possible opportunities to re-allocate these expenditures to the R3MP, and thereby estimate the likely net change in watershed monitoring costs. The Contractor shall work with the SC members to develop a standard approach for them to assemble a basic budget sheet of relevant existing expenditures.

Based on the estimated annual range in costs to implement the Program over its first five to ten years of operation, and given the estimated range in monies that might be allocated to the Program from other existing monitoring efforts, the Contractor shall work with the SC to estimate the likely range in net costs of the Program. These are likely to be coarse estimates subject to many assumptions. However, they are likely to help identify and prioritize funding needs and opportunities, while building SC member commitment to the Program.

Task 7 Summary Deliverables:

- 7.1 Project Progress Reports
- 7.2(a) Finalize TAC Charge Statement
- 7.2(b) Finalize TAC Membership Criteria and Roster
- 7.3(a) Prioritization of Monitoring Questions
- 7.3(b) Develop Master Monitoring Matrix
- 7.3(c) Develop Analytical Framework
- 7.4(a) Identify Existing Data and their sources
- 7.4(b) Identification of Data Gaps
- ~~7.4(c) Revised Master Monitoring Matrix~~
- 7.5(a) Assembled Data Collection Protocols and SOP's
- 7.5(b) Summary of Metrics, Methods, and Cost per Sample
- 7.5(c) 5-year Monitoring and Reporting Plan
- 7.6(a) Data Management Workshop Summary of Attendance, Meeting Notes, and Outcomes.
- 7.6(b) Outline and Description of Data Management Processes to Support a 5-Year Monitoring Plan
- 7.6(c) Update R3MP Website to Provide Access to Selected Data Management and Analytical Tools
- 7.7 Coordinate and Develop a Criteria or Other Guidance for Support Services
- 7.8(a) Review and Develop Summary of Monitoring Cost Ranges
- 7.8(b) Identify and Provide Summary of Approximate Range in Program Management Costs
- 7.8(c) Analysis of Approximate Annual Net R3MP OM Cost Range

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Task 8: San Francisco Bay Shoreline Operational Landscape Unit (OLU) Project – (Region 2 – DISCR)

The integrity and resilience of the natural and built communities along the San Francisco Bay shoreline are threatened by sea level rise (SLR) driven by anthropogenic climate change. This project is the second and third of ~~two~~ **three (3)** phases in the development of Operational Landscape Units (OLUs), which describes sea level rise adaptation strategies for the San Francisco Bay shoreline. The first phase (Phase 1.1) included three steps: (1) classifying the shoreline into discrete OLU based on physical, ecological, and socioeconomic characteristics, (2) analyzing the opportunities and constraints for adaptation strategies into each OLU, and (3) integrating these analyses into a web-based portal aimed at a broad range of land managers and decision makers. **The second phase (Phase 1.2) included two steps: (1) updating the suitability for ecotone levees for nutrient management developed in Phase 1.1 and assessing wildlife connectivity for regional shoreline adaptation planning, and (2) building from the Phase 1.1 results and developing shoreline adaptation pathways for 2**

The third phase (Phase 1.3) will look upstream within each OLU to analyze the potential for a creek-to-baylands connection to achieve greater ecological functioning and shoreline resilience to climate change. Phase 1.3 will build from the EPA-funded Flood Control 2.0 Changing Channels Report and the Healthy Watersheds, Resilient Baylands Regional Sediment Strategy.

Phase 1.1 depended on landscape-scale geospatial analysis that, while useful for considering broad opportunities, for implementing different types of adaptation strategies (e.g. wetland restoration, horizontal/ecotone levees, living shorelines, etc.), it is generally not detailed enough to consider more site-scale opportunities and constraints. **The second phase (Phase 1.2 and 1.3)** will address specific data gaps related to infrastructure, mudflats, and estuarine-upland transition zones, to develop more shoreline adaptation strategies and to consider how strategies can be implemented in a phased manner. Specifically, **Phases 1.2 and 1.3** will examine the site-scale conditions that inform the development of adaptation strategies and develop phased adaptation strategies.

Task 8.1 *Technical Regional Analysis and Further Research* **(Phase 1.2)**

The Contractor shall analyze newly available datasets to fill data gaps identified under Phase 1 to define and characterize OLU. These include analyzing opportunities for integrating wastewater infrastructure with nature-based adaptation measures, using newly available data sets to assess species dynamics/dispersal across previously mapped marsh restoration opportunities, and analyzing new sediment supply and demand data both from placement of sediment for nature based adaptation, as well as exploring creek connections/creek mouths. The Contractor shall consider extending the range of adaptation strategies to incorporate more manmade and natural features such as landfills and other contaminated sites, opportunities for infrastructure realignment, and wastewater treatment facilities and the potential to beneficially reuse treated wastewater. The Contractor shall use this information to refine the characterization of the OLU, as well as the list of appropriate adaptation strategies for each OLU. The Contractor shall also use these data to inform the development of phased adaptation strategies.

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The Contractor shall develop draft revised materials addressing critical data gaps for incorporation into report outputs from Phase 1, including data layers packaged into geodatabases for transmission to the Water Boards' Project Lead. The Water Boards' Project Lead will send any comments/edits to the Contractor within twenty (20) business days. The Contractor shall then generate final revised materials within an additional twenty (20) business days.

Task 8.2 **Identify Opportunities and Develop Guidance for OLU-Scale Creek-Bayland Connection (Phase 1.3)**

The Contractor shall identify the various creek-bayland connection types around the region and develop a classification/typology that reflects connections for flow, sediment, and wildlife. The Contractor shall then identify opportunities for creek-bayland reconnection (or improving existing connections) within each class/type and describe local watershed sediment supply, flood control implications, open space available for reconnection, potential for tidal habitat migration inland as sea level rises, and other factors. Of those opportunities, the Contractor shall identify high-level strategies for the most promising connection opportunity considering site conditions given physical opportunities and known constraints including, endangered species, existing infrastructure and other factors. The Contractor shall also assess overall benefits and ecosystem services associated with creek-bayland connection for the highest-ranked opportunities (e.g., flood protection, wildlife corridors, tidal habitat migration pathway, increased sediment delivery).

Task 8.3 **Guidance for Implementing Creek-Bayland Connection Projects (Phase 1.3)**
The Contractor shall work in close coordination with the technical advisors to develop high level guidance that can be used by restoration practitioners and flood control agencies to translate OLU scale reconnection recommendations and strategies into project design and implementation. The guidance will focus on key planning and design considerations and be built from the advisors' years of experience and on-the-ground expertise in watershed and bayland restoration projects around the region.

Task 8.4 **Technical review (Phase 1.2 and 1.3)**

The Contractor shall engage with the Technical Advisory Committee (TAC) for this project, which consists of members from external agencies and entities. TAC membership changes made by the Contractor shall be done in coordination with the Water Boards' Project Lead. TAC members will primarily provide review of and feedback on technical content. The Contractor shall at a minimum convene one (1) meeting with the TAC over the life of this agreement.

The Contractor shall submit the TAC meeting agenda and notes to the Water Boards' Project Lead. The Contractor shall also develop technical transfer materials for **Phase 1.2 for** use by community-led resilience projects.

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Task 8.35 *Project Management (Phase 1.2 and 1.3)*

The Contractor shall provide internal management of this project, science support, and coordination with the Water Boards Project Lead and the Water Boards Contract Manager and shall provide quarterly progress reports.

Task 8 Summary Deliverables:

8.1 (a) Draft revised materials for Phase 1.2 report, as an online addendum or appendix

8.1 (b) Final revised materials for Phase 1.2 report, as an online addendum or appendix

8.2 **Draft technical memo for creek-bayland connection opportunities and restoration guidance (Phase 1.3)**

8.3 **Final technical memo for restoration guidance (Phase 1.3)**

~~8.2~~ **8.4** (a) Meeting agenda and notes from the TAC meeting (Phase 1.2 and 1.3)

~~8.2~~ **8.4** (b) Technical transfer materials for community groups (Phase 1.2)

~~8.35~~ Project Progress Reports (Phase 1.2 and 1.3)

Task 9: Lower Klamath National Wildlife Refuge (LKNWR) – Analysis of Treatment Wetland Potential

U.S. Fish and Wildlife Service (USFWS) and the North Coast Regional Water Quality Control Board (NCRWQCB) have requested an analysis to determine to what extent existing wetland cells within the Lower Klamath National Wildlife Refuge (LKNWR) can function as treatment wetlands to assimilate nutrients in irrigation returns from the U.S. Bureau of Reclamation (USBR) Klamath Project, with the ultimate goal of improving water quality in the downstream Klamath River. The analysis will consider whether use of portions of the LKNWR for wetland treatment would be likely to affect existing uses of the wetland units in the short and/or long term, and potential impacts to downstream water availability due to water loss in the treatment wetlands through evapotranspiration and/or seepage. The project will occur over a three-year time period. The Contractor shall implement the activities described below to complete this analysis and produce a report on the findings. The duties include a collection of existing and new information necessary to the analysis, completing data analysis and modeling for short and long-term wetland restoration scenarios, and production of a report describing potential water quality improvements and impacts on downstream water availability.

Task 9.1: *Existing Data Compilation, Preliminary Analysis, and Identification of Data Gaps (Year 1)*

The Contractor shall compile, review, and use existing and readily available data to conduct a preliminary analysis to characterize hydrology, water quality, land surface elevation, soil salinity, vegetation composition and extent, evapotranspiration rates, and groundwater (including water temperature, nutrient, water quality, soil conductivity, general seasonal flow patterns, seepage rates, as available) for the LKNWR and surrounding areas. The Contractor shall consider whether existing data provides more information on how many and which LKNWR cells are best to include in the study. Based on the outcome of the preliminary analysis, the Contractor shall identify data gaps with a focus on data needed to support the assessment of the potential for effective wetland treatment at LKNWR. The Contractor shall conduct up to eight, but no less than four (**4**) coordination calls with the Agency Project Team (NCRWQCB, USFWS, the Oregon Department of Environmental Quality (ODEQ), USGS, and USBR) during

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October 2020 – March 2021 (up to once per month, as needed). This task includes potential for an in-person project kick-off meeting at the LKNWR, with participants from the USFWS (i.e., LKNWR Managers and Endangered Species/Partnership Program staff), (NCRWQCB), U.S. Geological Survey (USGS), and USBR. The in-person meeting will be held only if COVID-19 conditions allow and it would be in lieu of two (2) teleconference meetings.

Task 9.2: Monitoring Plan (Year 1)

The Contractor shall develop a draft and final monitoring plan to fill data gaps identified under Task 9.1. The plan shall be developed to address information needs that can be fulfilled during the one-year monitoring window allowed by the project schedule. The Agency Project Team will be consulted to identify and confirm information priorities. Year 2 monitoring activities shall consider the degree to which USBR can provide in-kind monitoring support to supplement project resources. The draft monitoring plan shall include detail regarding the parameters/constituents of interest, necessary monitoring methods and/or equipment, laboratory analysis methods, field staffing needed to collect the data, and QA/QC samples and protocols required. The Contractor shall provide the draft monitoring plan to the USFWS, the NCRWQCB, USBR, and the ODEQ for one round of review and comments. The Contractor shall conduct up to four (4) coordination calls during October 2020 – March 2021 (once or twice per month, as needed).

Task 9.3: Data Collection to Fill Identified Data Gaps (Year 2)

The Contractor shall collect data to fill gaps identified in Task 9.1 and included in the Task 9.2 *Monitoring Plan*. The Contractor shall perform up to three (3) field-site visits involving a limited set of monitoring activities (e.g., soil salinity, site-specific land surface elevation surveys). The Contractor shall follow the quality assurance and control requirements outlined in the monitoring plan and ensure the quality of the data collected. The Contractor shall enter field data into the most recent SWAMP Field Data Shell for submission to the Water Board's SWAMP IQ within twenty business days of sample collection along with any chain of custody forms. All analytical results, including QA/QC, will be submitted in the most current SWAMP templates to SWAMP IQ within sixty days of analysis. The Contractor shall hold up to twelve, and no less than eight, coordination calls with the agency partners (USFWS, ODEQ, CA NCRWQCB, and USBR) during January – December 2021 (once per month, as needed).

Task 9.4: Treatment Model (Year 1, 2 and/or 3)

The Contractor shall perform a modeling analysis of treatment wetland performance for distinct areas/cells in the LKNWR and for hydrologic scenarios (e.g., irrigation season, non-irrigation season) of interest to refuge managers. The Contractor shall assess treatment wetland performance with respect to nutrient removal and include an assessment of the potential for salinity increases and water losses due to evapotranspiration and/or seepage. The Contractor shall evaluate wildlife water needs within the LKNWR, as well as downstream water needs, as part of hydrologic scenario development. To address any data gaps

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that cannot be filled by monitoring during Year 2 the Contractor shall use appropriate literature-based estimates in the treatment wetland modeling. The Contractor shall conduct up to eight, no less than six coordination calls during 2020, 2021 and/or 2022, as needed.

Task 9.5: Final Report

The Contractor shall prepare a draft and final report summarizing the results of tasks 9.1 through 9.4. The Contractor shall provide recommendations for further study, which may include next steps for developing conceptual or more detailed level of design, implementation timeline, environmental compliance steps, and information needed to estimate implementation costs. The Contractor shall provide the draft report to USFWS, NCRWQCB, USBR, and ODEQ for two **(2)** rounds of review and comments. The Contractor shall hold up to eight, no less than six coordination calls during 2021 and/or 2022, as needed. The data used to prepare the report shall be provided with the submission of the report within a machine-readable electronic standardized format.

Task 9 Summary of Deliverables:

- 9.1(a) Coordination call agendas, notes
- 9.1(b) List of data gaps to be included in Task 9.2 Monitoring Plan
- 9.2(a) Draft Monitoring Plan
- 9.2(b) Final Monitoring Plan
- 9.2(c) Coordination call agendas, notes
- 9.3(a) Monitoring data
- 9.3(b) Coordination call agendas, notes
- 9.4(a) Treatment model results
- 9.4(b) Coordination call agendas, notes
- 9.5(a) Draft Report
- 9.5(b) Final Report and electronic dataset
- 9.5(c) Coordination call agendas, notes

Task 10 Pescadero-Butano Watershed Sediment Monitoring and Large Wood Debris (LWD) Surveys (Region 2 – DISCR)

Pescadero-Butano Watershed Sediment Total Maximum Daily Load (TMDL) and Habitat Enhancement Plan became effective on May 21, 2019. The numeric targets for the TMDL to achieve the water quality objectives for sediment and population and community ecology are residual pool volume (V^* , or the proportion of fine sediment in a pool), substrate composition, and large woody debris (LWD) loading in redwood channels. The implementation plan calls for the Water Boards to conduct baseline monitoring to document existing conditions for the numeric targets. During water years 2019 and 2020, Water Boards staff monitored Pescadero Creek to characterize the baseline conditions as related to V^* and sedimentation in pools. The proposed project would complement the staff report and the recent surveys by monitoring suspended sediment in the creeks and by developing protocols and training, and conducting LWD loading surveys. Water Boards will use the deliverables of this project to:

- 1) continue our efforts to develop baseline characterization of the creeks per the implementation plan;**
- 2) evaluate how close the watershed is to attaining water quality standards and**

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how to prioritize future efforts; and
3) support the on-going lagoon and marsh hydrodynamic modeling efforts by
developing suspended sediment rating curves for the creeks that are going to
be input to the hydrodynamic model.

Task 10.1: Continuous Turbidity/Suspended Sediment Monitoring and Storm Sampling in Pescadero Creek (Year 1 and 2).

10.1(a) The Contractor shall complete a Data Quality Objectives Write-Up Form(DQO Form) for review and approval by the Water Boards Project Manager and Water Boards QA Officer. The DQO Form shall have the following items completed and appropriate attachments uploaded as outlined below:

10.1(a)1 The Contractor shall include in the DQO Form a turbidity threshold sampling strategy within the Pescadero Creek watershed, in which suspended sediment samples are collected by an automated sampler as thresholds in creek turbidity measurements are crossed. The sampling strategy shall ensure that samples are collected across the range of turbidity encountered at the site during the sampling period. The strategy shall include the locations of monitoring sites, schedule and frequency of samples.

10.1(a)2 The Contractor shall include in the DQO Form a list of the equipment to be used for the study. The list shall include details on the location, owners, equipment specifications, maintenance schedule, and standard operating procedures. Please see Exhibit D for additional equipment purchasing requirements.

10.1(a)3 The Contractor shall include in the DQO Form the standard operating procedures for sample collection and handling.

10.1(a)4 The Contractor shall include in the DQO Form the project's requirements for analytical methods, measurement quality objectives, reporting levels and method detection limits.

10.1(a)5 The Contractor shall include in the DQO Form a detailed data management workflow, delivery schedule, and applicable data review and quality assurance standard operating procedures to be used.

10.1(a)6 The Contractor shall include in the DQO Form a detailed data analysis plan that includes a regression between the continuous turbidity and discrete SSC samples to allow for computation of a continuous suspended sediment concentration and loads.

10.1(a)7 The Contractor shall complete the DQO Form for review and approval by the Water Boards Project Manager and Water Boards QA Officer prior to commencing Task 10.1.b.

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- 10.1(b) Upon approval of the completed DQO Form by Water Boards Project Manager and Water Boards QA Officer, the Contractor shall initiate the monitoring project as outlined in the DQO Form.**
- 10.1(b)1 The Contractor shall install and maintain monitoring equipment for continuous measurement of turbidity and automated turbidity-threshold sampling of suspended sediment concentration (SSC) in Pescadero Creek at the USGS gauging station for two (2) years. The Contractor shall perform site construction, installation of equipment, solar panels and data logging equipment. The contractor shall uninstall and deconstruct the monitoring site equipment at the end of the 2-year effort.**
- 10.1(b)2 The Contractor shall collect the stormwater samples that will be used to help develop turbidity-SSC regression.**
- 10.1(b)3 The Contractor shall submit all electronic raw data to the to the Water Boards Project Lead within thirty (30) business days of downloading it from the equipment, or receiving it from the laboratory.**
- 10.1(c) Upon completion of Task 10.1.b, the Contractor shall develop a brief technical report summarizing the data and findings of the study, and any limitations encountered.**
- 10.1(c)1 The Contractor shall submit the draft technical report for review and feedback to the Water Boards Project Lead.**
- 10.1(c)2 Upon receiving feedback, the Contractor shall incorporate feedback and submit the final technical report for approval by the Water Boards Project Lead.**
- 10.1(c)3 The Contractor shall submit all electronic finalized reports to the Water Boards office in Oakland.**
- Task 10.2: Continuous Turbidity/Suspended Sediment Monitoring and Storm Sampling in Butano Creek (Year 1 and 2).**
- 10.2(a) The Contractor shall complete a Data Quality Objectives Write-Up Form (DQO Form) for review and approval by the Water Boards Project Manager and Water Boards QA Officer. The DQO Form shall have the following items completed and appropriate attachments uploaded as outlined below:**
- 10.2(a)1 The Contractor shall include in the DQO Form a turbidity threshold sampling strategy within the Butano Creek watershed, in which suspended sediment samples are collected by an automated sampler as thresholds in creek turbidity measurements are crossed. The sampling strategy shall ensure that samples are collected across the range of turbidity encountered at the site during the sampling period. The strategy shall include the locations of monitoring sites, schedule and frequency of samples.**

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- 10.2(a)2** The Contractor shall include in the DQO Form a list of the equipment to be used for the study. The list shall include details on the location, owners, equipment specifications, maintenance schedule, and standard operating procedures.
- 10.2(a)3** The Contractor shall include in the DQO Form the Standard Operating Procedures for sample collection and handling.
- 10.2(a)4** The Contractor shall include in the DQO Form the project's requirements for analytical methods, measurement quality objectives, reporting levels and method detection limits.
- 10.2(a)5** The Contractor shall include in the DQO Form a brief Data Management Plan that includes data management workflow, delivery schedule, and applicable data review and quality assurance standard operating procedures to be used.
- 10.2(a)6** The Contractor shall include in the DQO Form a detailed Data Analysis Plan that includes a regression between the continuous turbidity and discrete SSC samples to allow for computation of a continuous suspended sediment concentration and loads.
- 10.2(a)7** The Contractor shall complete the DQO Form for review and approval by the Water Boards Project Manager and Water Boards QA Officer prior to commencing Task 10.2(b)..
- 10.2(b)** Upon approval of the completed DQO Form by Water Boards Project Manager and Water Boards QA Officer, the Contractor shall initiate the monitoring project as outlined in the DQO Form.
- 10.2(b)1** The Contractor shall install and maintain monitoring equipment for continuous measurement of turbidity and automated periodic sampling during storms of suspended sediment concentration (SSC) in Butano Creek for two (2) years. The Contractor shall perform site construction, installation of equipment, solar panels and data logging equipment. The contractor shall uninstall and deconstruct the monitoring site equipment at the end of the 2-year effort.
- 10.2(b)2** The Contractor shall collect the stormwater samples that will be used to help develop turbidity-SSC regression.
- 10.2(b)3** The Contractor shall submit all electronic raw data to the to the Water Boards Project Lead within thirty (30) business days of downloading it from the equipment, or receiving it from the laboratory.
- 10.2(c)** Upon completion of Task 10.2.b, the Contractor shall develop a brief technical report summarizing the data and findings of the study, and any limitations encountered.

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- 10.2(c)1** **The Contractor shall submit the draft technical report for review and feedback to the Water Boards Project Lead.**
- 10.2(c)2** **Upon receiving feedback, the Contractor shall incorporate feedback and submit the final technical report for approval by the Water Boards Project Lead.**
- 10.2(c)3** **The Contractor shall submit all finalized to the Water Boards office in Oakland.**
- Task 10.3:** **LWD Loading Survey Protocol Development, and Training of Resource Conservation District (RCD) and Water Boards Staff (Year 1 and 2).**
- 10.3(a)** **The Contractor shall lead the development of a field protocol for large woody debris (LWD) loading into Butano and Pescadero Creeks. Protocol development will be completed in partnership with the Water Boards, the San Mateo Resource Conservation District (RCD), and regional scientists who have experience conducting LWD loading surveys in similar watersheds.**
- 10.3(a)1** **The Contractor shall work closely with the San Mateo RCD to review existing LWD loading protocols and potentially have protocol ideas vetted by selected regional scientists.**
- 10.3(a)2** **The Contractor will work closely with the San Mateo RCD to develop an initial protocol that will be provided to the Water Boards Project Lead and potentially selected regional scientists for review.**
- 10.3(a)3** **The Contractor shall incorporate the feedback and submit the finalized protocol to the Water Boards Project Lead for approval prior to beginning task.**
- 10.3(b)** **Following approval of the protocol document in Task 10.3.a, the Contractor shall host and lead a two-day field training on how to use the protocol for Water Boards staff, San Mateo RCD staff, and any other local partners who will be involved in conducting LWD surveys. The training shall, if possible, include sites in the Butano and Pescadero Creek watersheds.**
- Task 10.4:** **Low-flow monitoring in Pescadero Creek (Year 1 and 2)**
- 10.4(a)** **The Contractor shall complete a Data Quality Objectives Write-Up Form (DQO Form) for review and approval by the Water Boards Project Manager and Water Boards QA Officer. The DQO Form shall have the following items completed and appropriate attachments uploaded as outlined below:**
- 10.4(a)1** **The Contractor shall include in the DQO Form a two-year low-flow monitoring strategy for Pescadero Creek at a different location than those identified in Task 10.1. The strategy shall include site reconnaissance used to select the site, applicable permitting, the locations of the monitoring site, schedule and frequency of monitoring.**

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- 10.4(a)2** The Contractor shall include in the DQO Form a list of the equipment to be used for the study. The list shall include details on the location, owners, equipment specifications, maintenance schedule, and standard operating procedures.
- 10.4(a)3** The Contractor shall include in the DQO Form a brief Data Management Plan that includes data management workflow, delivery schedule, and applicable data review and quality assurance standard operating procedures to be used.
- 10.4(a)4** The Contractor shall include in the DQO Form a detailed Data Analysis Plan that includes manual low-flow velocity measurement and discharge rating curve development.
- 10.4(a)5** The Contractor shall complete the DQO Form for review and approval by the Water Boards Project Manager and Water Boards QA Officer prior to commencing Task 10.4.b.
- 10.4(b)** Upon approval of the completed DQO Form by Water Boards Project Manager and Water Boards QA Officer, the Contractor shall initiate the monitoring project as outlined in the DQO Form.
- 10.4(b)1** The Contractor shall install and maintain monitoring equipment for the two-year low-flow monitoring for Pescadero Creek for two (2) years. The Contractor shall perform site construction, installation of equipment, solar panels and data logging equipment. The contractor shall uninstall and deconstruct the monitoring site equipment at the end of the 2-year effort.
- 10.4(b)2** The Contractor shall submit all electronic raw data to the to the Water Boards office in Oakland within thirty (30) business days of downloading it from the equipment, or receiving it from the laboratory.
- 10.4(c)** Upon completion of Task 10.2.b, the Contractor shall develop a brief technical report summarizing the data and findings of the study, and any limitations encountered.
- 10.4(c)1** The Contractor shall submit the draft technical report for review and feedback to the Water Boards Project Lead.
- 10.4(c)2** Upon receiving feedback, the Contractor shall incorporate feedback and submit the final technical report for approval by the Water Boards Project Lead.
- 10.4(c)3** The Contractor shall submit all finalized reports to the Water Boards office in Oakland.

Task 10 Summary of Deliverables:

- 10.1(a)** **Data Quality Objectives Write-Up Form (DQO Form) - Pescadero Creek**

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<u>10.1(a)1</u>	<u>DQO - Sampling Plan - Pescadero Creek</u>
<u>10.1(a)2</u>	<u>DQO - Equipment List - Pescadero Creek</u>
<u>10.1(a)3</u>	<u>DQO - Sample Collection Standard Operating Procedures - Pescadero Creek</u>
<u>10.1(a)4</u>	<u>DQO- Project MQOs, methods, and Analytes - Pescadero Creek</u>
<u>10.1(a)5</u>	<u>DQO – Data Management Plan - Pescadero Creek</u>
<u>10.1(a)6</u>	<u>DQO – Data Analysis Plan - Pescadero Creek</u>
<u>10.1(a)7</u>	<u>DQO Form – Pescadero Creek</u>
<u>10.1(b)3</u>	<u>Electronic raw data submission - Pescadero Creek</u>
<u>10.1(c)1</u>	<u>Draft of Technical Report - Pescadero Creek</u>
<u>10.1(c)3</u>	<u>Final Technical Report submitted electronically - Pescadero Creek</u>
<u>10.2(a)</u>	<u>Data Quality Objectives Write-Up Form (DQO Form) - Butano Creek</u>
<u>10.2(a)1</u>	<u>DQO - Sampling Plan - Butano Creek</u>
<u>10.2(a)2</u>	<u>DQO - Equipment List - Butano Creek</u>
<u>10.2(a)3</u>	<u>DQO - Sample Collection Standard Operating Procedures - Butano Creek</u>
<u>10.2(a)4</u>	<u>DQO- Project MQOs, methods, and Analytes - Butano Creek</u>
<u>10.2(a)5</u>	<u>DQO – Data Management Plan - Butano Creek</u>
<u>10.2(a)6</u>	<u>DQO – Data Analysis Plan - Butano Creek</u>
<u>10.2(b)3</u>	<u>Electronic raw data submission - Butano Creek</u>
<u>10.2(c)1</u>	<u>Draft of Technical Report - Butano Creek</u>
<u>10.2(c)3</u>	<u>Final Technical Report submitted electronically - Butano Creek</u>
<u>10.3(a)1</u>	<u>Draft LWD loading protocol</u>
<u>10.3(a)2</u>	<u>Final LWD loading protocol</u>
<u>10.3(b)</u>	<u>2-day field training for using the protocol</u>
<u>10.4(a)</u>	<u>Data Quality Objectives Write-Up Form (DQO Form) - Low-flow Pescadero Creek</u>
<u>10.4(a)1</u>	<u>DQO - Sampling Plan - Low-flow Pescadero Creek</u>
<u>10.4(a)2</u>	<u>DQO - Equipment List - Low-flow Pescadero Creek</u>
<u>10.4(a)3</u>	<u>DQO - Data Management Plan - Low-flow Pescadero Creek</u>
<u>10.4(a)4</u>	<u>DQO - Data Analysis Plan - Low-flow Pescadero Creek</u>
<u>10.4(b)2</u>	<u>Electronic raw data submission - Low-flow Pescadero Creek</u>
<u>10.4(c)1</u>	<u>Draft Technical Report - Low-flow Pescadero Creek</u>
<u>10.4(c)3</u>	<u>Final Technical Report submitted electronically- Low-flow Pescadero Creek</u>

Task 11: Carquinez Strait Subsistence Fisher Consumption Survey (Region 2 - SWAMP)

Mercury and PCB concentrations in San Francisco Bay pose a threat to human consumers of Bay-caught fish. Water quality objectives and evaluation guidelines for these contaminants have been developed based on fish consumption rates for the sport fishing population about 20 years ago. The San Francisco Bay Regional Water Quality Control Board (SF Regional Water Board) would like to obtain updated and expanded information on fish consumption to assess whether these objectives and thresholds are protective of subsistence fishers. In this task a pilot study will be conducted to characterize consumption of Bay-caught fish by subsistence fishers in

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the Carquinez Strait region. Data to be collected will include number of servings per week for fisher and family (especially pregnant women and children), species consumed, and size of fish consumed. The study will also identify key locations for measuring contaminants in fish in future monitoring to characterize exposure of Carquinez Strait fishers.

Task 11.1 Plan and Implement the Study

- 11.1.a The Contractor shall design the study with guidance from Water Boards staff and one or more technical experts. The Contractor shall design a sampling survey plan and provide it to the San Francisco Bay Regional Water Board (SF Regional Water Board) prior to starting surveys. The plan will be included as an appendix in the final report. The survey study design will include key elements such as timing, target locations, and the target number of surveys to provide a robust characterization.
- 11.1.b The Contractor shall develop a survey questionnaire with input from the SF Regional Water Board and one or more technical experts. The survey will be adapted from the previous San Francisco Bay consumption study and other more recent surveys. The questionnaire will also be included as an appendix in the final report.
- 11.1.c The Contractor shall implement the survey following the study design. Data sheets from surveys will be retained, compiled, and provided electronically to the SF Regional Water Board by the Contractor.
- 11.1.d The Contractor shall compile the raw data into an Excel format or other similar electronic format.
- 11.1.e The Contractor shall produce a report documenting the background for the study, methods, and a quantitative analysis and interpretation of the results. A draft report will be distributed electronically for review by the Water Boards and other experts. The comments will be reviewed, and the report will be revised as necessary in response to review comments and finalized.
- 11.1.f The final report shall be in compliance with AB 434 and the Web Content Accessibility Guidelines. Once finalized, the final report shall be converted to an Americans with Disabilities Act (ADA) compliant portable document format (.pdf) that can be posted on the Water Boards' website.
- 11.1.g The Contractor shall create a PowerPoint presentation and electronically share results of the study at a public outreach meeting. The Contractor shall provide all deliverables to the SF Regional Water Board as they are completed.

Task 11 Summary Deliverables:

- 11.1a Survey plan
- 11.1b Survey questionnaire

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- 11.1c Compilation of raw data sheets
- 11.1d Compiled data in Excel (or similar format)
- 11.1e Draft report
- 11.1f Final report
- 11.1g A PowerPoint summary in a public outreach meeting

Task 12: Building Capacity for a Wetland Regional Monitoring Program (Region 9)

Through the San Diego Regional Water Quality Control Board, the Water Boards seeks to develop a Wetlands Regional Monitoring Program (WRMP) to, among other objectives, assess the collective effectiveness of permits to protect and restore wetlands, as defined by the State Water Board. In this regard, the Water Boards wishes to utilize and build upon the relevant past and present wetland monitoring efforts in the region and beyond. One current effort that is especially relevant to the Water Boards WRMP initiative is the [Coastal Wetlands, Beaches and Watersheds Inventory](#) that is being led by the San Francisco Estuary Institute and Aquatic Science Center (SFEI-ASC) on behalf of the Ocean Protection Council (OPC). This OPC project has three (3) complimentary main tasks.

- Update the [California Aquatic Resource Inventory \(CARI\)](#) for all HUC 8 watersheds draining directly to the California coast. CARI is a statewide basemap of surface waters and related habitats based on the best available regional and local digital maps.
- Create a public online dashboard that summarizes the content of CARI for the coastal watersheds.
- Establish a statewide “Level 1 Mapping Committee” (or “L1 Committee”) of the CA Wetland Monitoring Workgroup (CWMW) of the CA Water Quality Monitoring Council (WQMC) to advise and review mapping of state surface waters and related habitats. This L1 Committee is so named based on the 3-Level construct for state and tribal wetland programs provided by the USEPA. The 3-Level construct is described in detail as part of the CA Wetland and Riparian Area Monitoring Plan ([WRAMP](#)).

The Water Boards understands the value of these three (3) main tasks of the OPC project and is especially interested in building on the CARI update as a basemap for the Water Boards WRMP. The Water Boards recognizes that a base map of the current distribution, abundance, and diversity of wetlands and other surface waters is foundational to a successful WRMP.

Task 12.1: Confirm and validate OPC’s Coastal Mapping Inventory

The Ocean Protection Council (OPC) and Aquatic Science Center (ASC) are mapping the wetlands, beaches and related habitats of California’s coastal watersheds, to help implement the [OPC’s 2020-2025 Strategic Plan](#) and the [California Wetland Program Plan](#). The objectives of the inventory are to map the abundance, distribution, and diversity of wetlands and related habitats; support coordinated climate adaptation by coastal communities; and create community capacity to update the inventory as needed. The mapping is scheduled to be completed in the Spring 2022 and includes all the watersheds in the San Diego Regional Water Quality Control Board jurisdiction. More information on the OPC project can be found in this [fact sheet](#). The objective of this task is to confirm OPC’s coastal mapping is adequately correct in coverage and accuracy for use in San Diego Regional Water Quality Control Board’s Regional Wetland Monitoring Program.

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Task 12.1(a) Ground-truth the OPC map to determine its suitability for use in a Regional Wetland Monitoring Program

The Contractor shall help San Diego Regional Water Quality Control Board staff to conduct ground-truthing to review the accuracy of, and make corrections to, the OPC map using existing resource mapping conducted independent of the OPC mapping. QA/QC of the map will be performed by the Contractor in coordination with San Diego Regional Water Quality Control Board staff using the online California Aquatic Resource Inventory (CARI) Editor tool (www.ecoatlas.org/about/#cari-editor). San Diego Regional Water Quality Control Board staff will assist the Contractor with procurement of delineation maps for various wetland types, and the Contractor shall conduct mapping validation on 10 field days. The Contractor shall provide a technical summary report of field sites visited during the (10) ten field days. The summary shall include site location, field time per site, and if edits were identified as needed for a site.

Task 12.1(b) Incorporate edits and resolve mapping conflicts:

The Contractor shall work with San Diego Regional Water Quality Control Board to resolve any mapping conflicts and incorporate the edits received in the ground-truthing exercise into the CARI map layer. The Contractor will track and provide written documentation describing how each edit received was addressed.

Task 12.2: Analysis of the OPC mapping on the San Diego Regional Water Quality Control Board scale

The production and validation of the OPC map will allow for the assessment of Level 1 wetland metrics across the State of California. However, to meet the public reporting and future monitoring needs of the San Diego Regional Water Board, the OPC map will need to be analyzed at the San Diego Regional Water Quality Control Board scale.

Task 12.2(a) Analysis of OPC mapping for San Diego Regional Water Quality Control Board

The Contractor shall conduct an analysis of the OPC mapping on the San Diego Regional Board scale. This task includes identification of wetland types and extent within the San Diego Region, and presentation of this information in a technical report. Analysis shall be consistent with current evaluation methods conducted as Landscape Profiles on EcoAtlas. The technical report shall include written documentation and guidance on the methods used for conducting the analysis so it can be repeated by the San Diego Regional Water Board in the future as maps are updated.

Task 12.3: Provide Project Tracker Overview

[Project Tracker](#) is a data entry tool used by 3rd parties for uploading and editing information on wetland restoration, mitigation, and habitat conservation projects throughout California. Once projects are approved for public display by regional managers, they can be viewed and downloaded along with other projects and data layers on [EcoAtlas](#). An overview of project tracker and data input/output will allow San Diego

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Regional Water Quality Control Board staff to improve existing wetland mapping for implementation of a regional wetland monitoring program.

Task 12.3 (a) Conduct Project Tracker Overview for San Diego Regional Water Quality Control Board staff

The Contractor shall provide an overview of Project Tracker and how it is used by external regional managers to upload past and incoming projects. The half-day presentation will include an overview on how 3rd parties enter and manage project information in Project Tracker. This includes adding new codes to the database to assist with the upload of project information and how modifications to the guidance documentation is conducted.

Task 12 Summary Deliverables:

12.1(a) Ground-truthing Sites & Technical Summary Report

12.1(b) Summary list of map edits and accuracy & Revised CARI map layer

12.2(a) Technical Report on Wetland Types and Extent in the San Diego Region

12.3(a) Agendas and meeting materials (provided electronically in advance)

Task 13: Visual Plumes Model (Region 5)

The Visual Plumes model is used to simulate single and merging submerged plumes in arbitrarily stratified ambient flow and buoyant surface water discharges. This data model is used to inform regulatory decisions and offers a key service to the Water Boards and the public. However, the Visual Plumes program, in its current form, only functions under legacy versions of Microsoft Windows and the software code itself, written in Delphi, is no longer in common use. The Water Boards currently does not have experience with the underlying model programming or calculations to utilize or adapt the model in its current form.

At request of the Water Boards Project Leads the Contractor shall translate the existing model code into an open-source programming language, fully document the model, test the functionality in the new language, and upload all products to the Water Boards GitHub site at site (<https://github.com/CAWaterBoardDataCenter>).

The goal of this project to transform the current scientific knowledge of the Visual Plumes Model into a publicly accessible format that will allow the Water Boards and the public to utilize the data model freely.

Task 13.1 Historical Model Code Documentation.

13.1(a) The Contractor shall collaborate with external volunteers¹ to transfer knowledge to the Contractor. The Contractor shall fully document the current Model functionality, calculations, and code beyond the incidental comments currently available.

¹ External Volunteers are Walter Frick and Phillip Roberts. These individuals are volunteers for the Contractor. These individuals are not employees of the Water Boards or volunteers for the Water Boards, and are not compensated under this Contract.

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13.1(b) The Contractor shall obtain and submit to the Water Boards GitHub the historical Delphi-based code narrative as an artifact for future reference.

Task 13.2 Historical Model Code

13.2(a) The Contractor shall obtain and submit to the Water Boards GitHub the historical Delphi-based code/scripts as an artifact for future reference

13.2(b) The Contractor shall adapt and update the historical scripts to work within the translational coding platform.

Task 13.3 Open Source Translation of the Historical Code

13.3(a) The Contractor Shall translate the historical code into a fully open source programming language or combination thereof. The Contractor shall translate the calculations and functions of the historical Model from their original programming language in Delphi to their equivalent in R, Python, Rust, C++, C#, or a combination thereof working sequentially through the modules determined in Task 13.1.

13.3(b) The contractor shall conduct thorough testing of the model in the new open-source programming language and compare its function to the original model. The Contractor shall make any necessary adjustments to the code and calculations needed to ensure a successful translation and optimal efficiency. The Contractor shall provide to the Water Boards Project Leads a draft side-by-side comparison.

13.3(c) The Contractor shall provide to the Water Boards Project Leads, for approval, a final side-by-side comparison of at least two (2) data sets and decisions processed by the original model and newly translated models as demonstration of the successful translation. The Contractor shall obtain Water Boards Project Leads approval of the final code before submission of any of the remaining deliverables.

13.3(c) The Contractor shall upload the approved comparative results to the Water Boards GitHub site.

13.3(d) The Contractor shall upload the final code of the approved translated model to the Water Boards GitHub site (<https://github.com/CAWaterBoardDataCenter>).

13.3(e) The Contractor shall develop full documentation of the code and calculations under the new programming language. This documentation shall be provided to the Water Boards Git Hub site (<https://github.com/CAWaterBoardDataCenter>).

13.3(f) The Contractor shall hold meetings throughout the project with the Water Boards Project Leads to discuss interim mockups for user facing features to seek review and input by the Water Boards Project Leads.

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13.3(g) The Contractor shall develop and submit a draft, for review and approval, detailed instructions on how to utilize the model including: data intake format/template for calculations, recommended data quality objectives for intake data for optimal model calculation performance, definitions of any known calculation or measurement error and other instructional support materials. The Contractor shall provide any necessary edits to the instructions based on feedback by the Water Boards Project Leads.

13.3(h) Upon approval of Task 13.3.g, the Contractor shall upload the final instructions to the Water Boards Git Hub site (<https://github.com/CAWaterBoardDataCenter>).

Task 13 Summary Deliverables:

13.1(b) Historical Documentation

13.2(a) Historical Scripts

13.3(b) Draft Side-by-Side Comparison

13.3(c) Final Side-by Side Comparison

13.3(d) Open Source Code of Final Model

13.3(e) Final Model Documentation

13.3(f) Meetings

13.3(g) Draft Model Instructions

13.3(h) Final Model Instructions

4. AGREEMENT PROGRESS REPORTS:

- 9 Not later than October 10, 2020 and quarterly thereafter, during the life of this Agreement, the Contractor shall provide a complete progress report inclusive of all the projects undertaken under this Agreement to the Water Boards Contract Manager. The progress report shall describe activities undertaken, accomplishment of milestones, and any problems encountered in the performance of the work under this Agreement, and delivery of intermediate products, if any.
- 10 The Contractor shall submit to the Water Boards Contract Manager for approval the reports containing the results of the work performed in accordance with the Task and Deliverable Schedule Timeline of this Exhibit.
- 11 Not later than September 30, 2023~~4~~, the Contractor shall submit to the Water Boards Contract Manager a copy of a draft report describing the work performed pursuant to this Exhibit for review and comment.
- 12 Within four (**4**) weeks of receipt of the draft report, the Water Boards Contract Manager will submit final comments to the Contractor.
- 13 Not later than December 31, 2023~~4~~, the Contractor shall submit to the Water Boards Contract Manager for approval one reproducible master of the final report containing the collective results of all the work performed under this Agreement, addressing the comments submitted to the Contractor by the Water Boards Contract Manager.
- 14 The report shall not be considered final until reviewed and approved by the Water Boards Contract Manager.

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Agreement Summary Deliverables:
 Quarterly Progress Reports
 Draft Report
 Final Report

5. TASK AND DELIVERABLE SCHEDULE TIMELINE

Should the Contractor require more time to complete a deliverable, an individual deliverable extension request must be submitted to the Water Boards Contract Manager using the Deliverable Extension Request form, no later than 2 business days prior to the deliverable due date. The Contractor shall receive an approval or denial email for each deliverable extension submitted. All deliverable extensions dates will be tracked using the Deliverable Extension Request form and incorporated, if possible, in future contract amendments.

Task 1: Bioaccumulation Monitoring Program Implementation (SWRCB-SWAMP)			
Task	Task #	Deliverables	Due Date
1	1.1	BOG STEW Meeting Notes/Summary	15 business days from the conclusion of the meeting
1	1.2	Quality Assurance Project Plan and Monitoring Plan	June 30 th of each monitoring year
1	1.3	Kickoff Meeting Notes/Summary	15 business days from the conclusion of the meeting
1	1.4	Program Planning Budget	Upon Request
1	1.5	Data reports, technical reports, and fact sheets	Upon Request
Task 2: Remote Sensing to Monitor Cyanobacterial Harmful Algal Blooms (HABs) (SWRCB-SWAMP)			
Task	Task #	Deliverables	Due Date
2	2.1	Code and data processing scripts and quarterly updates to swamp (due 6 months from Agreement start date)	6 months from Agreement start date and quarterly thereafter, as changes occur October 1, 2021
2	2.2	Application Programming Interface (API)	January 31, 2021 October 1, 2021
2	2.3	Data and information requests	Upon Request
2	2.4	Tool feature and data functionality additions	Ongoing in consultation with SWAMP Program Manager
2	2.6(a)	Draft Workplan	60 days from Agreement start date October 1, 2021
2	2.6(b)	Final Workplan	Within 6 weeks of receiving draft comments from the SWAMP Program Manager
2	2.7	Quarterly status and coordination meeting summaries	15 business days from the conclusion of quarterly status meeting

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Task 3: Bioaccumulation Data Visualization (SWRCB-SWAMP)			
Task	Task #	Deliverables	Due Date
3	3.1	Written documentation for Safe to Eat Portal, including data processing steps, application and source code and data processing scripts	6 months from Agreement start date September 1, 2021
3	3.2	Training and technical support meeting summary notes	10 business days from the conclusion of the meeting
Task 4: Water Boards Special Project Support (SWRCB)			
Task	Task #	Deliverables	Due Date
4	4.1	Summary report of activities completed per request/event	15 business days from event or request
Task 5: Community Outreach and Support (SWRCB)			
Task	Task #	Deliverables	Due Date
5	5.1	Summary report of community outreach support activities including, as applicable: number of community participants supported; community engagement survey results; participant notes; meeting notes; feedback from community members, etc.	15 business days from event or request
Task 6: Water Quality Status and Trends Report and Future Monitoring Recommendations (Region 6 - DISCR)			
Task	Task #	Deliverables	Due Date
6	6.1	Summary list of compiled data	October 31, 2020 May 31, 2021
6	6.2(a)	Presentation of preliminary findings to the project workgroup	June 30, 2021 October 31, 2021
6	6.2(b)	Draft outline for the status and trends report	June 30, 2021 November 15, 2021
6	6.2(c)	Final R data analysis code (submitted as an electronic text file)	September 30, 2021 September 20, 2022
6	6.3	Workgroup meeting agendas, supporting materials, and meeting notes	Ongoing (submitted within 2 weeks after meetings)
6	6.4(a)	Draft Report	September 30, 2021 May 31, 2022
6	6.4(b)	Final Report	December 31, 2021 September 30, 2022
6	6.5	Project Progress Reports	Ongoing (not less than quarterly)
Task 7: Phase 2 Russian River R3MP (Region 1 – DISCR)			
Task	Task #	Deliverables	Due Date
7	7.1	Project Progress Reports	Ongoing, not less than quarterly

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7	7.2 (a)	Finalize TAC charge statement	One month after start of Agreement <u>February 26, 2021</u>
7	7.2 (b)	Finalize TAC membership criteria and roster	One month after start of Agreement <u>March 31, 2021</u>
7	7.3 (a)	Prioritization of monitoring questions	3 months after start of Agreement <u>December 31, 2021</u>
7	7.3 (b)	Develop master monitoring matrix	5 months after start of Agreement <u>December 31, 2021</u>
7	7.3 (c)	Develop analytical framework	5 months after start of Agreement <u>September 30, 2021</u>
7	7.4 (a)	Identify existing data and their sources	6 months after start of Agreement <u>June 30, 2022</u>
7	7.4 (b)	Identify data gaps	6 months after start of Agreement <u>June 30, 2022</u>
7	7.4 (c)	Revised master monitoring matrix	7 months after start of Agreement
7	7.5 (a)	Assembled data collection protocols and SOPs	10 (D) & 15 (F) months after start of Agreement <u>March 31, 2023</u>
7	7.5 (b)	Summary of metrics, methods, and cost per sample	12 months after start of Agreement <u>March 31, 2023</u>
7	7.5 (c)	5-year monitoring and reporting plan	18 months after start of Agreement <u>April 30, 2023</u>
7	7.6 (a)	Data management workshop summary of attendance, meeting notes, and outcomes.	12 months after start of Agreement <u>August 31, 2022</u>
7	7.6 (b)	Outline and description of data management processes to support 5-year monitoring plan	12 months after start of Agreement <u>July 31, 2023</u>
7	7.6 (c)	Update R3MP website to provide access to selected data management and analytical tools	14 months after start of Agreement <u>December 31, 2023</u>

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7	7.7	Coordinate and develop a criteria or other guidance for support services	15 months after start of Agreement <u>December 31, 2023</u>
7	7.8 (a)	Review and develop summary of monitoring cost ranges	15 months after start of Agreement <u>December 31, 2023</u>
7	7.8 (b)	Summary of identification of approximate range in program management costs	16 months after start of Agreement <u>December 31, 2023</u>
7	7.8 (c)	Summary of analysis of the approximate annual net R3MP OM cost range	18 months after start of Agreement <u>December 31, 2023</u>

Task 8: San Francisco Bay Shoreline Operational Landscape Unit (OLU) Project – (Region 2 – DISCR)

Task	Task #	Deliverables	Due Date
8	8.1 (a)	Draft revised materials for Phase <u>1.2</u> report	April 30 th , 2021
	8.1 (b)	Final revised materials for Phase <u>1.2</u> report	June 30 th , 2021
8	8.2 (a)	Meeting agenda and notes from the TAC meeting <u>Draft technical memo for creek-bayland connection opportunities and restoration guidance (Phase 1.3)</u>	Within ten (10) business days of the meeting <u>August 30, 2023</u>
	8.2 (b)	Technical transfer materials for community groups	June 30, 2021
8	8.3	Project Progress Reports Final technical memo for restoration guidance (Phase 1.3)	October 1, 2020 and quarterly thereafter <u>October 31, 2023</u>
<u>8</u>	<u>8.4 (a)</u>	<u>Meeting agenda and notes from the TAC meeting (Phase 1.2 and 1.3)</u>	<u>Within ten (10) business days of the meeting</u>
<u>8</u>	<u>8.4 (b)</u>	<u>Technical transfer materials for community groups (Phase 1.2)</u>	<u>March 31, 2022</u>
<u>8</u>	<u>8.5</u>	<u>Project Progress Reports (Phase 1.2 and 1.3)</u>	<u>October 1, 2020 and quarterly thereafter</u>

Task 9: Lower Klamath National Wildlife Refuge (LKNWR) – Analysis of Treatment Wetland Potential

Task	Task #	Deliverable	Due Date
9	9.1 (a)	Coordination call agendas, notes	<i>Agenda</i> : five business days prior to coordination call

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			<i>Notes: 15 business days after coordination call</i>
9	9.1 (b)	List of data gaps to be included in Task 9.2 Monitoring Plan	November 1, 2020 <u>May 31, 2021</u>
9	9.2 (a)	Draft Monitoring Plan	January 1, 2021 <u>July 31, 2021</u>
9	9.2 (b)	Final Monitoring Plan	February 1, 2021 <u>October 31, 2021</u>
9	9.2 (c)	Coordination call agendas, notes	<i>Agenda: Five business days prior to coordination call</i> <i>Notes: 15 business days after coordination call</i>
9	9.3 (a)	Field and Analytical Monitoring data submitted to SWAMP IQ	Field Data: Within 20 business days of sample collection. Analytical Data: Within 60 business days of analysis.
9	9.3 (b)	Coordination call agendas, notes	<i>Agenda: Five business days prior to coordination call</i> <i>Notes: 15 business days after coordination call</i>
9	9.4 (a)	Treatment model results 9.5	December 31, 2022 <u>August 31, 2023</u>
9	9.4 (b)	Coordination call agendas, notes	<i>Agenda: Five business days prior to coordination call</i> <i>Notes: 15 business days after coordination call</i>
9	9.5 (a)	Draft Report	March 1, 2023 <u>September 15, 2023</u>
9	9.5 (b)	Final Report and electronic data set	June 1, 2023 <u>December 31, 2023</u>
9	9.5 (c)	Coordination call agendas, notes	<i>Agenda: Five business days prior to coordination call</i> <i>Notes: 15 business days after coordination call</i>
<u>Task 10 Pescadero-Butano Watershed Sediment Monitoring and Large Wood Debris (LWD) Surveys (Region 2 – DISCR)</u>			
<u>Task</u>	<u>Task #</u>	<u>Deliverables</u>	<u>Due Date</u>

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<u>10</u>	<u>10.1(a)</u>	<u>Data Quality Objectives Write-Up Form (DQO Form) - Pescadero Creek</u>	<u>Within 90 days of executing contract amendment</u>
<u>10</u>	<u>10.1(a)1</u>	<u>DQO - Sampling Plan - Pescadero Creek</u>	<u>Same as 10.1(a)</u>
<u>10</u>	<u>10.1(a)2</u>	<u>DQO - Equipment List - Pescadero Creek</u>	<u>Same as 10.1(a)</u>
<u>10</u>	<u>10.1(a)3</u>	<u>DQO - Sample Collection Standard Operating Procedures - Pescadero Creek</u>	<u>Same as 10.1(a)</u>
<u>10</u>	<u>10.1(a)4</u>	<u>DQO- Project MQOs, methods, and Analytes - Pescadero Creek</u>	<u>Same as 10.1(a)</u>
<u>10</u>	<u>10.1(a)5</u>	<u>DQO – Data Management Plan - Pescadero Creek</u>	<u>Same -as 10.1(a)</u>
<u>10</u>	<u>10.1(a)6</u>	<u>DQO – Data Analysis Plan - Pescadero Creek</u>	<u>Same as 10.1(a)</u>
<u>10</u>	<u>10.1(a)7</u>	<u>DQO Form – Pescadero Creek</u>	<u>Same as 10.1(a)</u>
<u>10</u>	<u>10.1(b)3</u>	<u>Electronic raw data submission - Pescadero Creek</u>	<u>Same as 10.1(a)</u>
<u>10</u>	<u>10.1(c)1</u>	<u>Draft of Technical Report - Pescadero Creek</u>	<u>Within 6 months of completing Year 2 data collection</u>
<u>10</u>	<u>10.1(c)3</u>	<u>Final Technical Report submitted electronically - Pescadero Creek</u>	<u>30 business days after receiving Water Board comments</u>
<u>10</u>	<u>10.2(a)</u>	<u>Data Quality Objectives Write-Up Form (DQO Form) - Butano Creek</u>	<u>Within 90 days of executing contract amendment</u>
<u>10</u>	<u>10.2(a)1</u>	<u>DQO - Sampling Plan - Butano Creek</u>	<u>Same as 10.2(a)</u>
<u>10</u>	<u>10.2(a)2</u>	<u>DQO - Equipment List - Butano Creek</u>	<u>Same as 10.2(a)</u>
<u>10</u>	<u>10.2(a)3</u>	<u>DQO - Sample Collection Standard Operating Procedures - Butano Creek</u>	<u>Same as 10.2(a)</u>
<u>10</u>	<u>10.2(a)4</u>	<u>DQO- Project MQOs, methods, and Analytes - Butano Creek</u>	<u>Same as 10.2(a)</u>
<u>10</u>	<u>10.2(a)5</u>	<u>DQO – Data Management Plan</u>	<u>Same as 10.2(a)</u>
<u>10</u>	<u>10.2(a)6</u>	<u>DQO – Data Analysis Plan - Butano Creek</u>	<u>Same as 10.2(a)</u>

**EXHIBIT A
 SCOPE OF WORK**

<u>10</u>	<u>10.2(b)3</u>	<u>Electronic raw data submission - Butano Creek</u>	<u>Within 30 days of downloading from equipment</u>
<u>10</u>	<u>10.2(c)1</u>	<u>Draft of Technical Report - Butano Creek</u>	<u>Within 6 months of completing Year 2 data collection</u>
<u>10</u>	<u>10.2(c)3</u>	<u>Final Technical Report submitted electronically - Butano Creek</u>	<u>30 business days after receiving Water Board comments</u>
<u>10</u>	<u>10.3(a)1</u>	<u>Draft LWD loading protocol</u>	<u>Within 8 months of contract execution</u>
<u>10</u>	<u>10.3(a)2</u>	<u>Final LWD protocol</u>	<u>30 business days after receiving Water Board comments</u>
<u>10</u>	<u>10.3(b)</u>	<u>2-day field training for using the protocol</u>	<u>Within 2 months of finalizing the protocol</u>
<u>10</u>	<u>10.4(a)</u>	<u>Data Quality Objectives Write-Up Form (DQO Form) - Low-flow Pescadero Creek</u>	<u>Within 90 days of executing contract amendment</u>
<u>10</u>	<u>10.4(a)1</u>	<u>DQO - Sampling Plan - Low-flow Pescadero Creek</u>	<u>Same as 10.4(a)</u>
<u>10</u>	<u>10.4(a)2</u>	<u>DQO - Equipment List - Low-flow Pescadero Creek</u>	<u>Same as 10.4(a)</u>
<u>10</u>	<u>10.4(a)3</u>	<u>DQO - Data Management Plan - Low-flow Pescadero Creek</u>	<u>Same as 10.4(a)</u>
<u>10</u>	<u>10.4(a)4</u>	<u>DQO - Data Analysis Plan - Low-flow Pescadero Creek</u>	<u>Same as 10.4(a)</u>
<u>10</u>	<u>10.4(b)2</u>	<u>Electronic raw data submission - Low-flow Pescadero Creek</u>	<u>Within 30 days of downloading from equipment</u>
<u>10</u>	<u>10.4(c)1</u>	<u>Draft Technical Report - Low-flow Pescadero Creek -</u>	<u>Within 6 months of completing Year 2 data collection</u>
<u>10</u>	<u>10.4(c)3</u>	<u>Final Technical Report submitted electronically - Low-flow Pescadero Creek</u>	<u>30 business days after receiving Water Board comments</u>
<u>Task 11: Carquinez Strait Subsistence Fisher Consumption Survey (Region 2 - SWAMP)</u>			
<u>11</u>	<u>11.1(a)</u>	<u>Survey plan</u>	<u>Two months after start of Amendment</u>
<u>11</u>	<u>11.1(b)</u>	<u>Survey questionnaire</u>	<u>Two months after start of Amendment</u>
<u>11</u>	<u>11.1(c)</u>	<u>Compilation of raw data sheets</u>	<u>Eight months after start of Amendment</u>

**EXHIBIT A
 SCOPE OF WORK**

<u>11</u>	<u>11.1(d)</u>	<u>Summary of data in Excel</u>	<u>Eight months after start of Amendment</u>
<u>11</u>	<u>11.1(e)</u>	<u>Draft report</u>	<u>Eight months after start of Amendment</u>
<u>11</u>	<u>11.1(f)</u>	<u>Final report</u>	<u>Nine months after start of Amendment</u>
<u>11</u>	<u>11.1(g)</u>	<u>PowerPoint summary presented in a public outreach meeting</u>	<u>Nine months after start of Amendment</u>
<u>Task 12: Building Capacity for a Wetland Regional Monitoring Program (Region 9)</u>			
<u>Task</u>	<u>Task #</u>	<u>Deliverables</u>	<u>Due Date</u>
<u>12</u>	<u>12.1(a)</u>	<u>Ground-truthing Sites & Technical Summary Report</u>	<u>March 31, 2023</u>
<u>12</u>	<u>12.1(b)</u>	<u>Summary list of map edits and accuracy & Revised CARI map layer</u>	<u>June 30, 2023</u>
<u>12</u>	<u>12.2(a)</u>	<u>Technical Report on Wetland Types and Extent in the San Diego Region</u>	<u>June 30, 2023</u>
<u>12</u>	<u>12.3(a)</u>	<u>Agendas and meeting materials</u>	<u>June 30, 2023</u>
<u>Task 13: Visual Plumes Model (Region 5)</u>			
<u>13</u>	<u>13.1(b)</u>	<u>Historical Documentation</u>	<u>June 30, 2022</u>
<u>13</u>	<u>13.2(a)</u>	<u>Historical Scripts</u>	<u>June 30, 2022</u>
<u>13</u>	<u>13.3(b)</u>	<u>Draft Side-by-Side Comparison</u>	<u>March 31, 2023</u>
<u>13</u>	<u>13.3(c)</u>	<u>Final Side-by Side Comparison</u>	<u>June 30, 2023</u>
<u>13</u>	<u>13.3(d)</u>	<u>Open Source Code of Final Model</u>	<u>June 30, 2023</u>
<u>13</u>	<u>13.3(e)</u>	<u>Final Model Documentation</u>	<u>June 30, 2023</u>
<u>13</u>	<u>13.3(f)</u>	<u>Meetings</u>	<u>As Needed</u>
<u>13</u>	<u>13.3(g)</u>	<u>Draft Model Instructions</u>	<u>March 31, 2023</u>

**EXHIBIT A
 SCOPE OF WORK**

<u>13</u>	<u>13.3(h)</u>	<u>Final Model Instructions</u>	<u>June 30, 2023</u>
4. Agreement Progress Reports			
Quarterly Progress Reports		October 10, 2020; quarterly thereafter	
Draft Report		September 30, 2023 4	
Final Report		December 31, 2023 4	
<i>*All deliverables shall be submitted electronically</i>			

CURRICULUM VITAE

JAY A. DAVIS SENIOR SCIENTIST

San Francisco Estuary Institute/Aquatic Science Center
4911 Central Ave.
Richmond, CA 94804

EDUCATION

Ph.D. 1997	Ecology Graduate Group, University of California at Davis, Davis, CA
M.E.M. 1986	School of the Environment, Duke University, Durham, NC
B.A. 1984	Northwestern University, Evanston, IL

PROFESSIONAL POSITIONS

Senior Scientist: San Francisco Estuary Institute, Oakland, CA, 1986-1992, 1995-present

- RMP Lead Scientist 2008-present. Regional Monitoring Program management, technical design, interpretation, and reporting.
- Lead Scientist for Statewide Bioaccumulation Monitoring for California's Surface Water Ambient Monitoring Program, 2006-present
- Chair of the California Water Quality Monitoring Council's Bioaccumulation Workgroup, 2009-present.

SELECTED PUBLICATIONS

- Davis, J.A., J.R.M. Ross, S. Bezalel, L. Sim, A. Bonnema, G. Ichikawa, W.A. Heim, K. Schiff, C.A. Eagles-Smith, and J.T. Ackerman. 2016. Hg concentrations in fish from coastal waters of California and Western North America. *Science of the Total Environment* 568: 1146–1156.
- Fong, S., Louie, S., Werner, I., Davis, J. and Connon, R.E., 2016. Contaminant Effects on California Bay–Delta Species and Human Health. *San Francisco Estuary and Watershed Science* 14(4).
- Davis, J.A., R.E. Looker, D. Yee, M. Marvin-DiPasquale, J.L. Grenier, C.M. Austin, L.J. McKee, B.K. Greenfield, R. Brodberg, J.D. Blum. 2012. Reducing methylmercury accumulation in the food webs of San Francisco Bay and its local watersheds. *Environmental Research* 119: 3-26.
- Davis, J.A., B.K. Greenfield, G. Ichikawa, and M. Stephenson. 2008. Mercury in sport fish from the Sacramento–San Joaquin Delta region, California, USA. *Science of the Total Environment* 391: 66-75.
- Davis, J.A., F. Hetzel, and J.J. Oram. 2007. Polychlorinated biphenyls (PCBs) in San Francisco Bay. *Environmental Research* 105: 67-86.
- Davis, J.A. 2004. The long-term fate of PCBs in San Francisco Bay. *Environmental Toxicology and Chemistry* 23(10): 2396-2409.
- Davis, J.A., J.N. Collins, D. Yee, S. Schwarzbach, and S.N. Luoma. 2003. Issues in San Francisco Estuary tidal wetlands restoration: Potential for increased mercury accumulation in the Estuary food web. *San Francisco Estuary and Watershed Science* 1: issue 1, article 4.
- Davis, J.A., M.D. May, B.K. Greenfield, R. Fairey, C. Roberts, G. Ichikawa, M.S. Stoelting, J.S. Becker, and R.S. Tjeerdema. 2002. Contaminant concentrations in sport fish from San Francisco Bay, 1997. *Mar. Pollut. Bulletin*. 44: 1117-1129.

- Davis, J.A. 1997. Concentrations and Effects of Organochlorine Contaminants in Double-crested Cormorant Embryos from San Francisco Bay. Doctoral Dissertation, University of California, Davis, CA.
- Davis, J.A., D.M. Fry, and B.W. Wilson. 1997. Hepatic ethoxyresorufin-o-deethylase (EROD) activity and inducibility in wild populations of double-crested cormorants. *Environmental Toxicology and Chemistry* 16(7): 1441-1449.
- Davis, J.A., D.M. Fry, and B.W. Wilson. 1996. Field application of fluorescence-based catalytic assays for measuring cytochrome P450 induction in birds. Chapter 13 in: *Biomarkers for Agrochemicals and Toxic Substances (ACS Symposium Series 643)*, Blancato, J.N, R.N. Brown, C.C. Dary, and M.A. Saleh (eds.). American Chemical Society, Washington, D.C.
- Davis, J.A., A.J. Gunther, and J.M. O'Connor. 1992. Priority pollutant loads from effluent discharges to the San Francisco Estuary. *Water Environment Research* 64(2): 134-140.

SELECTED TECHNICAL REPORTS

- Davis, J.A., D. Yee, A.N. Gilbreath, and L.J. McKee. 2017. Conceptual Model to Support PCB Management and Monitoring in the Emeryville Crescent Priority Margin Unit. San Francisco Estuary Institute - Aquatic Science Center, Richmond, CA. Contribution # 812.
- Davis, J.A. and R. Sutton (eds). SFEI. 2015. The Pulse of the Bay: The State of Bay Water Quality, 2015 and 2065. SFEI Contribution #759. San Francisco Estuary Institute, Richmond, CA.
- Davis, J.A., L.J. McKee, T. Jabusch, D. Yee, and J.R.M. Ross. 2014. PCBs in San Francisco Bay: Assessment of the Current State of Knowledge and Priority Information Gaps. RMP Contribution No. 727. San Francisco Estuary Institute, Richmond, California.
- Davis, J. A., Looker, R. E., Yee, D., Marvin-DiPasquale, M., Grenier, J. L., Austin, C. M., McKee, L. J., Greenfield, B. K., Brodberg, R., and Blum, J. D. (2014). Reducing Methylmercury Accumulation in the Food Webs of San Francisco Bay and Its Local Watersheds. Contribution No. 707. San Francisco Estuary Institute, Richmond, California.
- Davis, J.A., J.R.M. Ross, S.N. Bezalel, J.A. Hunt, G. Ichikawa, A. Bonnema, W.A. Heim, D. Crane, S. Swenson, and C. Lamerdin. 2013. Contaminants in Fish from California Rivers and Streams, 2011. A Report of the Surface Water Ambient Monitoring Program (SWAMP). California State Water Resources Control Board, Sacramento, CA.
- Davis, J.A., M. Sedlak, R. Sutton, and C. Werme (eds). SFEI. 2013. The Pulse of the Bay: Contaminants of Emerging Concern. SFEI Contribution 701. San Francisco Estuary Institute, Richmond, CA.
- Davis, J.A., J.R.M. Ross, S.N. Bezalel, J.A. Hunt, A.R. Melwani, R.M. Allen, G. Ichikawa, A. Bonnema, W.A. Heim, D. Crane, S. Swenson, C. Lamerdin, M. Stephenson, and K. Schiff. 2012. Contaminants in Fish from the California Coast, 2009-2010: Summary Report on a Two-Year Screening Survey. A Report of the Surface Water Ambient Monitoring Program (SWAMP). California State Water Resources Control Board, Sacramento, CA.
- Davis, J.A., K. Schiff, A.R. Melwani, S.N. Bezalel, J.A. Hunt, R.M. Allen, G. Ichikawa, A. Bonnema, W.A. Heim, D. Crane, S. Swenson, C. Lamerdin, and M. Stephenson. 2011. Contaminants in Fish from the California Coast, 2009: Summary Report on Year One of a Two-Year Screening Survey. A Report of the Surface Water Ambient Monitoring Program (SWAMP). California State Water Resources Control Board, Sacramento, CA.
- Davis, J.A., C. Werme, and M. Sedlak (eds.). 2011. The Pulse of the Estuary: Pollutant Effects on Aquatic Life. SFEI Contribution 660. San Francisco Estuary Institute, Richmond, CA.
- Davis, J.A., A.R. Melwani, S.N. Bezalel, J.A. Hunt, G. Ichikawa, A. Bonnema, W.A. Heim, D. Crane, S. Swenson, C. Lamerdin, and M. Stephenson. 2010. Contaminants in Fish from California Lakes and Reservoirs, 2007-2008: Summary Report on Two-Year Screening Survey. A Report of the Surface Water Ambient Monitoring Program (SWAMP). California State Water Resources Control Board, Sacramento, CA.

Davis, J.A., A.R. Melwani, S.N. Bezalel, J.A. Hunt, G. Ichikawa, A. Bonnema, W.A. Heim, D. Crane, S.

Swenson, C. Lamerdin, and M. Stephenson. 2009. Contaminants in Fish from California Lakes and Reservoirs: Technical Report on Year One of a Two-Year Screening Survey. A Report of the Surface Water Ambient Monitoring Program (SWAMP). California State Water Resources Control Board, Sacramento, CA.

Davis, J.A., J.L. Grenier, A.R. Melwani, S.N. Bezalel, E.M. Letteney, E.J. Zhang, M. Odaya. 2007. Bioaccumulation of Pollutants in California Waters: A Review of Historic Data and Assessment of Impacts on Fishing and Aquatic Life. A Report of the Surface Water Ambient Monitoring Program (SWAMP). California State Water Resources Control Board, Sacramento, CA.

Davis, J.A., J.A. Hunt, B.K. Greenfield, R. Fairey, M. Sigala, D.B. Crane, K. Regalado, and A. Bonnema. 2006. Contaminant Concentrations in Fish from San Francisco Bay, 2003. SFEI Contribution #432. San Francisco Estuary Institute, Oakland, CA.

Davis, et al. 1999. 1999. Contaminant Concentrations in Fish from San Francisco Bay, 1997. San Francisco Estuary Institute, Richmond, CA.

ALISON A. WHIPPLE

EMAIL: alison@sfei.org, alison.whipple@gmail.com | PHONE: 650.387.8018

CAREER OBJECTIVE

Better balance needs for humans and the environment in a changing world through science-based water and land management.

EDUCATION

University of California, Davis. Ph.D. in Hydrologic Sciences. 6/2018.

River restoration, hydroecology, hydrologic and hydrodynamic modeling, climate change, water resources management, geomorphology

Dissertation: *Managing flow regimes and landscapes together: Hydrosatial analysis for evaluating spatiotemporal floodplain inundation patterns with restoration and climate change implications*

Stanford University, California. M.S. and B.S. in Earth Systems with Distinction. 6/2007.

Interdisciplinary environmental science and policy, hydrology, environmental engineering, ecology, land management, wetland science, environmental history, climate change

Master's Thesis: *Spatial and temporal variability of summer streamflow recessions in Mediterranean-climate tributary watersheds of the Russian River, California*

RESEARCH & PROFESSIONAL EXPERIENCE

Science Director and Senior Scientist, San Francisco Estuary Institute, Richmond, CA, 2/2022 – present.

- In addition to activities below, develop research area of hydroecology to support the reestablishment of physical processes in highly modified wetland and riverine ecosystems.
- In addition to activities below, enhance scientific integrity, continuity, and integration within the Resilient Landscapes Program, as well as cross-program collaboration.

Environmental Scientist, San Francisco Estuary Institute, Richmond, CA, 1/2019 – 2/2022.

- Conduct scientific research and analyses (spatiotemporal, GIS-based, statistical, numerical model-based) and develop planning and decision support tools to inform restoration, water, and land use planning and management in California.
- Write technical and general-audience reports and peer-reviewed manuscripts. Develop visualizations and graphics to communicate scientific concepts and results. Present at national and regional conferences and at local workshops and symposia for a wide range of audiences.
- Manage projects including developing proposals, guiding staff, and developing budgets, work programs, and timelines.
- Communicate with collaborators as well as resource managers and policy-makers to support science-based decision-making and program development.

Postdoctoral Scholar, University of California, Merced, 8/2018 – 12/2018.

- Conducted research relating to the UC Water Security and Sustainability Initiative, particularly as it relates to floodplain management for multiple benefits.
- Performed hydrosatial analysis using hydrodynamic modeling output and apply hydrological sciences methods, including hydroinformatics, climate change science, and environmental flows.
- Presented results at regional and international conferences, and write reports, scientific journal articles, and proposals.

Independent Contractor, Cloverdale, CA, 6/2018 – 12/2018.

- Applied hydrosatial analysis framework for tool development to quantify salmon habitat for Central Valley floodplain restoration projects.

Graduate Student Researcher, Center for Watershed Sciences, University of California, Davis, 9/2012 – 6/2018.

- Coursework and research in hydrologic and hydrosatial regime analysis, hydrodynamic modeling, landscape ecology and quantitative geography, restoration ecology, systems ecology, floodplain and riverine restoration, environmental flows, hydrologic and riverine ecosystem response to management and climate change.
- Presented research to local, national, and international audiences at conferences, as a guest lecturer, and for workshops. Wrote manuscripts for peer-reviewed publications. Developed successful research proposals and grant applications. Organized and co-led science workshops.
- Independently set objectives, tasks, and priorities to meet short- and long-term objectives.
- Participated in multi-disciplinary collaborations, including the Cosumnes Research Group at the UCD Center for Watershed Sciences and the Climate Change Water and Society NSF IGERT (Integrative Graduate Education and Research Traineeship).

Visiting Researcher, Fenner School of Environment and Society, Australian National University, Canberra, Australia. Australian Rivers Institute, Griffith University, Nathan, Australia, 7/2017 – 8/2017.

- Studied floodplain and water management approaches to address river restoration and ecosystem challenges in the Murray-Darling Basin.

Research Associate, San Francisco Estuary Institute, Richmond, CA, 7/2012 – 12/2014.

Associate Environmental Scientist, San Francisco Estuary Institute, Richmond, CA, 7/2010 – 7/2012.

Environmental Analyst, San Francisco Estuary Institute, Richmond, CA, 12/2007 – 7/2010.

- In all roles, performed historical ecology research to understand landscape patterns, processes, and functions, contributing to all aspects of projects (research and science synthesis, spatial and statistical analysis, graphics development, reporting, and writing manuscripts for peer reviewed publication).
- Led multi-disciplinary, collaborative, and multi-year historical ecology study of the Sacramento-San Joaquin Delta.
- Delivered presentations at national and regional conferences and at local workshops and symposia for a wide range of audiences. Participated in workshops and meetings with representatives across agencies and other organizations to discuss research implications for natural resource management and develop planning strategies.
- Managed projects including guiding staff and developing budgets, work programs, and timelines. Developed successful proposals and grant applications.

Stanford Bill Lane Center for the American West Fellow, San Francisco Estuary Institute, Richmond, CA, 9/2007 – 11/2007.

- Advanced use of mid-1800s U.S. General Land Office surveys, applied GIS-based analysis, collected and analyzed historical and contemporary data.

Independent Researcher, Stanford University, CA and University of California, Berkeley, 6/2006 – 9/2006.

- Conducted master's research project on low flow characteristics of small streams in the Russian River watershed, California, involving streamflow monitoring and GIS-based and statistical analysis.

Peer Advisor, Earth Systems, Stanford University, CA, 9/2006 – 6/2006.

- As part of advising team for over 100 students, provided guidance on course selection, degree progress, and internships. Coordinated program functions.
- Co-organizer of seminar course, California Water Policy Colloquium (Spring 2006). Designed curriculum, identified and invited outside speakers, coordinated logistics of course.

Research Assistant, University of California, Berkeley, 6/2005 – 9/2005.

- Developed and implemented interview-based independent research project on vineyard and ranching water use practices in the Russian River watershed.

Research Assistant, University of California, Berkeley, 6/2004 – 9/2004.

- Analyzed current and historical vineyard cover and reservoirs within the Russian River watershed using GIS, assisted preparation of a preliminary water budget, and analyzed fishery data.

Research Assistant, Steiner Environmental Consulting, Potter Valley, CA, 6/2003 – 9/2003.

- Performed fishery data entry and management. Assisted in salmon counts on an Eel River tributary.

JOURNAL PUBLICATIONS & BOOKS

Cloern JE, SM Safran, LS Vaughn, A Robinson, AA Whipple, KE Boyer, JZ Drexler, RJ Naiman, JL Pinckney, ER Howe, EA Canuel, JL Grenier. (2021). On the human appropriation of wetland primary production. *Science of The Total Environment*, 785: 147097. <https://doi.org/10.1016/j.scitotenv.2021.147097>

Whipple AA, JH Viers. 2019. Coupling landscapes and river flows to restore highly modified rivers. *Water Resources Research*, 55(6): 4512-4532. <https://doi.org/10.1029/2018WR022783>

Whipple AA. 2018. *Managing flow regimes and landscapes together: Hydrosatial analysis for evaluating spatiotemporal floodplain inundation patterns with restoration and climate change implications*, University of California, Davis.

Whipple AA, HE Dahlke, JH Viers. 2017. Flood regime typology for floodplain ecosystem management as applied to the unregulated Cosumnes River of California, USA. *Ecohydrology*. e1817.

Yarnell SM, GE Petts, JC Schmidt, AA Whipple, EE Beller, CN Dahm, P Goodwin, JH Viers. 2015. Functional flows in modified riverscapes: Hydrographs, habitats and opportunities. *BioScience*. 65:963-972.

Cloern JE, PL Barnard, EE Beller, JC Callaway, JL Grenier, ED Grosholz, RM Grossinger, K Hieb, JT Holligaugh, N Knowles, M Sutula, S Veloz, K Wasson, AA Whipple. 2015. Estuaries: life on the edge. In HA Mooney and ES Zavaleta (eds.) *Ecosystems of California*. University of California Press, Oakland.

Grossinger RM, RA Askevold, J Beagle, EE Beller, E Brewster, S Gardner, S Pearce, J Ruygt, M Salomon, CJ Striplen, B Stanford, AA Whipple. 2012. *Napa Valley Historical Ecology Atlas: Exploring a Hidden Landscape of Transformation and Resilience*. University of California Press, Oakland.

Whipple AA, RM Grossinger, FW Davis. 2011. Shifting baselines in a California oak savanna: Nineteenth century data to inform restoration scenarios. *Restoration Ecology*, 19(101):88-101.

WORKING PAPERS

Whipple AA, JH Viers. (in prep). Hydrosatial analysis of floodplain inundation patterns and its application to habitat quantification.

Whipple AA, JH Viers. (in prep). Responses of a restored floodplain to climate change using hydrosatial analysis.

REPORTS & OTHER PUBLICATIONS (SELECTED)

Zi T, P Kauhanen, AA Whipple, L Mckee. 2021. Green Stormwater Infrastructure Planning-level Analysis for Livermore-Amador Valley. SFEI Contribution No. 1063. San Francisco Estuary Institute, Richmond, CA.

Zi T, AA Whipple, P Kauhanen, E Spotswood, L Grenier, R Grossinger, RA Askevold. 2021. Trees and Hydrology in Urban Landscapes. SFEI Contribution No. 1034. San Francisco Estuary Institute, Richmond, CA.

Pearce S, L Mckee, AA Whipple, T Church. (2021). Towards a Coarse Sediment Strategy for the Bay Area. SFEI Contribution No. 1032. San Francisco Estuary Institute, Richmond, CA.

Valley Water and San Francisco Estuary Institute (SFEI). 2020. Coyote Creek Native Ecosystem Enhancement Tool (CCNEET). neet.ecoatlas.org

Panlasigui S, S Pearce, R Hegstad, M Quinn, AA Whipple. 2020. Wildlife Habitat and Water Quality Enhancement Opportunities at Castlewood Country Club. SFEI Contribution No. 1003. San Francisco Estuary Institute, Richmond, CA.

- Whipple AA, T Grantham, G Desanker, L Hunt, A Merrill, B Hackenjos, RA Askevold. 2019. Chinook Salmon Habitat Quantification Tool: User Guide (Version 1.0). Prepared for American Rivers. Funded by the Natural Resources Conservation Service Conservation Innovation Grant (#69-3A75-17-40), Water Foundation and Environmental Defense Fund. SFEI Publication #953. San Francisco Estuary Institute, Richmond, CA.
- Whipple AA. 2019. hydrospatial: Spatiotemporal Characterization of Floodplain Inundation and Habitat. R package version 0.0.0.9000. <https://github.com/sfei/hydrospatial>
- Mount J, G Gray, K Bork, J Cloern, F Davis, T Grantham, L Grenier, J Harder, Y Kuwayama, P Moyle, M Schwartz, A Whipple, S Yarnell. A Path Forward for California's Freshwater Ecosystems. 2019. Public Policy Institute of California.
- Whipple AA. "Making water for the environment count in an era of change: Cautionary tales from Australia", CaliforniaWaterBlog.com, 17 December 2017.
- Whipple AA. "Assessing drought and looking forward: A day of discussion hosted by PPIC", ccwas.ucdavis.edu/Blog/1/25/2015.
- Beagle J, AA Whipple, RM Grossinger. 2013. *Landscape Patterns and Processes of the McCormack-Williamson Tract and Surrounding Area: A Framework for Restoring a Resilient and Functional Landscape*. SFEI-ASC Publication #674, Richmond, CA.
- Stanford B, RM Grossinger, J Beagle, RA Askevold, RA Leidy, EE Beller, M Salomon, CJ Striplen, AA Whipple. 2013. *Alameda Creek Watershed Historical Ecology Study*. San Francisco Estuary Institute Publication #679, Richmond, CA.
- Whipple AA, RM Grossinger, D Rankin, B Stanford, RA Askevold, 2012. *Sacramento-San Joaquin Delta Historical Ecology Investigation: Exploring Pattern and Process*. Prepared for the California Department of Fish and Game and Ecosystem Restoration Program. SFEI-ASC Publication #672, San Francisco Estuary Institute, Richmond, CA. 408 pp.
- Whipple AA. 2012. "Knowing Delta's past offers new ideas forward," CaliforniaWaterBlog.com, 26 September 2012.
- Sommer L, AA Whipple, G McGhee. 2012. *Envisioning California's Delta As It Was*. Interactive Map by KQED QUEST Northern California, San Francisco Estuary Institute-Aquatic Science Center, and the Bill Lane Center for the American West. <http://science.kqed.org/quest/delta-map/>.
- Stanford B, RM Grossinger, RA Askevold, AA Whipple, R Leidy, EE Beller, M Salomon, C Striplen. 2011. *East Contra Costa County Historical Ecology Study*. Prepared for Contra Costa County and the Contra Costa Watershed Forum. SFEI Contribution #648, San Francisco Estuary Institute, Richmond, CA.
- Grossinger RM, EE Beller, M Salomon, AA Whipple, RA Askevold, C Striplen, E Brewster, and R Leidy, 2008. *South Santa Clara Valley Historical Ecology Study, including Soap Lake, the Upper Pajaro River, and Llagas, Uvas-Carnadero, and Pacheco Creeks*. Prepared for the Santa Clara Valley Water District and The Nature Conservancy. SFEI Contribution #558, San Francisco Estuary Institute, Richmond, CA.

PRESENTATIONS & SEMINARS (SELECTED)

- Pearce S, AA Whipple, K Harris, R Hegstad, C McClain. Unravelling the Mystery of Sycamores. *State of the Alameda Creek Watershed Webinar 5*. Virtual. Presentation. November 9, 2021.
- Whipple AA, G Desanker, JH Viers, T Grantham, L Hunt, A Merrill, J Katz, R Henery. Quantifying Dynamic Floodplain Habitat for Juvenile Salmon Using a Hydrospatial Approach. *Salmonid Restoration Federation Conference*. Virtual. Presentation. April 23, 2021.
- Whipple AA, S Safran, D Zeleke, E Wells, S Deverel, M Olds, J Medellín-Azuara, S Cole, A Guzman, J Rodríguez-Flores, L Grenier. Resilient Staten Island: Pilot Application for Landscape Scenario Analysis. *Bay-Delta Science Conference*. Virtual. Presentation. April 9, 2021.

- San Francisco Estuary Institute, H.T. Harvey and Associates, Zone 7 Water Agency. Sycamore Alluvial Woodland Presence and Distribution. Funded by EPA San Francisco Bay Water Quality Improvement Fund (99T69401). *Contra Costa Watershed Symposium*, Moraga, CA. Poster. December 5, 2019.
- Whipple AA. Hydrospatial Analysis for Evaluating Floodplain Response to Restoration and Climate Change. *EcoLunch, Point Blue*, Petaluma, CA. Invited Speaker. June 28, 2018.
- Whipple AA, JH Viers. Getting Specific about Effects of Restoration on Floodplain Habitat: Applying Hydrospatial Analysis to Floodplain Reconnection in the Central Valley, California. *2018 Fall Meeting, American Geophysical Union*, Washington, D.C. Poster. December 14, 2018.
- Whipple AA, JH Viers. Hydrospatial Analysis of Floodplain Restoration and Hydroclimate Change. *2018 Bay-Delta Science Conference*, Sacramento, CA. Poster. September 10-11, 2018.
- Whipple AA. The Sacramento-San Joaquin Delta: Past to Future. *ENVE140: Water Resources Management*, University of California, Merced. Guest Lecturer. April 5, 2018.
- Whipple AA, JH Viers. Hydrospatial Analysis of Inundation Patterns for a Restored Floodplain to Evaluate Potential Climate Change Impacts. *2017 Fall Meeting, American Geophysical Union*, New Orleans, LA. Poster. December 15, 2017.
- Whipple AA, JH Viers. Flood Regime and Floodplain Landscape of the Cosumnes River. *2017 Riparian Summit*, University of California, Davis. Invited Speaker. October 18, 2017.
- Whipple AA, JH Viers. Hydrospatial Analysis for Floodplain Restoration: Application for Sacramento Splittail Habitat on the Lower Cosumnes River, California. *2017 State of the Estuary Conference*, Oakland, CA. Poster. October 10, 2017.
- Whipple AA, WE Fleenor, JH Viers. 2D Hydrodynamic Modeling to Quantify Floodplain Inundation Patterns for Restoration. *California Water and Environmental Modeling Forum Annual Meeting*, Folsom, CA. Oral Presentation. March 22, 2017.
- Whipple AA. Quantifying Spatio-temporal Inundation Patterns for Floodplain Restoration on the Lower Cosumnes River, CA. *Delta Stewardship Council Meeting*, Sacramento, CA. Invited Speaker. February 23, 2017.
- Whipple AA, WE Fleenor, JH Viers. Quantifying Changes in Spatio-temporal Floodplain Inundation Patterns due to Restoration along the Lower Cosumnes River, California. EP51B-0892. *2016 Fall Meeting, American Geophysical Union*, San Francisco, CA. Poster. December 16, 2016.
- Whipple AA, WE Fleenor, JH Viers. Quantifying Spatio-temporal Inundation Patterns for Floodplain Restoration on the Lower Cosumnes River, California. *2016 Bay-Delta Science Conference*, Sacramento, CA. Poster. November 15, 2016.
- Whipple AA, WE Fleenor, JH Viers. Quantifying and Visualizing Floodplain Inundation Patterns in Space and Time. *2016 AWRA Summer Specialty Conference: GIS and Water Resources IX*, Sacramento, CA. Oral Presentation. July 12, 2016.
- Whipple AA. Exploring Land-water Connections: Mapping and Modeling to Inform Management. *Modeling and Representing Landscapes Seminar*, University of California, Davis. Guest Lecturer. March 4, 2016.
- Whipple AA. Learning from Process-Based Restoration: Biophysical Responses within the Lower Cosumnes River Floodplain. *2015 Floodplain Management Association Conference*, Rancho Mirage, CA. Oral Presentation. September 10, 2015.
- Whipple AA, LE Condon, HE Dahlke, JH Viers. Characterizing Past and Future Flood Regimes of California's Cosumnes River: A Hydroinformatic Approach. H31H-0715. *2014 Fall Meeting, American Geophysical Union*, San Francisco, CA. Poster. December 17, 2014.
- Whipple AA. Historical Ecology of the South Delta. *Independent Science Board Spring Delta Tour and Meeting*, South Delta region, CA. Invited Speaker. April 17, 2014.

- Grossinger RM, AA Whipple. Sacramento-San Joaquin Delta Historical Ecology Investigation. *Delta Stewardship Council Meeting*, West Sacramento, CA. Invited Speakers. November 15, 2012.
- Whipple AA, RM Grossinger, D Rankin. Building a Landscape Perspective for Ecosystem Planning: Lessons from Historical Ecology. *2012 Bay-Delta Science Conference*, Sacramento, CA. Co-Authored Oral Presentation. October 17, 2012.
- Sommer, L (reporter), RM Grossinger (interviewee), AA Whipple (interviewee). *California's Deadlocked Delta: Can We Bring Back What We've Lost?* KQED QUEST Northern California. May 11, 2012. *Restore the California Delta! To What, Exactly?* NPR Weekend Edition Sunday. October 7, 2012.
- Whipple AA, RM Grossinger, D Rankin, J Collins, C Wilcox. Historical Ecology of the Sacramento-San Joaquin Delta: Reconnecting Habitat Pattern and Process at the Landscape Scale. *Coastal and Estuarine Research Federation*, Daytona Beach, FL. Oral Presentation. November 8, 2011.
- Whipple AA, RM Grossinger. Habitat Characteristics that Made Delta Landscapes Unique: Perspectives for Ecosystem Restoration. *Delta Science Program Brown Bag Series*, Sacramento, CA. Invited Speaker. April 20, 2011.
- Whipple AA, RM Grossinger. Habitat Characteristics of Past Delta Landscapes: Knowledge for Improving Future Ecosystem Resilience. *45th Annual Conference of the American Fisheries Society, IEP Annual Workshop*, Folsom, CA. Oral Presentation. March 30, 2011.
- Whipple AA. Exploring Components of the Historical Landscape: From Oak Woodlands to Freshwater Tidal Wetlands. *CNPS Membership Meeting*, Orinda, CA. Invited Speaker. February 23, 2011.
- Grossinger RM (chair), AA Whipple (organizer). The Natural Delta: Pattern and Process before Modern Management. Special Session. *Bay-Delta Science Conference*, Sacramento, CA. September 27, 2010.
- Whipple AA, RM Grossinger, D Rankin, J Collins. The Historical Yolo Basin Landscape: What Parts Make the Whole? *Bay-Delta Science Conference*, Sacramento, CA. Oral Presentation. September 29, 2010.
- Grossinger RM, AA Whipple. Historical Ecology of the California Delta: Emerging Concepts of a Complex and Dynamic System. *CALFED Science Program Workshop: Ecosystem Restoration at the Landscape Scale*, Sacramento, CA. Invited Speakers. November 18, 2009.

GRANTS & AWARDS

- Best Poster Presentation, 1st Place. 2018 Bay-Delta Science Conference. Sacramento, California
- Best Poster Presentation, 1st Place. 2016 Bay-Delta Science Conference. Sacramento, California
- Delta Science Fellowship, Delta Stewardship Council Delta Science Program and California Sea Grant, 2016 (One year of graduate funding)
- Graduate Student Travel Award, 2015, University of California, Davis
- National Science Foundation (NSF) Integrative Graduate Education and Research Traineeship (IGERT) on Climate Change, Water, and Society, 2012, University of California, Davis (Two years of graduate funding)
- Herbert Kraft Fellowship, 2012, University of California, Davis (One year of graduate funding)
- Recognition and Appreciation of Exceptional Performance, 2011, San Francisco Estuary Institute
- Award for Excellence in Research, 2007, Earth Systems Program, Stanford University
- Director's Award, 2006-2007, Stanford Chamber Chorale
- Elected Phi Beta Kappa, 2005
- Undergraduate Research Grant Award, 2005, Stanford University Research Programs
- Robert C. Byrd Scholarship, 2002

PROFESSIONAL AFFILIATIONS & SERVICE

- Technical Advisory Committee member for McCormack-Williamson Tract Project (2018), Delta Floodplain Reconnection Project (2017), and Delta Landscapes Project (2012-2017), San Francisco Estuary Institute

- Rains Creek Water District Board member and current president (2015-present)
- Co-coordinator and moderator for first annual Climate Change, Water and Society workshop, “The Future of Water in California: Integrating Climate, Water and Policy” (2013).
- American Geophysical Union; American Water Resources Association; CA Water and Environmental Modeling Forum, Salmonid Restoration Federation

AREAS OF EXPERTISE

Hydrologic analysis; Ecological restoration; Hydrologic and hydrodynamic modeling; Spatial modeling and analysis; Habitat suitability analysis; Historical/archival research; Field methods for streams (gauging, surveying); Grant writing. Software: Experienced in R/RStudio, ArcGIS, HEC-RAS (hydrodynamic model), Adobe Suite (Illustrator, Photoshop, InDesign), Microsoft Office. Familiar with Git/GitHub, Python, LaTeX, Matlab.

REFERENCES

Provided upon request

San Francisco Estuary Institute
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Richmond, CA 94804
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email: cristina@sfei.org

CRISTINA S. GROSSO

SUMMARY OF QUALIFICATIONS

- Over 18 years experience managing and analyzing scientific data generated by environmental monitoring programs.
- 14 years experience managing workflow among staff for the timely delivery of high quality products.
- 6 years experience scoping and managing application and tool development.
- Excellent written and verbal communication skills.

RELEVANT PROFESSIONAL EXPERIENCE

Program Manager, Environmental Informatics

San Francisco Estuary Institute, Richmond, CA, 2014–present

Non-profit environmental scientific research organization that fosters the development of the scientific understanding needed to protect and enhance the San Francisco Estuary.

- Manage the workflow and timely delivery of products by the Environmental Informatics team, who specializes in data management, GIS, systems administration, web application development and design/communications.
- Manage application and tool development projects for uploading, editing, and accessing data. Projects include EcoAtlas, California Rapid Assessment Method for Wetlands (CRAM), Contaminant Data Display and Download (CD3), and CEDEN data checkers.
- Facilitate User Group input and coordinate feedback throughout the application and tool development process.

Regional Data Center Manager

San Francisco Estuary Institute, Richmond, CA, 2010-2014

- Manage the data technical services provided by SFEI, including uploading, reviewing, storing, maintaining, exchanging, and visualizing data.
- Coordinated data management procedures with the state's other regional data centers and the California Environmental Data Exchange Network (CEDEN).

Data Manager/Assistant Environmental Scientist

San Francisco Estuary Institute, Oakland, CA, 2002–2010

- Manage data generated from environmental monitoring programs and studies that include the Regional Monitoring Program for Water Quality in the San Francisco Estuary (RMP), California Rapid Assessment Method for Wetlands (CRAM), and Central Valley Monitoring Directory.
- Coordinate the standardization, internal scientific review, and annual reporting of monitoring data.
- Manage the Institute's data in a centralized database and assist in tool development to make these data accessible.
- Coordinate the Institute's Regional Data Center as part of the California Environmental Data Exchange Network (CEDEN).
- Provide training and assistance to staff on standard operating procedures for the Institute's information management system.
- Conduct data analysis, proposal development, report writing, and project management.

CRISTINA S. GROSSO

email: cristina@sfei.org

TECHNICAL SKILLS

- Databases: MS SQL Server (2005, 2008), PostgreSQL, MS Access
- Applications: SQL Server Management Studio, pgAdmin III, MS Office Suite
- Imaging: Adobe Illustrator and Photoshop

EDUCATION AND TRAINING

- **M.A. Geography**, Resource Management and Environmental Planning, San Francisco State University.
- **B.S. Mathematics**, Business Administration Minor, Vanderbilt University. Summer Study Program affiliated with the London School of Economics.

Database Training

- PostgreSQL Training for Developers, The Modern Solution LLC, Ontario, CA, June 2009
- Advanced Microsoft Access: Database Automation Using VBA, University of California, Berkeley Extension, Fall 2006
- SQL Programming, Hands On Technology Transfer, Inc., Sacramento, CA, September 2006
- Advanced Oracle Database Administration, University of California, Berkeley Extension, Spring 2002
- Introduction to Oracle 8i: SQL and PL/SQL, Oracle University, April 2001
- Data Modeling and Relational Database Design, Oracle University, July 2000

Project Management Training

- Powerful Non-Defensive Communication (February), CompassPoint Nonprofit Services, 2013
- Leading Effective Meetings (January), 2013

SELECTED PUBLICATIONS AND PRESENTATIONS

Journal Articles

Stein, E.D., A.E. Fetscher, R.P. Clark, A. Wiskind, J.L. Grenier, M. Sutula, J.N. Collins, and **C.S. Grosso**. 2009. Validation of a Wetland Rapid Assessment Method: Use of EPA's Level 1-2-3 Framework for Method Testing and Refinement. *Wetlands* 29(2):648-665.

Trowbridge, P.R., J.A. Davis, T. Mumley, K. Taberski, N. Feger, L. Valiela, J. Ervin, N. Arseme, A. Olivieri, P. Carroll, J. Coleman, Paul Salop, R. Sutton, D. Yee, L.J. McKee, M. Sedlak, **C. Grosso**, and J. Kelly. 2016. The Regional Monitoring Program for Water Quality in San Francisco Bay, California, USA: Science in Support of Managing Water Quality. *Regional Studies in Marine Science*. (Pending publication)

Conference Presentations

Presenter: **Grosso, C.** 2014. EcoAtlas. Environmental Data Summit. Session: Existing Environmental Data Management Systems in the Delta. Davis, CA. June 5, 2014. Webcast: <http://environmentaldatasummit2014.deltacouncil.ca.gov/#webcasts>

Presenter: **Grosso, C.** 2014. EcoAtlas and CRAM: Online Resource Management Support Tools. National Water Quality Monitoring Council (NWQMC) 9th National Monitoring Conference. Working Together for Clean Water. Session C4: Communicating Science for Action. Cincinnati, OH. April 28-May 2, 2014.

Presenter: **Grosso, C.** 2013. www.cramwetlands.org: A Collaboration Tool Built Collaboratively. 22nd Biennial Conference of the Coastal and Estuarine Research Federation (CERF). San Diego, CA. November 3-7, 2013.

Sarah Lowe

Senior Environmental Scientist and Senior Project Manager
(510) 746-7384

San Francisco Estuary Institute
4911 Central Avenue, Richmond, CA 94804

EDUCATION

M.A. Environmental Management University of San Francisco, CA.

B.A. Biology University of California, Santa Cruz, CA.

TECHNICAL SKILLS

Complex project management and accounting. General laboratory experience. Water, sediment, and benthos environmental sampling. Environmental data management and statistical analysis. Microsoft Office products: Access, Excel, Word, Power Point. R programming skills: spsurvey, various statistical and plotting packages.

EMPLOYMENT

10/2010 – present: **Senior Environmental Scientist/ Senior Project Manager** (Wetlands Focus Area)

San Francisco Estuary Institute, Richmond, CA.

Project manager and technical science support for SFEI's Chief Scientist (Josh Collins). Coordinates and manages about \$3M in federal, state, and local grants and contracts. Projects focus on developing and demonstrating standardized monitoring and assessment protocols, and online data management tools to access, visualize, and summarize the amount, diversity and condition of wetlands in a landscape context to support California's Wetland Protection Policy.

- Manage all aspects of a funded project (internal and client facing) including development of work plans, progress reports, staff workloads and budget tracking.
- Proposal development support.
- Develop ambient survey designs and sample draws for California Rapid Assessment Method (CRAM) projects around the state using the R-program and the USEPA's probability based sampling tools.
- Statistical analyses of environmental monitoring data, quality assurance advice and review, and reporting.

10/2004 – 10/2010: **Environmental Scientist** (Regional Monitoring Program for Water Quality - RMP)

San Francisco Estuary Institute, Oakland, CA.

A. Benthos and Toxicology Project Manager and Technical Support

- Managed the program's toxicology projects including annual status and trends monitoring in San Francisco Bay and special studies to develop laboratory methods to identify potential causes of toxicity.
- Managed and provided technical science support for the benthic community assessment project that worked with statewide partners to develop the Sediment Quality Objectives (SQO) methods for bays and estuaries and piloted the SQO methodology in the RMP Status and Trends program 2008-2010.
- Coordinated and led a S.F. Delta SQO pilot project to collect sediment, toxicity and benthos samples for use in index development.
- Principal investigator on a screening study in the lower Delta to investigate the effects of recreational boating activities during high-use holidays on water quality.

B. Data Management Team Supervisor

- Supervised SFEI's data management team for the RMP and developed standardized reporting requirements and technical efficiencies for field and laboratory data management, QA/QC, and online data reporting.
- Participated in the CA Surface Water Ambient Monitoring Program's (SWAMP) Data Management Team and the SWAMP Advisor Focus Group, bringing SFEI's expertise for quality assurance and managing long-term water quality data to this statewide program.

C. QA/QC Officer.

- Updated the RMP's quality assurance and quality control project plan and provided conducted ongoing verification

and validation of the RMPs annual water quality monitoring and special study datasets.

11/2001 – 10/2004: **Associate RMP Manager** (Regional Monitoring Program for Water Quality - RMP)
San Francisco Estuary Institute, Oakland, CA.

Co-manager of the RMP responsible for key elements of the program including: staff management and project tracking, budget and contract development (with an annual budget of ~\$3M), technical science support, data and information management and supervising, and fieldwork coordination and participation. Manager of the RMP Status and Trends Monitoring Program (~40% of the annual budget), RMP Annual Results publication, and co-lead on the 5-yr Exposure and Effects Pilot Study to investigate potential new indicators of contaminant effects for use in the Status and Trends program

SELECTED BIBLIOGRAPHY

Lowe S, Salomon M, Pearce S, Collins J, Titus D. 2017. *Lower Peninsula Watershed Condition Assessment 2016: Southwest San Francisco Bay, Santa Clara County, San Francisquito to Stevens Creeks*. Technical memorandum prepared for the Santa Clara Valley Water District. SFEI Contribution No. 809. San Francisco Estuary Institute: Richmond. p 53.

Lowe S, Sim L., Shusterman G, Grosso C, Collins J. 2016. *Enhancements to EcoAtlas' CRAM analysis tools: Habitat Development Curves and Ecoregional Cumulative Distribution Function plots (CDFs)*. Technical memorandum prepared for CALTRANS (HDR Inc. Contract 43A0304 –Task Order 18). San Francisco Estuary Institute: Richmond.

Pearce S, Lowe S, Collins J. 2016. *Relationship between Wetland Condition, Stress and Buffer*. Technical memorandum prepared for CALTRANS (HDR Inc. Contract 43A0304 –Task Order 18). San Francisco Estuary Institute: Richmond.

Lowe S, Robinson A, Frontiera P, Cayce K, Collins JN. *Creating Landscape Profiles of Aquatic Resource Abundance, Diversity and Condition*. Richmond, CA: San Francisco Estuary Institute - Aquatic Science Center; 2014 p. 21.

Kunze M, Dusterhoff S, Cayce K, Lowe S, Kass J, Kauhanen P, Pearce S. *RipZET: A GIS-Based Decision Support Tool for Estimating Riparian Zones at the Watershed and/or Project Scale*. 2014.

Collins JN, Lowe S, Pearce S, Roberts C. *Santa Rosa Plain Wetlands Profile: A Demonstration of the California Wetland and Riparian Area Monitoring Plan*. Richmond, CA: San Francisco Estuary Institute - Aquatic Science Center; 2014 p. 46.

Lowe S, Collins JN, Romsos S, Pearce S. *Demonstration Watershed Assessment for the Tahoe Basin Using the Wetland & Riparian Area Monitoring Plan*. Richmond, CA: San Francisco Estuary Institute; 2013.

Institute San Francisco. *Ecological Monitoring & Assessment Framework: Stream Ecosystem Condition Profile: Coyote Creek Watershed*. Oakland, CA: San Francisco Estuary Institute; 2011 p. 109.

Thompson B, Weisberg S, Melwani A, Lowe S, Ranasinghe JA, Cadien DB, Dauer DM, Diaz RJ, Fields W, Kellogg M, et al. *Low levels of agreement among experts using best professional judgment to assess benthic condition in the San Francisco Estuary and Delta*. *Ecological Indicators*. 2011; 12(1):167-173.

Phillips BM, Anderson BS, Lowe S. *RMP Sediment Study 2009-2010 Determining Causes of Sediment Toxicity in the San Francisco Estuary*. UC-Davis, Marine Pollutions Studies Laboratory; 2011.

Lowe S, Ridolfi K, McKee LJ. *Monitoring Plan Petaluma River Watershed Nutrient and Bacteria Impairment Study: Employing the Reachwide Benthos Method for Stream Algae Sampling and Additional Water Column Nutrient and Fecal Indicator Bacteria Measures*. Oakland, CA: Aquatic Science Center; 2010.

Lowe S, Stevens DL. *Redesign of Sediment Stations to include Wet Weather Sampling*. San Francisco Bay Regional Monitoring Program. 2009.

Dr. Maia Singer (*Ph.D., Civil and Environmental Engineering*) has over 20 years of experience in aquatic sciences and engineering spanning water quality, limnology, river and wetland ecology, mercury and selenium biogeochemistry, restoration planning, and monitoring design. Maia brings her technical expertise to a variety of interdisciplinary projects, including treatment wetland projects focused on removal of bacteria, nutrients and metals from urban stormwater, nutrients from agricultural return flows and secondarily treated wastewater, and suspended material resulting from in-lake seasonal algal blooms. Maia is a Certified Ecological Designer (CED) with the American Ecological Engineering Society.

AREAS OF EXPERTISE

- Water Quality
- Ecological Engineering
- Mercury and Selenium Biogeochemistry
- Treatment Wetlands
- Limnology/Reservoir Management
- Monitoring Plan Design
- Macroinvertebrate Monitoring

YEARS OF EXPERIENCE

At Stillwater: 17 years
In Total: 22 years

EDUCATION

Ph.D., Civil and Environmental Engineering (Ecological Engineering),
University of California at Berkeley,
2002

M.S., Civil and Environmental Engineering (Ecological Engineering),
University of California at Berkeley,
1997

B.S., Environmental Engineering Sciences,
University of Florida, 1995

PROFESSIONAL AFFILIATIONS

- American Ecological Engineering Society

SELECTED PUBLICATIONS

Downs, P.W., M. S. Singer, B. K. Orr, Z. E. Diggory, T. N. Church, and J.C. Stella. 2011. **Restoring Ecological Integrity in Highly Regulated**

SELECTED PROJECT EXPERIENCE

Upper Klamath Basin Wood River Valley Pilot Diffuse Source Treatment Wetlands, Wood River, OR (*Clients: Trout Unlimited, California Coastal Conservancy, and California State Water Resources Control Board*): As project manager and lead ecological designer, Dr. Singer worked closely with Trout Unlimited (previously the Klamath Basin Rangeland Trust) to develop landowner agreements, wetland designs, permits, and water quality monitoring strategy for multiple pilot diffuse source treatment wetlands (DSTWs) in the Wood River Valley. The first DSTW was installed in fall of 2018. Ultimately, full implementation of multiple pilot DSTWs will provide a better understanding of the relative contribution of DSTWs to achieving water quality goals for Wood River Valley and, potentially, the broader Upper Klamath Basin.

Agency Wetlands Project - Analysis of Wetland Treatment Potential, Wood River, OR. (*Client: Trout Unlimited*): As project manager and water quality lead, Dr. Singer worked closely with Trout Unlimited (previously the Klamath Basin Rangeland Trust) to assess the potential for several land parcels located along the northern shore of Agency Lake to be managed as treatment wetlands to remove nutrients from agricultural runoff and to expand habitat opportunities for migratory waterfowl and endangered Lost River and Shortnose suckers in Agency and Upper Klamath lakes. The project involved review of available data characterizing hydrology, the local ditch and levee network, and associated surface elevations; analysis of existing flow and nutrient data to determine water volumes and nutrient loads that may be diverted into parcels for wetland treatment purposes; consideration of how levee breaches during other lake restoration activities may affect the potential for inundation of the treatment wetlands parcels and whether this would affect long-term wetland treatment potential for these parcels; identification of data gaps that would further support efforts to develop engineering designs; and technical reporting.

Rivers: The Role of Baseline Data and Analytical References. Environmental Management. 48:847–864.

Fleming-Singer, M. S. 2002.

Optimization of nitrate removal in treatment wetlands using an episediment layer for increased denitrification potential. Doctoral dissertation. Department of Civil and Environmental Engineering, University of California.

SELECTED PRESENTATIONS

Constructed Wetlands for Water Quality and Wildlife. Ecological Design in the Ozarks, Ecological Design Case Studies & Best Practices Workshop, American Ecological Engineering Society. Fayetteville, AK. May 14, 2013.

Water Quality Improvement Techniques for the Upper Klamath Basin: A Technical Workshop and Project Conceptual Designs. Presentation to Upper Klamath Conservation Area Network. Klamath Falls, OR. September 24, 2013.

Klamath River Water Quality Workshop. Setting the Stage, Project Types, and Restoration/Rehabilitation Potential in the Upper Klamath Basin. Sacramento, CA. September 9-11, 2012.

Model Development and Estimation of Short-Term Impacts of Dam Removal on Dissolved Oxygen in the Klamath River. National Water Quality Monitoring Conference. Portland, OR. May 2, 2012.

Design of post-implementation monitoring plans for channel-floodplain restoration: Testing for effects when limiting factors are uncertain. American Ecological Engineering Society Conference. Fayetteville, AK. June 12, 2008.

Lower Klamath Project License Surrender CEQA, Klamath River, CA

(Clients: California State Water Resources Control Board, Klamath River Renewal Corporation): Dr. Singer served as project manager and lead water quality scientist for the development of an environmental impact report (EIR) for removal of four dams on the Klamath River as part of the Lower Klamath Project (LKP). The EIR was developed by Stillwater Sciences to support the Klamath River Renewal Corporation's LKP application for a water quality certification pursuant to Section 401 of the Clean Water Act. Dr. Singer led a team of Stillwater Sciences staff and several subcontractors to complete the project. Tasks included close coordination and frequent communications between the State Water Resources Control Board (SWRCB) and the consultant team during all aspects of the project; support for the SWRCB during public scoping and development of the scoping report; identification of key issues to be analyzed in the EIR; development of the Administrative Draft EIR, including technical analyses and agency and stakeholder coordination, as necessary; support for the SWRCB during AB 52 consultation with affected tribes; development of a mitigation monitoring and reporting plan (MMRP); development of the Public Draft EIR; facilitation of the public comment period for the Draft EIR, development of response to comments, and incorporation of issues raised during the public comment period into the Final EIR, as necessary and in collaboration with the SWRCB; and production of the Final EIR.

Klamath River Water Quality Workshop and Feasibility Study (Client: California Coastal Conservancy, PacifiCorp): Dr. Singer served as scientific lead and project manager for a multi-faceted project to identify technologies and strategies to reduce nutrient and organic matter loads to Upper Klamath Lake and the upper Klamath River in Oregon and California. The project was part of a set of interim measures implemented under the Klamath Hydroelectric Settlement Agreement and included development of a workshop that brought together experts in wetland treatment systems, wastewater treatment systems, and sediment treatment/management to describe the feasibility of technology application within the basin. She oversaw development of background information for workshop participants including effectiveness and feasibility of natural wetlands, treatment wetlands, diffuse (decentralized) treatment systems, water column filtration of algae and organic matter, water column aeration/oxidation, and sediment sequestration. Highly ranked options were subsequently presented as conceptual designs that can serve as a guide for development of more formal engineering feasibility analyses.

EIS/EIR and Secretarial Determination Overview Report for Klamath River Dam Removal (Client: US Bureau of Reclamation): Dr. Singer served as water quality lead for the multi-year synthesis and analysis of a large body of existing water quality information on the Klamath River and the Klamath Estuary in support of the Klamath Facilities Removal EIS/EIR and Secretarial Determination Overview Report. Technical

analyses included short-term and long-term effects of project alternatives on physical (water temperature, total suspended sediment, turbidity), chemical (dissolved oxygen, pH, nutrients, chlorophyll, algal toxins), and biological (phytoplankton, periphyton) characteristics of the Klamath River. She also provided technical support to the State and Federal water quality sub-team for the Secretarial Determination process in evaluating the feasibility and potential impacts of the removal of four dams. Primary technical analyses included evaluation of potential short-term sediment related impacts upon dissolved oxygen following dam removal and consideration of possible biotic toxicity caused by exposure to sediment-associated contaminants during dam removal (acid volatile sulfides, metals, pesticides, chlorinated acid herbicides, PCBs, VOCs, SVOCs, cyanide, dioxins).

John Muir Treatment Wetlands (*Client: San Francisco Public Utilities Commission*): Dr. Singer served on a multi-disciplinary team working to provide additional water supply to Lake Merced, San Francisco, through the use of a stormwater treatment wetland. Building upon preliminary removal estimates of bacteria, nutrients and metals from stormwater, Dr. Singer has provided design assistance for the John Muir Wetland through refinement of previous pollutant removal estimates for stormwater and dry weather flows. Design parameters are based upon a review of data from existing treatment wetlands and estimates of particle settling and hydraulic residence time. Pollutants considered include nitrogen, phosphorus, total suspended solids, metals (chromium, copper, nickel, lead, and zinc), and bacteria (total coliform, *Escherichia coli*). Dr. Singer also developed recommendations for mosquito control techniques and reviewed the potential for odor emissions from a variety of organic and inorganic compounds and corresponding control techniques.

Santa Clara River Estuary Water Treatment Discharge Study (*Client: City of Ventura*): Dr. Singer played a key role in the development of a comprehensive water quality study to examine the relative contributions from the lower Santa Clara River, California, the City of Ventura's Water Reclamation Facility, and local groundwater in addressing additional information requests as part of a discharge permit. Dr. Singer was also instrumental in a feasibility assessment for the use of wetlands to remove nitrate from the City's discharge stream. Dr. Singer modeled wetland treatment performance under various scenarios, in order to determine operating conditions that would support improved water quality in the estuary.

Evaluation of Nitrate Removal and Avian Habitat in San Joaquin Marsh, CA (*Client: Irvine Ranch Water District*): Dr. Singer was the lead project scientist analyzing four years of data from the San Joaquin Marsh, a 32-ha wetland in southern California, built for the dual purposes of removing nitrate from incoming creek water and maximizing habitat for waterfowl, shorebirds, and wading birds.

Soulajule Reservoir Mercury Bioaccumulation Study (*Client: Marin Municipal Water District*): Dr. Singer recently served as project manager, lead water quality scientist, and limnologist for an investigation of methyl mercury bioaccumulation and production in Soulajule Reservoir and downstream locations within the Walker Creek Watershed, Marin County. Management objectives included maintaining municipal drinking water storage and supply, downstream flows, and water quality; reducing upland mercury loads; decreasing levels of harmful blue-green algae; and managing fisheries to reduce mercury tissue concentrations.

Evaluation of Selenium Release From Drying Wetland Sediments (*M.S. research in Civil and Environmental Engineering [Ecological Engineering] at University of California at Berkeley*): Dr. Singer conducted experiments focused on the chemical release of inorganic and organic selenium species from wetland sediments subjected to alternating wetting and drying cycles, in order to determine the potential for selenium to become bioavailable to waterfowl, similar to conditions observed in Kesterson Reservoir, San Luis National Wildlife Refuge, California.

San Pablo Reservoir Water Quality Improvement Project, El Sobrante, CA (*Client: East Bay Municipal Utility District*): Dr. Singer served as the project manager and technical lead for an evaluation of potential options for reducing algal growth, algal metabolites (i.e., geosmin, MIB), and soluble manganese production in San Pablo Reservoir. Tasks included comprehensive review and analysis of existing water quality data; development of technical materials and facilitation at multiple client workshops to identify feasible control measures that would deliver the best benefit for the money spent; collection of up-to-date reservoir bathymetry data and preliminary design for a hypolimnetic oxygenation system; development of a comprehensive water quality management program; and developed a comprehensive final report, including management recommendations.

Scott R. Dusterhoff

Senior Scientists & Lead Geomorphologist
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Richmond, CA 94804

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OVERVIEW

Scott Dusterhoff is a geomorphologist at the San Francisco Estuary Institute-Aquatic Science Center with a background in fluvial geomorphology, watershed hydrology, and estuarine/tidal wetland dynamics. For over two decades, Scott has been working in coastal and upland watersheds throughout California, Oregon, and Washington, as well as in the Mid-Atlantic, on projects that use in-depth scientific investigations to inform sustainable ecosystem management approaches. He specializes in understanding the impacts of land disturbance and flow regulation on geomorphic processes and aquatic habitat for a variety of endangered species. He has extensive experience using a combination of field-based data, numerical modeling, and geospatial tools to characterize fluvial and coastal sediment transport dynamics and hydrologic/hydraulic processes. Scott currently leads several projects in the San Francisco Bay Area that focus on developing holistic management approaches that support resilient, multi-benefit landscapes.

EDUCATION

- M.S. Environmental Sciences & Hydrology, University of Virginia, 2001
- B.S. Geology, University of Maryland, 1996

EXPERIENCE

- 2013 – Present Senior Scientist & Lead Geomorphologist, San Francisco Estuary Institute-Aquatic Science Center
- 2003 – 2013 Senior Geomorphologist/Hydrologist, Stillwater Sciences
- 2001 – 2003 Staff Hydrologist, Philip Williams and Associates
- 1998 – 2001 Research Assistant, University of Virginia
- 1996 – 1997 Research Assistant, University of Maryland

SELECTED REPORTS & PUBLICATIONS

- Dusterhoff, S.,** K. McKnight, L. Grenier, and N. Kauffman. 2020. Sediment for Survival: A Strategy for the Resilience of Bay Wetlands in the Lower San Francisco Estuary. A SFEI Resilient Landscape Program. A product of the Healthy Watersheds, Resilient Baylands project, funded by the San Francisco Bay Water Quality Improvement Fund, EPA Region IX. Publication #1015, San Francisco Estuary Institute, Richmond, CA.
- Richey, A., **S. Dusterhoff,** S. Baumgarten, E. Clark, M. Benjamin, S. Shaw, R. Askevold, K. McKnight. 2020. Restoration Vision for the Laguna de Santa Rosa. An SFEI-ASC Resilient Landscapes Program report developed in cooperation with Sonoma Water, the Laguna de Santa Rosa Foundation, a Technical Advisory Committee, and a Management Advisory Committee. Publication # 983. San Francisco Estuary Institute-Aquatic Science Center, Richmond, CA.

- McKnight, K., **S. Dusterhoff**, R. Grossinger, R. Askevold. 2018. Resilient Landscape Vision for the Calabazas Creek, San Tomas Aquino Creek, and Pond A8 Area: Bayland-Creek Reconnection Opportunities. A SFEI-ASC Resilient Landscape Program report developed in cooperation with the Healthy Watersheds, Resilient Baylands Design Advisory Team, Santa Clara Valley Water District, and South Bay Salt Ponds Restoration Project, Publication #870, San Francisco Estuary Institute-Aquatic Science Center, Richmond, CA.
- Richey, A., **S. Dusterhoff**, K. McKnight, M. Salomon, S. Hagerty, R. Askevold, R. Grossinger. 2018. Resilient Landscape Vision for Upper Penitencia Creek. An SFEI-ASC Resilient Landscapes Program report developed in cooperation with the Santa Clara Valley Water District and a Science Advisory Hub. Publication #894. San Francisco Estuary Institute - Aquatic Science Center, Richmond, CA
- Schoellhamer, D., L. McKee, S. Pearce, P. Kauhanen, M. Salomon, **S. Dusterhoff**, L. Grenier, M. Marineau, and P. Trowbridge. 2018. Sediment Supply to San Francisco Bay, Water Years 1995 through 2016: Data, trends, and monitoring recommendations to support decisions about water quality, tidal wetlands, and resilience to sea level rise. Published by San Francisco Estuary Institute, Richmond, CA. SFEI Contribution Number 842.
- Dusterhoff, S.**, S. Pearce, L. McKee, J. Beagle, C. Doehring, K. McKnight, R. Grossinger, and R. Askevold. 2017. Changing Channels: Regional Information for Developing Multi-benefit Flood Control Channels at the Bay Interface. A SFEI-ASC Resilient Landscape Program report developed in cooperation with the Flood Control 2.0 Regional Science Advisors, Publication #801, San Francisco Estuary Institute-Aquatic Science Center, Richmond, CA.
- Dusterhoff, S.**, M. Sloat, and F. Ligon. 2017. The influence of coarse particle mobility on scour depth in salmonid spawning habitat. Manuscript under revision for publication in River Research and Applications.
- Downs, P., **S. Dusterhoff**, G. Leverich, and M. Napolitano. 2017. Sediment dynamics and recent morphological responses revealed by a sediment budget analysis for a regulated catchment in coastal California, USA. Manuscript under revision for publication in Earth Surface Processes & Landforms.
- Dusterhoff, S.**, C. Doehring, S. Baumgarten, R. Grossinger, and R. Askevold. 2016. Resilient Landscape Vision for Lower Walnut Creek: Baseline Information and Management Strategies. A SFEI-ASC Resilient Landscape Program report developed in cooperation with the Flood Control 2.0 project Regional Science Advisors and Contra Costa County Flood Control and Water Conservation District, Publication #782, San Francisco Estuary Institute-Aquatic Science Center, Richmond, CA.
- Salomon, M., **S. Dusterhoff**, R. Askevold, and R. Grossinger. 2016. San Francisquito Creek Baylands: Landscape Change Metrics Analysis. Flood Control 2.0. SFEI Contribution No. 784. San Francisco Estuary Institute - Aquatic Science Center: Richmond, CA. p 12.
- Dusterhoff, S.**, R. Grossinger, C. Doehring, M. Salomon, and R. Askevold. 2015. Novato Creek Baylands Vision: Integrating Ecological Functions and Flood Protection within a Climate-resilient Landscape. A SFEI-ASC Resilient Landscape Program report developed in cooperation with the Flood Control 2.0 project Regional Science Advisors and Marin County Department of Public Works, Publication #764, San Francisco Estuary Institute-Aquatic Science Center, Richmond, CA.
- Salomon, M., S. Baumgarten, **S. Dusterhoff**, E. Beller, R. Grossinger, and R. Askevold. 2015. Novato Creek Baylands Historical Ecology Study. A Report of SFEI-ASC's Resilient Landscapes Program, Publication #740, San Francisco Estuary Institute-Aquatic Science Center, Richmond, CA.
- Dusterhoff, S.**, J. Beagle, J. Collins, and C. Doehring. 2014. Initial Protocol to Identify and Delineate the Head of Tide Zone in San Francisco Bay Tributaries. Prepared for the San Francisco Bay Conservation and Development Commission. SFEI Publication #719, San Francisco Estuary Institute, Richmond, CA.

- Beller E., S. Baumgarten, R. Grossinger, T. Longcore, E. Stein, S. Dark, and **S. Dusterhoff**. 2014. Northern San Diego County Lagoons Historical Ecology Investigation: Regional Patterns, Local Diversity, and Landscape Trajectories. Prepared for the State Coastal Conservancy. SFEI Publication #722, San Francisco Estuary Institute, Richmond, CA.
- Booth D., G. Leverich, P. Downs, **S. Dusterhoff**, and S. Araya. 2014. A method for spatially explicit representation of sub-watershed sediment yield, southern California, USA. *Environmental Management*, 53: 968–84.
- Downs, P., **S. Dusterhoff**, and W. Sears. 2013. Reach-scale channel sensitivity to multiple human activities and natural events: Lower Santa Clara River, California, USA. *Geomorphology* 189, 121e134.
- Cui, Y., **S. Dusterhoff**, J. Wooster, and P. Downs. 2011. Practical considerations for modeling sediment transport dynamics in rivers. Manuscript in the American Geophysical Union Monograph Stream Restoration in Dynamic Systems: Scientific Approaches, Analyses, and Tools.
- Booth D., **S. Dusterhoff**, E. Stein and B. Bledsoe. 2010. Hydromodification Screening Tools: GIS-based catchment analyses of potential changes in runoff and sediment discharge. Technical Report 605. Southern California Coastal Water Research Project. Costa Mesa, CA.
- Downs, P, Y. Cui, J. Wooster, **S. Dusterhoff**, D. Booth, L. Sklar, and W. Dietrich, 2009. Managing sediment release in dam removal projects: an approach informed by physical and numerical modeling of non-cohesive sediments, *Journal of River Basin Management*, 7(3), p. 1-20.
- Cui, Y., J. Wooster, P. Baker, **S. Dusterhoff**, L. Sklar, and W. Dietrich. 2008. Theory of fine sediment infiltration into immobile gravel bed. *Journal of Hydraulic Engineering*, 134(10), pp.1421-1429.
- Cui, Y., J. Wooster, J. Venditti, **S. Dusterhoff**, W. Dietrich, and L. Sklar. 2008. Simulating sediment transport in a flume with forced pool-riffle morphology: examinations of two one-dimensional numerical models, *Journal of Hydraulic Engineering*, 134(7), p. 892-904.
- Wooster, J., **S. Dusterhoff**, Y. Cui, L. Sklar, W. Dietrich, and M. Malko. 2008. Sediment supply and relative size distribution effects on fine sediment infiltration into immobile gravels, *Water Resources Research*, 44, W03424, doi: 10.1029/2006WR005815.
- Dusterhoff, S.**, 2001. Controls on near-surface soil moisture dynamics in coastal environments. Master's Thesis, Department of Environmental Sciences, University of Virginia, 98 pp.
- Prestegard K., **S. Dusterhoff**, C. E. Stoner, K. Houghton, and K. Folk. 2000. Morphological and Hydrological Characteristics of Piedmont and Coastal Plain Streams in Maryland. Maryland Department of the Environment Water Management Administration, Baltimore, MD.
- Dusterhoff, S.**, 1996. Effects of bed particle size distribution on bed and hydraulic roughness in a natural stream environment. Undergraduate Thesis, Department of Geology, University of Maryland, 60 pp.

CONFERENCE SESSIONS CHAIRED

Riverine Multi-benefit Projects - Channeling your Flood Protection for the Environment
2016 Annual Floodplain Management Association (FMA) Conference

Southern and Central California Steelhead Habitat Rehabilitation from Tributaries to Estuaries
2014 Annual Salmonid Restoration Federation (SRF) Conference

SELECTED CONFERENCE PRESENTATIONS

- Dusterhoff, S., K. McKnight, and R. Grossinger. 2019. A Vision for Freshwater-Estuarine Transition Zone Restoration in San Francisco Bay. Annual Salmonid Restoration Federation (SRF) Conference, Santa Rosa, CA
- Dusterhoff, S., K. McKnight, L. Grenier, L. McKee, and M. Salomon. 2018. Sediment for Survival: Understanding the Need of Bay Marshes and Mudflats. Biannual Bay Delta Science Conference, Sacramento, CA.
- Dusterhoff, S., S. Pearce, L. McKee, R. Grossinger, and C. Doehring. 2017. Sediment of Salmon in San Francisco Bay: What's Needed? What's Available? What's Next? 35th Annual Salmonid Restoration Federation (SRF) Conference, Davis, CA.
- Dusterhoff, S., L. Grenier, L. McKee, S. Pearce, D. Schoellhamer, M. Salomon, and K. McKnight. Sediment Savvy: Developing a Sediment Strategy for Bayland Resilience. Biannual State of the Estuary Conference, Oakland, CA.
- Dusterhoff, S., S. Pearce, L. McKee, R. Grossinger, C. Doehring, J. Beagle, S. Baumgarten, M. Salomon, and R. Askevold. 2015. Flood Control Meets Ecosystem Restoration: A New Vision for Managing Channels at the Bay Margin. Biannual State of the Estuary Conference, Oakland, CA.
- Dusterhoff, S., R. Grossinger, L. McKee, J. Beagle, S. Pearce, C. Doehring, and C. Sweeney. 2014. Flood Control 2.0: Restoring Habitat through a New Vision for Flood Control Channel Design and Management. Society for Ecological Restoration California Chapter (SERCAL) Annual Conference, Santa Rosa, CA.
- Dusterhoff S. 2013. Sustainable restoration strategies informed by historical morphologic change: Santa Clara River Estuary, Ventura County, CA. Headwaters to Ocean (H2O) Annual Conference, San Diego, CA.
- Dusterhoff, S., C. Campbell, and P. Brand, 2012. Levee setback assessment of the lower Santa Clara River, Ventura County, California: Implications for flood risk management and ecological benefit. 1st North American Congress for Conservation Biology, Oakland, CA.
- Dusterhoff, S., J. Wooster, and Y. Cui, 2008. Improving the understanding of sediment pulse impacts on downstream biological processes. Annual Meeting of the Salmonid Restoration Federation, Lodi, CA.
- Dusterhoff, S., J. Wooster, Y. Cui., M. Malko, W. Dietrich, and L. Sklar. 2006. Supply and relative size distribution effects on fine sediment infiltration into immobile gravels. American Geophysical Union Fall Meeting, EOS Trans. AGU, 87(52), Fall Meeting Suppl., Abstract H51G-05.
- Dusterhoff, S., L. Sklar, W. Dietrich, F. Ligon, Y. Cui, and P. Downs. 2006. Physical modeling to guide river restoration projects: An overview. Biennial CALFED Science Conference, Sacramento, CA.
- Dusterhoff, S., P. Wiberg, J. Albertson, and L. Blum. 2005. On the interaction between tidal forcing, soil moisture, and vegetation dynamics within a tidal marsh-upland transition: implications for ecosystem state and evolution. Biennial Meeting of the Estuarine Research Federation, Norfolk, VA.
- Dusterhoff, S., J. Albertson, and P. Wiberg. 1999. Determination of near-surface soil moisture dynamics across a marsh to forested upland transition zone. American Geophysical Union Fall Meeting, EOS Trans. AGU, 80(48), Fall Meeting Suppl., Abstract H22D-02.
- Dusterhoff, S., J. Albertson, P. Wiberg, and L. Murray. 1999. The role of root water uptake in near-surface soil moisture dynamics. American Geophysical Union Spring Meeting, EOS Trans. AGU, 80(19), Spring Meeting Suppl., Abstract A51B-03.
- Dusterhoff, S., K. Houghton, and K. Prestegard. 1997. Effects of bed particle size heterogeneity on physical and hydraulic roughness in a natural stream environment. American Geophysical Union Spring Meeting, EOS Trans. AGU, 78(10) Spring Meeting Suppl., Abstract H52B-05.

EXHIBIT B
BUDGET DETAIL AND PAYMENT PROVISIONS

1. INVOICING AND PAYMENT

- A. For services satisfactorily rendered, and upon receipt and approval of the invoices, the Water Boards agree to compensate the Contractor for actual expenditures incurred in accordance with the rates specified herein, which are attached hereto and made a part of this Agreement.
- B. Invoices shall include progress reports (as outlined in Exhibit A, Scope of Work), the Agreement Number and shall be submitted ~~in triplicate~~ not more frequently than quarterly in arrears to:

Devan Burke~~Chad Fearing~~, Contract Manager
Office of Information and Management Analysis
1001 I Street MS19B
Sacramento, CA 95814

- C. The Contractor shall also send a copy of the invoice or payment request to the Water Boards' Accounting Operations Section:

State Water Resources Control Board – Accounting
1001 I Street, 18th Floor
Sacramento, California 95814

- D. Not less than 10% of the contract amount shall be withheld pending final completion of the Contract.
- F. Contractors who are certified as small businesses or recognized as non-profit organizations by the Office of Small Business and DVBE Services (OSDS) will be paid in accordance with California Government Code, Title 1, Section 926.15. Invoices for all other Contractors shall be paid within 45 calendar days. In either situation, payment of any invoice will be made only after receipt of a complete, adequately supported, properly documented and accurately addressed invoice or payment request. Failure to use the address exactly as provided above may result in return of the invoice or payment request to the Contractor. Payment shall be deemed complete upon deposit of the payment, properly addressed, postage prepaid, in the United States mail. All invoices must be approved by the Contract Manager.
- G. The invoice shall contain the following information:
1. The word "INVOICE" should appear in a prominent location at the top of page(s);
 2. Printed name of the Contractor;
 3. Business address of the Contractor, including P.O. Box, City, State, and Zip Code;
 4. The date of the invoice;
 5. The number of the Agreement upon which the claim is based; and
 6. An itemized account of the services for which the Water Boards is being billed;
 - a) The time period covered by the invoice, i.e., the term "from" and "to";
 - b) A brief description of the services performed;

EXHIBIT B
BUDGET DETAIL AND PAYMENT PROVISIONS

- c) The method of computing the amount due. On cost reimbursable Agreements, invoices must be itemized based on the categories specified in the Budget. The amount claimed for salaries/wages/consultant fees must also be explained; i.e., hours or days worked times the hourly or daily rate = the total amount claimed;
- d) The total amount due; this should be in a prominent location in the lower right-hand portion of the last page and clearly distinguished from other figures or computations appearing on the invoice; the total amount due shall include all costs incurred by the Contractor under the terms of this Agreement; and
- e) Original signature of Contractor (not required of established firms or entities using preprinted letterhead invoices).
- f) A line item for any payments made to a Disabled Veteran's Business Enterprise (DVBE) subcontractor.

2. BUDGET CONTINGENCY CLAUSE

- A. It is mutually agreed that if the Budget Act of the current year and/or any subsequent years covered under this Agreement does not appropriate sufficient funds for the program, this Agreement shall be of no further force and effect. In this event, the Water Boards shall have no liability to pay any funds whatsoever to Contractor or to furnish any other considerations under this Agreement and Contractor shall not be obligated to perform any provisions of this Agreement.
- B. If funding for any fiscal year is reduced or deleted by the Budget Act for purposes of this program, the Water Boards shall have the option to either cancel this Agreement with no liability occurring to the Water Boards, or offer an Agreement Amendment to Contractor to reflect the reduced amount.
- C. The Water Boards' obligation to make any payments under this Contract shall be suspended during such time as the Budget Act covering that fiscal year has not been approved by the Legislature and signed into law by the Governor.

3. PROMPT PAYMENT CLAUSE: Payment will be made in accordance with, and within the time specified in, Government Code Chapter 4.5, commencing with Section 927.

4. TIMELY SUBMISSION OF FINAL INVOICE

- A. A final undisputed invoice shall be submitted for payment no more than ninety (90) calendar days following the expiration or termination date of this Agreement. Said invoice should be clearly marked "Final Invoice," thus indicating that all payment obligations of the Water Boards under this Agreement have ceased and that no further payments are due or outstanding.
- B. The Water Boards may, at its discretion, choose not to honor any delinquent final invoice.
- C. This Agreement includes multiple years of funding with varying availability due to fund reversion limitations. Contract funds are only available in the Fiscal Year for which they

**EXHIBIT B
 BUDGET DETAIL AND PAYMENT PROVISIONS**

are allocated, as set forth in the table below. If the Contractor does not submit approvable invoices requesting all of the funds encumbered for that Fiscal Year by the Annual Invoice Request Deadline, any remaining amount will revert to the Water Board, and will not be available to reimburse costs incurred past the Annual Funding Availability End Date.

Fiscal Year	Allocated Contract Funds	Annual Funding Availability Start Date	Annual Funding Availability End Date	Annual Invoice Request Deadline	Agreement Final Invoice Deadline
2020-21	\$502,967.59	Earliest possible date: July 1, 2020	Latest possible date: June 30, 2023	3/31/2023	
2021-22	\$250,000.00 \$779,200.00	July 1, 2021	June 30, 2024	3/31/2024	
2022-23	\$250,000.00 \$275,517.72	July 1, 2022	June 30, 2024 <u>December 31, 2024</u>	3/31/2024 <u>2025</u>	
<u>2023-24</u>	<u>\$20,000.00</u>	<u>July 1, 2023</u>	<u>December 31, 2024</u>	<u>3/31/2025</u>	
					<u>3/31/2024</u> <u>2025</u>

*Shifts to Allocated Contract Funds between fiscal years may be proposed / requested by either the Water Board or Contractor in writing and must not increase or decrease the total Agreement amount allocated. Any shifts in Allocated Contract Funds must be approved by the Deputy Director of the Division of Administrative Services, or his/her designee, and must be sent to the Water Board’s Contracts Unit for processing in order for funding shift to be implemented.

- D. If this Agreement’s funding for any fiscal year expires due to reversion or is reduced, substantially delayed, or deleted by the Budget Act, by Executive Order, or by order or action of the Department of Finance, the State Water Board has the option to either cancel this Agreement with no liability occurring to the State Water Board, or offer an amendment to the Contractor to reflect the reduced amount.
- E. In order to be approved, invoice costs must be eligible and undisputed.
- F. The Contractor must submit its final invoice for each fiscal year not later than the relevant Annual Invoice Request Deadline set forth in the table above for the given fiscal year. This final invoice for each fiscal year must be clearly marked “Final Invoice for Fiscal Year #####-##” with the relevant fiscal year. Disputed Invoice costs on the Final Invoice for each fiscal year that are not resolved prior to the Annual Invoice Request Deadline may not be paid due to reversion.
- G. The Water Boards will have no payment obligation under this Agreement of any costs not approved. The Contractor shall not submit invoices not in compliance or consistent with the stipulations of the table above. The Contractor shall not incur any costs after the submittal of the Annual Invoice period for that Fiscal Year period. The Contractor shall not incur any costs after the submission of the Agreement Final Invoice.

EXHIBIT B
BUDGET DETAIL AND PAYMENT PROVISIONS

5. EXPENSE ALLOWABILITY/FISCAL DOCUMENTATION
- A. Invoices received from a Contractor and accepted and/or submitted for payment by the Water Boards, shall not be deemed evidence of allowable Agreement costs.
 - B. The Contractor shall maintain for review and audit and supply to the Water Boards upon request, adequate documentation of all expenses claimed pursuant to this Agreement to permit a determination of expense allowability.
 - C. If the allowability or appropriateness of an expense cannot be determined by the Water Boards because invoice detail, fiscal records, or backup documentation is nonexistent or inadequate according to generally accepted accounting principles or practices, all questionable costs may be disallowed and payment may be withheld by the Water Boards. Upon receipt of adequate documentation supporting a disallowed or questionable expense, reimbursement may resume for the amount substantiated and deemed allowable.
 - D. If travel is a reimbursable expense, receipts must be maintained to support the claimed expenditures.
 - E. Costs and/or expenses deemed unallowable are subject to recovery by the Water Boards. See provision entitled, "Recovery of Overpayments" for more information.
6. RECOVERY OF OVERPAYMENTS
- A. Contractor agrees that claims based upon a contractual agreement or an audit finding and/or an audit finding that is appealed and upheld, will be recovered by the Water Boards by one of the following options:
 - (a) Contractor's remittance to the Water Boards of the full amount of the audit exception within 30 days following the Water Boards' request for repayment;
 - (b) A repayment schedule, which is agreeable to both the Water Boards and the Contractor.
 - B. The Water Boards reserves the right to select which option will be employed and the Contractor will be notified by the Water Boards in writing of the claim procedure to be utilized.
 - C. Interest on the unpaid balance of the audit finding or debt will accrue at a rate equal to the monthly average of the rate received on investments in the Pooled Money Investment Fund commencing on the date that an audit or examination finding is mailed to the Contractor, beginning 30 days after Contractor's receipt of the Water Boards' demand for repayment, or commencing on the date that an audit or examination finding is mailed to the Contractor, if applicable.
 - D. If the Contractor has filed a valid appeal regarding the report of audit findings, recovery of the overpayments will be deferred until a final administrative decision on the appeal

EXHIBIT B
BUDGET DETAIL AND PAYMENT PROVISIONS

has been reached. If the Contractor loses the final administrative appeal, Contractor shall repay, to the Water Boards, the over-claimed or disallowed expenses, plus accrued interest. Interest accrues from the Contractor's first receipt of Water Boards' notice requesting reimbursement of questioned audit costs or disallowed expenses.

7. BUDGET FLEXIBILITY CLAUSE

- A. Subject to the prior review and approval of the Contract Manager, line item shifts of up to a cumulative maximum of \$25,000 or 10% of the annual Agreement total, whichever is less, may be made over the life of the Agreement. There must be a substantial business justification for any shifts made.
- B. Fund shifts which increase Indirect, Overhead or General Expense line items are prohibited.
- C. Line item shifts may be proposed / requested by either the Water Boards or Contractor in writing, and must not increase or decrease the total Agreement amount allocated. Any line item shifts must be approved by the Deputy Director of the Office of Information and Management Analysis , or his/her designee, and must be sent to the Contracts Office within ten (10) days of approval for inclusion in the Agreement folder.
- D. If the Agreement is formally amended, any line item shifts agreed to by the parties must be included in the amendment.

**EXHIBIT B, ATTACHMENT I
 BUDGET**

A. Personnel			
Title/Position	Hourly Rate	Estimated No. of Hours	Amount
Administration	\$ 57.37	53	\$3,040.61
Associate Scientist I & II/Associate Technician Specialist I&II	\$55.74	240 581	\$13,377.60 \$32,384.94
Environmental/Technician Analyst	\$39.39	248	\$9,768.72
Manager/Senior Scientist I	\$78.35	885 980	\$69,339.75 \$76,783.00
Program Director/Senior Scientist II	\$106.03 \$113.23	1016 985	\$107,726.48 \$111,531.55
Project Manager	\$49.82	91 224	\$4,533.62 \$11,159.68
Scientist I/Technician Specialist I & II	\$59.79 \$69.79	600 1771	\$35,874.00 \$123,598.09
Scientist II/Senior Technician Specialist I & II	\$79.38	550 994	\$43,659.00 \$78,903.72
Senior Environmental/Senior Technician Analyst	\$41.55	500 953	\$20,775.00 \$39,597.15
Personnel Subtotal			\$308,094.78 \$486,767.46
Fringe Benefit Rate (45%)			\$138,642.65 \$217,245.36¹
Indirect Rate (72.48%)			\$323,795.29 \$507,369.29²
Personnel Total			\$770,532.72 \$1,211,382.11
B. Operating Expenses (Supplies, Travel*, etc.)			
Sample Shipping			\$300.00
Per Diem – 11 22.5449 days @\$46.00/day			\$506.00 \$1,037.07

¹ Fringe Benefit Rate Calculation includes a deduction of \$4,000.00 from the Subcontractor budget.
486767.46-4000 X .45

² Indirect Rate Calculation includes a deduction of \$4,000.00 from the Subcontractor Budget.
704012.82-4000 X .7248

**EXHIBIT B, ATTACHMENT I
 BUDGET**

Lodging				\$660.00 \$1,860.00
34 79 trips @ 235.307 137.95 miles/trip @0.575/mile				\$4,194.35 \$6,266.38
Yearly travel for two (2) peer reviewers (1 meeting/year @ \$1000 per person for 3 years) plus airfare for 1 person (\$350.00)				\$6,000.00 \$6,350.00
<u>Equipment (turbidity sensor, data logger, etc.)</u>				\$7,635.00
Operating Expenses Total				\$11,660.35 \$23,448.44
*Travel expenses shall be done in coordination with the Water Boards' Project Manager. California travel expenses and per diem rates shall be reimbursed at the Cal HR travel rates . Travel expenses shall not exceed rates found in Exhibit B, Attachment I.				
C. Subcontracts				
<u>Services for Bid</u> : Subcontractors will be selected pursuant to a competitive bidding process that seeks at least three (3) bids from responsible bidders per SCM Vol.1 3.06(E)(3). Once subcontractors have been identified, this Agreement will be amended to incorporate subcontractor information.				
	Awardees	Hourly Rate	Estimated No. of Hours	Amount
	Harry Ohlendorf, Scientific Peer Reviewer (Independent Consultant)	\$190.00	70	\$13,300.00
	Bruce Monson, Scientific Peer Reviewer (State of Minnesota)	\$75.00	70	\$5,250.00
	Chris Schmitt, Scientific Peer Reviewer (Independent Consultant)	\$190.00	70	\$13,300.00
	Stillwater Sciences			\$130,924.52 \$153,124.52
	Technical Advisory Committee for OLU task			\$4,000.00
	Lab Analysis of Samples			\$9,000.00
	Community Based Organizations (TBD) <u>Honorariums & Community Engagement</u>			\$45,000.00 \$44,865.59
	<u>Services for Bid</u>			\$104,014.65

**EXHIBIT B, ATTACHMENT I
BUDGET**

	<u>\$ 220,774.52</u>
Subcontracts Total	<u>\$342,854.76</u>
	<u>\$1,002,967.59</u>
AGREEMENT TOTAL (A+B+C):	<u>\$1,577,685.31</u>

EXHIBIT D
SPECIAL TERMS AND CONDITIONS

1. **DISPUTE RESOLUTION PROCESS:** Any dispute arising under or relating to the terms of this Agreement, or related to the performance hereunder, which is not disposed of by Agreement shall be decided by the Contract Manager, who shall reduce such decision to writing and mail or otherwise furnish a copy thereof to the Contractor. The decision of the Contract Manager shall be final and conclusive unless, within fifteen (15) calendar days from the date of receipt of such copy, the Contractor mails or otherwise delivers a written appeal to the State Water Resources Control Board Executive Director. The decision of the Executive Director, or authorized representative, on such appeal shall be final and conclusive unless determined by a court of competent jurisdiction to have been fraudulent, or capricious, or arbitrary, or so grossly erroneous as necessarily to imply bad faith, or not supported by any substantial evidence. In connection with any appeal under this Section, the Contractor shall be afforded an opportunity to be heard and to offer evidence and argument in support of the appeal. Pending final decision on any dispute hereunder, the Contractor shall proceed diligently with the performance of the Agreement work as directed by the Contract Manager unless the Contractor has received notice of termination. Decisions on any disputes hereunder may include decisions of both fact and law; provided, however, that nothing herein shall be construed as making final any decision on a question of fact or law in the event of any subsequent legal proceeding before a court of competent jurisdiction.

Authority to terminate performance under the terms of this Agreement is not subject to appeal under this Section. All other issues including, but not limited to, the amount of any equitable adjustment and the amount of any compensation or reimbursement which should be paid to the Contractor shall be subject to the disputes process under this Section. (PCC 10240.5, 10381, 22200 et seq, 40 CFR 31.70)

2. **RIGHTS IN DATA:** The Contractor agrees that all data, plans, drawings, specifications, reports, computer programs, operating manuals, notes, and other written or graphic work produced in the performance of this Agreement shall remain the property of the State. The Contractor shall have the right to reproduce, publish, and use all such work, or any part thereof, upon the written authorization of Water Boards. The Water Boards reserve the right to reproduce, publish, and use such work, or any part thereof.

3. **ACCESSIBLE CONTENT REQUIREMENTS:**

The Contractor shall ensure that all data, plans, drawings, specifications, reports, computer programs, operating manuals, notes, and other written or graphic work submitted to the State Water Board or uploaded directly to any State internet website or database in the performance of this Agreement comply with the accessible content requirements set forth in Government Code sections 7405 and 11135; section 508 of the federal Rehabilitation Act (29 USC 794d) and the regulations promulgated thereunder (36 CFR part 1194); and the most current Web Content Accessibility Guidelines published by the Web Accessibility Initiative of the World Wide Web Consortium at a minimum Level AA success criteria.

If the Contractor provides any electronic or information technology, or related services, under this Agreement, the Contractor shall respond to and resolve any complaint brought to the attention of the Contractor regarding the accessibility of its products or services.

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4. **EVALUATION OF CONTRACTOR:** The Contractor's performance under this Agreement shall be evaluated within thirty (30) days after completion. For this purpose a form designated by the Department of General Services (the "Contract/Contractor Evaluation," Form STD. 4) shall be used. Post-evaluations shall remain on file for a period of thirty-six (36) months. If the Contractor did not satisfactorily perform the work or service specified in the Agreement, Contract Manager shall place one copy of the evaluation form in the Agreement file and send one copy of the form to the Department of General Services within five (5) working days of the completion of the evaluation. Upon filing an unsatisfactory evaluation with the Department of General Services, the Contract Manager shall notify and send a copy of the evaluation to the Contractor within fifteen (15) days. The Contractor shall have thirty (30) days to prepare and send a statement to the Contract Manager and the Department of General Services defending his or her performance under the Agreement. The Contractor's statement shall be filed with the evaluation in the Contract Manager's file and at the Department of General Services. (PCC 10369)
5. **CONTRACTOR'S RIGHTS AND OBLIGATIONS:** Public Contract Code Sections 10335-10381 contains language describing the Contractor's duties, obligations, and rights under this Agreement. By signing this Agreement, the Contractor certifies that he or she has been fully informed regarding these provisions of the Public Contract Code. As required by Public Contract Code Section 10371(e)(2), résumés attached hereto and by this reference are incorporated herein.
6. **DISCLOSURE REQUIREMENTS:** Any document or written report prepared in whole or in part pursuant to this Agreement shall contain a disclosure statement indicating that the document or written report was prepared through Agreement with the Water Boards. The disclosure statement shall include the Agreement number and dollar amount of all Agreements and Subcontracts relating to the preparation of such documents or written reports. The disclosure statement shall be contained in a separate section of the document or written report.

If the Contractor or Subcontractor(s) are required to prepare multiple documents or written reports, the disclosure statement may also contain a statement indicating that the total Agreement amount represents compensation for multiple documents or written reports.

The Contractor shall include in each of its Subcontracts for work under this Agreement a provision which incorporates the requirements stated within this Section. (Gov. Code 7550, 40 CFR 31.20)

7. **PERMITS, WAIVER, REMEDIES AND DEBARMENT:** The Contractor shall procure all permits and licenses necessary to accomplish the work contemplated in this Agreement, pay all charges and fees, and give all notices necessary and incidental to the due and lawful prosecution of the work.

Any waiver of rights with respect to a default or other matter arising under the Agreement at any time by either party shall not be considered a waiver of rights with respect to any

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other default or matter.

Any rights and remedies of the Water Boards provided for in this Agreement are in addition to any other rights and remedies provided by law.

Contractor shall not subcontract with any party who is debarred or suspended or otherwise excluded from or ineligible for participation in federal assistance programs under Executive Order 12549, "Debarment and Suspension". Contractor shall not subcontract with any individual or organization on USEPA's List of Violating Facilities. (40 CFR, Part 31.35, Gov. Code 4477)

In addition, the Contractor shall not subcontract with any party who is debarred, suspended, or otherwise excluded from or ineligible for participation in any work overseen, directed, funded, or administered by the State Water Board program for which this contract is authorized. The Contractor shall not subcontract with any individual or organization on the State Water Board's List of Disqualified Businesses and Persons that is identified as debarred or suspended or otherwise excluded from or ineligible for participation in any work overseen, directed, funded, or administered by the State Water Board program for which this contract is authorized.

The State Water Board's List of Disqualified Businesses and Persons is located at:

http://www.waterboards.ca.gov/water_issues/programs/ustcf/dbp.shtml

8. **HEALTH AND SAFETY: Contractors are required to, at their own expense, comply with all applicable health and safety laws and regulations. Upon notice, Contractors are also required to comply with the state agency's specific health and safety requirements and policies. Contractors agree to include in any subcontract related to performance of this Agreement, a requirement that the subcontractor comply with all applicable health and safety laws and regulations, and upon notice, the state agency's specific health and safety requirements and policies.**

9. **RUSSIAN SANCTIONS: The Contractor represents that the Contractor is not a target of economic sanctions imposed in response to Russia's actions in Ukraine imposed by the United States government or the State of California. The Contractor is required to comply with the economic sanctions imposed in response to Russia's actions in Ukraine, including with respect to, but not limited to, the federal executive orders identified in California Executive Order N-6-22, located at <https://www.gov.ca.gov/wp-content/uploads/2022/03/3.4.22-Russia-Ukraine-Executive-Order.pdf> and the sanctions identified on the United States Department of the Treasury website (<https://home.treasury.gov/policy-issues/financial-sanctions/sanctions-programs-and-country-information/ukraine-russia-related-sanctions>). The Contractor is required to comply with all applicable reporting requirements regarding compliance with the economic sanctions, including, but not limited to, those reporting requirements set forth in California Executive Order N-6-22 for all Contractors with one or more agreements with the State of California**

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**with an aggregated value of Five Million Dollars (\$5,000,000) or more.
Notwithstanding any other provision in this Agreement, failure to comply with the economic sanctions and all applicable reporting requirements may result in termination of this Agreement.**

For Contractors with an aggregated agreement value of Five Million Dollars (\$5,000,000) or more with the State of California, reporting requirements include, but are not limited to, information related to steps taken in response to Russia's actions in Ukraine, including but not limited to:

A. Desisting from making any new investments or engaging in financial transactions with Russian institutions or companies that are headquartered or have their principal place of business in Russia;

B. Not transferring technology to Russia or companies that are headquartered or have their principal place of business in Russia; and

C. Direct support to the government and people of Ukraine.

10. TRAVEL AND PER DIEM: Any reimbursement for necessary travel and per diem shall, unless otherwise specified in this Agreement, be at the rates and rules currently in effect, as established by the California Department of Human Resources (Cal HR). If the Cal HR rates change during the term of the Agreement, the new rates shall apply upon their effective date and no amendment to this Agreement shall be necessary. Local government agency, education and special districts will pay travel time and per diem according to their respective statutory requirements. No travel outside the state of California shall be reimbursed without prior authorization from the Water Boards. Verbal authorization should be confirmed in writing. Written authorization may be in a form including fax or email confirmation.

11. INSURANCE REQUIREMENTS:

A. General Provisions Applying to All Policies

- 1) Coverage Term – Coverage needs to be in force for the complete term of the Agreement. If insurance expires during the term of the Agreement, a new certificate and required endorsements must be received by the State at least thirty (30) days prior to the expiration of this insurance. Any new insurance must comply with the original Agreement terms.
- 2) Policy Cancellation or Termination and Notice of Non-Renewal – Contractor shall provide to the Water Board within five (5) business days following receipt by Contractor a copy of any cancellation or non-renewal of insurance required by this Contract. In the event Contractor fails to keep in effect at all times the specified insurance coverage, the Water Boards may, in addition to any other remedies it may have, terminate this Contract upon the occurrence of such event, subject to the provisions of this Contract.

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- 3) Premiums, Assessments and Deductibles – The Contractor is responsible for any premiums, policy assessments, deductibles or self-insured retentions contained within their insurance program.
- 4) Primary Clause – Any required insurance contained in this Agreement shall be primary and not excess or contributory to any other insurance carried by the WaterBoards.
- 5) Insurance Carrier Required Rating – All insurance companies must carry an AM Best rating of at least “A–” with a financial category rating of no lower than VI. If the Contractor is self-insured for a portion or all of its insurance, review of financial information including a letter of credit may be required.
- 6) Endorsements – Any required endorsements requested by the Water Boards must be physically attached to all requested certificates of insurance and not substituted by referring to such coverage on the certificate of insurance.
- 7) Inadequate Insurance – Inadequate or lack of insurance does not negate the Contractor’s obligations under the Agreement.
- 8) Available Coverages/Limits – All coverage and limits available to the contractor shall also be available and applicable to the State.
- 9) Satisfying an SIR - All insurance required by this contract must allow the State to pay and/or act as the contractor’s agent in satisfying any self-insured retention (SIR). The choice to pay and/or act as the contractor’s agent in satisfying any SIR is at the State’s discretion.
- 10) Use of Subcontractors - In the case of Contractor’s utilization of Subcontractors to complete the contracted scope of work, the Contractor shall include all Subcontractors as insured under the Contractor’s insurance or supply evidence of the Subcontractor’s insurance to the Water Boards equal to policies, coverages, and limits required of the Contractor.

B. Insurance Coverage Requirements

The Contractor shall display evidence of the following on an Acord certificate of insurance evidencing the following coverage:

- 1) Commercial General Liability – The Contractor shall maintain general liability with limits not less than \$1,000,000 per occurrence for bodily injury and property damage combined with a \$2,000,000 annual policy aggregate. The policy shall include coverage for liabilities arising out of premises, operations, independent Contractors, products, completed operations, personal and advertising injury, and liability assumed under an insured Agreement. This insurance shall apply separately to each insured against whom claim is made or suit is brought subject

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to the Contractor's limit of liability. The policy shall be endorsed to include, "The State of California, its officers, agents, employees, and servants as additional insured, but only insofar as the operations under this Agreement are concerned." This endorsement must be supplied under form acceptable to the Office of Risk and Insurance Management.

- 2) Automobile Liability – The Contractor shall maintain motor vehicle liability insurance with limits not less than \$1,000,000 combined single limit per accident. Such insurance shall cover liability arising out of a motor vehicle including owned, hired and non-owned motor vehicles. Should the scope of the Agreement involve transportation of hazardous materials, evidence of an MCS-90 endorsement is required. The policy shall be endorsed to include, "The State of California, its officers, agents, employees, and servants as additional insured, but only insofar as the operations under this Agreement are concerned." This endorsement must be supplied under form acceptable to the Office of Risk and Insurance Management.
- 3) Worker's Compensation and Employer's Liability – The Contractor shall maintain statutory worker's compensation and employer's liability coverage for all its employees who will be engaged in the performance of the Agreement. Employer's liability limits of \$1,000,000 are required. When work is performed on State owned or controlled property the policy shall contain a waiver of subrogation endorsement in favor of the State. This endorsement must be supplied under form acceptable to the Office of Risk and Insurance Management.
- 4) Professional Liability – Contractor shall maintain professional liability covering any damages caused by a negligent error; act or omission with limits not less than \$1,000,000 per occurrence and \$1,000,000 policy aggregate. The policy's retroactive date must be displayed on the certificate of insurance and must be before the date this Agreement was executed or before the beginning of Agreement work.

12. CANCELLATION / TERMINATION WITHOUT CAUSE: In addition to the "Termination for Cause" provisions in Section 7 of Exhibit C of this Agreement, the Water Boards may terminate this Agreement without cause if doing so is in the best interest of the State, by giving thirty (30) days written notice to the Contractor. Such notification shall state the effective date of termination or cancellation and include any final performance and/or payment/invoicing instructions/requirements. Upon receipt of a notice of termination or cancellation from the Water Boards, Contractor shall take immediate steps to stop performance and to cancel or reduce subsequent Contract costs.

Termination Process (for both Terminations for Cause and Terminations without Cause):

Any termination shall be effected by written notice to the Contractor, either hand-delivered to the Contractor or sent certified mail, return receipt requested. The notice of termination shall specify the effective date of termination.

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Upon receipt of notice of termination, and except as otherwise directed in the notice, the Contractor shall:

- a. Stop work on the date specified in the notice;
- b. Place no further orders or enter into any further Subcontracts for materials, services or facilities except as necessary to complete work under the Agreement up to effective date of termination;
- c. Terminate all orders and Subcontracts;
- d. Promptly take all other reasonable and feasible steps to minimize any additional cost, loss, or expenditure associated with work terminated, including, but not limited to reasonable settlement of all outstanding liability and claims arising out of termination of orders and Subcontracts;
- e. Deliver or make available to the Water Boards all data, drawings, specifications, reports, estimates, summaries, and such other information and material as may have been accumulated by the Contractor under this Agreement, whether completed, partially completed, or in progress.

In the event of termination, final payment may include reasonable compensation for satisfactory services rendered, materials supplied, and expenses incurred, if any, pursuant to this Agreement prior to the effective date of termination.

13. **COMPUTER SOFTWARE:** Contractor certifies that it has appropriate systems and controls in place to ensure that Water Boards funds will not be used in the performance of this Contract for the acquisition, operation or maintenance of computer software in violation of copyright laws.
14. **POTENTIAL SUBCONTRACTORS:** Nothing contained in this Agreement or otherwise, shall create any contractual relationship between the Water Boards and any Subcontractors, and no Subcontract shall relieve the Contractor of his responsibility and obligations hereunder. The Contractor agrees to be as fully responsible to the Water Boards for the acts and omissions of its Subcontractors and of persons either directly or indirectly employed by any of them as it is for the acts and omissions of persons directly employed by the Contractor. The Contractor's obligation to pay its Subcontractors is an independent obligation from the Water Boards' obligation to make payments to the Contractor. As a result, the Water Boards shall have no obligation to pay or to enforce the payment of any moneys to any Subcontractor. Should Water Boards determine that the work performed by a Subcontractor is substantially unsatisfactory and is not in substantial accordance with the Contract terms and conditions, or that the Subcontractor is substantially delaying or disrupting the process of work, Water Boards may request substitution of the Subcontractor.
15. **SUBCONTRACTING:**
 - A. As a requirement of this Agreement (and any amendments thereto) subcontracting is limited to \$50,000 or 25% of the total contract, whichever is less. If the total of all subcontracts exceeds the limitation, all subcontracts must be in accordance with the following conditions:

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- B. Subcontract service(s) must be selected by the primary contractor pursuant to a bidding process requiring at least three bids from responsible bidders. A bidding process is not required when a subcontractor(s) is one of the following entities:

Entities excluded from bidding:

1. Another state entity, including:
 - a) A governmental agency from any state (Public Contract Code § 10340)
 - b) A state college or state university from any state
2. A local governmental entity or agency, including those created as a Joint Powers Authority (JPA)
3. An auxiliary organization of the California State University (CSU), or a California community college
4. The Federal Government
5. A foundation organized to support the Board of Governors of the California Community Colleges, or
6. An auxiliary organization of the Student Aid Commission established under Education code § 69522.

- C. By signing this Agreement, the Contractor is certifying selection of a non-excluded subcontractor(s) was pursuant to a bidding process requiring at least three bids from responsible bidders.

- D. The Water Boards will only pay overhead charges on the first \$25,000 for each subcontract.

16. **FORCE MAJEURE:** Except for defaults of Subcontractors, neither party shall be responsible for delays or failures in performance resulting from acts beyond the control of the offending party. Such acts shall include but shall not be limited to acts of God, fire, flood, earthquake, other natural disaster, nuclear accident, strike, lockout, riot, freight embargo, public regulated utility, or governmental statutes or regulations superimposed after the fact. If a delay or failure in performance by the Contractor arises out of a default of its Subcontractor, and if such default of its Subcontractor, arises out of causes beyond the control of both the Contractor and Subcontractor, and without the fault or negligence of either of them, the Contractor shall not be liable for damages of such delay or failure, unless the supplies or services to be furnished by the Subcontractor were obtainable from other sources in sufficient time to permit the Contractor to meet the required performance schedule.

17. **EQUIPMENT PURCHASES PROVISION:**

A. When purchasing equipment with State funds, each item must be tagged with a State property identification tag. Upon request from the Contractor's Administrative Representative, the Property Control Officer will provide the Property Inventory In-Put Document for completion. Information needed to complete the Property Inventory In-Put document would include the following:

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- a. Description of the item**
- b. Manufacturer**
- c. Serial Number**
- d. Acquisition Date**
- e. Acquisition Document (PO#)**
- f. Cost**
- g. Name (Agency) and Location (Address)**

B. When submitting the Property Inventory In-Put document to the Property Control Officer, please attach a copy of the purchase order(s) and send to the Property Control Officer at the following address:

DAS - Business Services Management
State Water Resources Control Board
1001 I Street, 18th Floor
Sacramento, CA 95814

C. Once the Property Control Officer has received the completed Property Inventory In-Put Document, along with the purchase order (PO) for the item, a property identification tag will be assigned to each piece of equipment. The Property Control Officer, in coordination with the Contract Manager and the Contractor's Administrative Representative, will provide the Contractor with a copy of the Property Inventory In-Put Document and the State Property Identification Tag(s). Per the Property Inventory In-Put Document, each piece of equipment must have the proper identification tag and it must be adhered to the equipment.

D. Upon completion of the Contract, the Contract Manager will coordinate with the Contractor's Administrative Representative for the retrieval and return of the purchased equipment to the Water Boards.