

Sacramento River Settlement Contractors

proposal to
S.D. Bechtel, Jr. Foundation
regarding
Data-Driven Decision Platform for
Sacramento River Real-Time Water and
Fishery Coordination

June 7, 2016

Section 1: Project Overview and Objectives

1.1 Name of Demonstration Project

Data-Driven Decision Platform for Sacramento River Real-Time Water and Fishery Coordination

1.2 Project Overview Description

The demonstration project area will focus on the main stem of the Sacramento River from Lake Shasta to the I-Street Bridge in Sacramento.

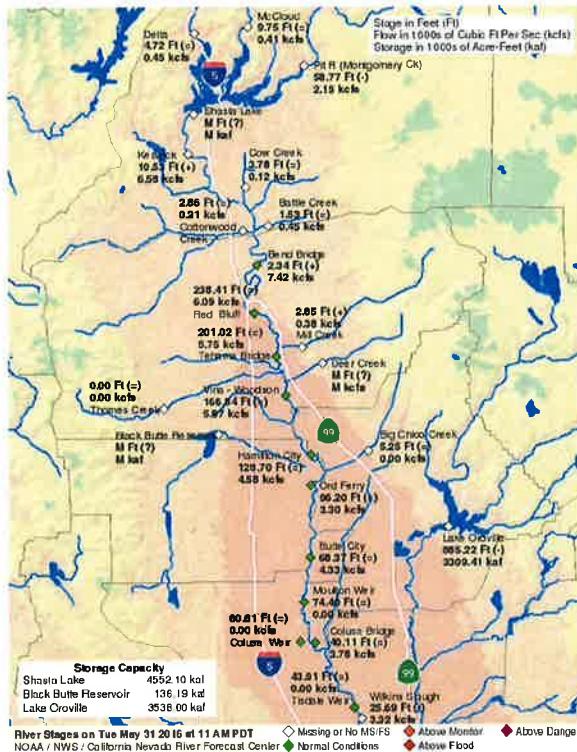


Figure 1. Portion of the Project Area on Sacramento River (River and Stage Map from DWR, source http://cdec.water.ca.gov/stage_maps/uprsac_0hr.html)

The primary objective of this demonstration project is to integrate diverse flow, water operations, fishery, and water quality data into a single, open data platform that facilitates more data-driven and timely decision making. On the section of the Sacramento River immediately below Lake Shasta, the fishery agencies have targeted water temperature as the most critical resource to successful spawning of winter-run Chinook salmon from late April through September. This single parameter controls the operation of Shasta Reservoir, Sacramento River Settlement Contractors (SRSC) diversions, the Central Valley Project (CVP), other project reservoirs, and the Bay Delta. The project will bring real-time and historical data into decision making that is shared between the National Marine Fisheries Service (NMFS) the California Department of Fish and Wildlife Service (CDFWS), and the State Water Resources Control Board (SWRCB) to increase the ability to make informed decisions. In addition, the platform will provide real-time tracking and accounting of operations based on those decisions,

and a database of historical operations and decision data that will provide critical information for ongoing decision making.

Key decisions on operations and fishery protection begin in the spring each year and continue through September. The fishery agencies, U.S. Bureau of Reclamation (Reclamation), and the SWRCB meet monthly, or more often if needed, as the Sacramento River Temperature Task Group (SRTTG) to discuss and decide on operations and adjustments. This Project will inform actions from that work group as well as provide members with real-time and historical data that will be useful between meetings, and facilitate more productive meetings.

1.3 Primary Participants

The SRSC includes various irrigation districts, reclamation districts, mutual water companies, partnerships, corporations, and individuals situated in the Sacramento Valley, and formed under the provisions of California law. Among Reclamation's hundreds of CVP water supply contracts, the SRSC Contracts have a unique history and nature. The SRSC divert water from the Sacramento River, miles upstream from the Bay-Delta and the upstream extent of Delta habitat. They divert water under area-of-origin water rights that were vested under California law well before the construction of the CVP began. The SRSC own and operate their own diversion facilities, and their water rights are not dependent in any way upon the operations or facilities of the CVP. The participating SRSC are shown in Attachment 1 and represent the major diverters on the river; those not included at this time are single landowner contractors and outreach to them will be continued.

Section 2: Project Team

The primary project proponent will be the SRSC Corporation, which is comprised of the participating agencies shown in Attachment 1 and represent the major diverters on the river. Those not included at this time are single landowner contractors and outreach is planned to be continued with them. As discussed in Section 1, the SRSC are a group of diverters on the Sacramento River that have prior and senior water rights to the Central Valley Project with some rights dating back to the 1800s. The SRSC currently coordinate closely with Reclamation on the operation and release patterns from Lake Shasta in order to meet temperature targets for salmon (primarily winter-run), diversion needs of the SRSC group, and flows into the delta to meet the goal of operating the system efficiently. The SRSC also coordinate with the set of partners and stakeholders, listed below, jointly and independently on river operations, habitat needs, data coordination, education, and accountability. This Project will provide another venue for the SRSC to again partner with these entities.

Partner	Level of Engagement
Sacramento River Settlement Contractors (see attached summary of the SRSC)	Project Lead, day-to-day engagement, data provider
U.S. Bureau of Reclamation	Primary data and decision partner, weekly to monthly engagement
California Department of Fish and Wildlife	Primary data and decision partner, weekly to monthly engagement
U.S. Fish and Wildlife Service	Primary data and decision partner, weekly to monthly engagement
National Marine Fisheries Service	Primary decision partner, weekly to monthly engagement
State Water Resources Control Board	Secondary data and decision partner, quarterly engagement
Stakeholder	
Ducks Unlimited	Monthly meetings, updates, and requests for feedback
Northern California Water Association	Monthly meetings, updates, and requests for feedback
California Department of Water Resources	Monthly meetings, updates, and requests for feedback
Golden Gate Salmon Association	Monthly meetings, updates, and requests for feedback
Tehama Colusa Canal Authority	Monthly meetings, updates, and requests for feedback
Other CVP Water Service Contractors	Monthly meetings, updates, and requests for feedback
Feather River Water Users	Monthly meetings, updates, and requests for feedback
The Nature Conservancy	Monthly meetings, updates, and requests for feedback

Table 1: Proposed Project Partners and Stakeholders

The partners will be directly engaged in the identification of objectives and deliverables associated with the demonstration project. Partner agencies will also be providing much of the data for this demonstration, largely through their existing publically accessible web repositories, portals, and services. The platform will use this data directly, as well as provide access back to the root data source to allow partners to see the direct connection to their original data. Project stakeholders will be engaged less frequently and typically will not provide large volumes of data. Stakeholders will weigh-in on the types of analytical tools and visualizations required to make the data behind decisions as transparent as possible, and will likely help the core team identify other issues to consider in the decision making around water supply and fishery management in this portion of the Sacramento River.

An initial action would be the formation of a Steering Committee (SC), with representatives from the partners and stakeholders listed above. The SC would provide direct input on the development of the detailed proposal and develop concepts illustrating how the platform would need to function in order to truly improve decision making. The SRSC would also propose that the S.D. Bechtel, Jr. Foundation (and/or its representatives) participate in the SC to ensure the final proposal achieves all objectives. The SC will be facilitated by Mike Harty, of Kearns & West, who regularly works on water resources and aquatic ecosystems. Kearns & West is also facilitating the Sacramento River Temperature Management Task Group and is familiar with many of the stakeholders and representatives.

A technical consultant team will develop and deliver the integrated data, visualization and analysis tools, and related technical tasks. The SRSC anticipates including an interdisciplinary firm experienced in adapting advanced data technology to water resources and aquatic ecosystem management (FlowWest), leading technology firms (and/or their philanthropic arms) in open data integration and publishing, analytics, and visualization, a civil engineering firm familiar with Sacramento River operations (MBK Engineers), and a biology firm (Natural Resource Scientists) familiar with Sacramento River fisheries. Table 2 summarizes the initial technical consultant team. SRSC will refine this team if this project is recommended for funding based on early interactions of the SC and core team.

Technical Consultant	Role
FlowWest	Advanced data technologies for water resources and aquatic ecosystems
Socrata Foundation (others tbd)	Open data publishing and integration
Tableau Foundation (others tbd)	Data analytics and visualization
MBK Engineers	Sacramento River operations
Natural Resources Scientists	Sacramento River fisheries
Kearns & West	Facilitation

Table 2: Proposed Technical Consultant Team and Roles

The project team has diverse experience developing data platforms for water resources and aquatic ecosystem analysis and decision making. FlowWest has spent the last five years laying the groundwork for the adoption of open data approaches and tools in water resources and aquatic ecosystem management. Their recent work includes a Big Data proof of concept project with the Delta Conservancy and Reclamation that resulted in Reclamation funding their own implementation of Big Data approaches for the Central Valley Project Improvement Act, and a review of the Bay Delta Conservation Plan for American Rivers and The Nature Conservancy that discovered important analytical flaws and missed ecosystem-flow relationships. In addition, FlowWest has been a lead author on the Delta Science Program's "Enhancing the Vision" report on better use of data in California water, and the S.D. Bechtel, Jr. Foundation's White Paper on open data needs for water management, and was a finalist in the State Water Resources Control Board's Data Innovation Challenge. FlowWest accomplishes this with a unique mix of interdisciplinary scientists and engineers with extensive experience in water resources and aquatic ecosystem management, paired with computer scientists recruited from outside the water sector who bring an agile workflow and state of the art programming skills.

The project team also includes leading organizations from the data integration/publishing sector and the analytics and visualization sector. The Socrata Foundation (see attached support letter) has already helped integrate and publish a subset of the data required for the Minimum Viable Product (MVP) and is the driving force behind open data frameworks such as California's Green Gov Challenge (<https://greengov.data.ca.gov/>). The Tableau Foundation (see attached support letter) is a leader in visualization technology and is a strong supporter of the open source community through its Tableau Public (<https://public.tableau.com/s/>) and Vizable (<https://vizable.tableau.com/>) platforms. While we will in no way constrain the platform developed for this project to these two team members (see proposed development scope below), we will greatly benefit from the input provided by their Foundation technology experts and the functionality and examples provided by their open data solutions. Finally, we intend to continue to consult with Steve Malers at the Open Water Foundation throughout the duration of this project, especially for assistance with data publishing approaches and time series data analytics.

Section 3: Current Status

Water operations and fishery management decision-making in this area are intricately connected, and having integrated real-time and historical data and information on water and fish would improve decision making for the system and lead to more efficient water management that will be more protective of the fishery, while maximizing water supply for other beneficial uses. The crux of the management decision problem addressed in this demonstration project, especially in dryer years, is that ***limited water must be delivered for both fish and contracted water demands, but most of the supporting data is not readily available in a format to guide these decisions.***

The result of this data-poor decision-making style has been that state and federal officials charged with decision making tend to be ultra-protective of fishery conditions, which has at times limited water supply availability unnecessarily. Further, knowledge about the value of past protective measures lags, or is not available to current management decision-making. The data-driven decision platform resulting from this project will put real-time, historical, and selected predictive model data in the hands of these decision makers to empower more finely resolved flow and fish management decisions that maximize fish benefits while minimizing water supply impacts. In addition, this decision platform will allow all interested stakeholders to view and understand the data and information supporting the decisions in formats that work for them and have the ability to manipulate as needed.

The primary and initial objective of this demonstration project is to integrate diverse flow, water operations, fishery, and water quality data into a single platform that facilitates more data-driven decision making, with the following specific sub-objectives:

1. Improved Sacramento River operation of the CVP and more precise delivery of flows for fishery temperature management and downstream diversions
2. Improved understanding of the data critical to flow and fish management decisions, and identification of additional monitoring needs or data gaps limiting more effective management
3. Improved calibration of existing predictive models such as those being developed for temperature and habitat, and contribution of data to drive new predictive models such as those being developed by Reclamation fisheries managers (e.g. SacPAS)

Following achievement of the initial objective and sub-objectives through this demonstration project, the partners would then determine, if and how, this platform could inform or implement more complex modeling to further support sound decision making on fish and flows in the Sacramento River.

The SRSC overarching goal for this effort is to ensure that the best available, supportable, and complete data and information is being used to make the best water supply and fishery management decisions. Currently, while much of this information may be publically available, the data are not effectively integrated. While numerous portals provide access to Sacramento River fish, flow, and water quality data, none have been developed to support the workflow of this project with open data approaches

that are scalable and transferable to other similar water data decision-making processes. Further, much of the data that would benefit Sacramento River fish and flow management are often not made available until operational decisions have already been made. The promise of this demonstration is to harness the myriad data portals together with new real-time data in a platform for all stakeholders that are directly transferable to other rivers with similar challenges.

The need for such a platform is critical. The recent historic drought and associated challenges on the Sacramento River and Lake Shasta to manage cold water for winter-run Chinook salmon has made the already stressed system even less flexible, and decisions about its management will become increasingly more challenging and controversial. If the full suite of data and information required for water supply and fishery management decisions is made available and used more rapidly, decisions may still be difficult, but at least they will be clearly justified based on best-available data and structured to maximize learning associated with implementation of management decisions. We expect that this demonstration project will facilitate true adaptive management capable of benefiting and protecting essential economic and environmental values of Sacramento Valley water supply and fisheries.

A prime example of our expectations for this demonstration is temperature management below Lake Shasta to protect winter-run salmon spawning. Currently, flow and temperature data is available in real-time, but is spread across a number of different sites with varied access and data formats. CDFWS also conducts aerial redd (i.e. salmon nest) surveys weekly and adult salmon carcass surveys daily; however, this information, while public, is not made readily available in real-time. Even where subsets of this data have been integrated (e.g. SacPAS <http://www.cbr.washington.edu/sacramento/> and Bay Delta Live <http://www.baydeltalive.com/>), user friendly connections to this data such as Application Program Interfaces (API) have not yet been developed. This severely restricts open access and use of all relevant data. The platform developed through this demonstration project will integrate and provide API for all data and information so that flows, water temperatures, redd locations, and a variety of related data can be viewed simultaneously and in real-time (in addition to historically), and operations can be evaluated and managed to protect salmon redds based on a data-driven understanding of environmental conditions instead of estimated temperatures at somewhat arbitrary compliance locations.

The SRSC have also been recently informed that the Sacramento River Watershed Program (SRWP) has been developing a Sacramento River Watershed Portal Project. According to the SRWP website (<http://www.sacriver.org/blog/sacramento-river-watershed-portal-project-update>), the Sacramento River Watershed Portal will “give users access to the extensive water monitoring data, studies, reports and articles on the Sacramento River Watershed. Users will be able to compile maps and graphs to better visualize data collection results and answer questions about the watershed. SRWP is working with a knowledgeable group of project partners and other stakeholders representing regulated dischargers, water managers, state and federal agencies, NGOs, and tribes to inform decisions regarding the content, design, and functionality of

the portal. This effort is part of SRWP's long-term program to improve watershed health by providing accurate, timely, and graphic information about the Sacramento River Watershed." As part of this project, we will be coordinating with the SRWP on their portal project effort.

Section 4: Project Description

4.1 Data Description and Management

Table 3 summarizes the types, sources, and availability of data that the SRSC expects to use in this demonstration project. Nearly all of the data is public. However, the “ease of use” varies significantly across data sources. Some data (e.g. USGS streamflows) are readily available in machine-readable formats, while other (e.g. juvenile salmon rotary screw trap monitoring) may require some formatting for integration. This demonstration project will also leverage previously developed portals such as Bay Delta Live and DataBasin to the greatest extent possible. While such portals are mostly developed with proprietary software architecture (e.g. Bay Delta Live is built in OpenNRM, a codebase that has not yet been made open source and can only be modified by its developers), they do provide convenient connections to data that will enhance our ability to connect to certain datasets using open data tools and programming languages in this demonstration. When combined with the fisheries data in Table 3 that will be new in the decision-making process served by this demonstration project, we expect that this demonstration project will yield a new open data resource with very high value to this and other fish and flow decision-making processes.

Data Type	Source	Website	Specific Data	Availability	Ease of Use
Water Operations	USBR	http://www.usbr.gov/mp/cvo/	CVP water and power operations analysis	Public	High
	Department of Water Resources Operation Control Office (DWROCO)	http://www.water.ca.gov/swp/operations/control/	SWP water and power operations analysis	Public	High
	DWROCO Daily Operations	http://www.water.ca.gov/swp/operations/control/docs/mapper/WTRRPT.MON	Daily flows	Public	High
	Settlement Contractor Diversions	n/a	Diversions, deliveries, losses	Public	Low
		http://www.waterboards.ca.gov/watertools/water_issues/programs/ewrims/index.shtml	Diversion point location, volume	Public	Low
	Water Rights		Lake Shasta storage, inflow, outflow, temperature, cold water pool volume;	Public	Moderate
Instream Flows	California Data Exchange Center (CDEC)	http://cdec.water.ca.gov/	Predicted future hourly flows	Public	High
	California Nevada River Forecast Center	http://www.cnrfc.noaa.gov/	Sacramento mainstem and tributary streamflows, Keswick flow releases	Public	High
	United States Geological Survey (USGS) Streamflow Waterdata	http://waterdata.usgs.gov/ca/nwis/current?type=flow	Temperature, turbidity, etc.	Public	High
Water Quality	USGS	http://cdec.water.ca.gov/	Temperature, turbidity, etc.	Public	High
	CDEC	http://www.cnrfc.noaa.gov/	Temperature, turbidity, etc.	Public	High
Climate / Weather	National Oceanic & Atmospheric Administration (NOAA)	http://radar.weather.gov/ridge/radar.php?rid=bbx&product=N0R&overlay=1110111&loop=no	Air temperature, precipitation, etc	Public	High
	Applied Climate Information System	http://www.rcc-acis.org/docs_datasets.html	Global climate / climate change	Public	Moderate
	Natural Resources Conservation Service	http://www.wcc.nrcs.usda.gov/web_service/awdb_web_service_landing.htm	Precipitation, snowpack, reservoir status	Public	Moderate
Fisheries	Adult salmon redd locations	n/a	Latitude / longitude, size	Public	Low
	Adult salmon carcass surveys	n/a	Latitude / longitude, size	Public	Low
	Juvenile salmon rotary screw trap monitoring	n/a	Daily count of juvenile salmon	Public	Low
	Salmon habitat mapping	n/a	Latitude / Longitude, extent, type	Public	Moderate
	Salmon habitat restoration sites	http://www.sacriver.org/aboutwatershed/DigitalAtlas	Latitude / Longitude, extent, type	Public	High
Modeling	Adult salmon video monitoring	n/a	Timing, number, size of fish passing	Public	Low
	River Assessment for Forecasting Temperatures Decision Support Tool	http://oceandview.pfeg.noaa.gov/RAFT/	Predicted future hourly temperatures	Public	Moderate
Portals	Bay Delta Live; Sacramento River Water Quality Data Portal (in development)	These portals provide access to some of the fish, flow, and water quality data identified in this table. Where an existing portal offers more direct access to or improved functionality of data required for this demonstration than the original source of the data, we will coordinate directly with the portal managers to connect through the portal and further expand the open distribution of important data			

Table 3: Summary of Types and Sources of Existing and Anticipated New Data for this Demonstration

The project team recognizes that in order to achieve the objectives of this demonstration project, as well as the broader open and transparent data objectives of the S.D. Bechtel, Jr. Foundation, a Minimum Viable Product (MVP) must be delivered. We expect that the biggest challenge to a successful MVP will be the data itself, as opposed to the analytical and visualization tools built on top of the data. We expect that the MVP data will include fish data (carcass counts, redd surveys, and rotary screw trap data), flow data (USGS and CDEC streamflow gauge sites), and water quality data (temperature data from gauge sites and loggers along the Sacramento River) and based on preliminary data collection, discussions with data providers, and initial data integration work, we are confident that we will be able to acquire and effectively use

these data during the project. The following sections describe preliminary data integration and open data publishing work completed to demonstrate the feasibility of assembling acquiring, integrating, and publishing the fish, flow, and water quality MVP data.

4.2 Data Analysis and Visualization

The SRSC will select and refine data integration, publishing, analytical, and visualization tools based on interactions with the Steering Committee (SC) described above and the Foundation, or its representatives. In response to concerns about availability and ease of use of the core data required to develop the MVP expected from this project, we developed a preliminary open data site (Figure 1) similar to the California Green Gov site that integrates a subset of the fish, flow, and water quality data and provides API that render the data actionable for this demonstration project and make it easily available to any other group of users interested in using the data. Based on our work with this preliminary open data site, we are confident that we can also develop the analytics, such as water temperature statistical and screening tools and correlation tools, for identifying patterns and correlations in and between juvenile salmon survival, streamflow, and water temperature data.

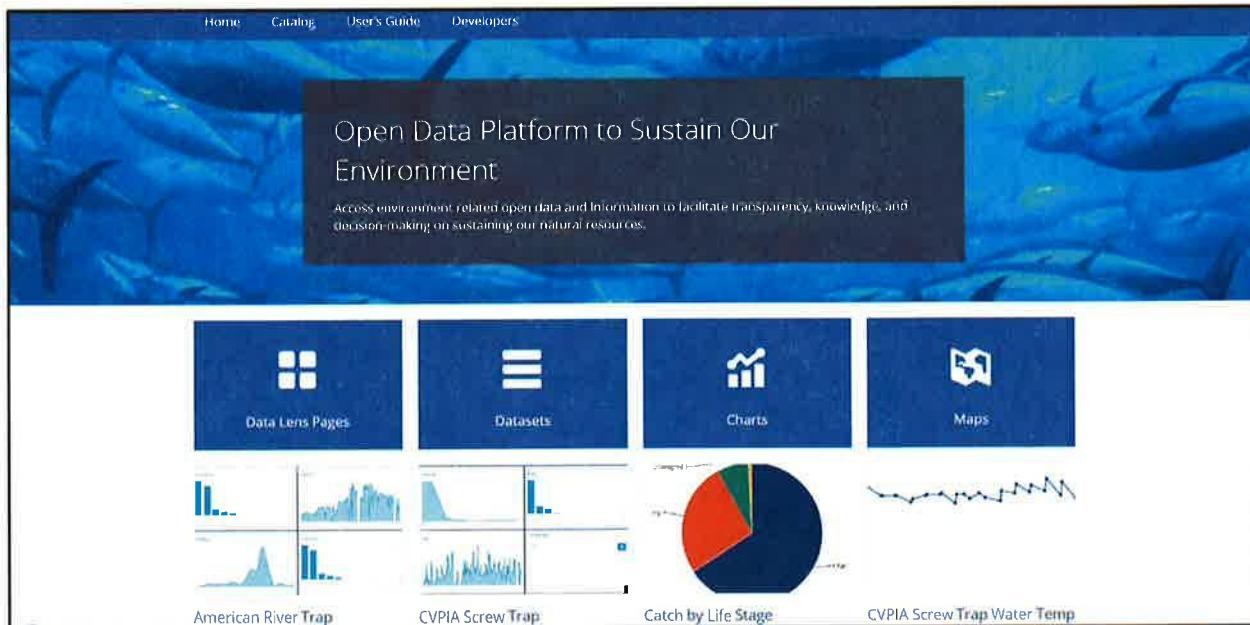


Figure 1: Preliminary Open Data Platform Demonstrating Ability to make MVP-Required Fish, Flow, and Water Quality Data Accessible to this Demonstration Project and Transferable to Other Uses

The sample dashboard from the project summary (Figure 2) shows streamflow (line graph in upper left corner) and floodplain habitat area (bar chart in lower left corner) keyed to specific locations on the map and is directly tied to completely open data that updates automatically. Similarly, we expect that the SC and stakeholders in this demonstration project will quickly learn the simple mechanics behind constructing analytical tools and visualizations tied to open data to expand the components and functionality of the MVP resulting from this effort. The simple visualization could now be

expanded on by any interested user through Tableau Public or translated to other analytical or visualization tools seamlessly because the base data is now available through an API to the hosted data.

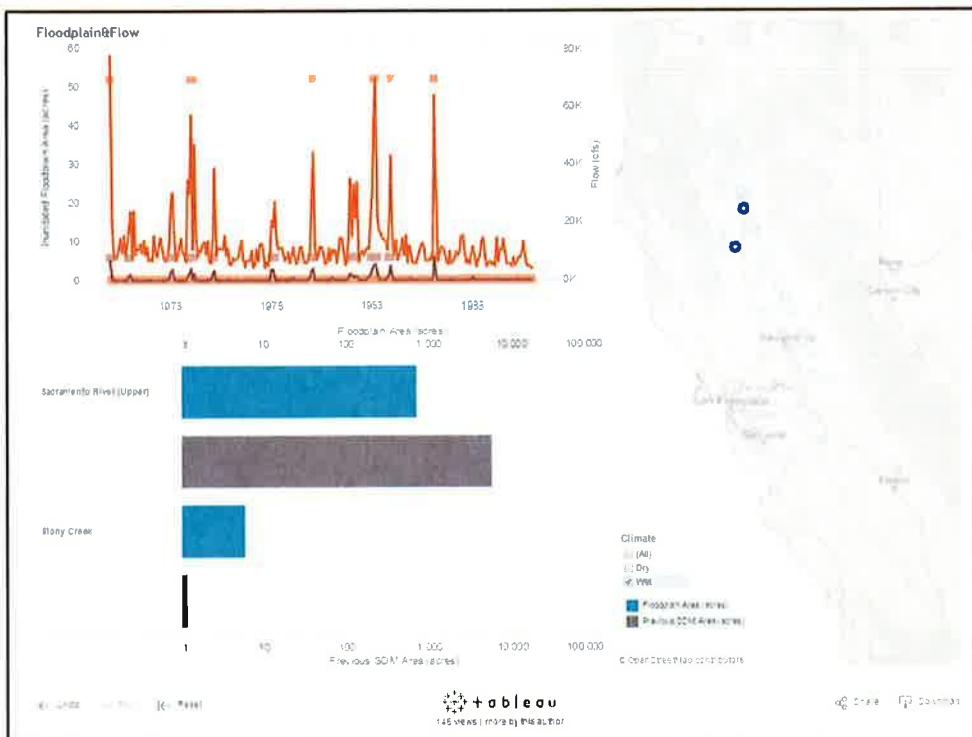


Figure 2: Example of Possible Analytical and Visualization Tool Showing Streamflow (line graph in upper left corner) and Floodplain Habitat Area (bar chart in lower left corner) Keyed to Specific Locations on the Map

Final analytical and software tools will be selected to best fit the workflow desired by the Steering Committee and Core Team, following the general approach outlined below.

- All data available through open web services (e.g. USGS streamflow) to be accessed directly, maintaining original data in the format of the maintaining agency, unless local integration and storage enhances the decision workflow
- All data not available through open web services (e.g. FWS rotary screw trap data) to be formatted following Federal Open Data standards (<https://project-open-data.cio.gov>). As described above, we have already begun coordination with partner agencies to identify the core set of data necessary for completion of an MVP through this project and demonstrated how it could be integrated and made open for this project and to others
- Data integration and management to be accomplished using a cloud based storage solution (e.g. Socrata, CKAN, or Amazon Web Services) and accompanied by an open source API to make integrated data available for other potential users

- d. Decision support platform developed and delivered as a web-service with the following analytics and visualization components:
 - i. Mapping / spatial data visualization using Google Maps (open source), CartoDB (open source), Leaflet (open source), Tableau Public (open source), and/or ESRI (proprietary), or similar
 - ii. Time series data visualization using Plotly (open source), Dygraphs (open source), TSTool (open source), and/or Tableau Public (open source), or similar, and d3 (open source) to build documents from data
 - iii. Predictive modeling integration using Shiny (open source R statistical evaluation web application) or eRAMS (open source), or similar
 - iv. Existing algorithms / visualizations from Reclamation's SacPAS Tool
 - v. Relevant links to data portals such as Bay Delta Live and the Sacramento River Watershed Program Project Portal

Individual tools will be selected through an agile software development approach (i.e. rapid iteration) that includes the following steps:

- 1) Initial demonstration project objectives, functionality, work flow needs developed and prioritized by stakeholders
- 2) Specific user needs (based on objectives, functionality, work flow) identified in regular (weekly or bi-weekly) user work sessions modeled on ongoing decision-making forums
- 3) Prototype solutions developed with multiple tools
- 4) Users select prototype tools for refinement based on functionality, cost, interoperability, maintenance needs, etc.
- 5) Selected tools refined to enhance functionality and integrate with other tools
- 6) Integrated tools combined on web-served platform / dashboards
- 7) Web-served platform / dashboards linked back to related open data sites and services

4.4 Linkage to Decision Making

From the very initial stages of this Project and the SC meetings, the focus will be on how existing and new data and innovative data visualization will result in better decision making and agreement on the types of water management decisions that will be improved as a result of project implementation.

As stated in Section 3, the primary and initial objective of this demonstration project is to integrate diverse flow, water operations, fishery, and water quality data into a single platform that facilitates more data-driven decision making, with the following specific sub-objectives:

1. Improved Sacramento River operation of the CVP and more precise delivery of flows for fishery temperature management and downstream diversions
2. Improved understanding of the data critical to flow and fish management decisions, and identification of additional monitoring needs or data gaps limiting more effective management

3. Improved calibration of existing predictive models such as those being developed for temperature and habitat, and contribution of data to drive new predictive models such as those being developed by Reclamation fisheries managers (e.g. SacPAS), including expected outcomes that will result in more sustainable water management for meeting the needs of people and nature

Additionally, we expect to also use this platform geospatially identify completed restoration projects and also where new restoration projects could and should be focused. For example, the platform will be able to provide historical and current data on the location of winter-run spawning redd locations and critical river temperature reaches. From that, field work can be done to identify the quality and quantity of habitat for this life stage, which can be added to the platform. With this data, specific types of restoration projects can be targeted such as adding spawning gravel or refugia to increase the population at this life stage. Other data such as identifying where and when hatchery fish are releases into the system and comparing that to river conditions on flow, turbidity, etc. to determine if this effort is successful or not. Lastly, we envision tools such as a new Shasta Lake temperature model, new monitoring data points in the lake, improvements in the RAFT model, etc. will be implemented soon and this platform could help provide data sets to the modeling effort, and outputs from those models could be incorporated into this platform.

As stated in Section 3, the goal will be to provide real-time and historical data that is georeferenced in such a way that decisions on water operations, restoration projects, additional modeling tools so that policy and decision makers will have better information available for timely decisions.

4.5 Budget and Schedule

4.5.1 Budget

The project budget is summarized in the attached budget form and includes in-kind costs from SRSC, the Socrata Foundation, and the Tableau Foundation, as well as technical and facilitations consultant costs. We developed this budget assuming an 18-month project duration and delivery of a minimum viable product for decision making on the Sacramento River that includes a sufficient collection of open data and open source analytics and visualization tools collected in dashboards. We have also completed a preliminary assessment of likely costs for improvements, to and ongoing maintenance of the MVP from this project and expect the cost to be approximately \$120,000 annually for the first three years. The SRSC intends to coordinate with stakeholder agencies and organizations to cover these costs and ensure adoption and continued use of the tools developed through this project. We expect this annual cost to be significantly reduced after year three as additional development needs are reduced and ongoing maintenance becomes the primary cost.

4.5.2 Schedule

Month 1 – Form SC and Core Team, develop contracts and RFPs for consultants

Month 2 – Finalize contractor team roles, lay out approach and agile workplan

Month 2-6 – Develop platform specifications with SC and Core Team, build first iteration of platform, beta test platform in meetings with SC and Partners, continue outreach to other interested stakeholders, bi-weekly iteration on Platform functionality

Month 6 – Workshop on Platform to date, solicit comments, present Platform functionality to other agencies, bi-weekly iteration on Platform functionality

Month 7-10 – Refine Platform based on input, analyze past information and operational decisions, does the Platform meet the objectives, bi-weekly iteration on Platform functionality

Months 10-12 – Continued outreach, bi-weekly iteration on Platform functionality

Months 13-18 – Platform is operational. Interactive discussions with the fishery agencies and SC on how platform is informing operations and how operational decisions will be based. Also begin discussions on having Platform begin to inform potential modeling of operations.

Section 5: Other Requirements

5.1 Project Commitments

The SRSC are committed to the project and are requesting letters of interest from applicable state and federal agencies, and stakeholders based on this final submission to the Foundation by June 24, including an interest to serve on the SC.

5.2 Project Synergies

The Foundation has expressed an interest to develop synergies to use lessons learned to enable project innovations to be used in other regions. Within the facilitation budget, the Project will include:

- Two 2-hour conference calls and two all-day meetings between project proponents
- External evaluation process, which will include one or more meetings with the evaluation team
- Communication strategies will be developed during project implementation in concert with the Foundation, which describes various means for educating interested parties about project results and lessons learned, including participation in workshops and conferences

5.3 Final Report and Outreach

The SRSC will prepare a Final Report upon project conclusion that provides an overview of the project and objectives, descriptions of the data management and

visualization tools used, lessons learned about project design and implementation, conclusions (especially those related to how well the project performed in terms of achieving objectives), and recommendations regarding project modifications for other regions that may choose to implement similar projects.

Attachment 1 – Participating Settlement Contractors

Glenn-Colusa Irrigation District
Reclamation District 108
Sutter Mutual Water Company
Anderson-Cottonwood Irrigation District
Natomas Central Mutual Water Company
Reclamation District 1004
Princeton-Codora-Glenn Irrigation District
Provident Irrigation District
Conaway Conservancy Group
Meridian Farms Mutual Water Company
Sycamore Mutual Water Company
River Garden Farms Company
Pleasant Grove-Verona Mutual Water Company
City of Redding
Maxwell Irrigation District
Tisdale Irrigation and Ditch Company
Pelger Mutual Water Company
Henle Family Limited Partnership



Mr. Thad Bettner, General Manager
Glenn-Colusa Irrigation District
344 East Laurel
PO Box 150
Willows, CA 95988

Dear Mr. Bettner:

I am pleased to provide my support for the “Data-Driven Decision Platform for Sacramento River Real-Time Water and Fishery Coordination” demonstration project and the collaborative efforts of the Glenn-Colusa Irrigation District, the Sacramento River Settlement Contractors, FlowWest, and the diverse group of public and private stakeholders that will contribute to this demonstration.

Tableau’s social impact mission is to encourage the use of facts and analytical reasoning to solve the world’s problems. The Sacramento River demonstration project proposes using data to inform decisions made to protect water supply and salmon in the Sacramento River. The demonstration intends to use data visualizations to support collaboration among multiple stakeholders, including community members, farmers, and state and federal water managers. We have seen this model work and are excited to support it.

We are pleased to support this important initiative with the following:

- 5 Tableau Desktop Professional licenses for the Glenn-Colusa Irrigation District project team, 2-year term valued at \$7,125
- Access to Tableau Service Corps a volunteer corps of experts to help you use Tableau
- Access to Tableau Public, Tableau’s free public server for sharing visualizations

We have invested in other environmental initiatives and organizations. Headwaters Economics (headwaterseconomics.org) is a great example. They use Tableau visualizations to help advocate for smart land and water conservation decisions in a collaborative and non-partisan way. Recently, they advocated for renewal of the Land and Water Conservation fund in the federal budget. The renewal was approved at \$450M which was more than they asked for. Headwaters credits data visualization for helping bring together and get support from multiple stakeholders; some of whom have conflicting perspectives. The data helped everyone involved understand the environmental benefits, economic impact and benefits, and other aspects of the program in a way that overcame political ideology and misinformed perspectives. We also recently supported the U.S. Bureau of Reclamation, the San Joaquin River Parkway and Conservation Trust, and FlowWest in a similar effort on the San Joaquin River.

We see many similar elements in the Sacramento River demonstration project and are excited to play our small part in supporting it.

Sincerely,

Neal Myrick

Neal Myrick (4/11/16 - 2018)

Neal Myrick
Director of Social Impact
Tableau Software



June 6, 2016

Mr. Thad Bettner
General Manager
Glenn-Colusa Irrigation District
344 East Laurel
PO Box 150
Willows, CA 95988

Dear Mr. Bettner,

I am writing on behalf of Socrata, a software company committed to Open Data.

Open Data programs present opportunities to enable economic opportunity, improve quality of life, and improve operational efficiencies. Socrata feels strongly that Open Data can help solve critical problems related to water resources and declining fisheries.

Socrata has invested time and resources in developing the proposal for the Sacramento River Settlement Contractor's demonstration project titled "Data-Driven Decision Platform for Sacramento River Real-Time Water and Fishery Coordination" in partnership with FlowWest and GCID.

In this proposal, Socrata is providing deeply discounted Open Data Portal platform technology and expert resources to ensure a successful implementation of data integration and publishing needs for this project. Socrata and the Socrata Foundation will continue to do all it can to help catalyze the use of modern Open Data practices and tools in this project and related water projects that benefit from the technologies developed here.

Sincerely,

A handwritten signature in black ink, appearing to read "Cam Caldwell".

Cam Caldwell
Socrata
Director, Non Profit and Philanthropic Partnerships
404.353.6990
cam.caldwell@socrata.com
[@CamLCaldwell](https://twitter.com/CamLCaldwell)

Organization Name: Sacramento River Settlement Contractors

Project Name: Data-Driven Decision Platform for Sacramento River Real-Time Water and Fishery Coordination

Date: 6/7/16

Grant Year: 7/1/2016 - 1/31/18

Fiscal Year:

1-Year Project Budget

Grant Year [07/01/2016 - 1/31/2018]			
Revenue			
Source	Amount	Status	Description
SRSC Agencies - In kind services	\$ 50,000.00		SRSC Agency staff in-kind salary and benefits
S. D. Bechtel, Jr. Foundation			
Fishery Agencies	\$ 50,000.00		Respective agencies posting data real time
Total Revenue	\$ 100,000.00	N/A	

Grant Year [07/01/2016 - 1/31/2018]			
Direct Costs			
Personnel Costs			
Salaries	FTE %	FTE % Allocated to Project	Project Budget SDBJF Request
None			N/A N/A
Total Salaries			\$ - \$ -
Benefits/Taxes			
Non-Personnel Costs			
Item	Project Budget	SDBJF Request	Description
None	N/A	N/A	
Total Non-Personnel Costs	\$ -	\$ -	
Total Direct Costs	\$ -	\$ -	
Indirect Costs			
Indirect %			
Indirect Costs	\$ -	\$ -	

Consultants and Contractors			
<i>This section reflects the applicant's current intent concerning specific consultant(s)/contractor(s). The final selection of such third parties and the terms of the applicant's relationship with them is within the applicant's sole discretion and control.</i>			
Individual/Firm	Project Budget	SDBJF Request	Description
FlowWest			Project management, coordination between water resources and aquatic ecosystem disciplines, data acquisition, data integration, open data publishing, analytics development, visualization development, decision platform development and iteration, report writing and documentation
	\$ 437,820.00	\$ 437,820.00	
Socrata	\$ 90,000.00	\$ 39,000.00	Open data publishing support
Tableau	\$ 17,125.00	\$ -	Analytics and visualization support
Kearns & West	\$ 71,025.00	\$ 71,025.00	Facilitation
MBK Engineers	\$ 50,000.00		SRSC/NCWA will fund this effort
Natural Resources Scientists	\$ 15,000.00	\$ -	SRSC/NCWA will fund this effort
[Consultant/Contractor]			
Total Consultant and Contractor Costs	\$ 680,970.00	\$ 547,845.00	

Subgrants			
<i>This section reflects the applicant's current intent concerning specific subgrantees. The final selection of such third parties and the terms of the applicant's relationship with them is within the applicant's sole discretion and control.</i>			
[Grantee/Program/Other Method of Itemization]	Project Budget	SDBJF Request	Description
None			
Total Subgrant Costs	\$ -	\$ -	

Total Expense	\$ 680,970.00	\$ 547,845.00
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SDBJF Request as % of Total Project Budget	80%
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Lobbying Expenses* Included in Total Project Budget	N/A
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**Please review the Instructions tab carefully for guidance regarding Lobbying Expenses.*

June 2016 - December 2017	Tompkins (Principal)	Lalonde (Developer)	Consortino (Data Scientist)	TOTALS	Assumptions/Notes
	\$200.00	\$150.00	\$130.00		
Task 1 Project Management & Interdisciplinary Coordination	General and technical project management for 18 month duration				
General project management	156			78	
Technical project management					
Task 1 total hours	156	0	78	234	
Task 1 total labor	\$31,200	\$0	\$10,140	\$41,340	
Other Direct Costs - Task 1					
Miscellaneous				\$1,500	Travel for meetings
	Task 1 total ODC			\$1,500	
Total - Task 1				\$42,840	
Task 2 Data Acquisition & Preparation	Ongoing data collection from agencies, portals, web services, project stakeholders, etc.				
Acquisition and preparation	78	156	156		
Task 2 total hours	78	156	156	390	
Task 2 total labor	\$15,600	\$23,400	\$20,280	\$59,280	
Other Direct Costs - Task 2					
Miscellaneous				\$1,000	Hard drives, shipping, etc
	Task 2 total ODC			\$1,000	
Total - Task 2				\$60,280	
Task 3 Data Integration and Publishing	Integrating data and making public using Federal open data standards				
Integration and publishing	78	234	156		
Task 3 total hours	78	234	156	468	
Task 3 total labor	\$15,600	\$36,100	\$20,280	\$70,980	
Other Direct Costs - Task 3					
Miscellaneous				\$1,200	AWS fees
	Task 3 total ODC			\$1,200	
Total - Task 3				\$72,180	
Task 4 Analytics Development	Agile (iterative) development of decision support analytics with project stakeholders				
Analytics	78	234	156		
Task 4 total hours	78	234	156	468	
Task 4 total labor	\$15,600	\$36,100	\$20,280	\$70,980	
Other Direct Costs - Task 4					
Miscellaneous				\$500	Travel for meetings with stakeholders
	Task 4 total ODC			\$500	
Total - Task 4				\$71,480	
Task 5 Visualization Development	Agile (iterative) development of decision support visualizations with project stakeholders				
Visualization	78	234	156		
Task 5 total hours	78	234	156	468	
Task 5 total labor	\$15,600	\$36,100	\$20,280	\$70,980	
Other Direct Costs - Task 5					
Miscellaneous				\$500	Travel for meetings with stakeholders
	Task 5 total ODC			\$500	
Total - Task 5				\$71,480	
Task 6 Decision Platform Development	Combining data, analytics, and visualizations into collection of open data dashboard				
Decision platform / dashboards	78	234	156		
Task 6 total hours	78	234	156	468	
Task 6 total labor	\$15,600	\$36,100	\$20,280	\$70,980	
Other Direct Costs - Task 6					
Miscellaneous				\$500	Travel for meetings with stakeholders
	Task 6 total ODC			\$500	
Total - Task 6				\$71,480	
Task 7 Report writing and documentation	Combining data, analytics, and visualizations into collection of open data dashboard				
Reports / technical documentation	78	78	156		
Task 7 total hours	78	78	156	312	
Task 7 total labor	\$15,600	\$11,700	\$20,280	\$47,580	
Other Direct Costs - Task 7					
Miscellaneous				\$500	Reproduction
	Task 7 total ODC			\$500	
Total - Task 7				\$48,080	
Total Hours for all Tasks (1-4)	624	1170	1014	2600	
Total Labor Costs for all Tasks (1-4)	\$124,600.00	\$175,500.00	\$131,820.00	\$432,120.00	
Total ODC for all Tasks (1-4)				\$5,100	
Total Labor and ODC				\$437,820	

June 2016 - December 2017	Harty (Principal)	Seapy (Sr. Associate)	TOTALS	Assumptions/Notes
	\$195.00	\$130.00		
Task 1: Project briefing and background				Jun-16
Task 1.1: Consult with SRSC, Bechtel, and other demonstration project sponsors or initiators about approach to facilitation, KW project role, and other foundational information	4	4		Assumes one meeting, either in person or via conference call
Task 1.2 Review relevant background material as necessary	2	2		
Task 1 total hours	4	4	8	
Task 1 total labor	\$780	\$520	\$1,300	
Other Direct Costs - Task 1				
Phone (0.6 cents/minute/caller)			\$58	Assuming use of K&W line for 1 (2hr) call with 8 ppl
Task 1 total ODC			\$58	
Total - Task 1			\$1,358	
Task 2: Steering Committee				June 2016 - December 2017
Task 1.1:				
2.1: Assist sponsors with Steering Committee formation	4	5		Relies on previous SWT outreach and assumes there is no need for in-person work - all by phone, email, web
2.2: Outreach to SC members to confirm or clarify key interests related to project, understand any concerns, support solutions or resolution;	18	18		18 month project duration
2.3: Organize framework or charter for the SC; draft groundrules	2	4		
2.4 Plan, design, and facilitate monthly SC meetings (18 total, each meeting 3 hrs total incl. early arrival and prep, immediate follow up); includes logistics such as venue location, AV needs, agenda development, meeting materials;	89	89		Assumes 18 SC meetings occur in Sacramento; each meeting 3 total hours; venues will be donated by participants, likely to change or shift; KW assists with logistics; KW does not pay for venue costs or AV costs; does not include any food or drink costs;
2.5 Take notes at each SC meeting; prepare draft summary; gather comments; prepare final summary	20	72		Assumes 18 summaries; one round of review by SC members; draft to be prepared within five working days of SC meeting.
2.6 Provide other process support as requested for SC	20	20		
Task 2 total hours	153	208	361	
Task 2 total labor	\$29,835	\$27,040	\$56,875	This estimate reflects a per meeting facilitation cost of \$1,625, with written summary an additional cost. If longer meetings are needed: \$2,145 is estimated per meeting facilitation cost for a 4 hour meeting; written summary is additional;
Other Direct Costs - Task 2				
Phone (0.6 cents/minute/caller)			\$300	Assumes total of 18 months
Mileage and parking			\$750	Based on 18 SC meetings in Sacramento
Task 2 total ODC			\$1,050	
Total - Task 2			\$57,925	
Task 3: Core Team Coordination and Support				June 2016 - December 2017
3.1: Consult with Core Team representatives as needed regarding SC activities, needs, issues;	20	10		
3.2: Provide facilitation services or other process support as requested;	10	10		
Task 3 total hours	30	20	50	
Task 3 total labor	\$5,850	\$2,600	\$8,450	
Task 5 total hours	0			
Task 5 total labor	\$0		\$0	
Other Direct Costs - Task 3				
Phone (0.6 cents/minute/caller)			\$100	Assumes total of 18 months
Task 3 total ODC			\$100	
Total - Task 3			\$8,550	
Task 4: Project Coordination and Reporting				June 2016 - December 2017
4.1 Coordinate as needed with project sponsors and KW team	10	10		
Task 4 total hours	10	10	20	
Task 4 total labor	\$1,950	\$1,300	\$3,250	
Other Direct Costs - Task 4				
Phone (0.6 cents/minute/caller)			\$0	
Task 4 total ODC			\$0	
Total - Task 4			\$3,250	
Total Hours for all Tasks (1-4)	197	242	439	
Total Labor Costs for all Tasks (1-4)	\$38,415	\$31,460	\$69,875	
Total ODC for all Tasks (1-4)			\$1,150	
Total Labor and ODC			\$71,025	

NOTE: All tasks, assumptions, and labor estimates are open to discussion - this is an initial estimate

SKU	Description	Term	Price
	Configuration and Training Services		
			Onetime Fees
SOC-PS-	Socrata Open Data Launch Package- Standard	Up to 150 hours total	\$30,000.00
ODP-S	- Scope as outlined in Description of Services		
	Subscription and Support Services		
	Socrata Open Data Portal – Basic Plan		
		12 Months:	
		08/01/216	
	Usage Limits:	07/31/2017	
SOC-OD-B	- 1 Instance		\$60,000.00
	- 150 Datasets		
	- Unlimited Users		
	- Unlimited APIs		
	- Unlimited Views and Visualizations		
	Socrata Basic Customer Support Package	12 Months:	
SOC-SU-		08/01/216	
ODP-B	- Email, phone, and web support		Included
	- Self-service knowledgebase	07/31/2017	
			Price Total: \$90,000.00
			Configuration and Training Services Discount: (\$3,000.00)
			Subscription and Support Services Discount: (\$48,000.00)
			Extended Price Total: \$39,000.00