

RECLAMATION

Managing Water in the West

Annual Work Plan, FY2016

October 1, 2015 – September 30, 2016

**In compliance with the “Management Agency Agreement
between the Central Valley Regional Water Quality Control
Board and the United States Bureau of Reclamation” executed
on December 4, 2014**



Salt Slough near Los Banos, CA



**U.S. Department of the Interior
Bureau of Reclamation**

July 1, 2015

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Abbreviations and Acronyms

Basin Plan	Water Quality Control Plan for the Sacramento and San Joaquin River Basins, 4 th Edition
CVP	Central Valley Project
CV Water Board	Central Valley Regional Water Quality Control Board
CV-SALTS	Central Valley Salinity Alternatives for Long Term Sustainability Stakeholder Group
DMC	Delta-Mendota Canal
DWR	California Department of Water Resources
EC	electrical conductivity
GBP	Grassland Bypass Project
GWD	Grassland Water District
LBNL	Lawrence Berkeley National Laboratory
LSJR	Lower San Joaquin River
MAA	Management Agency Agreement
$\mu\text{S/cm}$	micro Siemens per centimeter
mg/L	milligram(s) per liter (parts per million)
PTMS	Program to Meet Standards
Reclamation	United States Bureau of Reclamation
RTMP	Real Time Management Program
SJR	San Joaquin River
TID	Turlock Irrigation District
TMDL	total maximum daily load
WARMF	Watershed Analysis Risk Management Framework

Reclamation San Joaquin River Salinity TMDL MAA Fiscal Year 2016 Annual Work Plan

Purpose

The Central Valley Regional Water Quality Control Board's (CV Water Board) Salt and Boron Total Maximum Daily Load (TMDL) for the San Joaquin River was approved and placed into effect on July 28, 2006. In response to the Salt and Boron TMDL, the United States Bureau of Reclamation drafted an Action Plan (dated July 9, 2008) and entered into a Management Agency Agreement (MAA) with the CV Water Board on December 8, 2008. The Action Plan was created to accompany the MAA and provide details about Reclamation's planned activities to comply with the TMDL. Many of the activities were scientific in nature and intended to characterize the basin and identify future projects to meet the needs of the TMDL. A good example study that has been completed is the Delta Mendota Canal (DMC) Recirculation Project. This project evaluated the feasibility of recirculating water from the DMC to the San Joaquin River and back into the DMC when necessary to reduce the salinity concentration in the river. The project was not deemed feasible but serves as an example of the scientific study and discovery that was accomplished to find effective salinity management practices for the San Joaquin River.

The initial requirements for creating a real-time management program for the San Joaquin River were also explored and a real-time pilot has been implemented in the San Joaquin watershed to be used as an example for stakeholders within the watershed. A Reclamation Compliance Plan and Compliance Report (dated May 2010) were also written to provide the methodology used for the activities described in the Reclamation Action Plan. These documents contain information regarding the technical analysis, computation, and methodology utilized in each Reclamation activity. The updated MAA states that Reclamation actions will be described in an Annual Work Plan. The Annual Work Plan serves as a continuation of the work that was initiated in the Reclamation Action Plan.

The Annual Work Plan summarizes annual planned activities by Reclamation in conjunction with each element outlined in the MAA.¹ The original Action Plan described Reclamation's past practices and procedures to mitigate and manage adverse impacts of salt and boron imported into the San Joaquin River Basin via the (DMC) to help achieve compliance with the objectives contained in the CV Water Board's *Water Quality Control Plan for the Sacramento River and the San Joaquin River Basins – 4th Edition* (Basin Plan). Those actions have now been updated, added to the MAA and are reported in the Annual Work Plan.

Reclamation performs a variety of salinity management activities within the San Joaquin River watershed. Examples of these activities include the Grassland Bypass Project (GBP), WaterSMART Grant Program, New Melones Plan of Operations, real time salinity management program development, support to the Westside Regional Drainage Plan and salinity management support to Grassland Water District (GWD) and State and Federal wildlife refuges. Reclamation

¹ The activities in the Work Plan are subject to the availability of a financial allocation.

has committed significant resources to the development of a real time management pilot project in GWD to initiate the real-time water quality management program. Reclamation is committed to continuing the development of real time salinity management within the San Joaquin River watershed to reduce reliance on New Melones dilution flows. Reclamation's planned activities for FY2016 regarding the real time salinity management program are described in this work plan.

Reclamation Staff Resources

Table 1 lists Reclamation staff resources that are utilized at least in part for activities relating to salt and boron in the San Joaquin River.

Table 1: List of Reclamation Staff

Agency	Staff Resource Name	Role
USBR	Reginald Dones	PTMS project manager
Lawrence Berkeley National Lab/USBR	Nigel Quinn	Technical Expert contracted to Reclamation
USBR	Michael Mosley	Regional Water Quality Coordinator
USBR	Michael Eacock	Natural Resource Specialist
USBR	Jun Wang	WARMF modeler
USBR	Kirk Nelson	Contract manager; modeler

Goals and Objectives for FY2016

All the activities and technical support planned for the 2016 fiscal year are intended to provide resources, information and support to San Joaquin stakeholders that wish to participate in the real-time management program (RTMP). Reclamation intends to spend substantial time conducting outreach activities and providing technical support to those who wish to gather knowledge and/or participate in RTMP. Reclamation will continue to fund and support the RTMP within the GWD using the experience gained from this activity to guide expansion of the program into other water districts, refuges and entities in the San Joaquin River Basin.

Goals for the 2016 fiscal year:

- Complete automation of input data from agency websites and other web portals into the Watershed Analysis Risk Management Framework (WARMF) forecast model.
- Complete the WARMF Manager Module – which provides a simplified user interface for viewing model runs and forecast (with input from San Joaquin basin stakeholders).
- Initiate development of the WARMF-Online data and output visualization toolbox.

- Hold a stakeholder workshop to provide training on the WARMF-Online web portal and to encourage stakeholder coordination and cooperation.
- Assess model performance at the sub-watershed level with emphasis on the west-side drainage inflow stations and the wetland entities.
- Continue to provide technical support as needed.
- Continue the effort to incorporate real-time east side SJR data into the WARMF forecast model.

The Reclamation, in response to the passage of the Water Supply, Reliability, and Environmental Improvement Act ([Public Law 108-361](#)), which includes the CALFED Bay-Delta Authorization, has initiated implementation of the Program to Meet Standards (PTMS). This program intends to provide greater flexibility in meeting existing water quality standards for the Central Valley Project (CVP); a major objective of the program is to reduce reliance on releases from New Melones Reservoir for water quality purposes. Reclamation currently utilizes the CALFED funding authorization for the PTMS.

The goals for the 2016 fiscal year, listed above, include improvements and refinements to the existing WARMF San Joaquin River forecast model with emphasis on ease of use, automation of data inputs (which can take up to 3 hours to complete) and visualization of both data input and WARMF model output. Improving ease of use has been accomplished with the development of the WARMF Manager Module. The Manager Module simplifies the user interface by having all the controls and options included in a customized toolbox which has greatly reduced errors in data output.

A significant initiative in FY2016 will be continuing the development of online tools. These tools will allow users to access flow, water quality and meteorology data that is used directly in the model. This work coincides with work commissioned by the East-side Drainage Coalition under grant funding from the Environmental Protection Agency.

Reclamation will continue to provide technical support for the current real-time monitoring network and for those entities which desire to participate in RTMP. Each water district will pose a different challenge given the different levels of monitoring, reporting and automated control capabilities within each district. The Basin Plan includes a tiered implementation schedule; some stakeholders have chosen to participate earlier than required. Another goal associated with technical support is improved communication to solicit information on flows, electrical conductivity (EC) and salt loads discharged or diverted from the river that can be utilized to improve the quality of the WARMF forecast model.

Other planned activities include incorporating real-time data from Turlock Irrigation District into the WARMF forecast model and holding periodic informational meetings with stakeholders on the RTMP. Funded by Reclamation, Lawrence National Berkeley Laboratory (LBNL) will continue activities to improve the accuracy of the model at simulating flows and salt loads generated at the sub-watershed level. The work will focus on the eight west-side drainage stations and the managed wetland entities; improved model accuracy should facilitate stakeholder acceptance of the WARMF forecast model predictions. Reclamation is working to

create a schedule for Modesto Irrigation District, time and resources in FY 2016 are being focused on Turlock.

The following are specific FY2016 program goals and objectives:

A. Manage contracts, financial agreements, inter-agency agreements.

B. Provide technical support to the RTMP network.

1. Vital stations on the west side of the San Joaquin basin:²
 - i. Salt Slough at Hwy 165 (near Stevenson)^a
 - ii. Mud Slough near Gustine (GBP Site D)^a
 - iii. Mud Slough above San Luis Drain Confluence (GBP Site C)^b
 - iv. San Luis Drain at Outlet (GBP Site B)^b
 - v. Los Banos Creek at Highway 140^c
 - vi. Newman Wasteway^a
 - vii. Marshall-Spanish-Moran Drains^c
 - viii. Ramona Lake^c
 - ix. Orestimba Creek near Crows Landing^a
 - x. Westley Wasteway^c
 - xi. Del Puerto Creek^c
 - xii. Hospital Creek^c
 - xiii. Ingram Creek^c
 - xiv. San Joaquin River near Patterson^d
 - xv. San Joaquin River at Maze Road bridge^d
 - xvi. San Joaquin River near Crows Landing^a
2. Accurate model simulations and real-time forecasts using the WARMF model rely on the full array of stations reporting real-time (continuous data). At the present only three of the eight west-side tributary stations are reporting data in real-time to California Data Exchange Center (CDEC). Reclamation will provide technical support with the goal of having all of these stations reporting by the end of FY2016. Reclamation is providing troubleshooting assistance and overseeing maintenance of these stations in cooperation with the Westside Drainage Authority. Reclamation has contracted with the USGS for routine maintenance of many of the San Joaquin River stations as well as the important west-side tributary stations at Mud and Salt Slough. Reclamation currently cooperates with the USGS to provide timely technical support to minimize station down time.

C. Provide funding and technical support to the GWD.

² Stations are referenced from the 2014 San Joaquin River RTMP Framework Document

(a) Stations maintained by the USGS under contract with Reclamation

(b) Stations monitored for the GBP by the San Luis and Delta Mendota Water Authority (Authority) with funding from Reclamation

(c) Station monitoring supported by the Westside Drainage Authority (maintenance) and Reclamation (upgrades and troubleshooting)

(d) Stations maintained by California Department of Water Resources (DWR)

1. To support the GWD real-time salinity management staff, equipment, etc. During FY2016 solutions will need to be found to replace the current YSI-ECONet system, which is being retired by the XYLEM Corporation (which acquitted YSI). Considerable effort is being expended to find a cost-effective long-term solution. Several grant applications have been submitted to funding agencies to share some of the cost of the system refurbishment.
- D. Provide technical support for RTMP in the San Joaquin watershed; data acquisition from Irrigation Districts on the east and west sides of the San Joaquin River Basin.
1. RTMP technical support throughout the basin.
 2. Provide funding for a technical expert from the LBNL in RTMP.
 3. Considerable field level experience has been gained over the past 15 years with respect to monitoring station design, monitoring equipment integration and data telemetry options. The goal has always been to increase improved data access while causing minimum disruption or security threat to potential data providers. Reclamation continues to be involved in researching new sensors and monitoring technologies and improving monitoring integration. Reclamation has experience with solutions for real-time data quality assurance using the hydrological data management software WISKI. This software is being used by Merced, Turlock and Modesto Irrigation Districts and was recently installed in GWD.
- E. Work directly with Turlock Irrigation staff to develop a cost-effective and secure real-time data access solution.
1. During FY2016 a series of meetings will be scheduled with TID staff to explain the goals and principles of real-time salinity management and to explain model data needs and technical requirements for access. The most recent meeting concluded with a commitment from Turlock Irrigation District to develop a prototype solution for testing. Although irrigators in subareas on the east side of the San Joaquin River are not scheduled for compliance with load limits prescribed by the salinity TMDL or fully implement real-time salinity management until after 2016, early participation by TID and other stakeholders is important to the success of RTMP in the Lower San Joaquin River Basin.
- F. Hold informational meetings with Stakeholders
- G. Run the WARMF forecast model and make the information available to SJR Stakeholders.
1. Although Reclamation currently funds both development and use of the WARMF forecasting model – the long term goal is to have this activity be shared among primary stakeholders. These include DWR, the Westside Drainage Coalition, the Eastside Drainage Coalition and Reclamation. Responsibility for developing weekly forecasts has been successfully shared between a small number of entities

in the past. This had the advantage of keeping the major San Joaquin stakeholder agencies fully engaged in the activity.

H. Participate in CV-SALTS.

1. Reclamation attends CV-SALTS Executive Administrative and Policy sessions and Lower San Joaquin River Committee meetings. Reclamation provides support to the Central Valley Salinity Alternatives for Long Term Sustainability Stakeholder Group (CV-SALTS) Technical Advisory Committee.

Status of the Program

Table 2. FY 2016 Proposed Funding

No.	Funding Program	Year	Allocation	In Kind
I.	PTMS -Technical Support to RTMP Model data automation -Visualization tool WARMF-Online -Forecasting model development/improvements - Water district/agency outreach activities -GWD technical support	2016	\$700K estimated	
II.	Staff resources	2016		\$200K estimated
III.	Grassland Bypass Project ¹	2016	\$860K estimated	
IV.	WaterSMART Program ¹	2016	TBD	
V.	Westside Regional Drainage Plan ¹	2016	\$3.8M estimated	
¹ The funding allocation is not specifically a PTMS allocation but yields salinity benefits in the San Joaquin River.				

Funding amounts listed in Table 2 are subject to allocation and are to be considered estimates until allocations have been completed. The PTMS allocation is utilized to fund Reclamation activities directly related to salinity in the SJR. The GBP and WaterSMART Program also provide salinity management benefits to the SJR, and are listed accordingly in Table 2. Table 3 lists major activities planned in accordance with the funding allocation listed in Table 2. The

activities list is not all-inclusive or binding; Reclamation may choose to perform other tasks as necessary or required.

Table 3: Planned Reclamation Activities to meet San Joaquin River salinity regulations for Fiscal Year 2016

Activity Number	Table 2 Funding Authority	Activity Name	Activity Description	Estimated Completion Date
1	I	WARMF model forecasting capability	Improvements to algorithms to add groundwater flow capability to west-side watersheds to improve small watershed simulation. Model currently assumes no groundwater pumping on west-side of Valley. Work on wetland simulation to improve realism of wetland simulations.	New initiative projected completion in late FY2017
2	I	WARMF-Online data and output visualization	Improve relevance of model output visualization through use of customized stakeholder dashboards. Increase use of WARMF-Online.	2016
3	I	Technical Research Team meetings and participation in Westside Coalition RTMP Workgroup	Participate in meetings, activities and forecasting discussions related to implementation of RTMP. During late FY2016 and into FY2017 a new working group will be started under auspices of the Westside Drainage Coalition to develop protocols to implement short-term westside drainage management actions.	2017
4	I	CV-SALTS Participation	Participate in the CV-SALTS Executive Committee, Technical Committee and Lower San Joaquin River Committee.	2019
5	I	Contract/Project Management	New project contracting and renewal of existing contracts and cooperative agreements	2017
6	I	Technical support to GWD	Ongoing technical support. New initiative (starting in FY 2016) to develop a cost-effective, long-term alternative to YSI-ECONet which is	2019

Activity Number	Table 2 Funding Authority	Activity Name	Activity Description	Estimated Completion Date
			no longer being supported. Grant funding being applied for to offset costs.	
7	I	Technical support to other east and west-side water districts/agencies	Primary effort on data integration and development of common data quality assurance protocols. This will be accomplished using a combination of tools to be added to current WARMF Online capabilities and for individual water districts use of commercial real-time hydrological data management and QA tools such as WISKI.	2019
8	I	Outreach to east and west-side water districts	Ongoing technical support on design of monitoring stations, selection of sensors, choice of telemetry (CDMA, GOES, SCADA, LAN). Collaborative data acquisition and sharing. Resolution of web access, data quality assurance and data security issues.	2019
9	CVP Operations	New Melones Operations Plan	Reclamation will continue to operate New Melones reservoir according to State Water Board Water Rights stipulations to ensure that the D-1641 salinity standard at Vernalis is not exceeded.	Ongoing

Publications Update

- Quinn N.W.T, R. Tassej and J. Wang. 2014. Use of online data and computational resources to implement real-time salinity management - an efficient regulatory alternative to TMDL-mandated waste discharge requirements. DOI: 10.4018/978-1-4666-7336-6.ch004 In: Handbook of Research on Advancements in Environmental Engineering, Edition: Advances in Environmental Engineering and Green Technologies (AEEGT) Book Series, Chapter: Basin-Scale, Real-Time Salinity Management Using Telemetered Sensor Networks, Publisher: IGI Global, Editors: Nediljka Gaurina-Medjimurec, pp.89-117
- Quinn N.W.T. and J.R. Burns. 2015. Use of a hybrid optical remote sensing classification technique for seasonal wetland habitat degradation assessment resulting from adoption of real-time salinity management practices. *Journal of Applied Remote Sensing*. 03/2015; 9(1):1-25.
- Quinn N.W.T. and Olga Epshtein 2014. Seasonally-Managed Wetland Footprint Delineation and Evapotranspiration Estimation using Landsat ETM and Satellite Imagery. *Journal of Environmental Modeling and Software*. 04/2014; 54(April):9-23.
- Rahilly P.J.A., D. Li, Q. Guo, J. Zhu¹, R. Ortega, N.W.T. Quinn, and T.C. Harmon. 2012. Mapping swamp timothy (*Criopsis schenoides*) seed productivity using spectral values and vegetation indices in managed wetlands. *International Journal of Remote Sensing*. 33(16), 4902–4918.
- Quinn N.W.T. 2011. Contrasts in the use of information technology for real-time salinity management in the San Joaquin Basin, California, USA and Hunter River Basin, New South Wales, Australia. *Agricultural Water Management*. Vol. 98 (6), p.930-940, Apr 2011.
- Quinn N.W.T., R. Ortega and L. Holm. 2011. Environmental sensor networks and continuous data quality assurance to manage salinity within a highly regulated river basin. *Decision Support Systems in Agriculture, Food and the Environment: Trends, Applications and Advances*.
- Quinn N.W.T., G. Lee and D. Cozad. 2010. Information technology and decision support tools for stakeholder-driven river basin salinity management. *IEEE Proceedings*, 43rd Annual HICSS Conference, Kawaii, Hawaii, Feb 5-9, 2010.
- Quinn N.W.T., R. Ortega, P.J.A, Rahilly and C.W. Royer. 2010. Use of environmental sensors and sensor networks to develop water and salinity budgets for seasonal wetland real-time water quality management. *Environmental Modeling and Software*. Vol 25, 1045-1058
- Quinn N.W.T, 2009. Environmental decision support system development for seasonal wetland salt management in a river basin subjected to water quality regulation. *Agricultural Water Management*, 96 (2), p.247-254, Feb 2009.

References

- State Water Board
D-1641 Implementation of Water Quality Objectives for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary; A petition to Change Points of Diversion of the Central Valley Project and the State Water Project in the Southern Delta; and A Petition to Change Places of Use and Purposes of Use of the Central Valley Project. State Water Resources Control Board, March 15, 2000.
- CV Water Board
2004a Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of Salt and Boron Discharges Into the Lower San Joaquin River Draft Final Staff Report Appendix 1: Technical TMDL Report, Regional Water Quality Control Board Central Valley Region, July 4, 2004.
- Basin Plan 2011 The Water Quality Control Plan (Basin Plan) for the Sacramento River Basin and the San Joaquin River Basin, Fourth Edition, California Regional Water Quality Control Board Central Valley Region, October 2011.
- Reclamation Action
Plan 2008 Reclamation’s Salinity Management Plan, Actions to Address the Salinity and Boron Total Maximum Daily Load Issues For the Lower San Joaquin River, July 2008.
- Compliance Plan
2010 Compliance Monitoring and Evaluation Plan, In compliance with the “Management Agency Agreement between the Central Valley Regional Water Quality Control Board and the Bureau of Reclamation” executed on December 22, 2008, May 2010.
- Compliance Report
2010 Compliance Monitoring and Evaluation Report, WY 2000 to Present In compliance with the “Management Agency Agreement between the Central Valley Regional Water Quality Control Board and the Bureau of Reclamation” executed on December 22, 2008, May 2010.
- Management
Agency Agreement,
2008 and 2014 Management Agency Agreement Between the Central Valley Regional Water Quality Control Board and the United States Bureau of Reclamation, Mid-Pacific Region. A Cooperative Means of Implementing Relevant Provisions of the Regional Water Board’s Water Quality Control Plan for the Sacramento River and the San Joaquin River Basins – 4th Edition, executed in December 2008 and updated in December 2014.

Central Valley Water Board Comments on Reclamation's Draft Annual Work Plan, FY2016

No.	Page or Section Commented on	Water Board Comment	Reclamation Response
1	Page 6, second bullet item, second line	I think the first word of the line should be changed from "making" to "viewing".	Comment received; text updated
2	Page 6, bullet items	Add the following bullet item: Continue the effort to incorporate real-time east side SJR data into the WARMF forecast model.	Comment received; text updated
3	Page 6	The last paragraph on the page mentions plans to incorporate Turlock Irrigation District real-time data. Also, discuss plans to incorporate Modesto Irrigation District real-time data.	Turlock has been proactive in participating in RTMP; plans for Modesto will be incorporated in future Annual Work Plans.
4	Page 7, Section B. 1.	I think diversion and discharge locations along the main stem should also be listed.	Main stem stations have been listed (Patterson, Maze, Crow's Landing); Reclamation is working with the stakeholders to acquire diversion data.
5	Page 7, Section B. 1. i.	Is the station described at Salt Slough and Hwy 165 Site F of the Grasslands Bypass Project?	Yes, the station is named Site F for the Grassland Bypass Project.
6	Page 8, Section C.	This section describes plans to update and replace real-time management equipment in the Grassland Resource Conservation District. This money, and perhaps with the addition of even more money, should be earmarked for station upgrades and establishment of new stations throughout the LSJR Basin, not just one district or area within the Basin. Prioritizing available resource across the LSJR Basin would benefit the entire RTMP effort. Certain upgrades in one District may be less important to the entire program than new or upgraded stations in other areas of the Basin.	Grant proposals have been submitted but no money has been allocated to the Grassland effort for this purpose. Reclamation will provide technical support as available for the entire RTMP program.
7	Page 8, Section D. 2.	Should describe this technical expert, will it be a Reclamation staff position or RTMP MOU Group employee, or other?	Comment received; text updated
8	Page 8, Section E. 1.	As a means of being positive about TID's early participation, I would replace this paragraph with the following: "During FY 2016 a series of meetings will be scheduled with TID staff to explain the goals and principles of real-time salinity management and to explain model data needs and technical requirements for access. The most recent meeting concluded with a commitment from TID engineers and IT personnel to develop a prototype solution for testing. Although irrigators in subareas on the east side of the SJR are not scheduled for compliance with load limits prescribed by the salinity TMDL or fully implement real-time salinity management until after 2016, early participation by TID and other stakeholders is appreciated and important to the success of real-time salinity management in the LSJR Basin."	Comment received; text updated
9	Pages 7 through 9, Sections A. through H.	The budgets identified in Sections A through H total \$625,000 to \$725,000. I noticed that rows 1 and 2 of Table 2 on page 9 identifies approximately \$700,00 from PTMS and \$200,000 of Reclamation staff resources, for a total of \$900,000 in proposed funding for FY 2016. Does this mean that up to \$175,000 above the amount identified in Sections A through H are available?	The financial estimates included for goals and objectives is a source of confusion and have been removed. What is available for Reclamation is approximately \$700,000; the other not available is \$200,000 for staff resources, as indicated in Table 2.
10	Page 10, Table 3	Should the title of this table indicate that it is for activities in FY2016 rather than FY2017?	Comment received; text updated

