

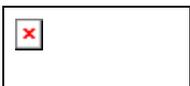
# RECLAMATION

*Managing Water in the West*

## **Revised Draft 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.

Version October 27, 2009



U.S. Department of the Interior  
Bureau of Reclamation  
Mid-Pacific Region

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## Abbreviations and Acronyms

Action Plan	Actions to Address the Salinity and Boron TMDL Issues for the Lower San Joaquin River
AF	acre-foot or acre-feet
Basin Plan	Water Quality Control Plan for the Sacramento and San Joaquin River Basins, 4 <sup>th</sup> Edition
BMP	Best Management Practices
CALFED	CALFED Bay-Delta Program
CDEC	California Data Exchange Center
CDFG	California Department of Fish and Game
CVO	Central Valley Operations
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
DMC	Delta-Mendota Canal
DWR	California Department of Water Resources
Draft Plan	Draft Compliance and Monitoring Plan (this document)
EC	electrical conductivity
EWA	Environmental Water Account
GBP	Grassland Bypass Project
ID	irrigation district
Interior	U.S. Department of the Interior
LSJR	Lower San Joaquin River
MAA	Management Agency Agreement
μS/cm	micro Siemens per centimeter
QA	Quality Assurance
QC	Quality Control
Reclamation	Bureau of Reclamation
Regional Water Board	Central Valley Regional Water Quality Control Board
RTMP	Real Time Management Program
Service	U.S. Fish and Wildlife Service
SFEI	San Francisco Estuary Institute
SLDMWA	San Luis and Delta-Mendota Water Authority
TAF	thousand acre-feet
USGS	United States Geological Survey
VAMP	Vernalis Adaptive Management Plan
WAP	Water Acquisition Program
WQO	water quality objective
WRDP	Westside Regional Drainage Plan

## Purpose

The purpose of the “Draft Compliance Monitoring and Evaluation Plan” (Draft Plan) is to meet one commitment of the initial monitoring, reporting, and assessment program agreed to in the “Management Agency Agreement between the Central Valley Regional Water Quality Control Board and the United States Bureau of Reclamation” (MAA) executed on December 22, 2008. The MAA describes the cooperative actions Reclamation will take under the Salt and Boron Total Maximum Daily Load for the lower San Joaquin River (Basin Plan Amendment<sup>1</sup>) as described in the Water Quality Control Plan for the Sacramento and San Joaquin River Basins, 4<sup>th</sup> Edition (Basin Plan). The MAA states:

[The United States Bureau of] Reclamation will submit a *Draft Compliance Monitoring and Evaluation Plan* to the Regional Water Board. Where appropriate, the draft plan will propose the data and quantification methods used to evaluate the salt loads from Delta-Mendota Canal (DMC) operations and salinity offset credits to be applied to the various elements of Reclamation’s Action Plan.

Data will include monitoring locations, parameters monitored, data collection methods, and data quality control. Included with the proposed quantification methods for salt load offset credits for each element of Reclamation’s Action Plan will be a description of the salt mitigation benefit of each element and a clear explanation of how the proposed quantification method accurately quantifies the salt load effect.

The MAA refers to Reclamation’s Salinity Management Plan of Actions to Address the Salinity and Boron Total Maximum Daily Load Issues for the Lower San Joaquin River (Action Plan), which can be downloaded at

[http://www.waterboards.ca.gov/centralvalley/water\\_issues/tmdl/central\\_valley\\_projects/vernalissaltboron/draftmaa.pdf](http://www.waterboards.ca.gov/centralvalley/water_issues/tmdl/central_valley_projects/vernalissaltboron/draftmaa.pdf)

The MAA can be downloaded at

[http://www.waterboards.ca.gov/centralvalley/water\\_issues/tmdl/central\\_valley\\_projects/vernalissaltboron/signedmaa22dec08.pdf](http://www.waterboards.ca.gov/centralvalley/water_issues/tmdl/central_valley_projects/vernalissaltboron/signedmaa22dec08.pdf).

Reclamation submitted the Draft Plan to the Central Valley Regional Water Quality Control Board (Regional Water Board) on July 1, 2009. On September 29, 2009 Regional Water Board staff submitted comments and suggested revisions on the Draft Plan. This Revised Draft Plan responds to those comments,

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<sup>1</sup> A TMDL specifies the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards and allocates pollutant loadings among point and nonpoint pollutant sources. A TMDL is the sum of the individual wasteload allocations (WLAs) for point sources and load allocations (LAs) for nonpoint sources and natural background (40 CFR 130.2) with a margin of safety (CWA section 303(d)(1)(c)). (US EPA TMDL Guidance, 2005)

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and, upon acceptance by the Regional Water Board, will become the final version of the Draft Plan.<sup>2</sup>

# Organization of Plan

Regional Water Board staff proposed a phased approach to developing the Compliance Monitoring and Evaluation. The first phase lasts two-years, and has specific tasks designed to obtain the necessary information, develop quantification methods, and develop a draft report evaluating the performance of the Action Plan elements. The second phase would be prescribed in a revised Management Agency Agreement.

The Action Plan describes all of the actions contemplated by Reclamation to implement the MAA. Within the Action Plan, actions are divided into three major categories: Flow, Salt Load Reduction, and Mitigation. The Action Plan also described potential future actions. For each implementation action and for salinity imported through the DMC this plan includes a brief description and status, quantification methodology and example, data sources, and current schedule. The quantification methodology and data sources for the compliance point are also described. An overall accounting methodology is described in order to summarize the amount of DMC excess salinity loads that are offset by the individual Action Plan actions. The status of potential future actions and estimated benefits will be described as they become relevant to the Action Plan. Quarterly reports will follow the described format and methodology.

Every effort has been made to use publicly available data, as requested by the Regional Water Board. Where public data is not currently available, but internal data is available and will eventually become publicly accessible, data sources are described and compared.

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<sup>2</sup> There is no requirement to produce a “Final Plan” in the MAA.

## A. Flow Actions

Under Water Rights Decision 1641, Reclamation is to provide temporary mitigation and dilution flows to meet the Vernalis salinity and boron objectives, which are also the objectives of the Basin Plan Amendment. Reclamation has provided dilution flows from the New Melones Project and through purchases for the Vernalis Adaptive Management Program (VAMP). Flow actions include: dilution flows from New Melones Reservoir and water acquisitions.

### ***1. New Melones Reservoir Operations – Provision of Dilution Flow***

*Description:* Congress authorized the construction and operation of New Melones Reservoir as a multi-purpose facility, which includes water quality. Non-consumptive water released from New Melones Reservoir is of high quality and provides large dilution flows for salinity in the San Joaquin River. Releases are made for in-stream fishery benefits based on schedules requested by the California Department of Fish and Game (CDFG), as well as the U.S. Fish and Wildlife Service (Service). Releases may also be made to maintain the dissolved oxygen level in the Stanislaus River at Ripon. If these releases are not sufficient to fully meet the salinity standard at Vernalis, then additional releases will be made from New Melones Reservoir until the salinity standard is satisfied. It is the total of the non-consumptive use release which provides the assimilative capacity at Vernalis and mitigates for increased salinity in the middle reaches of the San Joaquin River.

The New Melones Reservoir Interim Plan of Operation was developed as a joint effort between Reclamation and the Service in conjunction with the Stanislaus River Basin stakeholders. This process began in 1995 with a goal to develop a management plan with clear operating criteria for available water supplies in the Stanislaus Basin on a long-term basis. That effort was continued with a group of Stanislaus stakeholders in 1996; however, the focus shifted to an interim plan for 1997 and 1998 operations. During a stakeholder's meeting on January 29, 1997, a final interim plan of operation for the New Melones Reservoir was agreed upon in concept.

*Status:* New Melones Reservoir currently provides dilution flows to meet the Vernalis water quality objectives (WQOs) – essentially diluting salinity loads for the entire basin in real time. These flows offset salinity loads imported through the DMC. The combination of land retirement, increased level IV refuge water supply, and reduced salt loading from the Grasslands Bypass Project has altered the hydrology of the Basin and has improved the water quality of the San Joaquin River over the past ten years. New Melones Reservoir dilution flows currently provide the final action to ensure the water quality standard will be met. Through Public Law 108-361, Reclamation is directed to develop and implement the Program to Meet Standards, in part to reduce the reliance on New Melones Reservoir to provide flows to meet water quality and fish objectives. Included in

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the Program to Meet Standards is the purchase of water from willing sellers and an update to the plan of operation for the New Melones Reservoir. The status of these efforts will be updated in quarterly and annual reports.

Quantification Methodology: Items 12 and 13 of the Control Program for Salt and Boron Discharges into the Lower San Joaquin River of the Basin Plan Amendment states:

12. Salt loads in water discharged into the LSJR or its tributaries for the express purpose of providing dilution flow are not subject to load limits described in this control program if the discharge:

- a. complies with salinity water quality objectives for the LSJR at the Airport Way Bridge near Vernalis;
- b. is not a discharge from irrigated lands; and
- c. is not provided as a water supply to be consumptively used upstream of the San Joaquin River at the Airport Way Bridge near Vernalis.

13. Entities providing dilution flows, as described in item 12, will obtain an allocation equal to the salt load assimilative capacity provided by this flow. This dilution flow allocation can be used to:

- 1) offset salt loads discharged by this entity in excess of any allocation or;
- 2) trade, as described in item 10. The additional dilution flow allocation provided by dilution flows will be calculated as described in table IV-8.

Item 12 describes water “discharged ... for the express purpose of providing dilution flow” but does not define this expression beyond the conditions stated in 12a through 12c. Neither California Water Laws, the Basin Plan nor the Bay-Delta Plan define the expression “dilution flow”, therefore Reclamation can only rely on the evidence and words contained within the Basin Plan: the assumptions made in developing base flows for the Basin Plan Amendment (DWRSIM study 771) and on the three conditions 12a through 12c to interpret the phrase “express purpose of providing dilution flow.”

Reclamation manages releases on the Stanislaus River to meet a variety of environmental and water quality outcomes. Reclamation accounts for these releases under FERC requirements, state and federal Biological Opinions and the Central Valley Project Improvement Act (CVPIA), in order to ensure compliance and to ensure it does not exceed federal authorities regulating the management of releases from New Melones Reservoir. Reclamation does not have any accounting requirements pertaining to releases made to comply with Water Rights Decision 1641, but does have an accounting scheme for CVPIA and biological opinion compliance. Generally, flows that support fish outcomes have a higher management priority than water quality flows, therefore these flows are “accounted” for first (for the federal and state agencies mentioned). For the purposes of the Basin Plan Amendment, these flows are a) consistently and

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significantly below the Vernalis water quality objective, b) released from Goodwin Dam and not from irrigated lands, and c) designed to provide environmental flows in the lower Stanislaus River or at Vernalis, and are not intended for consumptive use above Vernalis. They therefore meet the conditions of “dilution flow” established by the Basin Plan Amendment.

In order to determine which of Reclamation’s Stanislaus River flows are not included in the design flow at Vernalis (and to maintain the environmental integrity of the salinity control program), Reclamation requested the DWRSIM study from which the Basin Plan Amendment design flows were obtained. Reclamation followed the procedures described in Appendix 41 to the Basin Plan Amendment to recreate Table 4-2 in the Appendix. From this re-creation, Reclamation then determined the years corresponding to the design flow years, identified in Table 1.

Year Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	86	58	93	93	93	65	37	80	65	77	77	77
Abv Normal	63	35	63	32	32	32	32	32	32	31	31	62
Blw Normal	62	48	48	50	66	62	62	62	28	24	61	61
Dry	26	72	72	33	72	33	64	26	33	25	25	33
Critical	91	91	77	31	31	92	92	92	92	91	88	90

Reclamation next used the month and years identified in Table 1 (corresponding to the month and year of the Basin Plan Amendment design flow), to identify the modeled releases from Goodwin Dam (node 16 or 681) contributing to the design flow at Vernalis. DWRSIM used CVPIA accounting terminology and priorities to model the Stanislaus River, and has a node 581 that modeled calls for additional water needed for Reclamation to meet the Vernalis salinity standard. Since these flows count towards dilution flow allocations, the equivalent “design flow” for Goodwin Releases is the flow of node 681 minus the flow of 581. These calculated values are presented in Table 2.

Year Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wet	18	18	9	28	28	20	5	18	15	8	12	13
Abv Normal	9	8	11	29	29	2	2	2	15	8	12	13
Blw Normal	9	13	11	36	46	2	2	2	15	9	12	13
Dry	12	19	17	28	61	2	3	12	15	10	14	13
Critical	9	8	9	28	28	0	0	0	1	8	13	13

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Table IV-8 in the Basin Plan Amendment states that dilution flow allocations are calculated as follows:

$$A_{\text{dil}} = Q_{\text{dil}} * (C_{\text{dil}} - \text{WQO}) * 0.8293$$

Where:

$A_{\text{dil}}$  = dilution flow allocation in thousand tons<sup>3</sup> of salt per month

$Q_{\text{dil}}$  = dilution flow volume in thousand acre-feet per month

$C_{\text{dil}}$  = dilution flow electrical conductivity in  $\mu\text{S}/\text{cm}$

WQO = salinity water quality objective for the LSJR at Airport Way Bridge near Vernalis in  $\mu\text{S}/\text{cm}$

Data Collection and Quality Assurance/Quality Control (QA/QC): Reclamation monitors flow operations at Goodwin Dam, where flows are released for multiple environmental purposes. Goodwin Dam is located at latitude 37.8750°N, longitude 121.6030°W. Flow operations are summarized on a monthly basis at <http://www.usbr.gov/mp/cvo/reports.html>. Goodwin dam releases are also available on the California Data Exchange Center (CDEC) database at <http://www.cdec.water.ca.gov> (GDW sensor number 71). Monthly flow releases above the design flows are used for the value  $Q_{\text{dil}}$ . Stanislaus River “design flows” derived from DWRSIM Study 771 are presented in Table 2 and will be referred to in quarterly and annual reports. (These design flows include spring VAMP pulse flows released from the Stanislaus River).

The closest measure of electrical conductivity to Goodwin Dam is at the Orange Blossom Bridge on the Stanislaus River. This station is maintained by the California Department of Water Resources (DWR) and is located at latitude 37.7830°N, longitude 120.7500°W. Electrical conductivity ( $C_{\text{dil}}$ ) is the monthly average of available daily measured EC (in  $\mu\text{S}/\text{cm}$ ), available on CDEC database at <http://www.cdec.water.ca.gov> (OBB sensor number 100).

Example: As an example, Table 3 lists data and monthly calculations for Water Year (WY) 2008 (a critical water year). Data for flow releases from Goodwin Dam, the Stanislaus River “design flows,” and salinity at Orange Blossom Bridge are used to calculate the monthly dilution flow allocations.

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<sup>3</sup> This is a typographical error in the Basin Plan Amendment. The units are actually tons.

**Table 3: WY2008 Goodwin Dam Monthly Dilution Flow Allocation, tons**

	Goodwin Dam Flow, TAF	Design Flow, TAF	Q <sub>dil</sub> , TAF	WQO, µS/cm	C <sub>dil</sub> (monthly average EC at Orange Blossom Bridge), µS/cm	Dilution Flow Allocation, A <sub>dil</sub> , tons
Oct	29	8	21	1000	73	16,144
Nov	17	13	4	1000	79	3,055
Dec	17	13	4	1000	72	3,078
Jan	16	9	7	1000	87	5,300
Feb	15	8	7	1000	109	5,172
Mar	57	9	48	1000	82	36,542
April	67	28	39	700	69	20,408
May	54	28	26	700	67	13,648
Jun	26	0	26	700	69	13,606
Jul	25	0	25	700	77	12,916
Aug	18	0	18	700	83	9,210
Sep	10	1	9	1000	72	6,926

## **2. Water Acquisitions – Water Acquisitions Program**

*Description:* The Central Valley Project Improvement Act of 1992 (CVPIA), signed into law on October 30, 1992, modified priorities for managing water resources of the Central Valley Project (CVP). CVPIA altered the management of the Central Valley Project to make fish and wildlife protection, restoration, and enhancement as project purposes having equal priority with agriculture, municipal and industrial, and power uses. To meet water acquisition needs under CVPIA, the U.S. Department of the Interior (Interior) has developed a Water Acquisition Program (WAP), a joint effort by Reclamation and the Service. The program's purpose is to acquire water supplies to meet the habitat restoration and enhancement goals of the CVPIA.

Historically, the majority of WAP expenditures in the San Joaquin River basin have supported the provision of VAMP flows. VAMP flows are non-consumptive releases primarily made to provide spring pulse flows for the salmon fishery, and are made in late April, early May and secondarily made to provide fall pulse flows. VAMP flows provide dilution capacity for salinity, as they meet the “dilution flow” requirements of the BPA, but they were included in the assumptions used to allocate salinity loads for the subareas. Through the San Joaquin River Agreement, Reclamation also purchases flows to provide pulse flows in October.

*Status:* The WAP is an ongoing program authorized through the CVPIA. The VAMP Agreement is in the process of being extended to 2011. The State Water Resources Control Board is re-evaluating flow requirements for fishery protection

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on the San Joaquin River, which will establish the direction of post-VAMP fish flow obligations.

Quantification Methodology: The discussion on dilution flow allocation presented in A-1 is pertinent here as well. Table IV-8 of the Basin Plan Amendment states that dilution flow allocations are calculated as follows:

$$A_{\text{dil}} = Q_{\text{dil}} * (C_{\text{dil}} - \text{WQO}) * 0.8293$$

Where:

- $A_{\text{dil}}$  = dilution flow allocation in thousand tons of salt per month
- $Q_{\text{dil}}$  = dilution flow volume in thousand acre-feet per month
- $C_{\text{dil}}$  = dilution flow electrical conductivity in  $\mu\text{S}/\text{cm}$
- WQO = salinity water quality objective for the LSJR at Airport Way Bridge near Vernalis in  $\mu\text{S}/\text{cm}$

Data Collection and QA/QC: WAP purchases and releases are tracked by Reclamation's Water Acquisitions Group (MP-400) and will be reported as monthly volumes along with the location from where the water is released. WAP purchases are primarily made to support the VAMP spring and fall pulse flows, and the release schedules, locations and volumes can be found in annual reports on the VAMP program at the San Joaquin River Group Authority's website: [www.sjrg.org/technicalreport/default.htm](http://www.sjrg.org/technicalreport/default.htm). Dilution flow salinity will be obtained from the Reclamation or CDEC-available EC monitoring station closest to the location of the WAP release point (or most downstream site). Appropriate station and QA/QC information for the station will be provided in subsequent data reports.

Example: In October 2007, Reclamation purchased 12.5 TAF on the Merced River ( $Q_{\text{dil}}$ ). The salinity (EC) of these flows was 67  $\mu\text{S}/\text{cm}$ , so the dilution flow allocation is 9,672 tons.

### **3. Water Acquisitions – Environmental Water Account**

Description: The Environmental Water Account (EWA) was a program element being implemented under the CALFED Bay-Delta Program's water supply reliability and ecosystem restoration objectives. Although this action is included in the Action Plan, no EWA purchases were made in 2008 and none are expected in the future. This action is no longer being pursued by Reclamation; however an alternative program may replace EWA in the future. Reclamation will provide status updates of the new program at that time.

#### **4. DMC Recirculation – Provision of Dilution Water**

Description: The DMC Recirculation Project is one project Reclamation is studying that could provide dilution water for salinity management. As part of the project studies, Reclamation conducted three pilot recirculation studies, in 2004, 2007, and 2008. The pilot studies pump water from the Delta at Tracy and convey it through the DMC to the Newman Wasteway, where it is then conveyed to the lower San Joaquin River.

Status: In the months of July, August, and September of 2008, water was conveyed to the San Joaquin River to pilot the DMC recirculation project and evaluate water quality.

Quantification Methodology: For the quantification of dilution flow allocations, the Basin Plan prescribes the following equation<sup>4</sup> to calculate assimilative capacity. The Basin Plan specifies that entities providing dilution flows obtain an allocation equal to the salt load assimilative capacity provided by this flow, calculated as follows:

$$A_{dil} = Q_{dil} * (C_{dil} - WQO) * 0.8293$$

Where:

$A_{dil}$	=	dilution flow allocation in tons of salt per month
$Q_{dil}$	=	dilution flow volume in thousand acre-feet per month
$C_{dil}$	=	dilution flow electrical conductivity in $\mu\text{S}/\text{cm}$
$WQO$	=	salinity water quality objective for the LSJR at Airport Way Bridge near Vernalis in $\mu\text{S}/\text{cm}$
0.8293	=	Salinity unit conversion, to convert TDS to tons (using the same EC:TDS as is used for the DMC)

Data Collection and QA/QC: Recirculation flows are tracked by Reclamation's Central Valley Operations office and are reported as monthly volumes in the tables described in Section D of the Draft Plan (CVO Table 25). Recirculation flows were monitored for a number of water quality constituents in the Newman Wasteway as part of the pilot study. EC was measured continuously (every 15 minutes) using YSI 600 XL sondes in several locations following the same QA/QC protocols as the existing Reclamation sampling program for the DMC, with an accelerated calibration schedule (every 2 weeks).

Example: In the 2008 pilot Recirculation study, flows were discharged from the Newman Wasteway into the San Joaquin River from July 28 through September 15. Technical difficulties in probe replacement resulted in less than full days of data during some of the study period. Available data at milepost 8.16 in the Wasteway was averaged over the days within each month that the study was in progress. Resulting load calculations for the 2008 pilot period is provided in Table 4.

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<sup>4</sup> ibid

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**Table 4: Dilution Flow Allocation of DMC Recirculation Pilot flows, tons**

	<b>Jul</b>	<b>Aug</b>	<b>Sep</b>
Volume, TAF	1.0	13.4	7.1
Salinity at Newman Wasteway, EC, $\mu\text{S}/\text{cm}$	795	450	530
Dilution Flow Allocation, tons	0	3,901	2,763

## B. Salt Load Reduction Actions

The Grassland subarea is listed as a high priority for implementing load allocations (Table IV-6 of the BPA) due to the high unit area loading of salt to the LSJR. Much of the salt load in this area is due to the high salt loads brought into the Subarea through the DMC (quantified in Section D). The Grassland and Northwest subareas also provide the physical link between the majority of the DMC load and the lower San Joaquin River, as much of the load flows through this area (and some is concentrated through the use of the water) to reach the river. Reclamation has a long history of involvement with salinity and drainage in this area. Reclamation is under a court order to provide drainage to its San Luis Unit, on the Westside of the lower San Joaquin River (including the Grassland Subarea and the Westland Water District south of the Subarea). As part of its efforts to provide drainage (the San Luis Drainage Feature Re-evaluation, <http://www.usbr.gov/mp/sccaosld/index.html>), Reclamation has historically financially supported the Westside Regional Drainage Program (WRDP) activities that support implementation of the San Luis Drainage Feature Re-evaluation preferred alternative.

Within the Action Plan, Reclamation identified Salt Load Reduction Actions that include Grassland Bypass Project, a component of the WRDP, and conservation programs (Water Use Efficiency Grant Programs, Water Conservation Field Services Program (WCFSP), Water 2025 Grants Program, and the CALFED Water Use Efficiency Program).

### **1. Grassland Bypass Project**

The Grassland Bypass Project (GBP) has significantly reduced contamination of the Grasslands subarea and lower San Joaquin River. The focus of the GBP has been to control selenium loading, but the project has also reduced salt loading through the control of agricultural drainage. The next phase of the GBP will include the construction of treatment facilities to remove all drainage from the GDA by 2015. Reclamation currently submits quarterly and annual reports to the Regional Water Board in compliance with its Waste Discharge Requirements. For the purposes of calculating salinity loading and credits, the GBP is considered a part of the Westside Regional Drainage Plan, and is not separately characterized. Since 1997 (the end of the historic period upon which the Basin Plan is based), the GBP has reduced its salt load to the lower San Joaquin River by 72 percent.

### **2. Westside Regional Drainage Plan**

*Description:* The Grassland Area Farmers formed a regional drainage entity in March 1996 under the umbrella of the San Luis and Delta-Mendota Water Authority (SLDMWA) to implement the Grassland Bypass Project (<http://www.usbr.gov/mp/grassland/>). The Project consolidates subsurface drainage flows on a regional basis and utilizes a portion of the federal San Luis Drain to convey drainage flows around habitat areas, in order to reduce the high

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selenium concentrations due to the historic transport of subsurface drainage flows through the same channels as habitat supply water. Participants include the Broadview Water District, Charleston Drainage District, Firebaugh Canal Water District, Pacheco Water District, Panoche Drainage District, Widren Water District and the Camp 13 Drainage District (located in part of Central California Irrigation District). This entity includes approximately 97,000 acres of irrigated farmland, an area referred to as the Grassland Drainage Area. The Grassland Area Farmers, with state and federal funding support, have implemented several activities aimed at reducing discharge of subsurface agricultural drainage waters to the San Joaquin River. These activities have included the GBP (to remove agricultural drainage waters from wetland channels) and the San Joaquin River Improvement Project (SJRIP, the purchase and planting of an area land for the reuse and concentration of agricultural drainage water on increasingly salt tolerant crops). These efforts collectively have evolved into the Grassland Drainage Area's portion of the Westside Regional Drainage Plan.

The Westside Regional Drainage Plan (WRDP) was developed by stakeholders to address the immediate actions that could be taken to assist Reclamation in meeting the goals of the San Luis Drainage Feature Reevaluation Program with an in-valley solution. The WRDP focuses on regional drainage projects that can be implemented on a short timeline. The chief components include land retirement, groundwater management, source control, regional re-use, treatment, and salt disposal. Reclamation has been providing consistent funding, with a 50 percent cost share requirement, since 2006; as well as varying degrees of funding since 1996.

Status: The Grassland Bypass Project is in the 14<sup>th</sup> year of its implementation. Reclamation provided \$3.5 million in grant funding in 2008 and expects to provide up more than \$7.5 million<sup>5</sup> in funding in 2009 to implement the GBP. The GBP is also incorporated into the San Luis Delta-Mendota Water Authority's Integrated Regional Water Management Plan, and has been awarded implementation funds through California Proposition 50 in 2007. These funds are being used to implement components of the Westside Regional Drainage Plan by expanding and developing the drainage reuse area, implementing groundwater pumping programs, and investigating salt disposal technologies. Specific funded activities and cost-shares will be reported through the Draft and Final Reports Reclamation submits to the Regional Water Board in compliance with this Draft Plan. The current San Luis Drain Use Agreement expires in December 2009 and an Environmental Impact Report/Statement (EIR/EIS) has been released to cover a renewal of the Use Agreement.

Quantification Methodology: The San Luis and Delta Mendota Water Authority (SLDMWA) submits an annual report on discharges of selenium and salinity from the Grassland Drainage Area in compliance with Waste Discharge Requirements. SLDMWA also estimates the amount of reduced salt load based on discharge

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<sup>5</sup> Includes grants and assistance agreements with the Service, USGS, and CDFG.

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volumes in 1995. Discharges from this area are calculated on a daily time step, due to the high variability in discharge volumes and salinity concentrations.

*Data Collection and QA/QC:* This is performed by the SLDMWA in a separate report to the Regional Board. There has not yet been a determination on the dissemination of reduction credits among the participating parties.

*Example:* On December 28, 2008, SLDMWA submitted its 2008 annual report to the Regional Board. This report states that the project reduced salt loads by 72% in Water Year 2008 when compared to Water Year 1995. Table 1 of the report states that in 1995 the area discharged 237,530 tons of salt and in 2008 the area discharged 66,254 tons. This is a reduction of 171,276 tons in water year 2008. Since Reclamation is the only participant currently regulated by the Basin Plan Amendment, Reclamation is assuming credit for the entire salt load reduction until other parties become regulated.

### **3. Conservation Efforts**

*Description:* A water conservation measure is a practice, technique, or technology that improves the efficient use of water and thus reduces water loss or waste. Although conservation is usually seen as a water management tool to increase supplies, conservation measures also enhance water quality through reducing irrecoverable flows to saline groundwater sinks, decreasing non-beneficial evapotranspiration, eliminating or significantly decreasing water runoff, decreasing leaching, and improving water quality through reduced fertilizer and pesticide application. When water conservation measures are developed and tailored to meet the needs of local conditions, water conservation enables water users to meet environmental obligations or regulations. A recent Agricultural Water Management Council report (AWMC 2006a) notes that irrigation system improvements also reduce drainage water runoff thereby reducing the regulatory burden on farmers and providing downstream environmental and public health benefits.

Reclamation's water use efficiency (WUE) program includes several grant programs (Water 2025, CALFED, and WCFSP) that fund actions to assure efficient use of existing water supplies. In addition to these grant programs, Reclamation also requires that all water contractors maintain current Water Management Plans which include Best Management Practices, all of which pertain to water use efficiency and conservation.

*Status:* The Water Conservation Program is an ongoing program mandated through the Reclamation Reform Act of 1982 (RRA) and the Central Valley Project Improvement Act of 1992 (CVPIA).

*Quantification Methodology, Data Collection and QA/QC:* Currently there is a lack of information regarding the baseline condition (i.e. irrecoverable flows, water runoff, water quality, etc.) of many of the project implementation areas.

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Without sufficient baseline data, it is challenging to quantify actual changes to water use in a project area. In addition, efforts to assess and project water use efficiency potential on farm are limited by the lack of reliable water use measurement data for agriculture.

Each grant application submitted to Reclamation must include requirements for performance and accountability; however, the recipients expected benefits of the proposed actions have generally been qualitative in nature. In addition, projects generally take 24 months to complete, and true impacts of a project can only be accurately assessed over a minimum period of five years to account for yearly temporal differences, variable cropping patterns, etc. The nature of the grant program makes it difficult for the recipient to implement a proper monitoring program due to cost and time limitations. Until a mechanism is developed to effectively capture this information and place the information in a centralized data repository, it will be difficult to quantify the contribution the WUE program on reduction to salinity impacts to the river.

*Example:* Although Reclamation is unable to quantify the benefits of the various funded projects as related to salinity reduction, the following information is provided to depict the agency's water conservation efforts in the basin. Through Water 2025, CALFED, and the WCFSP, Reclamation has awarded 36 projects in the San Joaquin Valley that require performance measures since 2006. As information is collected from these projects, quantifiable benefits may be determined in the future.

## C. Mitigation Actions

In the Action Plan, Reclamation identifies two mitigation actions to mitigate salinity loads: a real time management program (RTMP) to maximize the removal of salt using assimilative capacity in the San Joaquin River, and a wetlands Best Management Practices (BMP) plan to research and potentially develop practices to reduce or better manage salinity loading from managed wetlands. Reclamation has actively supported the development of a real time monitoring and forecasting program in the River and in managed wetlands.

### 1. ***Real Time Management Program – Development of Stakeholder-Driven Program***

*Description:* The Real Time Management Program is described in the Basin Plan as a stakeholder driven effort to use “real-time” water quality and flow monitoring data to support water management operations in order to maximize the use of assimilative capacity in the San Joaquin River. The Regional Board describes this assimilative capacity as up to 85 percent of the load determined by Vernalis salinity objective minus the actual load in the river and uses this adaptive approach as a means to encourage the maximum export of load from the basin while still meeting the stated objective.

The salinity issues in the San Joaquin River are complex and diverse, involving many interested stakeholders. The process of developing and implementing a successful program must have broad support and consensus from all parties. This effort will include engaging stakeholders in developing a plan, addressing obstacles identified by stakeholders, and designing implementable strategies for the program, including the identification and implementation of physical infrastructure to facilitate real-time management. A neutral third party coordinator is necessary to manage the group’s efforts and keep the focus on developing a viable program without bias through a collaborative process.

*Status:* Reclamation has contracted with a facilitation firm to support the development of a stakeholder-driven program. Currently, Reclamation is funding efforts, but anticipates that the program will explore cost-sharing arrangements. To date, a work plan has been developed which includes a stakeholder survey, scoping meetings, three workshops, work elements meetings, and technical group meetings. The program schedule, meeting notes, related documents, and additional information regarding the program are available at <http://www.sanjoaquinriverrtmp.com/>.

*Quantification Methodology:* Quarterly reports will include the status and quarterly accomplishments of the following Program tasks:

- Solicit stakeholder comments and feedback on RTMP
- Form working groups to develop program components
- Engage stakeholders in related basin activities

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- Conduct periodic stakeholder workshops
- Develop an implementable program

*Data Collection and QA/QC:* Technical memorandums and work group products will be vetted through the stakeholder process and made available to all interested parties.

*Example:* Actions undertaken in 2008 include:

- Executed a contract to procure the service of a consultant to facilitate stakeholder involvement in developing a RTMP.
- Directed a consultant to develop and conduct a stakeholder survey to solicit feedback on the RTMP process and garner suggestions on salinity management in the basin.
- Conducted several coordinating and planning meetings to develop and prepare for the first stakeholder workshop held on January 8, 2009.

## **2. Real Time Management Program – Technical Support**

*Description:* A successful RTMP will require a real time monitoring network on the San Joaquin River and a model capable of reasonably accurate forecasting of assimilative capacity. The RTMP may also require the construction of new physical infrastructure to optimize the program. Reclamation is committed to participating in the process, supporting the development of data and analytical tools, and the study of the system capacity and physical infrastructure needs. Reclamation staff has valuable experience in all of these areas. The stakeholder process will direct the technical support of this program.

*Status:* Reclamation is already involved in the development of various tool and analytical models and will be an active participant in the various technical working groups. Reclamation has made personnel available to serve as technical resources to support the various working groups, and has retained some initial engineering support for other technical needs. Reclamation and DWR share a common interest in collection of flows and water quality data on the San Joaquin and are working collaboratively to adapt the existing monitoring networks to support the RTMP.

*Quantification Methodology:* Quarterly reports will include the status and quarterly accomplishments of the following Program tasks:

- Survey of existing tools/monitoring points
- Identify data/analysis gaps
- Stakeholder subgroup to scope and manage technical support efforts

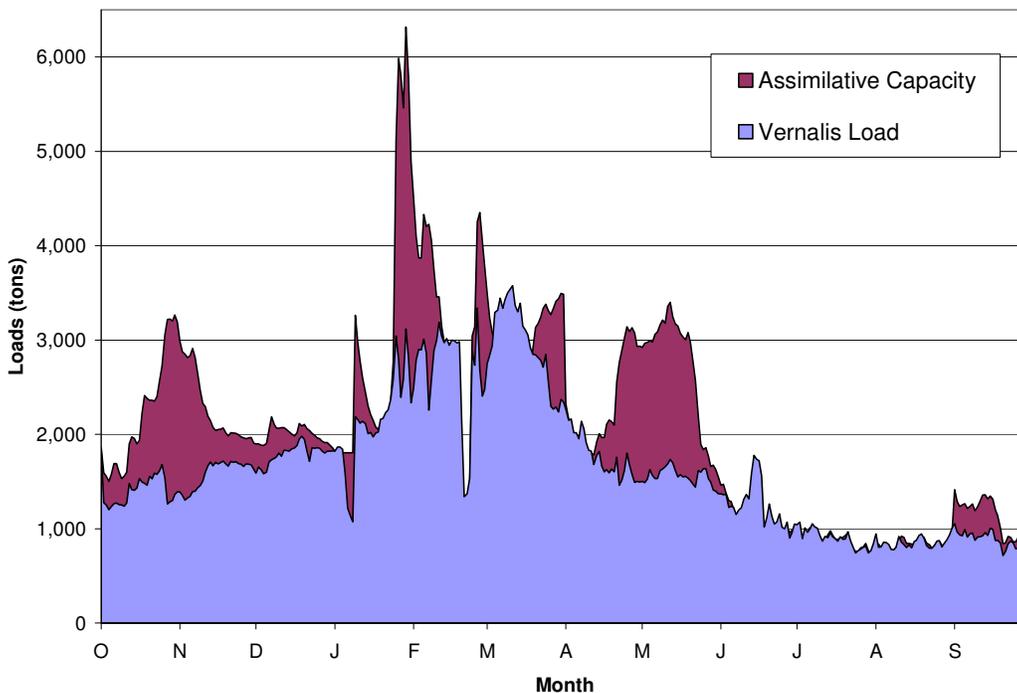
*Data Collection and QA/QC:* Technical memorandums and work group products will be vetted through the stakeholder process and made available to all interested parties.

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*Example:* In order to illustrate the potential use of assimilative capacity, Reclamation calculated the available daily capacity in 2008. In 2008, assimilative or dilution capacity was available for 246 days of the year in the San Joaquin River (times at which the river was less than 85 percent of the Water Quality Objective) for a total of approximately 115,000 tons of salt (when calculated on a daily basis). On the other hand, the assimilative capacity of the river was exceeded for 119 days. The concept behind the RTMP is to enable the use of this available assimilative capacity to export salt loads from the basin or to better time the release of salinity loads into the river to times when there is greater dilution capacity, which should also reduce the times where river capacity is exceeded (to the extent that exceedance is caused by discharges and not by background or allowed loads). Development of an accurate forecast model will to serve as a decision making tool to help manage salinity loads in the river without violating water quality standards.

Using the same data as was used to calculate Vernalis salinity (section F, Table 12), Figure 1 and Table 5 were generated. Figure 1 illustrates the timing and magnitude of potential dilution capacity in tons for 2008, by calculating actual WY2008 salinity loads at Vernalis and the Basin Plan load goals of meeting 85 percent of the Water Quality Objective. Table 5 illustrates assimilative capacity at Vernalis (allowed loads based on existing WQO and a margin of safety minus actual loads) in monthly tons.

**Figure 1: WY2008 Vernalis Load and Assimilative Capacity, on a Daily Scale**



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**Table 5: Monthly “Real-Time” Assimilative Capacity at Vernalis in WY2008, tons**

	Vernalis Flow, TAF	Vernalis EC, $\mu\text{S}/\text{cm}$	Vernalis actual load, tons	Vernalis max load, tons	“Real-Time” Assimilative Capacity, tons
September to March Standard, 1000 $\mu\text{S}/\text{cm}$					
Oct	95	554	43,719	68,354	24,635
Nov	99	589	47,536	68,216	20,679
Dec	88	760	55,562	62,012	6,451
Jan	136	686	78,011	97,384	19,373
Feb	133	750	84,096	95,339	11,243
Mar	133	847	94,881	95,215	334
April to August Standard, 700 $\mu\text{S}/\text{cm}$					
Apr	141	479	55,570	73,020	17,450
May	169	367	48,292	83,440	35,149
Jun	68	669	38,422	34,177	none
Jul	55	611	28,325	27,519	none
Aug	53	600	26,846	26,641	none
September to March Standard, 1000 $\mu\text{S}/\text{cm}$					
Sep	48	687	27,530	34,084	6,554

### 3. Wetlands Best Management Practices Plan

*Description:* Managed wetlands compose a majority of the acreage within the Grassland Subarea. Although wetlands do not increase salinity to the degree that agriculture does, there is a significant volume of DMC water supply that flows through the systems. The Program to Meet Standards and the Action Plan describe the development of a strategic plan for identifying, studying and implementing Best Management Practices in managed wetlands. The goal of this concept is to reduce salinity in discharges or to manage the timing of discharges while optimizing the ecological benefits of managed wetlands.

*Status:* Reclamation has been working with the Service, CDFG, and the Grassland Water District to develop a Strategic Wetlands BMP Plan. Reclamation also provides resources to support the development of a real-time monitoring network (over 28 stations) and other potential BMP analysis tools within federal, state, and private managed wetlands. At present, the Plan has not been completed and released to the public. In 2009, Reclamation will work with the Service to facilitate the sharing of information on these tools between investigators, with the goal of finalizing a strategic plan for moving forward. Wetland water and salinity balances will also likely be explored through the RTMP.

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Quantification Methodology: These efforts are not at a stage where they can be quantified. Reporting will focus on the status of Plan development and on study results.

Data Collection and QA/QC: See above.

Example: See status.

## D. Central Valley Project Deliveries Load Calculation

*Description:* The Central Valley Project (CVP) delivers water to both the Grassland and Northwest subareas (as described in the Basin Plan) through the Delta-Mendota Canal (DMC). The DMC starts at the pumping headworks in the Delta, the C.W. Jones (Jones) Pumping Plant at Tracy, California. Water is conveyed south to the San Luis Reservoir, where water is mixed with the State Water Project in O’Neill Forebay and then either pumped into San Luis Reservoir for later delivery, or conveyed further south through the DMC to the Mendota Pool. Turnouts and groundwater pump-ins occur at several locations along the DMC. “Reach 1” of the DMC includes turnouts between the Jones Pumping Plant and the San Luis Reservoir. Deliveries for Reach 1 are made through the San Luis Canal and the Cross Valley Canal, as well as directly out of the DMC. “Reach 2” of the DMC includes turnouts between the O’Neill Forebay and the Mendota Pool. “Reach 3” covers deliveries made out of the Mendota Pool. Some simplification of this system has been made for accounting purposes, as some districts take portions of their deliveries through several turnouts.

Figure 4 is a map of the DMC water quality monitoring locations. Figure 5 is a map of the agencies served by the DMC.

*Quantification Methodology:* The Basin Plan allocates a load to Reclamation for water delivered to the Grassland and Northwest side Subareas. This load allocation is calculated according to Table IV-8 Summary of Allocations and Credits:

$$LA_{DMC} = Q_{DMC} * 52 \text{ mg/L} * 0.0013599$$

Where:

- $LA_{DMC}$  = Load Allocation of salts, in tons
- $Q_{DMC}$  = monthly amount of water delivered to Grassland and Northwest side subareas, in acre feet
- 52 = “background” TDS of water in the San Joaquin River at Friant per the Basin Plan
- 0.0013599 = factor for converting units into tons

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Figure 2 (attached as pdf)

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Figure 3 (attached as pdf)

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Actual DMC salt loads are calculated by the following equation:

$$L_{DMC} = Q_{DMC} * (C_{DMC}) * 0.0013599$$

Where:

$L_{DMC}$  = excess salt load above the Load Allocation ( $LA_{DMC}$ ), in tons

$Q_{DMC}$  = monthly amount of water delivered to Grassland and Northwest side subareas, in acre feet

$C_{DMC}$  = monthly average (arithmetic mean) of salinity of the water delivered to Grassland and Northwest Subareas, in mg/L TDS

0.0013599 = factor for converting units into tons

Each delivery reach's  $Q_{DMC}$  is calculated and then paired with the associated monthly average EC for that reach, so the equation essentially becomes:

$$L_{DMC} = 0.0013599 * \Sigma(Q_{DMC} * C_{DMC})_{Reach\ 1-3}$$

This equation is then broken into two calculations, one for each subarea.

Data and QA/QC: Water delivery data is assembled by the San Luis Delta Mendota Water Authority's (SLDMWA) water master and submitted to Reclamation and SLDMWA members. Reclamation checks submitted numbers against contract schedules and measured pumping volumes at the Bill Jones Pumping Plant in Tracy and at O'Neill Forebay. CVO compiles and publishes this data on-line at: [http://www.usbr.gov/mp/cvo/CVO\\_Rpts.html](http://www.usbr.gov/mp/cvo/CVO_Rpts.html).

Data are publicly available shortly after the end of each month, and the pertinent reports are the San Joaquin and Mendota Pool (Table 24), Delta-Mendota Canal (Table 25), and San Luis and Cross Valley Canals (Table 26).

The delivered water is applied within contractors' service areas. Some service areas lie partially within the Grassland and/or Northwest subareas (defined in the Basin Plan). Since the subareas are given their own load allocations with a supply water credit, it is important to differentiate how much imported water is delivered to each subarea. Using the boundary description of subareas in the Basin Plan (Appendix 1, Item 41), Reclamation applied GIS tools to determine the proportion of acres for each service area that lies only partially within one or both subareas (less than 100 percent of the DMC supply water is used within the subarea). There are seven parties that apply less than 100 percent of their Delta water supplies within a subarea, and the percent of area that lies within each subarea are quantified in Table 6.

To compute the  $Q_{DMC}$  needed to calculate excess loads, delivered water from each reach is summarized, in some cases prorated by the subset of irrigated or wetland acreage within the defined subareas.

**Table 6: CVP Districts that are Less than 100 Percent Served by DMC Control Point**

Recipient	Tables	Total Acres	Grassland		Northwest	
			Acres Served	Percent Served	Acres Served	Percent Served
CDFG - China Island Unit	24, 25	3,699	3,174	86%	525	14%
Central California ID	24, 25	149,814	129,805	87%	20,007	13%
Columbia Canal Co	24	16,719	15,762	94%		0%
Del Puerto WD	25	54,673	11,656	21%	43,017	79%
USFWS - San Luis NWR	24	28,048	23,712	85%		
Banta-Carbona ID	25	16,728			1,055	6%
West Stanislaus ID	25	22,192			21,291	96%

For each reach, daily EC data is averaged over the month<sup>6</sup> to determine  $C_{DMC}$ . Daily TDS measurements for the DMC Headworks and DMC Check 21, and electrical conductivity measurements for DMC Check 13 are publicly available at <http://www.usbr.gov/mp/cvo/wqrpt.html>. The CVO data are continuously collected and publicly available, so they are used to represent the water quality through this reach. EC and TDS are measured continuously (every 15 minutes) by Hydrolab MS5 sondes. The CVO probes are suspended in the middle of the canal. Currently the Check 21 probe is encased to prevent fouling due to debris; the probe at Check 13 is not. There is a proposal to encase the Check 13 probe in the near future. The CVO stations are maintained and calibrated every 2 months by personnel from Reclamation’s Tracy Area Office. The EC probes are calibrated from a range of 0 – 2000  $\mu\text{S}/\text{cm}$  according to manufacturer’s recommendations. Although the probes generally demonstrate good stability, accuracy, and reproducibility between calibrations, previous data is not corrected if a calibration reveals sensor drift or other problems.

Reclamation also operates autosamplers at each site that collect daily composite samples. These data will be used to verify the CVO measurements and replace missing data if necessary. Reclamation currently publishes monthly reports of DMC water quality.

*Example:* 2008 load allocations and actual loads are calculated as an example. Reprints of CVO Water Delivery Report Tables 24 through 26 for 2008 are attached as Appendix B.

For the Grasslands Subarea, water delivery data is taken from all three CVO Water Delivery Report Tables. Monthly deliveries from CVO Table 24 are multiplied by Check 21 TDS to determine total salinity loads, deliveries from CVO Tables 25 and 26 are multiplied by Check 13 EC and an EC:TDS conversion factor of 0.62 to determine total salinity loads. Where appropriate,

<sup>6</sup> To be consistent with the Vernalis WQO calculation.

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deliveries are prorated to reflect the proportion of service area within the Grasslands Subarea that receives CVP water (when less than 100 percent). Total salinity loads from the DMC and Mendota Pool are then summed for the subarea. The DMC loads from the Grassland area that are above the TMDL load allowance are calculated by subtracting the allowance from the load. Calculations are presented in Tables 7 through 9.

For the Northwest Subarea, water delivery data is taken from CVO Tables 24 and 25. Monthly deliveries from CVO Table 24 are multiplied by Check 21 TDS to determine total salinity loads, deliveries from CVO Table 25 are multiplied by DMC Headworks TDS to determine total salinity loads. Where appropriate, deliveries are prorated to reflect the proportion of service area within the Northwest Subarea (when less than 100 percent). Total salinity loads from the DMC and Mendota Pool are then summed for the subarea. The DMC loads from the Northwest area that are above the TMDL load allowance are calculated by subtracting the allowance from the load. Calculations are presented in Table 10.

DMC salinity loads above load allocations are tabulated in Table 11.

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**Table 7: WY2008 San Joaquin River and Mendota Pool Deliveries from CVP (Grassland Subarea)**

	Laguna WD (via CCID), TAF	San Luis WD (via CCID), TAF	Central California ID (CCID), TAF	Columbia Canal Co, TAF	Firebaugh Canal WD, TAF	San Luis Canal Co (SLCC), TAF	Grassland WD (via CCID & SLCC), TAF	Kesterson (USFWS) (via CCID), TAF	Los Banos WMA (CDFG) (via CCID), TAF	San Luis NWR (USFWS) (via SLCC), TAF	China Island Unit (CDFG), TAF	Salt Slough Unit (CDFG), TAF	Freitas Unit (USFWS) (via CCID), TAF	Total Deliveries, TAF	Average TDS at Check 21, mg/L	Monthly Salt Load, thousand tons
Multiplier	1.00	1.00	0.87	0.94	1.00	1.00	1.00	0.85	1.00	0.85	0.86	1.00	0.85	NA	NA	NA
September to March Standard, 1000 $\mu$ S/cm																
Oct	0	0	23.1	4.7	1.4	4.1	12.1	0	4.3	3.7	0.7	1.4	1.9	57.5	329	26.8
Nov	0	0	1.0	0	0	0.5	5.4	0	3.3	4.3	0.4	1.2	1.1	17.3	345	8.1
Dec	0	0	1.7	0	0	0	3.2	0	3.0	3.2	0.8	1.1	1.0	13.9	375	7.1
Jan	0	0	0	0	0.4	0	4.9	0	1.8	3.2	0.6	0.8	1.1	12.7	451	7.8
Feb	0	0.08	15.2	1.5	4.0	3.9	4.3	0.6	0.9	7.9	0.7	0.6	0.3	40.8	384	21.3
Mar	0	0.02	38.8	4.7	3.9	11.4	0.5	0.2	0.3	1.5	0.1	0.2	0.1	61.9	415	34.9
April to August Standard, 700 $\mu$ S/cm																
Apr	0	0	24.0	5.0	5.6	14.4	0.3	0.1	0.2	0	0.1	0.1	0.2	50.1	361	24.6
May	0	0.1	47.2	6.3	5.2	14.1	3.4	0.1	0.3	2.4	0.1	0.2	0.2	79.5	352	38.1
Jun	0	0.04	42.6	7.5	6.2	24.9	0.9	0	0.1	0	0.1	0.1	0	82.5	362	40.5
Jul	0	0.05	52.6	8.2	5.4	27.5	0.1	0	0.1	0	0.2	0.1	0	97.9	271	36.1
Aug	0	0.04	44.7	8.3	5.5	24.2	0.4	0	0.5	0	0.1	0.2	1.0	84.0	336	38.4
September to March Standard, 1000 $\mu$ S/cm																
Sep	0	0	25.8	6.0	3.3	6.1	19.8	0	3.2	4.9	0.9	1.4	1.9	72.3	393	38.7

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**Table 8: WY2008 Delta- Mendota Canal Deliveries from CVP (Grassland Subarea)**

	Del Puerto WD, TAF	Eagle Field WD, TAF	Mercy Springs WD, TAF	Oro Loma WD, TAF	Panoche WD - Ag, TAF	Panoche WD - M&I, TAF	San Luis WD - Ag, TAF	San Luis WD - M&I, TAF	Central California ID (Abv C, TAF)	Central California ID (Blw C, TAF)	Firebaugh Canal WD, TAF	Total Deliveries, TAF	Average EC at Check 13, $\mu\text{S}/\text{cm}$	Monthly Salt Load, thousand tons
Multiplier	0.21	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.87	0.87	1.00	NA	NA	NA
September to March Standard, 1000 $\mu\text{S}/\text{cm}$														
Oct	0.4	0	0.1	0	0.1	0	0.1	0	1.5	0.1	0.5	2.9	506	1.2
Nov	0.3	0	0.1	0	0.1	0	0.1	0	0.2	0	0.5	1.2	519	0.5
Dec	0	0	0	0	0	0	0.1	0	0	0	0.2	0.4	571	0.2
Jan	0	0	0	0	0.1	0	0	0	0	0.4	0.1	0.6	673	0.3
Feb	0	0	0	0.1	0.1	0	0.2	0	0	0.8	0.2	1.6	557	0.7
Mar	1.0	0	0.1	0	1.0	0	0.7	0	1.0	7.6	0.4	11.8	557	5.5
April to August Standard, 700 $\mu\text{S}/\text{cm}$														
Apr	1.8	0	0.1	0	0.7	0	0.6	0	1.4	6.2	0.4	11.2	475	4.5
May	2.0	0	0.2	0	0.8	0	0.6	0	2.0	10.6	2.0	18.3	525	8.1
Jun	1.8	0	0.1	0	0.9	0	0.9	0	1.8	17.3	2.5	25.3	523	11.2
Jul	1.9	0	0.2	0	0.8	0	1.3	0	1.6	23.5	3.9	33.1	376	10.5
Aug	2.0	0.1	0.1	0	0.7	0	0.7	0	1.9	23.1	2.0	30.5	468	12.0
September to March Standard, 1000 $\mu\text{S}/\text{cm}$														
Sep	1.1	0	0.2	0	0.2	0	0.4	0	1.4	0.4	0.1	3.7	566	1.8

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Table 8 (Continued): WY2008 Delta- Mendota Canal Deliveries from CVP (Grassland Subarea)

	China Island Unit (CDFG) (76, TAF)	Frietas Unit (USFWS) (76.05L), TAF	Salt Slough Unit (CDFG) (76, TAF	Los Banos WMA (CDFG) (76.05), TAF	Volta WMA (CDFG), TAF	Grassland WD (76.05L & CCID), TAF	Grassland WD (Volta Wasteway), TAF	Kesterson Unit (USFWS) (Volta Wasteway), TAF	Kesterson Unit (USFWS) (76.0), TAF	Total Deliveries, TAF	Average EC at Check 13, µS/cm	Monthly Salt Load, thousand tons
Multiplier	0.86	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	NA	NA	NA
September to March Standard, 1000 µS/cm												
Oct	0	0	0	2.5	8.0	13.0	0	1.0	0	21.7	506	9.3
Nov	0	0	0	1.5	3.0	5.4	0	0.8	0	10.7	519	4.7
Dec	0	0	0	0.4	0	1.3	0	0.7	0	2.4	571	1.2
Jan	0	0	0	0	0.2	1.1	0	0.6	0	1.8	673	1.0
Feb	0	0	0	0	0.4	6.0	0.7	0	0	7.2	557	3.4
Mar	0.4	0.8	0.5	0.5	0	1.5	0	0	0.6	4.2	557	2.0
April to August Standard, 700 µS/cm												
Apr	0.3	0.5	0.4	0.7	0.1	0.9	0.4	0	0.3	3.6	475	1.5
May	0.3	0.5	0.7	0.8	0.4	8.9	3.7	0	0.3	15.5	525	6.9
Jun	0.2	0.3	0.4	0.3	0.3	2.7	1.0	0	0.1	5.1	523	2.3
Jul	0.5	0	0.4	0.4	0	0.4	0	0	0	1.8	376	0.6
Aug	0.4	0	0.5	0.7	1.9	1.2	0.3	0	0	5.0	468	2.0
September to March Standard, 1000 µS/cm												
Sep	0	0	0	0	2.6	21.6	17.0	0.9	0	42.1	566	20.1

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**Table 9: WY2008 San Luis and Cross Valley Canal Deliveries from CVP (Grassland Subarea)**

	CDFG - O'Neill Forebay WMA, TAF	City of Dos Palos, TAF	Pacheco WD, TAF	Pacheco CCID Non-project (Hamburg), TAF	Panoche WD, TAF	San Luis WD, TAF	San Luis WD - Ag (via O'Neill Forebay), TAF	San Luis WD - M&I (via O'Neill Forebay), TAF	VA Cemetery, TAF	Total Deliveries, TAF	Average EC at Check 13, µS/cm	Monthly Salt Load, thousand tons
Multiplier	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	NA	NA	NA
September to March Standard, 1000 µS/cm												
Oct	0	0.1	0.1	0	0.9	3.3	0.1	0.1	0	4.6	506	2.0
Nov	0	0.1	0.1	0	0.5	1.7	0.1	0.1	0	2.6	519	1.2
Dec	0	0.1	0.1	0	0.4	0.1	0	0	0	0.9	571	0.4
Jan	0.1	0.1	0	0.1	0.1	0.6	0	0	0	1.1	673	0.6
Feb	0	0.1	0	0.8	1.2	3.5	0.3	0	0	5.9	557	2.8
Mar	0	0.1	0.2	1.1	3.3	5.5	0.7	0.1	0	11.0	557	5.2
April to August Standard, 700 µS/cm												
Apr	0	0.1	0	1.5	4.9	7.2	0.7	0.1	0	14.4	475	5.8
May	0	0.1	0	1.3	5.1	9.0	0.8	0.2	0	16.6	525	7.4
Jun	0.1	0.2	0.8	0.8	4.9	8.9	0.8	0.2	0	16.7	523	7.3
Jul	0.1	0.2	1.0	0	4.9	10.5	1.2	0.1	0	18.0	376	5.7
Aug	0.1	0.2	0.7	0	2.1	6.8	0.7	0.1	0	10.7	468	4.2
September to March Standard, 1000 µS/cm												
Sep	0.1	0.1	0.3	0	1.2	3.8	0.4	0.1	0	6.1	566	2.9

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Table 10: WY2008 Deliveries from CVP to Northwest Subarea)

	<i>San Joaquin River and Mendota Pool Deliveries from CVP</i>					<i>Delta- Mendota Canal Deliveries from CVP</i>									
	China Island Unit (CDFG), TAF	Central California ID (CCID), TAF	Total Deliveries, TAF	Average TDS at Check 21, mg/L	Monthly Salt Load, thousand tons	Banta-Carbona ID, TAF	Del Puerto WD, TAF	Patterson WD, TAF	West Stanislaus ID, TAF	Central California ID (Abv Ck13), TAF	Central California ID (Blw Ck 13), TAF	China Island Unit (CDFG) (76), TAF	Total Deliveries, TAF	Average TDS at Headworks, mg/L	Monthly Salt Load, thousand tons
Multiplier	0.14	0.13	NA	NA	NA	0.06	0.79	1.00	0.96	0.13	0.13	0.14	NA	NA	NA
September to March Standard, 1000 $\mu$ S/cm															
Oct	0.1	3.6	3.7	329	1.6	0	1.6	0	0	0.2	0	0	1.7	319	0.7
Nov	0.1	0.2	0.2	345	0.1	0	1.0	0.6	0	0	0	0	1.6	329	0.7
Dec	0.1	0.3	0.4	375	0.2	0	0.1	0.3	0	0	0	0	0.4	380	0.2
Jan	0.1	0	0.1	451	0.1	0	0	0	0	0	0.1	0	0	416	0
Feb	0.1	2.3	2.4	384	1.3	0	0.2	0.4	0	0	0.1	0	0.6	358	0.3
Mar	0	6.0	6.0	415	3.4	0	3.5	0	0.7	0.2	1.2	0.1	3.6	427	2.1
April to August Standard, 700 $\mu$ S/cm															
Apr	0	3.7	3.7	361	1.8	0	6.7	0.2	2.8	0.2	1.0	0.1	6.9	335	3.2
May	0	7.2	7.3	352	3.5	0	7.4	0.6	1.9	0.3	1.6	0	8.0	280	3.1
Jun	0	6.5	6.5	362	3.2	0	6.7	0.9	2.8	0.3	2.7	0	7.6	340	3.5
Jul	0	8.6	8.6	271	3.2	0	7.0	1.0	3.4	0.2	3.6	0.1	8.0	240	2.6
Aug	0	6.9	6.9	336	3.1	0	7.3	1.0	3.8	0.3	3.6	0.1	8.3	315	3.6
September to March Standard, 1000 $\mu$ S/cm															
Sep	0.1	4.0	4.1	393	2.2	0	4.2	1.5	1.5	0.2	0.1	0	5.7	355	2.7

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Table 11: Example Calculation of WY2008 DMC Allocations and Loads

	Grassland Subarea						Northwest Subarea						Total
	San Joaquin River and Mendota Pool Deliveries from CVP, load in thousand tons	Delta- Mendota Canal Deliveries from CVP, load in thousand tons	San Luis and Cross Valley Canal Deliveries from CVP, load in thousand tons	Total Flow, TAF	Load Allocation, thousand tons	Actual Load – Load Allocation, thousand tons	San Joaquin River and Mendota Pool Deliveries from CVP, load in thousand tons	Delta- Mendota Canal Deliveries from CVP, load in thousand tons	Total Flow, TAF	Load Allocation, thousand tons	Actual Load – Load Allocation, thousand tons	Total DMC Actual Load – Load Allocation, thousand tons	
September to March Standard, 1000 $\mu$ S/cm													
Oct	25.8	10.3	2.0	86	6.1	31.9	1.6	0.7	5	0.4	2.0	<b>33.9</b>	
Nov	8.1	5.1	1.2	32	2.2	12.2	0.1	0.7	2	0.1	0.7	<b>12.9</b>	
Dec	7.1	1.3	0.4	18	1.2	7.6	0.2	0.2	1	0.1	0.4	<b>8.0</b>	
Jan	7.7	1.4	0.6	16	1.1	8.7	0.1	0	0	0	0.1	<b>8.7</b>	
Feb	21.3	4.1	2.8	55	3.9	24.2	1.3	0.3	3	0.2	1.3	<b>25.5</b>	
Mar	34.9	7.1	5.2	88	6.2	41.0	3.4	2.1	10	0.7	4.8	<b>45.7</b>	
April to August Standard, 700 $\mu$ S/cm													
Apr	24.6	5.2	5.8	88	5.5	30.1	1.8	3.2	10	0.8	4.2	<b>34.3</b>	
May	38.1	14.1	7.4	128	9.0	50.4	3.5	3.1	15	1.1	5.5	<b>55.9</b>	
Jun	40.5	12.6	7.3	128	9.0	51.5	3.2	3.5	14	1.0	5.7	<b>57.2</b>	
Jul	36.1	10.5	5.7	149	10.5	41.8	3.2	2.6	17	1.2	4.6	<b>46.4</b>	
Aug	38.4	13.2	4.2	128	9.1	46.8	3.2	3.6	15	1.1	5.6	<b>52.4</b>	
September to March Standard, 1000 $\mu$ S/cm													
Sep	38.7	21.3	2.9	123	8.7	54.2	2.2	2.7	10	0.7	4.2	<b>58.5</b>	

## E. Future Actions

Reclamation is currently involved in several planning studies and long-term projects that would have potential benefits in improving the water quality of the San Joaquin River Basin. Although the studies are underway, the potential outcome of these studies and projects may not be known for some time. Projects include, but are not limited to, the following:

- Delta-Mendota Canal Recirculation
- New Melones Revised Plan of Operations
- Flow and Water Quality Data Collection
- San Luis Unit Drainage Features Re-Evaluation
- South Delta Improvements Project (SDIP)
- Franks Tract Project (formerly the Flooded Islands Study)
- Delta Habitat Conservation and Conveyance Program
- San Joaquin River Restoration Program
- Upper San Joaquin River Basin Storage Studies

Both Reclamation and the Board have agreed to revise the MAA when any of the above actions are implemented. For example, federal legislation authorizing the San Joaquin River Restoration Settlement Act was recently enacted and should result in spring and fall water releases from Millerton Dam beginning in the fall. It is unknown at this time what amount of that water will be conveyed to the lower San Joaquin River. Reclamation will document the methodology of any new quantification, such as dilution flows for salinity, when enough information becomes available. Reclamation will report on potential and expected salinity benefits from these projects. Otherwise, Reclamation will report on document availability.

## F. Vernalis Water Quality

*Description:* The Water Quality Objective (WQO) that the Basin Plan Amendment addresses is Salinity and Boron at Vernalis, in the lower San Joaquin River. The boron objectives are considered met if the salinity objectives are met. The WQOs are split into two separate seasonal objectives: 1000  $\mu\text{S}/\text{cm}$  EC from September 1 to March 31 and 700  $\mu\text{S}/\text{cm}$  EC from April 1 to August 31.

*Quantification Methodology:* Because the goal of the Basin Plan is to achieve these objectives, each quarterly report will include a section with tabular and graphical representations of this outcome. Vernalis water quality will be downloaded from the CDEC water data base at <http://cdec.water.ca.gov> for both VER (a Reclamation monitoring station) and SJR (a new Department of Water Resources (DWR) monitoring station). Two years ago, Reclamation moved its Vernalis sampling station to a location within 15 feet of the new DWR monitoring station. Data will be downloaded from CDEC as daily values, and a thirty day average will be calculated beginning with the 29 days prior to the start of the reporting period.

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*Data and QA/QC:* Reclamation data will be used in preference to calculate mean monthly averages and a running thirty day average over the reporting period. Reclamation’s water quality monitoring device is placed directly in the San Joaquin River, while DWR’s sampling station withdraws water from the River into its sampling station. Reclamation maintains the Hydrolab MS5 sonde every two months according to the procedure outlined in Appendix A, calibrating from 0- 2000 according to manufacture's procedure.

*Example:* The running thirty-day average salinity for 2008 was calculated using this methodology and is presented in Figure 4<sup>7</sup>. The monthly mean EC<sup>8</sup> for 2008 is presented in Table 12. WY2008 was classified as critical years for the San Joaquin River.

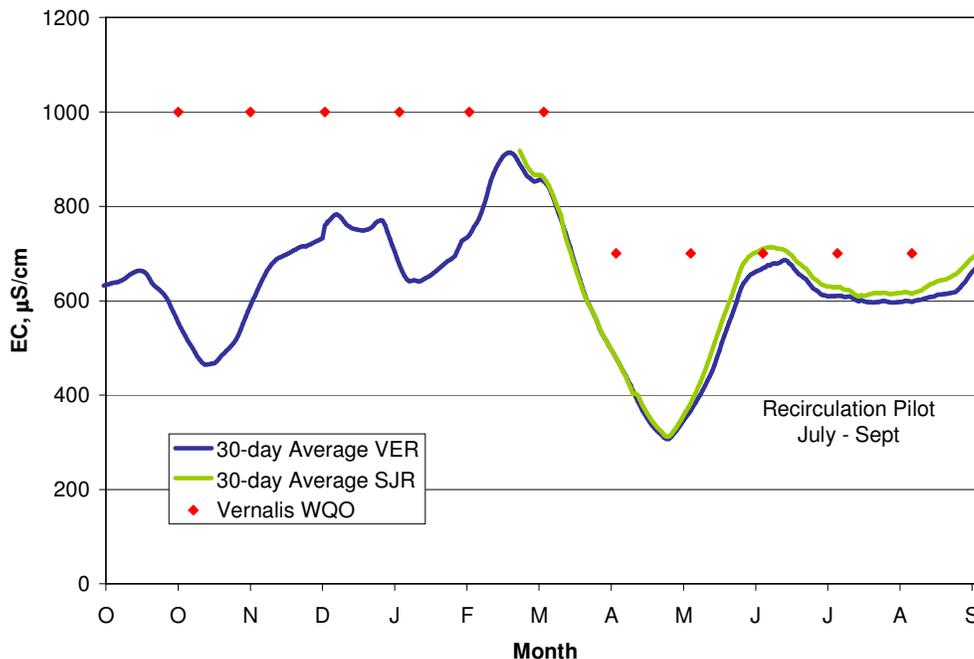
**Table 12: WY2008 Monthly mean EC at Vernalis,  $\mu\text{S}/\text{cm}$**

	Reclamation Station	DWR Station
September to March Standard, 1000 $\mu\text{S}/\text{cm}$		
Oct	554	
Nov	589	
Dec	760	
Jan	686	
Feb	750	
Mar	847	856
April to August Standard, 700 $\mu\text{S}/\text{cm}$		
Apr	479	479
May	367	383
Jun	669	710
Jul	611	630
Aug	600	617
September to March Standard, 1000 $\mu\text{S}/\text{cm}$		
Sep	687	713
Oct	600	617
Nov	763	755
Dec	870	887

<sup>7</sup> Footnote 2 to Table 2 of Water Rights Decision 1641 (revised) states “Determination of compliance with an objective expressed as a running average begins on the last day of the averaging period. The averaging period commences with the first day of the time period for the applicable objective. If the objective is not met on the last day of the averaging period, all days in the averaging period are considered out of compliance.”

<sup>8</sup> Note, the monthly mean EC is mathematically closest to the last day of the running 30 day average EC.

Figure 4: 2008 Vernalis Water Quality



## G. Reporting Requirements

In the MAA, Reclamation agreed to provide quarterly reports to the Regional Board. The first quarter 2009 report is attached as Appendix C. Reclamation will consult with the Regional Board before proposing any changes to the sample report format. Quarterly reports are due 45 days after the end of the calendar quarter:

### Reporting Milestones

End of calendar quarter	Due date of Quarterly report
December 31, 2008	February 13, 2009
March 31, 2009	May 15, 2009
June 30, 2009	August 14, 2009
September 30, 2009	November 13, 2010
December 31, 2009	February 12, 2010
March 31, 2010	May 14, 2010
June 30, 2010	August 13, 2010
September 30, 2010	November 12, 2010
December 31, 2010	February 14, 2011

Reclamation also agreed to prepare an annual report on compliance, due by January 1, 2010. The annual report will follow the same format as used in the Draft Plan.

## **H. Funding Reporting**

In the MAA, Reclamation agreed to seek additional funding, including grant funding, to support salinity control efforts. Reclamation is operated on a three year budget cycle. Budget is requested two years in advance, and not all annual budgets are spent within a year but rather obligated to a specific contract or grant. Reclamation will report its funding based on the official report provided from the Office of Management and Budget. Activities for which Reclamation has requested funding will also be reported. Fiscal years run from October 1 to September 30 (similar to the water year). In its quarterly reports, Reclamation will report on other efforts to support the securing of additional funding.

## **I. Monitoring Program**

To support the actions described in this Draft Plan and to support evaluation of salinity loads, Reclamation will work with the Regional Board to develop a monitoring program. As a first step, Reclamation has identified existing monitoring data to support its evaluations of baseline, reductions, and offsets. Table 13 lists the existing monitoring sites used in the Draft Plan.

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**Table 13: Monitoring Locations used in Draft Plan**

<b>Symbol (Sensor)</b>	<b>Description</b>	<b>Parameter</b>	<b>Operator</b>	<b>Frequency</b>	<b>Website</b>
Reservoir Operations Reports (Goodwin)	River Spills from Goodwin Reservoir	Flow, cfs	Reclamation	Daily	<a href="http://www.usbr.gov/mp/cvo/reports.html">http://www.usbr.gov/mp/cvo/reports.html</a>
Supplemental Water Contributions	Flows provided under the VAMP Agreement from Merced and Tuolumne Rivers	Flow, cfs	San Joaquin River Group	Daily	<a href="http://www.sjrg.org/technicalreport">www.sjrg.org/technicalreport</a>
Newman Wasteway Recirculation	Recirculation Flows (Newman Wasteway MP 6.88)	Deliveries, AF	SLDMWA Water Master and Reclamation CVO	Monthly (based on daily)	<a href="http://www.usbr.gov/mp/cvo/deliv.html">http://www.usbr.gov/mp/cvo/deliv.html</a>
Monthly Water Deliveries	DMC, Cross Valley Canal, San Luis Canal, Delta- Mendota Pool, and San Joaquin River	Deliveries, AF	SLDMWA Water Master and Reclamation CVO	Monthly	<a href="http://www.usbr.gov/mp/cvo/deliv.html">http://www.usbr.gov/mp/cvo/deliv.html</a>
VNS	San Joaquin River at Vernalis	Flow, cfs	USGS and DWR	Hourly/Daily	<a href="http://cdec.water.ca.gov/">http://cdec.water.ca.gov/</a>
USGS 11303500	SJR at Vernalis	Discharge, cfs	USGS	Continuous	<a href="http://waterdata.usgs.gov/nwis">http://waterdata.usgs.gov/nwis</a>
OBB (100)	Stanislaus River at Orange Blossom Bridge	EC, $\mu$ S/cm	DWR	Hourly/Event	<a href="http://cdec.water.ca.gov/">http://cdec.water.ca.gov/</a>
NWDS	Newman Wasteway MP 8.16	EC, $\mu$ S/cm	Reclamation	Continuous during study	<a href="http://www.usbr.gov/mp/dmcrecirc/index.html">http://www.usbr.gov/mp/dmcrecirc/index.html</a> <i>Not yet released to public.</i>
DMC Check 13	In DMC, immediately downstream of O'Neill Forebay	EC, $\mu$ S/cm	Reclamation	Continuous	<a href="http://www.usbr.gov/mp/cvo/wqrpt.html">http://www.usbr.gov/mp/cvo/wqrpt.html</a>
DMC Check 21	Entrance to Mendota Pool	EC, $\mu$ S/cm	Reclamation	Continuous	<a href="http://www.usbr.gov/mp/cvo/wqrpt.html">http://www.usbr.gov/mp/cvo/wqrpt.html</a>
VER	San Joaquin River at Vernalis	EC, $\mu$ S/cm	Reclamation	Continuous	<a href="http://cdec.water.ca.gov/">http://cdec.water.ca.gov/</a>
SJR	San Joaquin River at Vernalis	EC, $\mu$ S/cm	DWR	Continuous	<a href="http://cdec.water.ca.gov/">http://cdec.water.ca.gov/</a>

## J. Summary

Reclamation has spent considerable time examining the Basin Plan Amendment in order to understand how to calculate the allocations and offsets of Reclamation actions in a way that both complies with the TMDL, applicable laws, federal authority and that maintains the environmental integrity of the TMDL.

Reclamation has been operating to meet the objective of the TMDL since 1995. Reclamation believes these operations suffice to meet the objective of the TMDL, and therefore is examining the dilution allocation that these operations provide.

Reclamation has conducted extensive stakeholder outreach to develop representative and acceptable accounting of DMC loads, dilution allocations, offsets, credits, and trading of loads. Sections A through C of the Draft Plan quantified, where possible, the potential sources of dilution allocations and mitigation credits. Table 14 combines these individual calculations with the DMC load calculations and Vernalis salinity.

**Table 14: Example of Calculated Loads and Assimilative Capacity of Individual Draft Plan Elements for WY2008, thousand tons of salt**

	DMC Load over Allocation	A-1: New Melones	A-2: WAP	A-4: Recirculation	B-3: WRDP (annual only)	Vernalis average Salinity, $\mu\text{S}/\text{cm}$
September to March Standard, 1000 $\mu\text{S}/\text{cm}$						
Oct	33.9	16.1	9.7			554
Nov	12.9	3.1				589
Dec	8.0	3.1				760
Jan	8.7	5.3				686
Feb	25.5	5.2				750
Mar	45.7	36.5				847
April to August Standard, 700 $\mu\text{S}/\text{cm}$						
Apr	34.3	20.4				479
May	55.9	13.6				367
Jun	57.2	13.6				669
Jul	46.4	12.9				611
Aug	52.4	9.2		3.9		600
September to March Standard, 1000 $\mu\text{S}/\text{cm}$						
Sep	58.5	6.9	0	2.8		687
<b>TOTAL</b>	439,506	146,005	9,672	6,664	171,276	

Within the MAA is a goal for Reclamation to offset or reduce DMC excess loads by 25 percent by July 2010. For Water Year 2008, Reclamation engaged in actions that offset DMC loads by over 75%.

# Appendix A: Sonde Multiprobe (Yellow Springs Instruments) – Operation and Calibration

USBR, Branch of Environmental Monitoring (MP-157) SOP # \_\_\_\_\_

## SUMMARY

This SOP describes operation and calibration procedures for the Yellow Springs Instruments (YSI) 600XL and 6600 Sonde multiprobes.

## REAGENTS

1. Electrical conductivity standard solution – 1,000  $\mu S/cm$
2. pH standard solution – 7.0 (yellow)
3. pH standard solution – 10.0 (blue)
4. Turbidity standard solution – 0.0 NTU
5. Turbidity standard solution – 123 NTU or 11.2 NTU
6. Deionized (DI) water

## EQUIPMENT

1. Sonde multiprobe
2. Field cable
3. MDS 650 display/data logger
4. Four Size “C” alkaline batteries (6600 Sonde only)



## PROCEDURE - OPERATION

1. Before operating the instrument, calibrate it as described below.
2. If needed, attach the Sonde to the data display unit with the field cable.
3. Cover the probes with the perforated probe guard and submerge the probe end of the unit about a foot under the surface of the water to be measured. Alternately, attach the clear plastic calibration cup (cal cup) and pour environmental water into the cup until the

probes are completely covered. Discard this water and repeat twice more before filling a final time.

4. To turn the on the display unit, press the green button (upper left). Use the up/down arrow key to select “Run” from the file menu. When selected, press “Enter” (←).
5. Wait for readings to stabilize: this should take less than a minute. If readings don’t settle (and you are not taking measurements directly from the source), try holding the Sonde around the cal cup – this should stabilize the temperature and EC readings.
6. Record physical measurements in the Field Log Book (SOP#\_\_\_\_) and on the Field Sheet (SOP #\_\_\_\_).
7. When finished, turn the unit off by pressing the green button.
8. If making measurements over an extended time period, verify the instrument calibration every 8 hours. If measuring less than 8 hours, verification is not needed. Document the instrument verification on the Instrument Calibration Sheet.

#### GENERAL PROCEDURE – CALIBRATION AND CALIBRATION VERIFICATION

1. Before sampling, verify the instrument calibration for each physical constituent to be measured. If the calibration cannot be verified, the instrument must be recalibrated for that measurement. Since some calibrations are interdependent, perform verifications and calibrations in the following order:
  - Specific conductance (EC)
  - pH
  - Dissolved oxygen (DO)
  - Turbidity
  - Depth
  - Oxidation/reduction potential (ORP)
2. Attempt to verify the calibration.
3. If the calibration cannot be verified, calibrate as described for each measurement (below).
4. Document the verification and/or calibration on an “Instrument Calibration Sheet” (see SOP#\_\_\_\_).

#### Conductivity (EC)

1. EC calibration is easy to do, so recalibrate even if the old calibration can be verified.
2. Pre-rinse the cal cup and sensors with a small amount of the 1.0 mS/cm (1,000  $\mu\text{S}/\text{cm}$ ) calibration standard and discard. Repeat. If 1,000  $\mu\text{S}/\text{cm}$  standard is not available, it is OK to calibrate with standard  $\geq 1.0$  mS/cm.
3. Fill the cal cup with standard ensuring that the conductivity probe is completely submerged. The hole in the side of the probe must be under the surface of the solution and not have any trapped bubbles in the side opening.
4. Scroll to “Sonde Menu” and press “Enter”
5. Scroll to “Calibrate” press “Enter”
6. Scroll to “Spec. Cond” and press “Enter”
7. Type in “1” (if using 1,000  $\mu\text{S}/\text{cm}$  standard) and press “Enter”. The sonde requires the input in milli-siemens.
8. If the sonde should report “Out Of Range”, investigate the cause. **Never override a calibration error message.** This error message can result from: 1) low fluid level, 2) air bubbles in the probe cell, and/or 3) an incorrect entry. For example, entering 1000 (for *microsiemens*) instead of 1.0 (for *millisiemens*) will result in an Out of Range error.

9. When prompted by the display unit, press “Enter” to accept the calibration.
10. After the calibration has been accepted, check the conductivity cell constant which can be found in the Sonde’s Advanced Menu under Cal Constants. Record the value on the calibration sheet. If the cell constant is out of range ( $5.0 \pm 0.45$ ) the probe may need replacing.

**pH**

1. pH calibration is easy to do, so recalibrate even if the old calibration can be verified.
2. If necessary, attach a temperature probe to the Sonde (temperature is needed to measure pH).
3. If needed, go to the Sonde “Report Menu” and turn on the pH millivolt (mV) display. This will allow the Sonde to display the probe’s raw output as well as pH units.
4. If the in-situ pH value is unknown, use a three point calibration. If the general pH range is known, bracket the anticipated value using a two point calibration.
5. Start all calibrations (two or three point) with yellow Buffer 7 standard solution.
6. Pre-rinse the cal cup and sensors with a small amount of the calibration standard and discard. Repeat.
7. Fill the cal cup with standard. Ensure that the pH probe is completely submerged.
8. Calibrate the pH as directed by the data display unit. Record the pH mV on the Calibration Sheet at each calibration point. The acceptance level for each buffer is:

Buffer	Millivolt Reading	Tolerance
4	180	± 50 mV
7	0	
10	180	

9. Determine the difference between the mv recorded for the 4 & 7 or the 7 & 10 calibration points. For example, if buffer 7 gave a 3 mV reading and buffer 10 gave a -177 mV reading, the difference is 180mV. The acceptable range for the mV difference is 165 to 180. If the mV difference is outside of this range, the pH probe should be replaced.
10. Do not use a probe that has given a “Calibration Error” or “Out of Range” message.
11. Recondition the probe if pH readings are slow to settle. The reconditioning procedure is in the “Sonde Care and Maintenance” section of the YSI manual.

**Dissolved Oxygen (DO)**

1. Attempt to verify the DO calibration (steps 2- 5, this section). If the calibration is good, don’t recalibrate.
2. Put about ½ cm of water in the cal cup and set the lid on the cup. Don’t tighten down the lid. Alternately, if the probe guard is on, wrap the guard in a moist towel. This will place the DO probe in a saturated atmosphere.
3. Go to the “Run” menu and press “Enter”
4. On the Calibration/Verification sheet, record the barometric pressure and the DO in %. If the DO reads between 95 and 105 % (at sea level), no calibration is needed.
5. If you are not at sea level, you must determine the acceptable DO range for your altitude.
6. If the calibration cannot be verified, inspect the DO probe anodes. If the anodes are not bright and shiny, remove the membrane and recondition using the 6035 reconditioning kit. If the o-ring looks loose or old, replace it as described in the YSI manual.

7. After replacing the membrane, allow the Sonde to run for 10 minutes. Check the DO Charge after about 5 minutes, it should read between 25 and 75.
8. After the 10 minute “burn-in”, go to the Advanced Menu and confirm that the RS-232 auto sleep function is enabled. If the Sonde is to be connected to an SDI-12 data logger then the SDI-12 auto sleep must be enabled as well. After turning on auto sleep, wait one minute before proceeding.
9. Start the probe in the Discrete Run mode at a 4 second rate and record the first 10 DO% numbers on paper, the numbers must start at a high number and drop with each four second sample, example: 110, 105, 102, 101.5, 101.1, 101.0, 100.8, 100.4, 100.3, 100.1. It does not matter if the numbers do not reach 100%, it is only important that they have the same high to low trend. If you have a probe that starts at a low number and steadily climbs upward then the sensor has a problem and it must not be used. Note: Initial power up can make the first two DO% samples read low, the first two samples can be disregarded.
10. A new membrane will be slightly unstable for 3 to 6 hours after replacement so wait a few hours and then try again to verify your calibration.
11. If you still can't verify the calibration, calibrate by setting “auto sleep” ON for unattended studies and OFF for discreet sampling.
12. Fill the calibration cup as in Step 2. Let the DO probe sit idle, **not in “Run” mode**, in this saturated environment for at least 10 minutes before beginning the DO calibration.
13. Calibrate the Sonde in DO%.
14. Enter the local barometric pressure in mm/hg. In Unattended mode (RS-232 Auto-Sleep ON) the DO probe will be calibrated automatically once the barometric pressure is entered and the warm-up time counter counts down to zero.
15. For “Discrete” or “Sampling” modes, press the Enter Key when the DO readings are stable. Wait at least three minutes and press the enter key again to calibrate.
16. When the calibration is complete, go to the “Advanced” menu and then to “Cal Constants”. Record the DO gain on the Calibration Sheet. The gain should be between -0.7 and +1.4.

### **Turbidity (6600 only)**

Notes: The calibration of all YSI turbidity sensors must be done with either YSI distributed standards, Hach StablCal, Diluted Hach 4000 NTU formazin or standards that have been prepared according to instructions in Standard Methods (Section 2130B). Standards from other vendors are NOT approved, and their use will likely result in a bad calibration and incorrect field readings. Please refer to the turbidity calibration section of your manual for more information.

Calibrating turbidity is best done in a lab. It is better to post-calibrate an optical probe back in the lab than to attempt a field calibration, especially if you are working out of a small boat or in less than clean conditions.

Never override a calibration error message without fully understanding the cause of the problem. Calibration errors messages usually indicate that problems exist that will result in incorrect field readings.

1. Before calibrating or verifying calibration, confirm that 1) the wiper on the turbidity probe is parking approximately 180 degrees opposite of the optics, 2) the wiper reverses

direction during the wipe cycle, 3) the probe output increases when a finger is placed in front of the optics, 4) all submerged parts of the sonde and wipers are clean and 5) the optics are clean and clear of fingerprints.

2. Remove the EDS wiper and replace it with a clean standard (no brush) wiper.
3. Start with the zero (0) NTU standard. Pour the 0 NTU standard into the calibration cup – pour down the side to avoid aerating the sample. Set the Sonde on top of the calibration cup, do not engage the threads. Verify that there are no air bubbles on the probe face.
4. Run the wiper at least once before accepting the first point. To accept the point, press “Enter”.
5. Calibrate the second point with 123 NTU standard (for the 6136 sensor). Wipe the probe at least once, then press “Enter”.

**Depth**

Note: To calibrate, the depth sensor module must be in air and the sensor channel must be free of dirt. If the channel needs cleaning, use a syringe to flush water through it.

1. From the Calibration menu, select Pressure-Abs or Pressure-Gage (depending if you have a vented level sensor).
2. Input 0.00 or some known offset in feet. Press Enter and monitor the stabilization of the depth readings with time.
3. When no significant change occurs for approximately 30 seconds, press Enter to confirm calibration. This zeros the sensor with regard to current barometric pressure. Then press Enter again to return to the Calibration menu.
4. Go to the “Advanced” menu and then to “Cal Constants” and record the pressure offset on the Calibration Sheet.

**CALIBRATION CHART**

<u>Temperature Celsius</u>	<u>Zobell Solution Value, mV</u>
-5	270.0
0	263.5
5	257.0
10	250.5
15	244.0
20	237.5
25	231.0
30	224.5
35	218.0
40	211.5
45	205.0
50	198.5

**EMPLOYEE SAFETY**

1. Handle standards with care; do not ingest.

**POLLUTION PREVENTION AND WASTE MANAGEMENT**

1. Place used batteries in recycle bin at the 112 lab. Tape battery ends before binning them.

## Appendix B: 2008 CVO Water Delivery Tables 24, 25, and 26

The following are the water delivery tables from calendar year 2008. Names highlighted in red are used in the Grassland SubArea calculations. Names highlighted in blue are used in the Northwest SubArea calculations. Names highlighted in purple are used in both SubArea calculations.

**Reclamation Draft Compliance Monitoring and Evaluation Plan**

**Appendix B**

Table 24

U.S. Department of Interior - Bureau of Reclamation  
Central Valley Operations Office

San Joaquin and Mendota Pool  
2008

Monthly Deliveries in AF

Water User	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Fresno Slough WD	0	18	80	97	437	156	276	54	0	0	0	0	1118
Tranquility Public Utilitie	0	0	13	0	0	27	33	29	0	0	0	0	102
James ID	28	4515	487	612	2459	5418	3747	1945	936	224	84	0	20455
Meyers (SLWD)	619	1216	1242	583	147	113	256	825	987	61	226	0	6275
Dudley & Indart (formerly C Mid-Valley WD (no contract)	15	159	117	176	165	220	217	225	39	63	1	0	1397
Reclamation District #1606	0	0	0	0	0	0	0	0	0	0	0	0	0
Terra Linda Farms (Coelho F	0	14	51	52	118	134	73	11	0	0	0	0	453
Tranquility ID	284	585	746	758	1066	1473	1533	1053	470	245	55	0	8268
Westlands WD (Lateral 6 & 7	0	2197	2631	2565	4585	6372	6372	2943	1082	365	500	0	29612
Wilson, JW (no contract)	0	0	0	0	0	84	316	84	363	0	0	0	847
Wilson, JW (no contract)	0	82	107	0	0	208	233	272	76	0	0	0	978
<b>Laguna WD (via CCID)</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>San Luis WD (via CCID)</b>	<b>0</b>	<b>82</b>	<b>20</b>	<b>0</b>	<b>50</b>	<b>40</b>	<b>45</b>	<b>37</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>274</b>
<b>Total</b>	<b>946</b>	<b>8868</b>	<b>5494</b>	<b>4843</b>	<b>9027</b>	<b>14245</b>	<b>13101</b>	<b>7478</b>	<b>3953</b>	<b>958</b>	<b>866</b>	<b>0</b>	<b>69779</b>
Exchange Contractors													
<b>Central California ID (CCID)</b>	<b>0</b>	<b>17424</b>	<b>44627</b>	<b>27615</b>	<b>54252</b>	<b>48941</b>	<b>64554</b>	<b>51418</b>	<b>29618</b>	<b>29935</b>	<b>1801</b>	<b>0</b>	<b>370185</b>
<b>Columbia Canal Co</b>	<b>0</b>	<b>1628</b>	<b>4975</b>	<b>5278</b>	<b>6701</b>	<b>7940</b>	<b>8735</b>	<b>8799</b>	<b>6420</b>	<b>3500</b>	<b>46</b>	<b>0</b>	<b>54022</b>
<b>Firebaugh Canal WD</b>	<b>426</b>	<b>3979</b>	<b>3902</b>	<b>5629</b>	<b>5221</b>	<b>6150</b>	<b>5431</b>	<b>5541</b>	<b>3259</b>	<b>2071</b>	<b>1665</b>	<b>916</b>	<b>44190</b>
<b>San Luis Canal Co (SLCC)</b>	<b>0</b>	<b>3913</b>	<b>11387</b>	<b>14426</b>	<b>14064</b>	<b>24935</b>	<b>27450</b>	<b>24210</b>	<b>6102</b>	<b>2000</b>	<b>2750</b>	<b>0</b>	<b>131237</b>
<b>Total</b>	<b>426</b>	<b>26944</b>	<b>64891</b>	<b>52948</b>	<b>80238</b>	<b>87966</b>	<b>106170</b>	<b>89968</b>	<b>45399</b>	<b>37506</b>	<b>6262</b>	<b>916</b>	<b>599634</b>
Refuges													
<b>Grasslands WD (via CCID &amp; S</b>	<b>4892</b>	<b>4280</b>	<b>500</b>	<b>303</b>	<b>3410</b>	<b>897</b>	<b>146</b>	<b>400</b>	<b>19765</b>	<b>9649</b>	<b>10173</b>	<b>0</b>	<b>54415</b>
<b>China Island Unit (CDFG) (v</b>	<b>647</b>	<b>803</b>	<b>151</b>	<b>119</b>	<b>101</b>	<b>70</b>	<b>195</b>	<b>174</b>	<b>1046</b>	<b>884</b>	<b>1008</b>	<b>0</b>	<b>5198</b>
<b>Los Banos WMA (CDFG) (via C</b>	<b>1759</b>	<b>944</b>	<b>341</b>	<b>233</b>	<b>272</b>	<b>99</b>	<b>144</b>	<b>518</b>	<b>3218</b>	<b>4590</b>	<b>2447</b>	<b>0</b>	<b>14565</b>
Mendota Wildlife Area (CDFG	556	1149	1479	1317	1776	1864	2817	1338	5259	5863	2678	693	26789
<b>Salt Slough Unit (CDFG) (vi</b>	<b>835</b>	<b>605</b>	<b>173</b>	<b>144</b>	<b>220</b>	<b>122</b>	<b>134</b>	<b>151</b>	<b>1381</b>	<b>1577</b>	<b>1208</b>	<b>0</b>	<b>6550</b>
<b>Freitas Unit (USFWS) (via C</b>	<b>1069</b>	<b>1106</b>	<b>256</b>	<b>181</b>	<b>173</b>	<b>89</b>	<b>0</b>	<b>0</b>	<b>968</b>	<b>1865</b>	<b>1396</b>	<b>0</b>	<b>7103</b>
<b>Kesterson (USFWS) (via CCID</b>	<b>0</b>	<b>662</b>	<b>197</b>	<b>108</b>	<b>108</b>	<b>22</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1164</b>	<b>0</b>	<b>2261</b>
<b>San Luis NWR (USFWS) (via S</b>	<b>3708</b>	<b>9295</b>	<b>1749</b>	<b>0</b>	<b>2840</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>5822</b>	<b>4136</b>	<b>2994</b>	<b>0</b>	<b>30544</b>
													0
<b>Total</b>	<b>13466</b>	<b>18844</b>	<b>4846</b>	<b>2405</b>	<b>8900</b>	<b>3163</b>	<b>3436</b>	<b>2581</b>	<b>37459</b>	<b>28564</b>	<b>23068</b>	<b>693</b>	<b>147425</b>
<b>Total Deliveries</b>	<b>14838</b>	<b>54656</b>	<b>75231</b>	<b>60196</b>	<b>98165</b>	<b>105374</b>	<b>122707</b>	<b>100027</b>	<b>86811</b>	<b>67028</b>	<b>30196</b>	<b>1609</b>	<b>816838</b>

\* Delivery data is based on District turn-out readings and may include water in addition to water service contract deliveries.

Reclamation Draft Compliance Monitoring and Evaluation Plan

Appendix B

Table 25

U. S. Department of Interior - Bureau of Reclamation  
Central Valley Operations Office

Water User	Delta-Mendota Canal 2008												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Tracy, City of	277	0	0	415	736	942	1,045	1,003	903	849	472	349	6,991
Byron Bethany ID (formerly P	13	9	52	455	621	564	510	423	350	241	46	21	3,305
West Side ID	0	0	0	402	263	255	371	43	0	0	0	0	1,334
Banta Carbona ID	0	0	0	431	222	133	727	473	0	1	0	0	1,987
West Stanislaus ID	0	41	766	2,884	2,028	2,934	3,584	3,917	1,610	0	0	0	17,764
Patterson WD	11	400	35	210	602	910	1,000	1,010	1,458	567	72	0	6,275
Del Puerto WD	44	199	4,484	8,506	9,448	8,503	8,893	9,228	5,389	2,907	1,030	305	58,936
San Luis WD - Ag	0	238	717	597	566	863	1,273	747	359	172	30	60	5,622
San Luis WD - M&I	1	1	2	16	19	23	19	1	33	14	6	1	136
Panoche WD - Ag	65	112	956	655	845	869	768	663	209	107	181	62	5,492
Panoche WD - M&I	2	2	2	2	2	2	2	2	2	2	2	2	24
Eagle Field WD	31	0	0	0	1	0	13	72	1	1	0	0	119
Oro Loma WD	0	56	0	0	10	22	17	28	0	0	0	0	133
Mercy Springs WD	0	0	92	108	194	95	162	71	155	207	1	18	1,103
Newman Wasteway Recirculatio	0	0	0	0	0	0	1,065	13,439	7,089	0	0	0	21,593
DWR Intertie @MP7.70-R	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total</b>	<b>444</b>	<b>1,058</b>	<b>7,106</b>	<b>14,681</b>	<b>15,557</b>	<b>16,115</b>	<b>19,449</b>	<b>31,120</b>	<b>17,558</b>	<b>5,068</b>	<b>1,840</b>	<b>818</b>	<b>130,814</b>
Exchange Contractors													
Central California ID (Abv C	0	32	1,209	1,642	2,358	2,121	1,855	2,156	1,577	949	321	781	15,001
Central California ID (Blw C	407	971	8,821	7,146	12,240	19,949	27,083	26,621	456	183	100	0	103,977
Firebaugh Canal Co	129	248	353	405	1,955	2,483	3,916	1,992	62	0	61	6	11,610
<b>Total</b>	<b>536</b>	<b>1,251</b>	<b>10,383</b>	<b>9,193</b>	<b>16,553</b>	<b>24,553</b>	<b>32,854</b>	<b>30,769</b>	<b>2,095</b>	<b>1,132</b>	<b>482</b>	<b>787</b>	<b>130,588</b>
Refuges													
China Island Unit (CDFG) (76	0	0	452	357	302	212	585	524	0	0	0	1,176	3,608
Los Banos WMA (CDFG) (76.05	0	0	485	698	818	296	432	720	0	0	0	837	4,286
Salt Slough Unit (CDFG) (76.	0	0	519	432	659	366	401	453	0	0	0	915	3,745
Volta WMA (CDFG) (Volta West	156	421	0	62	370	260	25	1,911	2,588	2,756	1,516	183	10,248
Grasslands WD (76.05 & CCID)	1,051	5,990	1,500	910	8,857	2,691	438	1,199	21,551	12,744	7,617	500	65,048
Grasslands WD (Volta Wastewa	10	748	0	360	3,740	980	0	283	17,003	11,759	1,014	312	36,209
Kesterson Unit (USFWS) (76.0	0	0	591	324	324	66	0	0	0	0	0	828	2,133
Kesterson Unit (USFWS) (Volt	616	0	0	0	0	0	0	0	942	1,523	0	0	3,081
Frietas Unit (USFWS) (76.05	0	0	767	542	518	267	0	0	0	0	0	886	2,980
<b>Total</b>	<b>1,833</b>	<b>7,159</b>	<b>4,314</b>	<b>3,685</b>	<b>15,588</b>	<b>5,138</b>	<b>1,881</b>	<b>5,090</b>	<b>42,084</b>	<b>28,782</b>	<b>10,147</b>	<b>5,637</b>	<b>131,338</b>

Reclamation Draft Compliance Monitoring and Evaluation Plan

Appendix B

Table 26

U. S. Department of Interior - Bureau of Reclamation  
Central Valley Operations Office

San Luis and Cross Valley Canals  
2008

Monthly Deliveries in AF

Water User	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
SAN LUIS CANAL													
City of Avenal	194	191	213	202	193	169	169	171	133	252	202	173	2262
City of Coalinga	324	310	369	537	626	671	796	715	672	648	381	432	6481
<b>City of Dos Palos</b>	<b>130</b>	<b>107</b>	<b>109</b>	<b>123</b>	<b>149</b>	<b>172</b>	<b>182</b>	<b>174</b>	<b>143</b>	<b>115</b>	<b>75</b>	<b>36</b>	<b>1515</b>
City of Huron	66	61	90	125	114	116	127	127	110	106	88	56	1186
<b>Pacheco WD</b>	<b>1</b>	<b>1</b>	<b>237</b>	<b>1</b>	<b>1</b>	<b>765</b>	<b>1003</b>	<b>652</b>	<b>318</b>	<b>1</b>	<b>22</b>	<b>53</b>	<b>3055</b>
<b>Pacheco CCID Non-project (Hamburg)</b>	<b>96</b>	<b>772</b>	<b>1109</b>	<b>1494</b>	<b>1346</b>	<b>806</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>142</b>	<b>116</b>	<b>0</b>	<b>5881</b>
Panoche WD	106	1224	3318	4872	5054	4883	4887	2106	1175	874	343	327	29169
<b>San Luis WD</b>	<b>586</b>	<b>3467</b>	<b>5472</b>	<b>7150</b>	<b>9017</b>	<b>8930</b>	<b>10490</b>	<b>6827</b>	<b>3812</b>	<b>4712</b>	<b>2703</b>	<b>28</b>	<b>63194</b>
Westlands WD	5588	23834	60024	76747	97166	81129	83558	61458	35231	25309	10161	5754	565959
Mendota WMA (CDFG) (via WWD Lateral	0	0	0	28	0	1	31	1	1	0	0	0	62
Mendota WMA (CDFG) (via WWD Lateral	0	0	0	0	0	0	0	0	0	0	0	0	0
Kern National Wildlife Refuge (USFW	489	2266	0	0	276	0	0	1562	3949	3640	4857	4154	21193
Total	7580	32233	70941	91279	113942	97642	101243	73793	45544	35799	18948	11013	699957
O'NEILL FOREBAY DELIVERIES													
<b>Oneill Forebay Wildlife</b>	<b>138</b>	<b>31</b>	<b>0</b>	<b>0</b>	<b>14</b>	<b>147</b>	<b>79</b>	<b>108</b>	<b>140</b>	<b>148</b>	<b>84</b>	<b>100</b>	<b>989</b>
<b>San Luis WD Ag</b>	<b>38</b>	<b>274</b>	<b>675</b>	<b>666</b>	<b>834</b>	<b>759</b>	<b>1225</b>	<b>734</b>	<b>404</b>	<b>346</b>	<b>151</b>	<b>100</b>	<b>6206</b>
<b>San Luis M&amp;I</b>	<b>41</b>	<b>42</b>	<b>92</b>	<b>93</b>	<b>153</b>	<b>168</b>	<b>81</b>	<b>113</b>	<b>107</b>	<b>81</b>	<b>53</b>	<b>33</b>	<b>1057</b>
<b>VA Cemetary</b>	<b>1</b>	<b>1</b>	<b>14</b>	<b>20</b>	<b>37</b>	<b>30</b>	<b>30</b>	<b>25</b>	<b>24</b>	<b>13</b>	<b>5</b>	<b>5</b>	<b>205</b>
Total	218	348	781	779	1038	1104	1415	980	675	588	293	238	8457
CROSS VALLEY CANAL (See Note 1 below)													
County of Fresno	0	0	0	0	0	0	152	272	776	0	0	0	1200
County of Tulare	0	0	0	0	0	0	123	0	1072	928	0	0	2123
Lower Tule River ID	0	0	0	0	0	0	2026	3212	1998	1083	307	96	8722
Pixley ID	0	0	0	0	0	0	2027	3212	1997	1083	307	96	8722
Kern-Tulare WD	0	0	0	0	0	0	0	3541	12459	0	0	0	16000
Rag Gulch WD	0	0	0	0	0	0	0	249	5071	0	0	0	5320
Hills-Valey ID	0	0	0	0	0	0	169	309	860	0	0	0	1338
Tri-Valley ID	0	0	0	0	0	0	58	107	292	0	0	0	457
Total	0	0	0	0	0	0	4555	10902	24525	3094	614	192	43882

\* Delivery data is based on District turn-out readings and may include water in addition to water service contract deliveries.

Note 1: Cross Valley Canal section represents deliveries on behalf of the contractors listed, not necessarily what flows went into the Cross Valley Canal.

# **Appendix C: Sample Quarterly Report (4<sup>th</sup> Quarter 2008)**

## Quarterly Activity Report

October 1 – December 31, 2008

*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 22, 2008*

February 15, 2009

## Abbreviations and Acronyms

Action Plan	Actions to Address the Salinity and Boron TMDL Issues for the Lower San Joaquin River
AF Authority	acre-foot or acre-feet San Luis & Delta-Mendota Water Authority
Basin Plan	Water Quality Control Plan for the Sacramento and San Joaquin River Basins, 4 <sup>th</sup> Edition
BMP	Best Management Practices
CALFED	CALFED Bay-Delta Program
CDEC	California Data Exchange Center
CDFG	California Department of Fish and Game
cfs	cubic feet per second
Corps	U.S. Army Corps of Engineers
CVO	Central Valley Operations
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CVRWQCB	Central Valley Regional Water Quality Control Board
CV-SALTS	Central Valley Salinity Alternatives for Long Term Sustainability
DCRT	Data Collection and Review Team
DMC	Delta-Mendota Canal
DWR	California Department of Water Resources
EC	electrical conductivity
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
Exchange Contractors	San Joaquin River Exchange Contractors Water Authority
GBP	Grassland Bypass Project
GDA	Grassland Drainage Area
GRCD	Grassland Resource Conservation District
GUI	graphical user interface
ID	irrigation district
Interior	U.S. Department of the Interior
IPO	Interim Plan of Operations

MAA	Management Agency Agreement
μS/cm	micro Siemens per centimeter
μg/L	microgram(s) per liter
mg/L	milligram(s) per liter
NPDES	National Pollutant Discharge Elimination System
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
Reclamation	Bureau of Reclamation
RTMP	Real Time Management Program
Secretary	Secretary of the Interior
Service	U.S. Fish and Wildlife Service
SJR	San Joaquin River
SJRIP	San Joaquin River Improvement Project
SJRWQMG	San Joaquin River Water Quality Management Group
SLDMWA	San Luis and Delta Mendota Water Authority
SWP	State Water Project
SWRCB	State Water Resources Control Board
TAF	thousand acre-feet
TDS	total dissolved solids
TMDL	total maximum daily load
TPRT	Technical Policy and Review Team
VAMP	Vernalis Adaptive Management Plan
WAP	Water Acquisition Program
WCFSP	Water Conservation Field Service Program
WDR	Waste Discharge Requirement
WQO	water quality objective
WRDP	Westside Regional Drainage Plan
YSI	Yellow Spring Instrument

### Purpose

The Central Valley Regional Water Quality Control Board's Salt and Boron Total Maximum Daily Load (TMDL) was approved and placed into effect on July 28, 2006. In response to the Salinity and Boron TMDL, the United States Bureau of Reclamation (Reclamation) developed a salinity control plan, *Actions to Address the Salinity and Boron TMDL Issues for the Lower San Joaquin River* (Action Plan) and entered into a Management Agency Agreement (MAA) with the Central Valley Regional Water Quality Control Board on December 22, 2009. The MAA describe the actions Reclamation will take to meet the obligations allocated to it by the Salinity and Boron TMDL for the lower San Joaquin River. The MAA states:

Reclamation will submit quarterly reports to the Regional Water Board by 45 days after the end of the calendar quarter. The quarterly reports will include a summary of activities conducted by Reclamation during the quarter in conjunction with each element included in their Action Plan, including activities related to developing a Real Time Management Program. In addition Reclamation will include data collected relevant to DMC load evaluation.

The "Quarterly Activity and Monitoring Report" summarizes the activities conducted by the Reclamation in conjunction with each element outlined in its salinity control plan for the lower San Joaquin River. The Action Plan describes Reclamation's past, current and planned practices and procedures to mitigate and manage adverse impacts of salt and boron imported into the San Joaquin basin via the Delta Mendota Canal (DMC) in order to help achieve compliance with the objectives contained in the Regional Water Board's *Water Quality Control Plan for the Sacramento River and the San Joaquin River Basins – 4<sup>th</sup> Edition* (Basin Plan).

### Organization of Quarterly Report

The quarterly report will provide a synopsis of the various activities associated with each element identified in the Action Plan. The Action Plan describes all of the actions contemplated by the MAA. Within the Action Plan, actions are divided into three major categories: Flow, Salt Load Reduction, and Mitigation. For each action a brief description and list of activities are identified. The quarterly report will include calculations of salt loads based on DMC deliveries and calculations of assimilative capacity provided through dilution flows. The calculation methods used in this report are provisional and some elements in this report (such as the Westside Regional Drainage Plan) does not include estimations of benefits at this time. Reclamation is in the process of developing the *Compliance Monitoring and Evaluation Plan* which will outline the criteria and methodology for determining DMC loads and credits.

### A. Flow Actions

Reclamation has agreed to provide mitigation and dilution flows to meet the Vernalis salinity and boron objectives. Historically, Reclamation has provided dilution flows from the New Melones Project and through purchases for the Vernalis Adaptive Management Plan. Flow actions include: dilution flows from New Melones and water acquisitions.

#### 1. New Melones flows

Brief Description: In the Flood Control Act of October, 1962, the Congress reauthorized and expanded the New Melones project (P.L. 87-874) to a multipurpose unit to be built by the U.S. Army Corps of Engineers (Corps) and operated by the Secretary of Interior as part of the Central Valley Project (CVP), thus creating the New Melones Unit. The multipurpose objectives of the unit include flood control, irrigation, municipal and industrial water supply, power generation, fishery enhancement, water quality improvement, and recreation. New Melones Reservoir is currently operating under an "Interim Operating Agreement." This agreement was completed in 1996 with significant input from stakeholder interests.

Activity:

- Working to develop a process to efficiently obtain the operations data on a routine basis for future reports.

Month	Volume of Releases (cfs) <sup>9</sup>	Volume of Releases (AF/month)	Volume of Releases (TAF/month)	Monthly Average EC (µS/cm) <sup>10</sup>	Assimilative Capacity (tons/month)
Oct-08	12453	24657	25	86	18690
Nov-08	7573	14995	15	91	11304
Dec-08	7454	14759	15	97	11057
Quarterly Total	27480	54410	54		41050

For the quantification of dilution flow allocations, the Basin Plan prescribes the following equation<sup>11</sup> to calculate assimilative capacity. The TMDL specifies that entities providing dilution flows obtain an allocation equal to the salt load assimilative capacity provided by this flow, calculated as follows:

$$Adil = Qdil * (Cdil - WQO) * 0.8293$$

Where:

Adil = dilution flow allocation in thousand tons of salt per month

Qdil = dilution flow volume in thousand acre-feet per month

Cdil = dilution flow electrical conductivity in µS/cm

WQO = salinity water quality objective for the LSJR at Airport Way Bridge near Vernalis in µS/cm

2. Water Acquisitions

Brief Description: The Central Valley Project Improvement Act (CVPIA), signed into law on October 30, 1992, modified priorities for managing water resources of the Central Valley Project. CVPIA altered the management of the Central Valley Project to make

<sup>9</sup> Flow data obtained from CVO Office; non-consumptive releases from Goodwin Dam

<sup>10</sup> Water quality data obtained from California date Exchange Center (CDEC); Ripon (RPN) monitoring station.

<sup>11</sup> Water Quality Control Plan for the Sacramento and San Joaquin River Basins, 4<sup>th</sup> Edition; Page IV-32.07, Table IV-4.4 Summary of Allocations and Credits

fish and wildlife protection, restoration, and enhancement as project purposes having equal priority with agriculture, municipal and industrial, and power uses. To meet water acquisition needs under CVPIA, the U.S. Department of the Interior (Interior) has developed a Water Acquisition Program (WAP), a joint effort by the Reclamation and the U.S. Fish and Wildlife Service (Service). The program's purpose is to acquire water supplies to meet the habitat restoration and enhancement goals of the CVPIA and to improve the Interior's ability to meet regulatory water quality requirements.

Activity:

- *Provided fall pulse flow releases in October 2008.*
- *Working to develop a process to efficiently obtain the water acquisitions information on a routine basis for future reports.*

<i>Month</i>	<i>Volume Acquired</i> <sup>12</sup>	<i>Source</i>	<i>Volume of Releases (TAF/month)</i>	<i>Monthly Average EC</i> <sup>13</sup> ( $\mu\text{S/cm}$ )	<i>Assimilative Capacity</i> <sup>14</sup> (thousand tons/month)
Oct-08	12500	Merced R. <sup>15</sup>	12.5	87 <sup>16</sup>	9460
Nov-08	0	-	-	-	-
Dec-08	0	-	-	-	-
Quarterly Total	12500				9460

## **B. Salt Load Reduction Actions**

Reclamation is under a court order to provide drainage to its San Luis Unit, on the Westside of the lower San Joaquin River. As part of its efforts to provide drainage, Reclamation has historically supported the Westside Regional Drainage Plan (WRDP) through monetary grants and in-kind services. Reclamation recognizes there is still much to be done to implement the Westside Regional Drainage Plan. Salt Load Reduction Actions include the Grasslands Bypass Project, the Westside Regional Drainage Plan, and conservation programs (Water Conservation Field Services Program, Water 2025 Grants Program, and the CALFED Water Use Efficiency Program).

### **1. Grasslands Bypass Project (GBP)**

Brief Description: The Grassland Bypass Project is a multi-agency stakeholder project based upon an agreement between the Reclamation and the Authority to use a 28-mile

<sup>12</sup> Water acquisition data obtained from MP-400, Water Acquisitions Group

<sup>13</sup> Average electrical conductivity data obtained from CDEC; monitoring station dependent upon location of acquired water.

<sup>14</sup> Same formula used as cited on page 2 of this report. Formula taken from *Water Quality Control Plan for the Sacramento and San Joaquin River Basins, 4<sup>th</sup> Edition*; Page IV-32.07, Table IV-4.4 Summary of Allocations and Credits

<sup>15</sup> 12500 AF was acquired from the San Joaquin River Group Authority from October 1-24.

<sup>16</sup> Average electrical conductivity data obtained from CDEC; Merced River at Stevinson (MST) monitoring station.

segment of the San Luis Drain. The San Luis Drain is used to convey agricultural subsurface drainage water from the Grassland Area farmers to Mud Slough, a tributary of the San Joaquin River. The purpose of the project is to separate unusable agricultural drainage water from wetland water supply conveyance channels, facilitate drainage management that maintains the viability of agriculture in the area, and promote continuous improvement in water quality in the San Joaquin River.

Activity:

- *Reclamation continues to support portions of sediment and water monitoring effort necessary for the project. These include weekly, quarterly and annual monitoring of locations in the San Luis and Kesterson National Wildlife Refuges, Mud Slough, Salt Slough, DMC, Mendota Pool, and the San Luis Drain. Activities include collection of samples, incorporation of samples into a prescribed QA/QC program, funding analytical analyses, validation of analytical data, periodic updating of the Quality Assurance Project Plan, and routine QA audits of all analytical laboratories performing work on the project.*
- *Reclamation is actively involved with project partners to pursue a third use agreement to fully develop the project. The administrative draft EIS/EIR for the continuation of the Grassland Bypass Project went out for public review in December 2008. This document will be used to support an amendment to the Basin Plan*
- *Reclamation continues to be a member of the Technical Policy Review Team (TPRT) and the Data Collection and Reporting Team (DCRT). The DCRT produces the Annual Report and help revise the Quality Assurance Project Plan. The TPRT is responsible for tracking the monitoring program carried out by the various agencies.*

## 2. Westside Regional Drainage Plan (WRDP)

**Brief Description:** The Westside Regional Drainage Plan is a local stakeholder program developed by integrating all consistent elements of drainage management developed by government and local agencies and private partnerships. The original efforts of the WRDP focused on reducing selenium discharges to the San Joaquin River. Success of the original effort prompted a proposal to expand the WRDP to go beyond regulatory requirements and eliminate selenium, boron, and salt discharges to the San Joaquin River, while maintaining productivity of agriculture lands in the solution area and enhancing water supplies for the region.

While Reclamation lacks control of many of the resources needed to be an active participant in the WRDP, Reclamation provides annual funding to support and sustain the WRDP.

Activity:

- *In 2008, Reclamation provided \$4 million in funding to the WRDP. Combined with state Proposition 50 funding and local cost sharing, the funds have been*

*used to develop more than 6,000 acres of reuse lands. Funds were used to install facilities to collect and distribute drain water across the reuse area, remove and replace open drain ditches that were hazardous to waterfowl, and line earth canals with concrete to reduce seepage losses. Funds were also used for the EIS/EIR required for the continuation of the Grassland Bypass Project, a critical part of the WRDP, after 2010.*

### 3. Conservation Efforts

Brief Description: The water use efficiency program element includes several grant programs which fund actions to assure efficient use of existing and any new water supplies. Efficiency actions can alter the pattern of water diversions and reduce the magnitude of diversions, providing additional benefits. Efficiency actions can also result in reduced discharge of effluent or drainage and improved water quality. Although Reclamation is unable to quantify the benefits of the various funded projects as related to salinity reduction, the following information is provided to depict the agency's water conservation efforts in the basin. Through Water 2025, CALFED, and the WCFSP, Reclamation has awarded 36 projects in the San Joaquin Valley that require performance measures since 2006. As information is collected from these projects quantifiable benefits may be determined in the future.

#### Activity:

- *In 2008, the Water Conservation Field Service Program and the CALFED Water Use Efficiency Program received 44 proposals and funded 21 proposals. Of the 21 proposals granted funding, 7 were in the San Joaquin Basin totaling approximately \$275,000.*
- *In 2008, the Water 2025 Grant Program received 68 proposals and provided Federal cost share funding to 3 proposals. Of the 3 proposals that received funding, 2 were in the San Joaquin Basin totaling \$600,000.*
- *Reclamation extended a \$433,000 contract to 2011 with the Agricultural Water Management Council to promote and advance effective water management practices to meet the water conservation goals and best management practices.*

### C. Mitigation Actions

Reclamation's Action Plan identifies two mitigation actions to reduce salinity loads: a real time management program to maximize the removal of salt using assimilative capacity in the San Joaquin River, and a wetlands BMP plan to research and potentially develop practices to reduce salinity loading from managed wetlands. Reclamation has actively supported the development of a real time monitoring and forecasting program in the River and in managed wetlands.

#### 1. Real Time Management Program – Development of Stakeholder-Driven Program

Brief Description: The Real Time Management Program is described in the TMDL as a stakeholder driven effort to use “real-time” water quality and flow monitoring data to support water management operations in order to maximize the use of assimilative capacity in the San Joaquin River. The Regional Board describes this assimilative capacity as up to 80% of the load determined by Vernalis salinity objective. Reclamation has contracted with a facilitation firm to support the development of a stakeholder-driven program.

Activity:

- *Executed a contract to procure the service of a consultant to facilitate stakeholder involvement in developing a Real Time Management Program (RTMP)*
- *Directed a consultant to develop and conduct a stakeholder survey to solicit feedback on the RTMP process and garner suggestions on salinity management in the basin.*
- *Conducted several coordinating and planning meetings to develop and prepare for the first stakeholder workshop held on January 8, 2009.*

## 2. Real Time Management Program – Technical Support

Brief Description: A successful RTMP will require a real time monitoring network and a model capable of reasonably accurate forecasting of assimilative capacity. Reclamation is committed to participation in and support of the development of these tools. Reclamation staff has valuable experience in both of these areas. The technical support of this program will follow the stakeholder process.

Activity:

- *Executed a contract to procure the service of a consultant to develop a graphical user interface (GUI) and water quality data management tool.*
- *Executed a contract to purchase three YSI multi-parameter environmental monitoring probes to be used with the existing monitoring network on the lower San Joaquin River.*
- *Executed a contract to purchase a software package that will be used to evaluate and perform quality control and quality assurance validation on time series data collected on the San Joaquin River.*

## 3. Wetlands BMP Plan

Brief Description: The Service, CDFG, and the Grassland Resource Conservation District (GRCD) in coordination with Reclamation are developing BMP plans to reduce the impact of discharges from managed wetlands into the San Joaquin River. Currently, the developed draft BMP plan is awaiting the Service’s approval.

Activity:

- *Reclamation is sponsoring a project entitled “Water Quality Monitoring in the Grassland Resource Conservation District”. Through this project a contract was executed to retrofit six monitoring stations located in the Grassland Water District and California State Fish and Game wetlands and an agreement is in place to maintain 28 real time monitoring sites associated with a pilot study in the Grassland Resource Conservation District.*
- *Reclamation is working with the Service, CDFG, and local wetlands managers to finalizing the BMP Plan.*
- *Reclamation is working on a contract to purchase additional monitoring equipment to develop a real time monitoring network on managed wetlands.*

4. Involvement in CV-SALTS program

Brief Description: The Central Valley Water Board and State Water Board have initiated a comprehensive effort to address salinity problems in California’s Central Valley and adopt long-term solutions that will lead to enhanced water quality and economic sustainability. The Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) is a collaborative basin planning effort aimed at developing and implementing a comprehensive salinity management program. The goal of CV-SALTS is to maintain a healthy environment and a good quality of life for all Californians by protecting the state’s most essential and vulnerable resource: water.

Activity:

- *Reclamation is involved in the various sub-committees in the program – Leader Group, Technical Advisory Committee, Economics, Education and Outreach.*

**D. DMC Load Evaluation**

The calculated DMC load is determining by the volume of deliveries made to the Northwest and Grassland subareas and the corresponding TDS. The summary data tables below are taken from the monthly report titled *Delta-Mendota Canal Water Quality Monitoring Program*.

Loads of salt delivered to the Grasslands Subareas through CVP water <sup>17</sup>

	October	November	December	Quarterly Total
EC <sup>18</sup> (µS/cm)	502	460	745	
TDS <sup>19</sup> (mg/L)	326	299	484	
Cal. Salt Load <sup>20</sup> (tons)	40810	16250	5070	62130
Supply Allocation <sup>21</sup>	6487	2818	542	9847

<sup>17</sup> Table 9b, *Delta Mendota Canal Water Quality Monitoring Program for Selenium, Salinity and Boron*, Reclamation

<sup>18</sup> Flow weighed EC calculated as follows: (Sum of (daily flow \* specific conductance of daily sample))/(Sum of daily flows when samples collected)

<sup>19</sup> The TDS value is flow weighed and calculated as follows: (Sum of (daily flow \* TDS of daily sample))/(Sum of daily flows when samples collected)

<sup>20</sup> Salt load (tons) =Total Flow (acre-feet) \* total dissolved solids (mg/L) \* 0.00136

(tons)				
Excess Load (tons)	34323	13432	4528	52283

Loads of salt delivered to the Northwest Subareas through CVP water <sup>22</sup>

	October	November	December	Quarterly Total
EC <sup>10</sup> (µS/cm)	509	525	743	
TDS <sup>11</sup> (mg/L)	331	341	483	
Cal. Salt Load <sup>12</sup> (tons)	3130	580	320	4030
Supply Allocation <sup>13</sup> (tons)	490	89	35	614
Excess Load (tons)	2640	491	285	3416

### **E. Reporting Requirements**

In the MAA, Reclamation agreed to provide quarterly reports to the Regional Board. Reclamation will consult with the Regional Board before proposing any changes to the sample report format. Quarterly reports are due 45 days after the end of the calendar quarter:

<b>End of calendar quarter</b>	<b>Due date of Quarterly report</b>
Dec 31, 2008	Feb 15, 2009
March 31, 2009	May 15, 2009
June 30, 2009	August 15, 2009
September 30, 2009	November 15, 2010
December 31, 2009	February 15, 2010
March 31, 2010	May 15, 2010
June 30, 2010	August 15, 2010
September 30, 2010	November 15, 2010
December 31, 2010	February 15, 2011

### **F. Funding Reporting**

Reclamation agreed in the MAA to seek additional funding, including grant funding, to support salinity control efforts. In its quarterly reports, Reclamation will report on its efforts to support the securing of additional funding.

Activity:

- *A funding request was submitted for the 2011 budget for administrative coordination and activities related to the RTMP.*

<sup>21</sup> Supply Water Allocation Salt Load (tons) = LADMC = QDMC \* 85 µS/cm \* 0.8293

LADMC = DMC load allocation (1000 tons/month)

QDMC = Volume of water delivered from the DMC to the subarea (1000 acre-feet/month)

85 µS/cm = Background specific conductance of water from the Sierra Nevada

from Page IV-32.07 of the Basin Plan

<sup>22</sup> Table 10b, *Delta Mendota Canal Water Quality Monitoring Program for Selenium, Salinity and Boron*, Reclamation

**Regional Board Staff comments on  
Reclamation's Draft Compliance Monitoring and Evaluation Plan  
Dated July 1,2009**

## General Comments:

1. Much of the plan discusses assimilative capacity and how to calculate it. However, in our opinion, the use of assimilative capacity as the basis for quantifying offset credit for Reclamation is not appropriate for purposes of the MAA, but is more appropriate for the real-time management effort and should be removed from this plan.
2. The consideration of all releases from New Melones made for the purpose of fishery flow, DO, etc., and water acquisitions to provide VAMP flows for dilution flow allocations does not appear to be consistent with the “for the express purpose of providing dilution flow” language found in Section 12, page IV-32-02 of the Basin Plan. We recognize Reclamation’s position on this issue and would definitely like to get as much stakeholder input on the issue as possible.

## Specific comments:

1. Page 4, 3<sup>rd</sup> sentence – The “dilution flow allocation” formula should be inserted after “the following equation”, and the rest of the sentence should be deleted.
2. Pages 5 & 6 – The figure and text on page 5 and table on page 6 should be redone to calculate dilution flow allocations, not assimilative capacity.
3. Pages 6 through 9 – If all or part of the WAP and EWA flows are counted as dilution flow, the same methodology used to calculate credits should be used as for New Melones release.
4. Pages 11 through 16 – It is our opinion that the methodology proposed for calculating credits for the Westside Regional Drainage Plan are not appropriate. We agree with the statement made on the top of page 42 that an accounting method needs to be developed to calculate the avoided discharge loads provided by the WSRDP, and Reclamation should be credited with that portion of the avoided loads for which they are responsible.
5. Page29 – The word “Excess” should be deleted from the last sentence of both paragraphs.
6. Page 42, Table 16 – An overall accounting table will be necessary to determine whether Reclamation has met its commitment in the MAA to implement projects that will offset at least 25% of the excess DMC salt load by July 1, 2010, but the

RTMP column should not be included in that table, since it is unlikely it will be operational by then.