



# **Municipal Water Quality Investigations Program 2013-2014 Work Plan**

**06/21/13  
Final**





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# 1. MISSION STATEMENT

The mission of the Municipal Water Quality Investigations (MWQI) Program is to:

- a) Support the effective and efficient use of the State Water Project (SWP) as a source water supply used for municipal purposes through monitoring, forecasting, and reporting of SWP water quality;
- b) Provide early warning of changing conditions in source water quality used for municipal purposes;
- c) Provide data and knowledge based support for operational decision-making on the SWP;
- d) Conduct scientific studies of drinking water importance; and
- e) Provide scientific support to the Department of Water Resources (DWR), the State Water Project Contractors Authority (SWPCA), MWQI Specific Project Committee (MWQI-SPC), and other governmental entities.

## 2. INTRODUCTION

### 2.1. Background and Work Plan Structure

Through this annual work plan, the MWQI Program conducts water quality monitoring (both real-time and discrete) in the Sacramento-San Joaquin Delta (Delta) for municipal and industrial uses and produces and disseminates daily and weekly Real-Time Data Forecasting (RTDF) reports as explained in the Municipal Water Quality Investigations Agreement (Funding Agreement) between DWR's Division of Environmental Services' (DES) MWQI Program, SWPCA, and the participating SWP Urban Water Contractors. The MWQI Program also conducts drinking water research on the quality of drinking water supplies taken from the Delta, provides data and knowledge based support for DWR's operational decision-making on the SWP, and provides scientific drinking water expertise and support to DWR, SWP Urban Water Contractors and other governmental entities, and stakeholders. Finally, the MWQI Program supports data and database infrastructure management and sharing activities to enhance and improve the long-term storage and retrieval of RTDF data, administers essential program management activities mandated by DWR's policies and procedures, and works to ensure the health and safety of staff in the workplace.

This annual work plan describes work to be performed under the California DWR MWQI Program for the FY13-14 (July 1, 2013 to June 30, 2014). Work identified in this work plan is prioritized by the DWR MWQI Program management staff, SWPCA, and MWQI-SPC, and may be subject to revisions depending on unforeseen events such as staff vacancies, workload shifts, or the extension of the Governor's furlough program. Any necessary changes to work plan priorities will be discussed between MWQI Program management staff, SWPCA, and the MWQI-SPC.

The DWR MWQI Program is composed of staff from the Municipal Water Quality Investigations, Water Quality Special Studies, and Field Support Sections. The SWPCA and MWQI-SPC are composed of members of the SWP Urban Water Contractors, all of whom have an interest in the MWQI Program's monitoring of drinking water supplies in the SWP.

Approval of the annual work plan is provided by "voting members" of the MWQI Technical Advisory Committee (TAC), which includes DWR MWQI Program and management staff, and the SWP Urban Water Contractors committed to funding the MWQI Program's planned work. Other TAC representatives include the California Department of Public Health (CDPH), Contra Costa Water District, (which is an invited participant associated with the TAC), the SWPCA program management consultant, and other invited members of outside agencies.

Representatives serving on the MWQI-SPC can differ from those serving on the MWQI TAC.

The majority of the MWQI Program (2.7 million in FY 13-14) is funded by the SWPCA MWQI SPC through the Statements of Charges. Additional funds are provided through the MWQI SPC for the items listed in Section 3.2 of this Work Plan and under the "SWPCA Fund" column of Table 1. CCWD also provides funding to the MWQI SPC for the items listed in Table 1. The MWQI SPC members are:

1. Alameda County Flood Control and Water Conservation District, Zone Seven
2. Alameda County Water District
3. Antelope Valley-East Kern Water Agency
4. Castaic Lake Water Agency
5. Central Coast Water Authority
6. Crestline-Lake Arrowhead Water Agency
7. Kern County Water Agency, Municipal and Industrial Use
8. Mojave Water Agency

9. Metropolitan Water District of Southern California
10. Napa County Flood Control and Water Conservation District
11. Palmdale Water District
12. San Bernardino Valley Municipal Water District
13. San Geronimo Pass Water Agency
14. San Luis Obispo County Flood Control and Water Conservation District
15. Santa Clara Valley Water District
16. Solano County Water Agency

## **2.2. Work Plan Elements**

The MWQI Program collects real-time data and conducts water quality studies to develop an understanding of the sources of drinking water pollutants which affect the quality, treatability, and reliability of treatment of water supplied to municipal water purveyors. The MWQI Program continues to provide technical water quality expertise to other units within DWR, to local municipal water agencies, and to the State and Regional Water Quality Control Boards (SWRCB), and contributes water quality expertise while participating in regulatory and planning processes through the work plan elements. The following work plan elements are essential functions of the MWQI Program and are further explained in subsequent sections of this work plan.

- Water Quality Assessment
- The Real-Time Data and Forecasting Comprehensive Program (RTDF-CP) including real-time water quality monitoring, forecasting, and data dissemination
- Science Support (Special Studies)
- Emergency Response
- Other Water Quality Program Related Activities – funded by the MWQI Program
- Program Management
- Departmental Support Activities – not funded by the MWQI Program

In addition to the work plan, a series of appendices complement the work plan by providing more in-depth information regarding the essential elements of MWQI Program. These appendices are:

- Appendix 1- MWQI Program FY13-14 work plan element costs and staff workload assessments
- Appendix 2 – The RTDF-CP Overview and Evolution
- Appendix 3 – Project Management documentation
- Appendix 4 – Sampling Sites and Corresponding Analyses for MWQI
- Appendix 5 – The MWQI Program’s 5-year Strategic Plan

### **2.3. MWQI Program Responsibilities**

In addition to conducting water quality monitoring and special studies, providing technical water quality expertise and RTDF data dissemination and reporting, the MWQI Program, as well as the Municipal Water Quality Program Branch management and the Office of Water Quality management staff will continue to periodically participate in the various additional activities that relate to drinking water quality. MWQI Program staff will also continue to participate in any other ongoing regulatory activities (Regional Board, Department of Health Services, etc.) that can affect the drinking water quality or operations of the SWP Urban Water Contractors. And, the MWQI Program staff will continue to coordinate its activities in these areas with the MWQI-SPC as it has done in the past.

#### **MWQI Program responsibilities:**

- Conduct continuous long-term water quality monitoring (grab samples) in the Delta
- Conduct real-time water quality monitoring (automated, high frequency data collection stations) in the Delta
- Provide scientific support on Delta and SWP drinking water issues
- Analyze Delta drinking water quality monitoring data
- Provide Delta drinking water quality historical data
- Provide SWP drinking water quality early warning (RTDF-CP) data
- Provide SWP drinking water quality forecasting (RTDF-CP) data and information

- Provide support to SWPCA's MWQI-SPC

**MWQI Program staff also provide support on occasion to:**

- The Delta Stewardship Council for the Bay-Delta Plan
- The Delta Conservancy for public outreach events
- The State Water Resources Control Board for their CDEN database development efforts
- The California Water Quality Monitoring Council for their "My Water Quality" web portal development efforts
- The Interagency Ecological Program (IEP) for their strategic plan efforts
- The California Water Plan for periodic update and review efforts
- The DWR Safety Office for workplace safety efforts
- Support DWR's emergency response efforts, if needed and where possible
- Support DWR's annual effort in producing Bulletin 132, Chapter 4 – Water Quality

**Customers/Regulators using MWQI data:**

- SWPCA
- Contra Costa Water District
- Central Valley Regional Water Quality Control Board
- California Department of Public Health
- DWR's Operation Control Office
- DWR's Bay Delta Office
- Other State government agencies
- US Environmental Protection Agency
- Bay Delta Conservation Plan

## **2.4. Program Accomplishments**

The MWQI Program has accomplished a number of goals listed in the FY12-13 work plan despite a challenging 5% reduction in staff time due to furloughs. These include:

- Installation of the water quality station at the Gianelli Pumping/Generating (P/G) plant. Station is providing data on-line to California Data Exchange Center (CDEC) and daily MWQI Program RTDF water quality reports
- Continuous operation of five real-time water quality stations
- Continuous data dissemination of water quality reports
- Weekly distribution of short-term water quality forecasts
- Monthly distribution of volumetric, EC, and organic carbon source fingerprints
- Update of MWQI Program's 5 year Strategic Plan
- Installation and calibration of the Metrohm anion analyzer at the Gianelli water quality station
- Installation and calibration of new StreamWalkers units on the Sievers organic carbon analyzers so that both TOC and DOC continuous real-time data is made available from the water quality monitoring stations
- Calibration and reporting limit studies commenced on the new replacement water quality monitoring equipment
- Initiation of version 2 of the Field Station Real-Time Monitoring Standard Operating Procedures
- Completion of sample collection for both the fluorescence and spectrofluorometry study
- Production of several projects to develop data for simulation of historical condition and Watershed Analysis Risk Management Framework (WARMF) model development for the Delta and Aqueduct models water quality including assembling, synthesizing, and refining EC, DOC, and bromide data necessary to define boundary conditions. These projects are part of a large RTDF-CP Water Quality Forecast project involving the BDO and OCO.

## **2.5. Changes/Updates from the 2012-13 Work Plan**

The new MWQI Program's work plan continues to evolve to meet the changing water quality, regulatory, and data sharing landscape while following DWR policies and processes. In this work plan cycle, several special studies projects are ongoing and continue forward from the

FY12-13 work plan, and these projects will be completed within this work plan cycle. A number of the tasks associated with the RTDF-CP were planned to continue into the FY13-14 work plan.

In 2011 DWR approved Water Resources Engineering Memorandum 65a (WREM 65a) which sets forth standardized documentation and processes to initiate, authorize, administer, and manage new and legacy programs, projects, and activities in a consistent and professional manner. Utilizing the WREM65a processes upper management has the information necessary to make informed decisions. Per WREM65a, the documentation required to initiate and authorize a project are an initial request or legislative/regulatory mandate to initiate work, and a project charter, resource agreement, and project management plan (a standardized document which provides scope of work, schedule, and cost estimate).

Also, in 2011 DWR accepted the Project Management Body of Knowledge, or PMBOK standard for managing individual projects, and MWQI staff participated in the DWR sponsored PMBOK training classes. Per PMBOK, the documentation required to initiate and manage a project are a charter and project management plan.

The MWQI Program staff will use both WREM65a and PMBOK standards when conducting their scientific special studies. Staff responsible for conducting scientific special studies, called lead investigators, will manage their projects using the basic process steps of initiating, planning, executing, monitoring and controlling, and closing a project using project initiation forms, as well as charters, resource agreements, and project management plans. DWR resource agreements serve as an agreement between the MWQI Program Manager and the Program Manager in other Departmental Divisions doing the work. Lead investigators may need to incorporate a resource agreement into their projects if support is required from other DWR Divisions.

To ensure the success of the new special studies, the study's lead investigators will also be responsible for developing and refining: the project management integration, scope of work, timelines, cost estimates, quality; staffing requirements; and communication management, risk management, procurement management, and stakeholder management plans. Also, the study's lead investigators will be responsible for identifying their project's specific reporting relationships and the participant roles and responsibilities, and monitoring change control and reporting policies, and procedures. By incorporating their knowledge along with the basic process steps of project management, the lead investigator will additionally integrate principles of sound scientific study design and will develop milestone tracking steps that will need to be

accomplished in order to achieve an effectively managed project while efficiently producing deliverables within scope, schedule, and budget.

Some projects in this work plan have not yet been thoroughly discussed and developed with the MWQI Program staff and the MWQI-SPC members therefore staff do not yet possess enough information to develop the project initiation forms or project charters. When sufficient information is developed and if there are sufficient staff resources, the special project may be included in this work plan cycle or may be included in the next work plan cycle.

SWPCA is committed to ensuring the success of the MWQI Program's planned work and therefore, has identified project partners to serve as technical advisors on several of the special study projects. These project partners will help guide and advise staff throughout their projects to completion. Throughout the life of the special study projects, staff is encouraged to meet regularly with their project partners and then provide periodic updates during future monthly TAC meetings.

Special study final reports will be posted on the MWQI Program's website at:

<http://www.water.ca.gov/waterquality/drinkingwater/>. Before publication, special study final reports will follow DWR's publication policy and will be initially peer-reviewed by the MWQI staff then MWQI Program management followed by the project partners and SWP Urban Water Contractors, and finally by DWR's upper management. Some of the completed reports may be published as journal articles.

## **2.6. Challenges and Opportunities**

The following is a description of challenges and opportunities associated with management of the MWQI Program, and the Municipal Water Quality Program Branch.

### **2.6.1 DWR Staffing, State Budget Actions, and Executive Orders**

In early 2012, the MWQI Program experienced two Environmental Scientist vacancies, one in the Field Support Section and the other in the MWQI Section. In February of 2012, the MWQI Program experienced a Senior Environmental Scientist vacancy. In September 2012, and again in April 2013, the Municipal Water Quality Program Branch experienced a vacancy within the Staff Services Analyst position. Although efforts to fill each of these vacancies began soon after

the positions were vacated, many delays ensued resulting in two of the Environmental Scientist positions being filled in the spring of 2012. The third position, the Senior Environmental Scientist vacancy was filled in May 2012 while the Staff Services Analyst position was filled in October 2012, and again in June 2013. Currently, in the MWQI Program there is a vacancy in the MWQI Section and in the Field Support Section.

The Governor's mandatory reduction in cell phones and vehicles had a significant impact on DWR, DES and the MWQI Program. DES' Division Chief quickly implemented a cell phone policy requiring that staff members conducting remote field work be in possession of a cell phone. Therefore, with the reduction of cell phones to each program within the division, the Field Support Section staff was forced to temporarily reschedule sampling until pool cell phones were available. Currently the Field Support Section is in possession of two pool phones and is currently conducting their full-time routine water quality sampling and station support activities. Additionally, per the Governor's order, state agencies reduced their number of vehicles by 50%. The MWQI Program's vehicles were spared from the Governor's 50% vehicle reduction. If the MWQI Program needs to give up any vehicles, it is expected that projects and maintenance of real-time stations would be impacted.

Finally, per the Governor's executive order, B-06-11, travel restrictions are fully enforced by DWR therefore, only mission-critical in-state travel which fits certain exemption categories will be approved.

The MWQI Program will adjust accordingly by addressing the program's core functions while becoming more flexible with project deadlines, prioritizing training, and reducing the number of meetings that staff are required to attend.

### **3. PROGRAM FUNDING NEEDS**

#### **3.1. MWQI and SWPCA Funds**

The new 3-year MWQI Agreement between the MWQI Program, SWPCA and 16 SWP Urban Water Contractors is expected to gain the required approvals and be executed prior to taking effect in January 2014. For FY13-14, the total budget is \$3.1 million with \$2.7 million for the DWR MWQI Program and \$400,000 for the MWQI SPC fund. The DWR MWQI Program portion will fund staff salaries including benefits and operating expenses, Real-Time Data Forecasting,

support to the DWR modelers, and research on the quality of drinking water supplies taken from the Delta. The SWPCA portion will provide funds to retain consultants, and purchase certain goods and services deemed necessary and desirable for station operation and research by both the MWQI TAC and the MWQI-SPC. The estimated budget expenses for this work plan cycle are shown in Table 1.

The majority of the \$2.7 million budget for the MWQI Program is funded by the SWPCA MWQI-SPC through the Statement of Charges. Additional funds are provided through the MWQI-SPC for the items listed in section 3.2 of this work plan and under the "SWPCA Fund" column of Table 1. The Contra Costa Water District also provides funding to the MWQI-SPC for the items listed in Table 1.

For FY13-14, the MWQI Program will make use of \$40,000 of US EPA grant funds through the DWR's Division of Statewide Integrated Water Management to support the efforts of the DWR Water PIE. Water PIE is a database with a web interface that will consolidate many data sets within DWR. One very large DWR data-set is the water data library, or WDL that will be placed within the Water PIE so that the WDL data can be interchanged with US EPA databases among others. Two scientific aids have been hired for a 4 to 6 month period of time and will be funded by this grant money to enter the O&M historic data sheets into the WDL.

A contract between the MWQI Program and the San Luis and Delta Mendota Water Authority (SLDMWA) is current and effective through December 2013. Remaining funds in this contract will be rolled over into a no-cost extension from the original contract to December 2014. With this contract in place, SLDMWA can continue to provide supplemental support of the MWQI Program water quality monitoring equipment installed at the Jones Pumping Plant.

The FY13-14 MWQI Program and SWPCA budget is presented in Table 1 below, followed by an updated explanation of MWQI and SWPCA expenditures. Partner staffing in this budget reflects 1 Person Year, or 1 PY each for the Bay Delta Office, the Division of Operations & Maintenance's Environmental Assessment Branch, and Operations Control Office. Managing and controlling the work done by MWQI partner staff will be accomplished using resource agreements. Resource agreements are mutually agreed-upon work products and approved by Program Managers within the respective DWR Divisions. Resource agreements can vary in length and be renewed or revised at any time with approvals by the participating Program Managers.

**Table 1. Program Element Costs FY13-14 (MWQI and SWPCA funds)**

Workplan Element	Program Element	Old IO# Name	2013 Renamed IO#	Labor PY's	Labor Hours	Labor Cost	Contract costs	Operating Equip & Expenses	Total Cost	SWPCA Fund	Total Budget
5	<b>Water Quality Assessment</b>										
5.1	Routine Monitoring Program	V20833701010	VWQASSMENT13	1.01	2090.4	\$156,780	\$0	\$205,000	\$361,780		\$361,780
6	<b>RTDF-Comprehensive Program</b>										
6.1	<b>RTDF-CP Real Time Monitoring</b>										
	6.1.1* MWQI Real Time Stations	V10093000000	VRTMONITOR13	1.38	2870.4	\$215,280	\$4,000	\$134,328	\$353,608	\$32,500	\$386,108
	6.1.2 Gianelli WQ Station	V20833704010	VGIANNELLI13	0.40	832	\$62,400		\$40,000	\$102,400		\$102,400
6.2	<b>RTDF-CP Water Quality Forecasting</b>										
	6.2.1 BDO- Bay Delta Office Modeling	V10387600000	VRTBDOMODL13	1.00	2080	\$218,400			\$218,400		\$218,400
	6.2.2 OCO- Operations Control Office Modeling	V20833706010	VRTOCOMODL13	1.00	2080	\$218,400			\$218,400		\$218,400
	6.2.3 Model Support - Trends Analysis, modeling, rpt	V20833707010	VTRENDSAMR13	0.05	104	\$7,800			\$7,800		\$7,800
6.3	<b>RTDF-CP Information Management and Data Dissemination</b>										
	6.3.1 RTDF Data Dissemination & Reporting	V10387700000	VRTDDISRPT13	0.45	936	\$70,200			\$70,200	\$13,000	\$83,200
	6.3.2 Administration and Database Activities			0.00	0	\$0			\$0	\$70,000	\$70,000
7	<b>Science Support (Special Studies)</b>										
7.1	<b>Watershed Sanitary Survey Action Items</b>										
	7.1.1** Data Access Improvements Project	V20833719010	VWSSACTION13	0.00	0	\$0			\$0		\$0
7.2	Limnology of the SWP		VLIMNOLOGY13	1.45	3016	\$226,200			\$226,200	\$40,000	\$266,200
	7.2.2 Nutrient Budget Study		VNTDYNSTDY13	0.40	832	\$62,400			\$62,400		\$62,400
7.3	San Joaquin River Watershed Sanitary Survey		VSJRSANSRV13	0.50	1040	\$78,000			\$78,000		\$78,000
7.4	FDOM Proof of Concept	V10093600012	VFDOMPOCS013	0.31	644.8	\$48,360		\$500	\$48,860		\$48,860
7.5	Urban Sources and Loads Investigation	V10092500000	VURBANSL0013	0.15	312	\$23,400			\$23,400		\$23,400
7.6	O'Neill Forebay Mixing Study	V20833710010	VONEILFRBY13	0.10	208	\$15,600			\$15,600		\$15,600
7.7	Spectrofluorometer Study	V20833713010	VSPCTROFLU13	0.30	624	\$46,800			\$46,800	\$2,000	\$48,800
7.8	Tidal Marsh Restoration Literature Review	V10093400011	VTIDALMRSH13	0.06	124.8	\$9,360			\$9,360		\$9,360
7.9	MWQI Pathogen Study write-up	V20833708010	VPATHOGEN013	0.10	208	\$15,600			\$15,600		\$15,600
7.10	MWQI Summary Report	V10093300011	VSUMMRYRPT13	0.05	104	\$7,800			\$7,800		\$7,800
7.11	CIWQS Database Search	V10093300011	VWWTRTPLNT13	0.10	208	\$15,600			\$15,600		\$15,600
7.12	Feasibility Study for MWQI Portable Monitoring Sta.	V10093100011	VPORTBLSTN13	0.05	104	\$7,800			\$7,800		\$7,800
8	<b>Other MWQI Funded Program Activities</b>										
8.1	Administration Work	V10092700000	VDWRRQDDPC13	1.25	2600	\$195,000		\$30,000	\$225,000	\$1,500	\$226,500
8.2	Field Unit Office Duties	V20833703010	VFUOFCWORK13	0.75	1560	\$117,000			\$117,000		\$117,000
8.3	O & M WQ other duties	V20833705010	VOMWQH00013	0.60	1248	\$93,600		\$500	\$94,100		\$94,100
8.4	MWQI Annual Workplan	V20833715012	VWORKPLAN013	0.24	499.2	\$37,440			\$37,440		\$37,440
8.5	DWR Bulletin 132	V20833717012	VBULL132WQ13	0.00	0	\$0			\$0		\$0
8.6	MWQI Funding Agreement	V20833716012	VFUNDAGRMT13	0.00	0	\$0			\$0		\$0
8.7	Workplace Safety	V20833718012	VSAFTYDOCS13	0.05	104	\$7,800		\$2,000	\$9,800		\$9,800
8.8	Emergency Response	V10387400000	V911RESPNS13	0.03	62.4	\$4,680			\$4,680		\$4,680
8.9	Miscellaneous meetings attended by staff	V20833719012	VOTHERWQPA13	0.27	561.6	\$42,120			\$42,120		\$42,120
9	<b>Program Management-Status Reporting</b>	V10092200000	VPROGMMGMT13	0.80	1664	\$124,800			\$124,800	\$84,100	\$208,900
10	<b>Non-MWQI Funded Program Management</b>			0.00	0	\$0			\$0		\$0
11	<b>Other Required Program Costs</b>				0	\$0		\$3,000	\$3,000	\$95,000	\$98,000
11.1	MEO Insurance & Fuel		G1111290005I					\$1,000			\$0
	<b>Total</b>			12.85	26717.6	\$2,128,620	\$4,000	\$415,328	\$2,547,948	\$338,100	\$2,886,048
	* 6.1.1 Includes contracts with San Luis & Delta Mendota Water Authority, Area Restroom and maintenance contracts for WQ Station analyzers.										
	** Includes Bruce (funded by QA/QC) & Dennis' (funded by the SWPCA's) time, and 2 Sci-aids funded for 5-6 months thru UPEPA grant of \$40K.										

## 3.2. Explanation of Table 1 Program Element Costs for FY13-14 Work Plan Projects

### Specific Tasks to be Implemented using SWPCA Funds

The SWPCA will provide funding to provide technical support on program tasks associated with the MWQI Program:

#### Program Element 6.1.1 MWQI Real Time Stations

- **\$32,500** allocated, if needed, for real time station and special study equipment and/or rental needs

#### Program Element 6.3.1 RTDF Data Dissemination & Reporting

- Consultant to provide technical expertise on the RTDF-CP Program up to **\$13,000**.

#### Program Element 6.3.2 Administration and Database Activities

- Consultant to provide technical and managerial expertise with RTDF-CP administration, database activities, and data management support up to **\$70,000**.

#### Program Element 7.2 Limnology of SWP

- Consultant will act as the Project Manager to provide technical and managerial expertise for the Limnology of SWP Study up to **\$40,000**.

#### Program Element 7.7 Spectrofluorometry Study

- Consultant to provide technical expertise on the MWQI Spectrofluorometry Study up to **\$2,000**.

#### Program Element 8.1 Administration Work/Training/TEC/MWQI

- **\$1,500** allocated for staff travel costs for conferences, subject to approval by DWR management staff.

#### Program Element 9 Program Management/Status Reporting

- Consultant to administer SWPCA managed fund and serve as a liaison between MWQI and the SWP Urban Water Contractors up to **\$75,000**. The SWPCA-MWQI Consultant will provide technical and managerial expertise on program tasks associated with the MWQI Program. The consultant serves as a member of the MWQI-TAC, administers the SWPCA fund, and serves as a liaison between SWPCA and the MWQI Program.

- Program Management expenses including SWC staff services, legal, administration expenses, and Annual Meeting costs up to **\$9,100**.

#### Program Element 11 Unassigned Funds

- Consultant to develop artificial neural network model, up to **\$95,000**.

### **MWQI contracts required for FY13-14 Work Plan Elements**

The MWQI Program maintains a planned budget of **\$8,250** to cover the total expenses of the following contracts:

1. The contract has been extended with the San Luis Delta Mendota Water Authority that covers the cost of phone service at the Jones Pumping Plant where MWQI maintains a RTDF water quality station. The service is necessary for safety reasons since staff may be working for extended periods of time in the lower level of this working plan where their cell phones may not have service, and in case of emergency staff would need access to a working landline phone.
2. The MWQI Program maintains the contract with Area Restroom services that provides a portable toilet at the Hood RTDF WQ Station. This service is necessary since staff may be on-site for extended periods of time while calibrating the instruments and there are no other similar facilities in the local vicinity.

### **MWQI Operating Equipment and Expenses using the MWQI Program's Planned Budgeted Funds**

#### Program Element 5.1 Grab Samples Collections

- **\$205,000**, of which \$105,000 is allotted for bi-weekly contract lab analyses, \$90,000 for the van replacement, and the remaining \$10,000 allocated for equipment and supplies related to the discrete monitoring program.

#### Program Element 6.1.1: MWQI Real Time Stations

- **\$134,328** allocated for the purchase of replacement filters, miscellaneous station supplies, and analyzer specific components and service agreements.

#### Program Element 6.1.2: Gianelli WQ station

- **\$40,000** allocated for the purchase of replacement filters, miscellaneous station supplies, and analyzer specific components and service agreements.

#### Program Element 7.4: FDOM Proof of Concept Study

- **\$500** allocated for the purchase of quantitative standards for instrument calibrations.

#### Program Element 8.1: Administration Work

- **\$30,000** allocated for training classes, registration fees, travel related expense, and the cost for the annual or offsite meetings. The Annual Meeting costs may include rental fees for a facility, AV equipment and technical assistance, refreshments, deposit for reserving dates and other miscellaneous meeting package elements. This budget covers the additional training expenses for new staff and promoted staff in the MWQI Program.

#### Program Element 8.3: O&M WQ Other Duties

- **\$500** allocated for the purchase of quantitative standards for instrument calibrations.

#### Program Element 8.7: Workplace Safety

- **\$2,000** allocated for the purchase of miscellaneous safety equipment for example, vehicle fire extinguishers and first aid kits, personal flotation devices, earplugs, safety glasses, etc.

#### Program Element 11. Other Required Program Costs

- **\$3,000** allocated for the expenses incurred if the DWR Project Services Office staff review any MWQI project reports prior to publication. Recall that as of July 1, 2013 the Project Services Office will no longer be covered by overhead expenses and will begin charging their document review services.
- **\$1,000** allocated for the expenses associated with insurance and fuel for the MWQI Program's field support sampling vehicles. Currently the Field Support Section has four

vehicles in its service fleet, two vans and two trucks that are necessary to maintain the MWQI Program's continuous monitoring and support to various special studies.

## **4. Municipal Water Quality Investigations Program Budget Impacts**

Although not currently anticipated, any extension to the Governor's mandated work furlough program may impact the MWQI Program by limiting staff time available to accomplish the work described in this work plan. MWQI Program core elements will receive priority throughout this fiscal year work plan, and are listed in priority of importance to the MWQI-SPC. If it becomes apparent that there are demands on these core elements, the water quality monitoring, RTDF-CP and support will continue as the highest planned priority.

### **4.1. MWQI Program Core Elements**

1. Water quality monitoring (both real-time and discrete) at existing stations and sites
2. Modeling duties associated with real-time forecasting used in the RTDF daily and weekly reports
3. Production and dissemination of daily and weekly RTDF reports
4. Data management activities pertaining to database infrastructure enhancement and development to improve long-term storage and retrieval of RTDF data
5. Special Studies
6. Program management activities listed in the MWQI agreement and those mandated by DWR required for health and safety of the MWQI Program staff. This includes monthly MWQI TAC meetings and quarterly budget updates.
7. Other required Program activities that are mandated by DWR and/or essential to the MWQI Program (i.e. purchasing, contracts, budgeting, 2013 Department Environmental Scientist Workshop, safety and policy training, specific meetings and conferences).

## **4.2. MWQI Program Potential Core Element Impacts**

Work on specific program core elements that could be delayed pending any staff vacancies and/or potential extension of furlough days include:

- Report production deadlines and timelines associated with some tasks
- Cross-training of MWQI staff on modeling and GIS functions
- Delay of RTDF data management tasks when assistance is needed from the Division of Technology Services or MWQI Program staff. The MWQI Program's Data Management Consultant (Dennis Huff) can continue to work his regularly scheduled hours since his contract costs are funded by SWPCA.
- If needed, implementation of special studies will be delayed to accommodate core Program elements.

To ensure that core functions are not affected, some staff may curtail participation in MWQI Program's related meetings such as the Environmental Scientist Workshop.

## **5. WATER QUALITY ASSESSMENT**

Water quality monitoring has been a key feature of the MWQI Program since its inception in 1983. Data from the MWQI Program are used extensively by DWR, SWP Urban Water Contractors, non-governmental organizations, the public, and numerous other federal, State, and local agencies, for drinking water supply planning studies. Data are used to identify long-term trends in drinking water quality in the Delta region and the SWP. Monitoring data also helps DWR and other agencies develop research and mitigation measures to reduce drinking water contaminants in Delta waters and the SWP. In collaboration with the DWR's BDO, O&M, and OCO, monitoring data from the Delta and California Aqueduct continue to be used to further develop the "early warning" system that provides advance notice to Delta water users of possible drinking water quality problems. The MWQI Program provides the SWP Urban Water Contractors with ways of managing unplanned water quality impacts.

Water quality assessment consists of two different monitoring strategies, 1) discrete grab samples, and 2) continuous real-time monitoring via remote instrumentation. This section focuses on discrete grab sample monitoring for FY13-14. Section 6.1 focuses on continuous remote real-time instrumentation monitoring.

Aside from routine monitoring costs, additional cost will be incurred in FY13-14 to purchase a new van. The MWQI Program's two water quality monitoring vans have reached the end of their useful life and need to be replaced. To minimize the financial strain to the MWQI Program, one van will be purchased this fiscal year and one will be purchased during FY14-15.

Based on previous van and retrofit costs, the estimated cost for the van is \$90,000, with the majority of that being for the conversion. The MWQI Program will attempt to minimize the cost of the conversion this go-round, but will keep the estimated cost at \$90,000 for budgeting purposes. Due to the State budget, vehicle purchase restrictions and other bureaucratic limitations, it is possible that this purchase may not occur until the FY14-15 work plan. Costs associated with these purchases will be billed against the Water Quality Assessment – Grab Sample Collections Internal Order (IO) number.

In this FY13-14 work plan, the MWQI Program's discrete monitoring effort will be expanded to collect monthly grab samples from approximately 27 sites in the Delta region. Twelve of these sites are part of the MWQI Program's long-term monitoring program with data available for a number of years. Additional monitoring sites, shown in Table 3, are associated with short-term modeling support and other approved special studies. The Table 3 monitoring locations may be adjusted as special studies become more clearly defined. Figure 1 presents a map of all MWQI Program's (grab and real-time) sampling sites for FY13-14. A detailed description of the MWQI Program's discrete and in-situ monitoring can be found in Appendix 4.

## **5.1. Routine Monitoring Program**

The collection at long-term monitoring sites remains mostly unchanged from FY12-13, with the only exception being the relocation of the Rock Slough monitoring site to the Contra Costa Water District's new fish screen facility. This monitoring location has moved numerous times over the past 5 years, but this new location is intended to be permanent. All other routine monitoring sites remain unchanged from last year. Analytical requests have changed somewhat for FY13-14 in relation to special studies. These changes are described in Table 3 and in Appendix 4.

As part of real-time instrument quality control, grab samples are also collected bi-weekly at the Banks Pumping Plant, Jones Pumping Plant, Gianelli Pumping Plant, and Hood and Vernalis river stations. These river and canal samples are collected to examine instrument operation, but

are also representative discrete samples of these sites. Discrete grab sample data are available through the DWR's Water Data Library (WDL). As part of improving the QA/QC effort in the RTDF program, the MWQI Program will be working to make RTDF station data available on the WDL, as well.

Deliverables and timelines associated with discrete sample collection are shown in Table 4.

## **5.2. Short-term, Special Study Monitoring**

Aside from the routine monitoring program, many other samples are collected for various MWQI special studies. In December 2012, the last of the Spectrofluorometer special study field samples were collected. Now that the monitoring efforts relating to this study have ended, associated analytes and sample sites have been removed from the monitoring program. The only active special study monitoring from FY12-13 is the Eastside WARMF/Yolo Delta Simulation Model 2 (DSM2) monitoring which is described in section 5.3.

In this FY13-14 work plan a few new studies will be added that will require additional MWQI resources for monitoring. All of these new monitoring activities will be combined with existing field runs whenever possible to increase efficiency. Some of these new studies have yet to be clearly defined. The station information described below is preliminary so, station names may not correspond with Table 3 and Figure 1 station names.

### **5.2.1 Eastside WARMF and Yolo DSM2 Monitoring (2010 – 2015)**

During FY10-11, the Eastside stream sampling was approved and added to MWQI Program's duties; however, due to the work plan production cycle, it was not included in the FY10-11 work plan. Sample locations for this monitoring effort are

- Mokelumne River at Wimpy's Marina
- Calaveras River near the University of the Pacific
- Shag Slough at Liberty Island Bridge

The Mokelumne River station lies below the confluence of the Mokelumne and Cosumnes Rivers and is thus representative of both rivers. The Calaveras River station was moved

approximately 1.6 river miles upstream of its original location for better accessibility; there are no major inputs between these locations. The Shag Slough station is representative of the Yolo Bypass west side toe-drain. The Yolo Bypass is outside the domains of the WARMF models; however, the location is of interest as a modeled boundary in DSM2 simulations.

Sampling at the East Side Streams and Yolo Bypass is scheduled to continue monthly for three to five years depending on the October 2013 data assessment. Additionally, storm event samples will be taken during peaks in runoff flow. The deliverable for this study is making the data available in the WDL therefore, no written report is required.

### **5.2.2 DSM2 Nutrient Study**

A DSM2 nutrient modeling study was put forward by the SWP Urban Water Contractors for inclusion in MWQI's FY13-14 work plan. There is considerable overlap between this study and pre-existing Eastside WARMF and Yolo DSM2 monitoring, so some monitoring efficiencies will be possible.

The goal of this additional monitoring is to define water quality conditions at key DSM2 nodes located throughout the Delta Region so that the DSM2 nutrient model can be improved. Weekly data are requested, but the MWQI Program's resources will not allow for sampling at that frequency. In order to meet the data needs, MWQI Program staff will sample the DSM2 nodes (or similar, to be determined) twice a month.

Site selection will require further discussion and reconnaissance to meet the needs of the DSM2 nutrient model. If existing sites and analytes will work, MWQI will attempt to minimize the addition of additional sites and analytes. Additional laboratory expenses may result if analytical support from Bryte Laboratory is not available.

Monitoring for the DSM2 nutrient model will continue for one year, through the end of the FY13-14 work plan. At that time, the need for continued monitoring will be assessed. Project management documentation of this study can be found in Appendix 3.

### **5.2.3 Cache/Yolo Complex Pre-Restoration Baseline Monitoring**

In the coming years, numerous ecologically driven restoration projects are slated to begin construction in the Cache/Yolo Complex. The Cache/Yolo Complex includes the Yolo Bypass,

North Bay tributaries draining into the Delta, and in-Delta, Sacramento River connected sloughs. Planned restoration projects are of various sizes but cumulatively could total over 8000 acres. These planned habitat restoration activities will have unknown impacts to in-stream drinking water quality; therefore, they may result in additional costs to drinking water municipalities treating thru-Delta water. Currently, other DWR groups and sister agencies are starting to initiate baseline monitoring efforts as required by the Fish Restoration Program Agreement (FRPA). The proposed FRPA monitoring program is still in the initial phase of development and it is unclear if drinking water quality concerns will be covered by the FRPA monitoring plan and there is uncertainty over when monitoring might commence.

Due to the uncertainty regarding FRPA monitoring, and with the backing of the SWPCA, the MWQI Program will conduct a two-phased approach to help define baseline, pre-restoration water quality in the Cache/Yolo Complex. Phase 1 involves working with FRPA to make sure that drinking water quality monitoring concerns are addressed in future FRPA monitoring. If this is successful, the MWQI Program may be able to step-back from its monitoring responsibilities tied to Phase 2 of this study. Phase 2 is the MWQI Program staff leading field monitoring of key locations in the Cache/Yolo Complex. Project management documentation for phase 1 and 2 can be found in Appendix 3. Both phases will run concurrently.

**Table 2. Long-term routine, discrete, sampling stations.**

<b>Station #</b>	<b>Stations</b>	<b>WDL Stations (ID)</b>	<b>Analytes Collected</b>	<b>Frequency</b>
1	Natomas East Main Drainage Canal	Natomas EMDC @ El Camino Rd (A0V83671280)	Std. Mineral, nutrients, TOC, DOC, UVA, turbidity, bromide, metals	Monthly
2	American River at E.A. Fairbairn WTP Intake	American River W.T.P. (A0714010)	Std. Mineral, nutrients, TOC, DOC, UVA, turbidity, and bromide, metals	Monthly
3	Sacramento River at West Sacramento WTP Intake	Sacramento River at W. Sac Intake Structure (A0210451)	Std. Mineral, nutrients, TOC, DOC, UVA, turbidity, and bromide, metals	Monthly
4	Sacramento River at Hood	Sacramento R @ Hood (B9D82211312)	Std. Mineral, nutrients, TOC, DOC, UVA, turbidity, and bromide, metals	Once every two weeks
5	Sacramento River at Mallard Island	Sacramento River @ Mallard Island (E0B80261551)	Std. Mineral, nutrients, TOC, DOC, UVA, turbidity, and bromide, metals	Monthly

Station #	Stations	WDL Stations (ID)	Analytes Collected	Frequency
6	San Joaquin River near Vernalis	San Joaquin R. nr. Vernalis (B0702000)	Std. Mineral, nutrients, TOC, DOC, UVA, turbidity, and bromide, metals	Once every two weeks
7	Old River at Bacon Island	Old River at Bacon Island (B9D75811344)	Std. Mineral, nutrients, TOC, DOC, UVA, turbidity, and bromide, metals	Monthly
8	Old River at Station 9	Old R. nr. Bryon (st9) (Near HWY 4 Bridge) (B9D75351342)	Std. Mineral, nutrients, TOC, DOC, UVA, turbidity, and bromide, metals	Monthly
9	‡ Banks Pumping Plant at Headworks	Delta P.P. Headworks at H.O. Banks Pumping Plant (KA000331)	Anions, TOC, DOC (MWQI)  Std. Mineral, turbidity, UVA, TOC, DOC, bromide, total phosphorous, total suspended solids, phytoplankton, purgeable organics, taste and odor (MIB & geosim), asbestos, and radiological, pesticides and herbicides. (O&M)	Depending on analyte, Bi-weekly (MWQI), Monthly (O&M), or Quarterly (O&M)
10	Contra Costa Canal @ Rock Slough(replaces Rock Slough @ DRB-B9D75861372))	Contra Cost Canal @ Rock Slough Fish Screen (B9C75861385)	Std. Mineral, nutrients, TOC, DOC, UVA, turbidity, and bromide	Monthly
11	Middle River @ Union Point	Middle River A Union Point (B9D75351292)	Std. Mineral, Turbidity, UVA, TOC, DOC, Bromide, nutrients, metals	Monthly
12	Jones Pumping Plant at DMC Headworks	Delta Mendota Canal at Jones Headworks (B9C74701355)	Anions, TOC, DOC	Once every two weeks
13	Gianelli Pumping/Generating Plant	Gianelli WQ Station (ON003050)	Anions, TOC, DOC	Once every two weeks
14	Colusa Ag Drain near. Sacramento River-Sacramento WARMF	Ag Drain on Colusa Basin Main Drain (A0294500) station	Std. Mineral, nutrients, TOC, DOC, UVA, turbidity, bromide, TTHMFP/HAAFP, Fluorescence, Suspended Solids, metals	Monthly & Rice Drainage events

‡ Samples collected by DWR's Division of Operations and Maintenance

- Physical Parameters collected at all sites: Temperature, pH, Turbidity, Dissolved Oxygen, and Specific Conductance

- Standard Mineral analysis includes: Ca, Mg, Na, K, S, Cl, B, Alkalinity, Nitrate, Dissolved Solids, Specific Conductance
- Standard Nutrient analysis includes: Nitrate + Nitrite, Ammonia, Organic Nitrogen and Ammonia, Total Phosphorus (unfiltered), and orthophosphorus
- Metals—ICP/MS Trace elements including: Aluminum, Arsenic, Copper, Iron, Manganese

**Table 3. MWQI Program discrete sampling stations for work plan special studies.**

#	Stations	WDL Stations (ID)	Analytes Collected	Frequency	Study
15	Shag Sl. @ Liberty Island Sacramento DSM2 station Yolo Bypass West Toe Drain	Shag Slough @ Liberty Island Bridge (B9S81841416)	Std. Mineral, nutrients, TOC, DOC, UVA, turbidity, bromide, suspended solids, chlorophyll, CBOD, metals	Biweekly/Storm Event	Eastside WARMF; DSM2, Cache/Yolo Complex; DSM2 Nutrient
16	North Fork Mokelumne River @ Wimpy's Marina Eastside Streams WARMF station	NF Mokelumne @ Wimpy's Marina (B9D81371295)	Std. Mineral, nutrients, TOC, DOC, UVA, turbidity, bromide, suspended solids, chlorophyll, CBOD, TTHMFP/HAAFP, fluorescence, metals	Biweekly/Storm Event	Eastside Streams WARMF; DSM2 Nutrient
17	Calaveras River @ UOP Footbridge Eastside Streams WARMF station	Calaveras River @ Footbridge (B9D75851208)	Std. Mineral, nutrients, TOC, DOC, UVA, turbidity, bromide, suspended solids, chlorophyll, CBOD, metals	Biweekly/Storm Event	Eastside Streams WARMF; DSM2 Nutrient
18	Lindsey Slough at Hastings Cut	TBD	TBD	Biweekly	Cache/Yolo Complex
19	Cache Slough below Ulatis Creek	TBD	TBD	Biweekly	Cache/Yolo Complex
20	Sacramento	TBD	TBD	Biweekly	Cache/Yolo

#	Stations	WDL Stations (ID)	Analytes Collected	Frequency	Study
	Shipping Channel above Prospect Island				Complex
21	Yolo Bypass East Toe Drain	TBD	TBD	Biweekly	Cache/Yolo Complex
22	Miner Slough nr. confluence with Cache Slough	TBD	TBD	Biweekly	Cache/Yolo Complex
23	Miner Slough @ Hwy84 Bridge	TBD	TBD	Biweekly	Cache/Yolo Complex
24	Cache Slough above Streamboat Slough	TBD	TBD	Biweekly	Cache/Yolo Complex
25	Sacramento River at I Street Bridge	TBD	TBD	Biweekly	DSM2 Nutrient
26	Cosumnes River nr. Franklin Rd bridge	TBD	TBD	Biweekly	DSM2 Nutrient
27	Mallard Island	TBD	TBD	Biweekly	DSM2 Nutrient

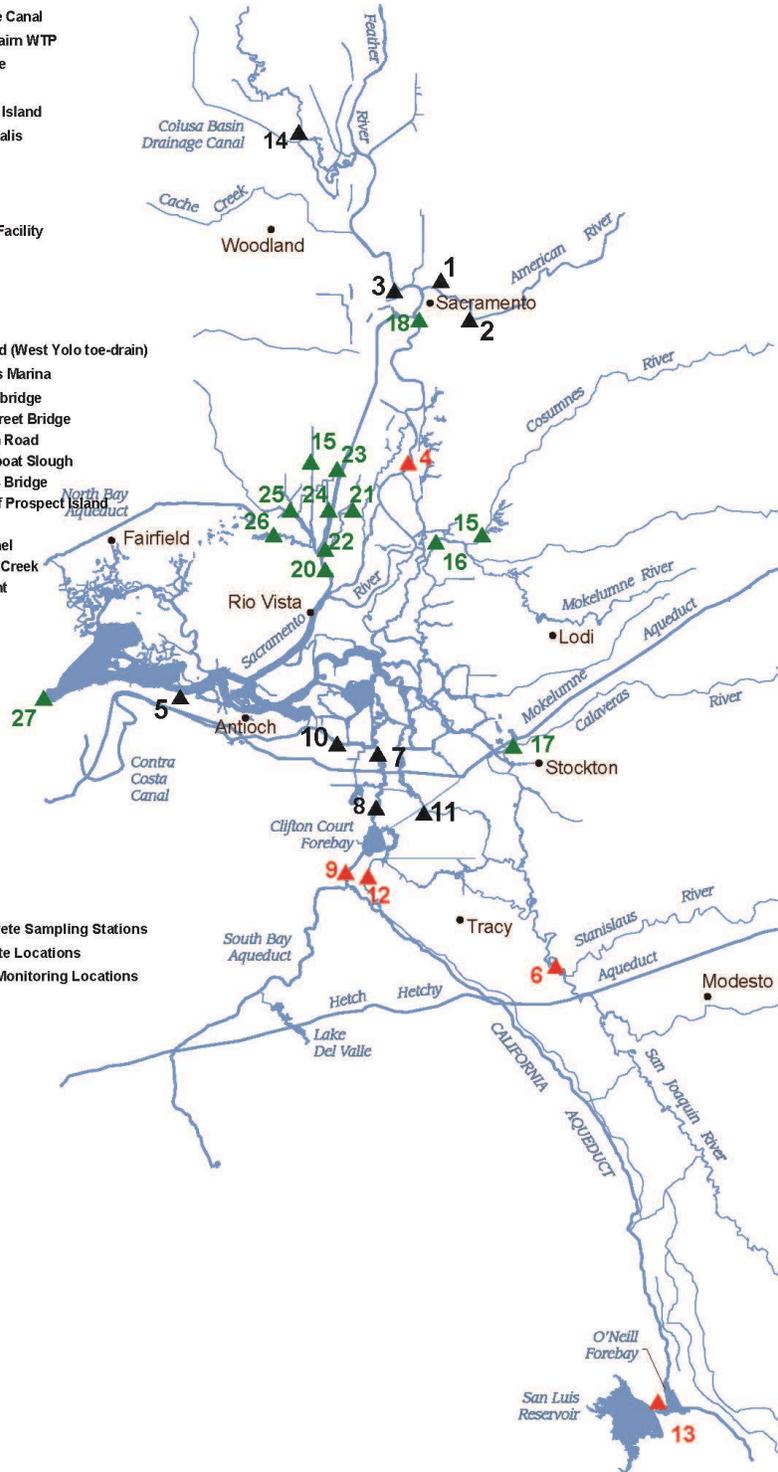
- Physical Parameters collected at all sites: Temperature, pH, Turbidity, Dissolved Oxygen, and Specific Conductance
- Standard Mineral analysis includes: Ca, Mg, Na, K, S, Cl, B, Alkalinity, Nitrate, Dissolved Solids, Specific Conductance
- Standard Nutrient analysis includes: Nitrate + Nitrite, Ammonia, Organic Nitrogen and Ammonia, Total Phosphorus (unfiltered), and orthophosphorus
- Metals—ICP/MS Trace elements including: Aluminum, Arsenic, Copper, Iron, Manganese

**Figure 1. MWQI Discrete (“Grab”) & Real-Time Sampling Locations, FY13-14**

**Proposed MWQI Sampling Locations, FY13/14**

1. Natomas East Main Drainage Canal
2. American River at E.A. Fairbairn WTP
3. West Sacramento WTP Intake
4. Sacramento River at Hood
5. Sacramento River at Mallard Island
6. San Joaquin River near Vernalis
7. Old River at Bacon Island
8. Old River at Station 9
9. Banks Pumping Plant
10. Rock Slough at CCWD Fish Facility
11. Middle River at Union Point
12. Jones Pumping Plant
13. Gianelli Pumping Plant
14. Colusa Ag Drain
15. Shag Slough at Liberty Island (West Yolo toe-drain)
16. Mokelumne River at Wimpy’s Marina
17. Calaveras River at UOP Footbridge
18. Sacramento River below I Street Bridge
19. Cosumnes River nr. Franklin Road
20. Cache Slough above Steamboat Slough
21. Miner Slough at Highway 84 Bridge
22. Miner Slough downstream of Prospect Island
23. East Yolo toe-drain
24. Sacramento Shipping Channel
25. Cache Slough below Eulatis Creek
26. Barker Slough Pumping Plant
27. Martinez

- ▲ RTDF and Discrete Sampling Stations
- ▲ Routine, Discrete Locations
- ▲ Special Study, Monitoring Locations



**Table 4. Routine and Special Study Discrete Grab Sample Deliverables and Timelines**

<b>Deliverable</b>	<b>Participants</b>	<b>Estimated Start Date</b>	<b>Estimated Completion Date</b>
Records of monthly and bi-weekly monitoring data.	<b>MWQI</b>	N/A	Currently available upon request
Records of periodic calibration of field monitoring equipment	<b>MWQI</b>	N/A	Currently available upon request
Records demonstrating consistent and timely application of QA/QC procedures	<b>MWQI</b>	N/A	Currently available upon request
Timely analysis and posting of results to the Water Data Library	<b>MWQI</b>	N/A	Monthly Available on-line
Eastside Streams WARMF and Yolo DSM2 Monitoring	<b>MWQI</b>	October 2010	Reassess Sept 2013 may run through 2015
DSM2 Nutrient Monitoring	<b>MWQI</b>	July 2013	Reassess June 2014
Cache/Yolo Complex, FRPA Engagement	<b>MWQI</b>	July 2013	Reassess June 2014
Cache/Yolo Complex Monitoring	<b>MWQI</b>	March 2013	Reassess June 2014

N/A = not applicable or available

## **6. REAL-TIME DATA AND FORECASTING COMPREHENSIVE PROGRAM**

The Real Time Data Forecasting-Comprehensive Program (RTDF-CP) focuses on providing a single location that compiles and disseminates real-time drinking water quality data gathered across agencies to enable water managers to make operating decisions based on observed and forecasted changes in water quality. The RTDF-CP includes a network of real-time water quality monitoring stations and a modeling component intended to allow greater predictive ability of water quality in real-time and the future.

The RTDF-CP crosses organizational boundaries within DWR and reaches out to other agencies to gather the necessary data and information. Historically, the geographic scope of the MWQI Program was confined to the Delta. However, the scope of real-time monitoring and forecasting encompasses not only the watersheds of the Delta, but also the SWP, and portions of the federal Central Valley Project that are interconnected to the Delta and SWP. As a result, this element includes MWQI funded positions within DWR’s Bay Delta Office (BDO), the Operations Control Office (OCO), and the Division of Operations and Maintenance, Water

Quality Section (O&M WQ) as well as a contract with the San Luis and Delta Mendota Water Authority (SLDMWA).

**The RTDF-CP Consists of Three Principle Activities:**

1. Remote instrumentation that provides real-time water quality data
2. Mathematical modeling to provide water quality forecasting
3. Information management and dissemination of real-time data to interested parties

Emergency response is also part of the RTDF-CP, but is treated separately in this work plan.

Real-time monitoring, forecasting and data dissemination activities are guided by the RTDF Steering Committee, a group of technical experts composed of MWQI Program staff, Contra Costa Water District and participating MWQI-SPC agencies. The RTDF Steering Committee reports to the MWQI TAC.

**6.1. RTDF-CP Real-Time Monitoring**

Real-time water quality data are used to:

- a) make informed operational decisions affecting the Delta and SWP;
- b) support development of water quality forecasting tools for better management of SWP water supplies;
- c) provide early warning of changing water quality conditions for users downstream; and
- d) provide information for water quality and water supply planning studies.

In addition to DWR and the SWP Urban Water Contractors, this information is used by many federal, state, and local agencies, non-governmental organizations, and the public.

This program element is comprised of:

- a) instrumentation installed at key remote locations,
- b) field operations which ensure proper operation and maintenance of all automated sampling equipment,
- c) the timely transmission of real-time data,
- d) the documentation of Standard Operating Procedures,
- e) the implementation and documentation of data QA/QC.

In past work plans, Field Support Section's office labor charges in support of the RTDF program were billed to a separate, Field Unit Office Duties charge number. This was done for simplicity's sake, but increased interest in accounting for staff time has led to the following change. During FY13-14, all field unit office duties that are undertaken in support of the RTDF program will be charged to the RTDF specific charge number. This will result in an increase in RTDF program labor costs and a proportionate decrease in Field Unit Office Duties labor costs. Field office labor associated with real-time monitoring (RTM) includes: ordering RTM supplies; phone consultation with instrument manufacturers; creation of RTM QC sampling runs; creation of instrument specific chemical standards, solutions, and reagents; in-office repairs to station peripheral components (pumps, compressors, etc.); cleaning of equipment used on RTM runs; data entry and analysis of RTM QC data; and working on instruments remotely via Remote Desktop and data logger telemetry programs. Commodity and service charges will be unaffected by this change, and will continue to be charged to the appropriate account.

Table 5 summarizes station locations, water quality parameters, and automated analyzer equipment used by the MWQI Program's RTM. Figure 1 shows the location of the RTM stations.

Currently there are four MWQI Program remote real-time stations located in the Delta and one south of the Delta (Table 5). The Delta stations include Hood located on the Sacramento River near the town of Hood, Banks Pumping Plant located at the head of the California Aqueduct, Jones Pumping Plant located at the head of the Federal Central Valley Project (CVP) Delta Mendota Canal and Vernalis located on the San Joaquin River near the town of Vernalis. The southern station, Gianelli, is located within the O&M San Luis Field Division on O'Neill Forebay below San Luis reservoir.

In the past year, new instrumentation was installed at Banks, Jones and Vernalis. The anion analyzer located at Jones Pumping Plant was moved to Gianelli to make way for one of these new analyzers. Installation of an anion analyzer at Gianelli was requested by the MWQI TAC. The goal in moving the Jones station anion instrument was to attain standardization for field staff working at the MWQI Program's water quality stations. The new instruments included three Thermo Fisher ion chromatographs (ICS-2100's) and three Sievers 5310 organic carbon analyzers along with three StreamWalker sample stream splitters. The StreamWalker enables one analyzer to sample two supply streams- a filtered stream representing dissolved organic carbon (DOC) and a whole-water stream representing total organic carbon (TOC).

FY13-14 work plan deliverables focus on the efficient operation of the water quality monitoring sites and the development of a new, QC'd data set for station online data. Organic carbon and anion data are available from all five real-time stations with the exception of anion data at Hood. This fulfills the RTDF-CP objective to provide organic carbon and anion data. Having this foundational objective met allows for other RTDF-CP objectives to be completed.

**Table 5. MWQI Program Real-Time station locations, parameters, and equipment**

<b>Station</b>	<b>MWQI Program Parameters &amp; Instruments</b>	<b>Non-MWQI Program Parameters</b>
Sacramento River at Hood (HOOD)	TOC, DOC (Sievers 900-oxidation)	Water: chlorophyll, EC, DO, pH, temperature and turbidity. Atmospheric: solar radiation, temperature, wind speed and direction.
San Joaquin River near Vernalis (VERNALIS)	TOC, DOC ( Sievers 5310-oxidation) bromide, chloride, nitrate, sulfate, (Dionex ICS-2100)	Water: chlorophyll, DO, EC, pH, river flow and stage, temperature and turbidity.
Delta P.P. Headworks (BANKS)	TOC, DOC ( Sievers 5310-oxidation), bromide, chloride, nitrate, sulfate, (Dionex ICS-2100)	Water: EC, fluorescence, pH, pump discharge, temperature, turbidity, UVA 254. Atmospheric: temperature, wind speed and direction.
Jones Pumping Plan (JONES)	TOC, DOC, ( Sievers 5310-oxidation), bromide, chloride, nitrate, sulfate, (Dionex ICS-2100)	Water: EC, pump discharge, temperature.
Gianelli P/G Plant	TOC, DOC (Sievers 5310), EC, temp, turbidity, DO, pH (YSI 6600) bromide, chloride, nitrate, sulfate (Metrohm IC 850)	N/A

N/A = not applicable or available

Table 6 summarizes the deliverables and timelines associated with real-time monitoring. As mentioned previously, some of the tasks associated with the 2006 Sanitary Survey Update are associated with groups outside of MWQI Program. These projects are indicated with a (SS) in the column labeled “participants.” Unless there is a direct connection to the MWQI Program through the Budget Change Proposal (BCP) positions, accomplishments associated with these projects are as a result of the ongoing efforts of the group outside of the MWQI Program.

**Table 6. Real-Time Monitoring Deliverables and Timelines**

(Lead organization(s) are shown in bold)

<b>Deliverable</b>	<b>Participants</b>	<b>Estimated Start Date</b>	<b>Estimated Completion Date</b>
Continue operation of automated stations at Hood, Banks, Jones, Vernalis, and Gianelli. Identify and fix critical data gaps.	<b>MWQI Program, O&amp;M Water Quality (SS)</b>	Ongoing	Ongoing
<b>A)</b> Update SOPs: documenting maintenance, operation and quality assurance/quality control of all in-situ equipment.  <b>B)</b> Work towards standardizing, streamlining, and consolidating DWR's in-situ: equipment, data quality control, and data dissemination.	<b>MWQI Program / O&amp;M Water Quality (SS)</b>  <b>B) MWQI Program O&amp;M Water Quality (SS)</b> NCRO IEP	July 2013  na	<b>A)</b> June 2014  <b>B)</b> Ongoing
As needed, request SLDMWA staff to repair water quality station at Jones PP.	<b>MWQI Program /SLDMWA</b>	na	Ongoing
Evaluate the need, and planning for, other installations per the RTDF-CP (together with RTDF Steering Committee).	<b>RTDF SC</b> MWQI TAC	July 2008	Ongoing
Provide readily accessible data and fill in TDS/EC data gaps on pump-in activities. TDS data is posted in WDL Check 13 = KA007089 Check 21 = KA017226 Check 23 = KA019705 Check 29 = KA024454 Check 39 = KA029021 Semitropic 2 = GKA02098 Semitropic 3 = GKA02070 CVC = GKA02380 Kern Water Bank Canal = GKA02382 Arvin Edison Canal = GKA02773.	<b>O&amp;M WQ (SS)</b>	July 2008	Ongoing
Pursue alternative strategies for debris removal at Vernalis station.	<b>MWQI Program</b>	N/A	Low priority

N/A = not applicable or available

## 6.2. RTDF-CP Water Quality Forecasting

The RTDF-CP will continue water quality monitoring using in-situ instrumentation which provides information on current and past water quality conditions. The second component of the RTDF-CP is to use this monitoring data and other operational information with mathematical modeling techniques to help further develop water quality forecasting tools. These include the WARMF tributary watershed models and DSM2 Delta and Aqueduct Extension models. The MWQI Program collaborates with the OCO and the BDO to accomplish these forecasting tasks. The objective of this effort is to better incorporate forecast modeling insight with water quality monitoring and maximize the use of modeling results by water quality managers.

In FY12-13, one goal was to produce weekly DOC forecasts for the Delta and the California Aqueduct. However, achieving this was dependent on the development of the Sacramento WARMF model by the California Urban Water Agencies (CUWA). Due to State budget shortfalls, funding for the WARMF model was delayed. Resumption of work on the development of the WARMF model began again in 2011, including efforts by BDO effectively sponsored by RTDF-CP. When completed, there is the potential to again address the FY13-14 goal to produce weekly DOC forecasts for the Delta.

In July of 2011, the MWQI Program, BDO, and OCO began updating the Gantt chart timeline to include the WARMF tasks. The intention is to improve the forecast capability of the Sacramento and San Joaquin WARMF models. The Gantt chart provides the detailed steps required for the progression of necessary tasks to improve the WARMF model. Forecasting tasks for FY13-14 are shown in Tables 8 through 12. The tasks in this section require numerous steps and do not lend themselves to the task/deadline formats used in other sections of the work plan. Therefore, forecasting tasks were taken directly from the Gantt chart in Appendix 2; however, tasks and deadlines could change based on the new Gantt chart updates as directed by the RTDF Steering Committee and MWQI TAC. The group responsible for task completion is shown in bold after each task item.

During the previous fiscal year, OCO and the MWQI Program focused on the Historical and Short-term forecasts, and on tasks associated with Seasonal Forecasts and Planning Studies. In this FY, the MWQI Program will concentrate on the WARMF development and calibration tasks and will continue to work on WARMF model improvement. However, the MWQI Program may also begin working on tasks associated with short-term and seasonal forecasts. As shown

in Tables 8 and 9, tasks associated with modeling historical hydraulics, EC and DOC conditions from 1990-present have been completed for both the DSM2 Delta and the Aqueduct Extension models.

The Gantt chart working group focused on five subject areas in the development of improved modeling capabilities. In order of priority these are:

- **WARMF Model development and staff training:** Requires collecting, processing, and presenting a report on the WARMF data from the Sacramento and San Joaquin Watershed stations, reporting findings and recommendations, and modifying the existing Sacramento and San Joaquin WARMF model.
- **Historical simulations (1990-present):** Requires collecting, processing and filling in missing flow data, water quality data, and data on project operations, running the simulations, comparing results to field data, and investigating sources of error in the results.
- **Short-term (2 week) forecasts:** Meaningful short-term forecasts require an accurate description of initial water quality throughout the system, knowledge of future operational events, and higher resolution time series of boundary water quality input.
- **Seasonal forecasts:** Seasonal forecasts extend out up to one-year and require establishing boundary water quality conditions and projecting future operations at points along the SWP.
- **Planning studies:** A planning study requires the generation of boundary conditions and project operations under an assumed hydrology, water demands, institutional constraints, and project operation goals. It is used to compare scenarios.

The Gantt chart and the task list associated with integrating the DSM2 Delta and Aqueduct model is used to coordinate the above 5 model products. For each overall product, model development tasks are further subdivided into hydrology/hydraulics (water flow), salinity (EC), bromide concentration (Br), and DOC components (see Table 7). When creating the Gantt chart, task subject areas and subtasks were prioritized to provide at least useful coverage or capability. The goal is to achieve working coverage under all subject headings, with refinement of coverage to follow as needed. In most cases, the priority is first on enabling modeling of Delta water quality, then on modeling Aqueduct water quality. Within these, good hydrology

(water balance) model performance is required before water quality (EC, Br, DOC) modeling can move forward. The ultimate goal is to link the WARMF, Delta and Aqueduct models to enable on-demand water quality forecasts for the Contractor’s use. Note that as the DSM2 model is improved by upgrades or new calibrations, the most current, vetted, supported version of the model will be used.

**Table 7. Example of Two Subject Areas and Associated Subtasks.**

Historical, 1990-Present								Short-term (2 week) forecasts							
Delta (DSM2) Component				Aqueduct Component				Delta (DSM2) Component				Aqueduct Component			
Hydrology	EC	Br	DOC	Hydrology	EC	Br	DOC	Hydrology	EC	Br	DOC	Hydrology	EC	Br	DOC

Note: A capability may already exist for some subareas.

The Gantt chart and task list are updated each month with the percentage of work completed by BDO, OCO, and the MWQI Program. Then the Gantt chart is reviewed and discussed at the monthly RTDF Steering Committee meetings.

**Table 8. Deliverables for WARMF Model Development**

<b>WARMF Model Development and Staff Training</b>	
<b>Hydraulics</b>	Adjust model parameters for hydrologic and hydraulics components <b>(BDO)</b> .
<b>EC</b>	Completed
<b>Bromide</b>	Completed
<b>Tools</b>	<ul style="list-style-type: none"> <li>• Review comparisons of the computed results at internal and downstream points to assess model validity <b>(BDO)</b>.</li> <li>• Report summary findings and recommendations <b>(MQWP, BDO)</b>.</li> <li>• Develop tools and procedures to extend WARMF forecasting capabilities from 7 days to 21 days <b>(OCO)</b>.</li> <li>• Develop tools to extract forecasted DSM2 boundary conditions from WARMF binary file for use in short-term Delta forecasts <b>(OCO)</b>. <ul style="list-style-type: none"> <li>○ Training refers to BDO &amp; OCO cross-training after model development.</li> </ul> </li> </ul>

**Table 9. Deliverables for Simulation of Historical Conditions, 1990 – present**

	<b>Delta (DSM2) Component</b>	<b>Aqueduct Component</b>
<b>Hydraulics</b>	Completed	Completed
<b>EC</b>	Completed	Completed
<b>Bromide</b>	Completed	Completed
<b>DOC</b>	Completed	Completed
<b>Tools</b>	Document historical simulation of Delta and Aqueduct hydrodynamics/hydraulics, EC, bromide, and DOC <b>(BDO)</b> .	

**Table 10. Deliverables for Short-Term Forecast of Water Quality Conditions**

	<b>Delta (DSM2) Component</b>	<b>Aqueduct Component</b>
<b>Hydraulics</b>	Completed	Completed
<b>EC</b>	Completed	Completed
<b>Bromide</b>	Complete test of methodology for making short-term forecast of Delta bromide based on simulated EC Completed 7/11/2012 <b>(BDO)</b> .	Completed
<b>DOC</b>	Develop capability for forecasting DOC at Delta boundaries <b>(BDO)</b> . Develop capability for establishing initial Delta DOC conditions <b>(BDO)</b> .	Complete test of methodology for making short-term forecast of Aqueduct DOC <b>(BDO)</b> .

**Table 11. Deliverables for Seasonal Forecasts of Water Quality Conditions**

	<b>Delta (DSM2) Component</b>	<b>Aqueduct Component</b>
<b>Hydraulics</b>	Completed	Completed
<b>EC</b>	Completed	Completed
<b>Bromide</b>	Completed	Completed
<b>DOC</b>	Completed	Completed
<b>Tools</b>	Refine seasonal forecast of Aqueduct system operations ( <b>OCO</b> ). Refine assumptions of EC for Aqueduct inflow for seasonal forecast ( <b>BDO, OCO</b> ). Refine assumptions of bromide for Aqueduct inflow for seasonal forecast ( <b>BDO, MWQI Program</b> ). Document methodology of producing refined seasonal forecasts of Aqueduct hydraulics, EC, and bromide ( <b>BDO</b> ).	

**Table 12. Deliverables for Hydrodynamics and Water Quality Simulations of Water Quality Conditions based on CALSIM II planning studies**

	<b>Delta (DSM2) Component</b>	<b>Aqueduct Component</b>
<b>Hydraulics</b>	Completed	Refine assumed project operations ( <b>OCO</b> ).
<b>EC</b>	Completed	Refine assumed EC assigned to various inflows ( <b>BDO, MWQI Program</b> ).
<b>Bromide</b>	Completed	Refine assumed bromide assigned to various inflows ( <b>BDO, MWQI Program</b> ).
<b>DOC</b>	Completed	Refine method for generating DOC at Aqueduct system boundaries with Jones and Banks Pumping Plant DOC provided by Delta simulation ( <b>BDO</b> ).
<b>Tools</b>	Document new/refined capability for producing Delta and Aqueduct hydrodynamics/hydraulics and water quality simulations based on CALSIM II planning studies ( <b>BDO</b> ).	

### **6.3. RTDF-CP Information Management and Data Dissemination**

This program element includes the information management and data dissemination tasks associated with grab sample and real-time data. It involves the synthesis of real-time data from a variety of federal, State and local agency water quality monitoring programs, and the rapid data quality control, analysis, and dissemination of results to all interested parties. Grab sample data, including data collected by the MWQI Program, is stored in the California Water Data Library (WDL) (<http://wdl.water.ca.gov/>). Real-time data from the MWQI Program's real-time monitoring stations are stored on a MWQI Program server and posted on DWR's California Data

Exchange Center (CDEC) (<http://cdec.water.ca.gov/>), sent out as daily and weekly summary emails, and the MWQI Program web site ([http://water.ca.gov/waterquality/drinkingwater/rtdf\\_rprt.cfm](http://water.ca.gov/waterquality/drinkingwater/rtdf_rprt.cfm)).

Information management and dissemination tasks have the goal of enabling real-time analytical data and modeled forecasting data to be presented in user-friendly information products. Tasks under this program element include:

- a) continued refinement of the WDL data set (i.e. fully accessible historical MWQI Program data, and repository for current O&M Water Quality and MWQI Program water quality data)
- b) database management for delivery of real-time data to users
- c) continued development and enhancement of online tools for editing, evaluating and interpreting MWQI Program water quality data (QA/QC and scientific visualization)
- d) improving means to distribute daily and weekly water quality reports via the Internet
- e) improving database development for storage and management of real-time data
- f) developing a storage location where QC'd real-time data can be accessed directly by interested parties.

The WDL is the preferred storage location due to the ability to query results as the user's needs dictate, and the general understanding that data within the WDL have been QC'ed. The RTDF staff are also working to develop tools to delete erroneous data from the CDEC data sets provided by the RTDF program.

The MWQI Program has developed, and continues to improve, software developed in-house for data QA/QC and display. The Field Unit's maintenance and calibration records and field journal entries have been integrated into this tool, enabling all MWQI staff to evaluate real-time data. Staff also continues to make improvements to the MWQI Program Management application, website and database. This application produces the MWQI Program monthly status report for review at TAC meetings.

Tasks and deadlines for the data dissemination portion of the RTDF program are shown below in Table 13.

**Table 13. Information Management and Data Dissemination Deliverables and Timelines**

(Lead organization(s) is (are) shown in bold)

Task	Participants	Estimated Start Date	Estimated Completion Date
<p>Improve/Upgrade database infrastructure. This task includes:</p> <p><b>A)</b> Continue to develop, implement and test backup and restoration capabilities for both the server and the SQL Server database. Apply service packs and patches as appropriate.</p> <p><b>B)</b> Enhance routine, automated QA/QC processes to the database. Initial screening tools have been completed. Continued evaluation is needed to eliminate questionable data. Also need capability to test and apply to historic data.</p> <p><b>C)</b> Continue to develop and enhance the QA/QC database in collaboration with staff.</p> <p><b>D)</b> Continue to develop the station journal database and applications, including the creation of intranet browsing tools.</p> <p><b>E)</b> Continue to develop desktop data management tools. Enhance plotting capabilities. Link time series and QA/QC and Station Journal databases.</p> <p><b>F)</b> Continue to document and</p>	<p><b>MWQI Program</b></p>	<p><b>A)</b> January 2009</p> <p><b>B)</b> January 2009</p> <p><b>C)</b> July 2008</p> <p><b>D)</b> January 2010</p> <p><b>E)</b> January 2010</p> <p><b>F)</b> July 2009</p> <p><b>G)</b> January 2010</p>	<p><b>A)</b> Ongoing</p> <p><b>B)</b> Ongoing</p> <p><b>C)</b> Ongoing</p> <p><b>D)</b> Ongoing</p> <p><b>E)</b> Ongoing</p> <p><b>F)</b> Ongoing</p> <p><b>G)</b> Ongoing</p>

Task	Participants	Estimated Start Date	Estimated Completion Date
<p>maintain infrastructure.</p> <p><b>G)</b> Add new sensors to the database as needed</p> <p><b>H)</b> Develop a storage area that will hold QC'd real-time data for use by interested parties.</p>		<p><b>H)</b> April 2013</p>	<p><b>H)</b> September 2013</p>
<p>Improve Field Data Communications. This task includes:</p> <p><b>A)</b> Work to eliminate use of Corsica polling computer and transfer its functions to Einstein.</p> <p><b>B)</b> Continue to develop, test and enhance intranet/ internet components.</p> <p><b>C)</b> Develop and implement as feasible procedures, practices and standards for supporting the reliability of field system data systems.</p>	<p><b>MWQI Program</b></p>	<p><b>A)</b> February 2009</p> <p><b>B)</b> January 2011</p> <p><b>C)</b> July 2011</p>	<p><b>A)</b> Ongoing</p> <p><b>B)</b> Ongoing</p> <p><b>C)</b> Ongoing</p>
<p>Provide timely access to current QA/QC'd SWP operations data i.e. conduct QA/QC on historical data and remove inconsistencies and gaps.</p>	<p><b>OCO/Office of Reconciliations</b></p>	<p>N/A</p>	<p>Ongoing</p>
<p>Development and enhancement of MWQI Program data dissemination products,</p> <p><b>A)</b> As needed, add new stations &amp; sensors to the website or daily summary table.</p> <p><b>B)</b> As needed, enhance the</p>	<p><b>MWQI Program</b></p>	<p><b>A)</b> N/A</p> <p><b>B)</b> N/A</p>	<p><b>A)</b> Ongoing as needed</p> <p><b>B)</b> Ongoing as needed</p>

Task	Participants	Estimated Start Date	Estimated Completion Date
website presentation.  <b>C)</b> Enhance procedures for emailing the daily summary report.		<b>C)</b> N/A	<b>C)</b> Ongoing as needed

N/A = not applicable or available

## 7. SCIENCE SUPPORT (SPECIAL STUDIES)

The Special Studies described in this MWQI Program FY13-14 work plan have been identified by the MWQI Program in consultation with the MWQI-SPC as valuable contributions to improving drinking water quality through improved understanding of processes affecting source waters, storage, and conveyance. Some studies from the FY12-13 work plan are ongoing and updated summaries of these studies are discussed below, along with summaries of proposed new special study work.

### 7.1. Watershed Sanitary Survey Action Items

#### 7.1.1 Data access Improvements Project—Lead Investigator: Bruce Agee

The data access improvement project comes from action items described in both the 2006 and 2011 updates to the Watershed Sanitary Survey. The goals of this project are to:

1. Assemble taste & odor data (ongoing and historical) in the WDL – Priority is given to adding complete data that meets the WDL QC data standards. The process has been initiated and is currently being handled by Metropolitan Water District of Southern California (MWDSC). Once MWDSC addresses the outline of data needs that has been provided by MWQI Program data support staff, staff will begin to develop an automated process to import the data into the WDL. Once the automated process is developed, tested, and implemented, data will continually be imported into the WDL.
2. Enter the O&M historical data into the WDL – Two new Scientific Aids have been hired to conduct the critical data review and entry. Funding for these two positions will be part of a U.S. EPA grant of \$40,000 for a limited period of time to complete the project benefiting the DWR’s Water PIE efforts and any WDL Stakeholders.

Therefore, the MWQI Program will not incur costs for the scientific aids and they may be retained after the data entry project is complete if funding is provided from another outside source.

3. Collect the MWQI data from contracted laboratories and enter it into the WDL – As time allows, the two new scientific aids will enter the full information via the Bryte Lab Chemist module. This would serve not only the SWP Urban Water Contractors but other DWR programs.
4. Develop a mechanism for posting MWQI real-time data after it has been properly QC'd – MWQI staff is currently working on a solution to piggyback our efforts on those already provided by the Division of Statewide Integrated Water Management (DSIWM) for reporting QC's continuous monitoring data.

Data Access improvements deliverables and timelines are shown below in Table 14.

**Table 14. Data Access Improvements Deliverables and Timelines**

<b>Deliverables</b>	<b>Participants</b>	<b>Estimated Start Date</b>	<b>*Estimated Completion Date</b>
Develop data entry system to import taste & odor data (ongoing and historical) into the WDL.	<b>MWQI Program &amp; MWDSC</b>	Initiated, but waiting on MWDSC	Depends on arrival of MWDSC information
O&M historic data entry	<b>MWQI Program</b>	June 2013	November 2013
Data entry from contracted laboratories in WDL	<b>MWQI Program</b>	TBD	TBD
Develop mechanism for posting MWQI real-time data after it has been properly QC'd data	<b>MWQI Program</b>	June 2013	August 2013

## **7.2. Limnology of the SWP: Rich Losee - Project Manager provided by SWPCA and MWQI-SPC, and Lead Investigators: Mark Bettencourt, Ted Swift, & Jason Moore**

There is currently limited understanding of the limnology (aquatic biology, chemistry, physics, and ecology) of the SWP conveyances. However, reservoir and conveyance limnology affects or determines organic carbon, taste and odor, and algal toxin levels entering our treatment plants. Conveyance organic carbon dynamics, that is production of new organic carbon and consumption of new and old organic carbon, determines the potential for disinfectant byproduct

formation in our treatment plants. Conveyance nutrient dynamics control production of organic matter in the aqueduct; of which taste-and-odor compounds and algal toxins are of special interest to drinking water. The SWP Urban Water Contractors would like to establish a long-term program the objective of which is to understand the physical-chemical and ecological functioning of the SWP conveyances in order to better manage the drinking water quality of the SWP. This effort would include elucidating plant (algal and macrophyte) productivity, secondary productivity (microbial, benthic and planktonic invertebrate, and vertebrate), organic carbon decomposition/transformations, and nutrient dynamics. It is expected this would require participation and coordination across divisions with DWR and might require assistance from outside entities as well. This would be a multi-year effort that would likely have some aspects incorporated into the routine monitoring program. The SWP Urban Water Contractors recognize that this project will require resources that go well beyond the current MWQI Program and have identified a two-phased approach.

SWPCA will contract with a consultant to serve as the project manager to coordinate and lead this project.

### **Phase 1. Develop Limnology Project Work Plan and Feasibility Study**

The first phase of work will be to develop a work plan for the Limnology Project. The work plan will identify the components of the project, the potential lead investigator for each component (e.g. MWQI Program staff, O&M staff, Contractor staff) and other resource needs such as consultants with specialized expertise or laboratories to conduct analyses that the Bryte Lab is unable to conduct. Mechanisms for coordinating across DWR divisions and with the SWP Urban Water Contractors and outside experts will be developed. The SWP Urban Water Contractors recognize that securing cooperation of the other DWR Divisions' Program Managers will be critical to the overall success of this effort so part of the work plan will be a feasibility study on how to best secure that cooperation. The work components will be prioritized so that the elements that require the least amount of coordination will be initiated in the FY13-14 work plan cycle. This approach is proposed so that studies can be initiated while the mechanisms for coordination on more complex studies are developed. Study work plan development is expected to take approximately four to six months.

The first step in developing the Limnology Project work plan will be to identify a Technical Advisory Group to assist with work plan development and to review work products and provide overall guidance as the project progresses. The SWP Urban Water Contractors have identified a preliminary list of the key components of the study. The Technical Advisory Group will develop the final list and will develop more fully the studies to be conducted and the schedule for conducting those studies.

- Organic Carbon Cycling – Conceptually organic carbon dynamics provides a unifying framework for understanding the elements of this study; primary productivity, consumption and decomposition (secondary productivity), and nutrient dynamics. These elements then provide the context in which ecological interactions take place that determine community species composition and the occurrence, for example, of taste-and-odor events. The objective of this study is to understand organic carbon dynamics, including production of new organic matter by algae and aquatic plants, and decomposition and transformations through microbial, photolytic and secondary consumer processes as water travels from the Delta to Contractor intakes. This work could lead to better control of organic carbon disinfectant byproduct precursors and disinfectant demand in SWP source water.
- Primary Productivity Study – The objective of this study is to understand the levels of primary productivity (algal and macrophyte) and how they change from the Delta to the terminal reservoirs. This study could help identify areas of the SWP that could benefit from algal or macrophyte control through nutrient limitation or other means. Outcomes of this study could be better control of taste and odor producing and filter clogging algae, aquatic weeds, and organic carbon disinfectant byproduct precursors and disinfectant demand.
- Secondary Productivity Study – The objective of this study is to understand organic carbon processing by photolytic reactions, the microbial community, and consumers. In addition, consumer and algal interactions are likely to be important factors determining algal community species composition, which determines the community's propensity to produce taste-and-odors or algal toxins. These same community level processes may also affect DBP precursor quantity, chemical composition and reactivity.
- Nutrient Dynamics – The objective of this study is to understand the sources of nutrients to the SWP, nutrient transformations and changes in the reservoirs and conveyance

structures, and methods of potentially controlling nutrients. This work could lead to better control of algal and macrophyte growth. It could also potentially lead to development of a nutrient component of the aqueduct extension model.

A feasibility study will be developed for each project component that the Technical Advisory Group recommends for implementation. The project team will conduct a feasibility study to identify the locations of the SWP conveyances and storage facilities to be studied, the departmental staff at those locations responsible for assisting with this long-term study, and other departmental Divisions that may be involved with or integrated into the project component. The feasibility study will also identify the needed project resources that span DWR's Divisional Program Managers and gain their cooperation to support the project component. Finally, the feasibility study will identify the roles, responsibilities, expectations, deliverables, and deadlines for the individual participants involved in the project component. The lead investigator for each project component will then follow the DWR program management process for planning and executing the study.

Since the first four to six months of FY13-14 will be spent developing the work plan and the feasibility studies for the initial project components under the leadership of a project manager provided by SWPCA, the initiation form for the Limnology Project is not included in Appendix 3 at this time. As stated previously, the appropriate program management tools and processes will be identified and used as the project components are approved.

### **7.2.2 Nutrient Budget Study—Lead Investigator: Marcia Scavone-Tansey with Project Partner- Rich Losee**

Nutrients play an important role in the proper functioning of aquatic ecosystems. However, when they are present in excessive concentrations, the algal growth that occurs may cause a variety of undesirable effects such as additional organic carbon resulting in algal blooms and reduced dissolved oxygen, significant taste and odor issues, production of toxic algal compounds, high levels of ammonia and undesirable disinfection byproducts, physical obstruction in conveyance facilities, obstruction in water treatment filters, and increased costs of water treatment.

The objective of this initial study is to understand the sources of nutrients to the SWP. Data are available in the Water Data Library and from other sources that will be used to develop, a nutrient budget for the SWP. This will be a paper study that will identify data gaps and suggest next steps to elucidate the processes that define nutrient cycling and affect productivity and community structure in the SWP. The first step in this process will be to identify the key components of the SWP for which a nutrient budget will be developed (e.g. the Delta, major reservoirs, key reaches of the California Aqueduct). The next step will be to determine what data are available for each component and to develop a preliminary budget for various hydrologic and season conditions. The scope of work was developed in a meeting in June, the work will be initiated in July, and the project management documentation for this study can be found in Appendix 3.

Nutrient Budget Study deliverables and timelines are shown below in Table 15.

**Table 15. Nutrient Budget Study Deliverables and Timelines**

<b>Deliverables</b>	<b>Participants</b>	<b>Estimated Start Date</b>	<b>*Estimated Completion Date</b>
Identify key components of the SWP to include in the study	<b>MWQI Program SWPCA</b>	<b>June 2013</b>	<b>June 2013</b>
Obtain water quality and flow/pumping data for Phase 1 locations	<b>MWQI Program SWPCA</b>	<b>July 2013</b>	<b>July 2013</b>
Develop time series graphs for Phase 1 locations	<b>MWQI Program SWPCA</b>	<b>July 2013</b>	<b>July 2013</b>
Conduct additional data analysis for Phase 1 locations	<b>MWQI Program SWPCA</b>	<b>TBD</b>	<b>TBD</b>
Develop methodology for Phase 2 locations	<b>MWQI Program SWPCA</b>	<b>TBD</b>	<b>TBD</b>
Obtain water quality and flow/pumping data for Phase 2 locations	<b>MWQI Program SWPCA</b>	<b>TBD</b>	<b>TBD</b>
Develop time series graphs for Phase 2 locations	<b>MWQI Program SWPCA</b>	<b>TBD</b>	<b>TBD</b>
Conduct additional data analysis for Phase 2 locations	<b>MWQI Program &amp; Project Services Office</b>	<b>TBD</b>	<b>TBD</b>
Submit Draft Report to DWR management and SWPCA for Review	<b>MWQI Program SWPCA</b>	<b>TBD</b>	<b>TBD</b>
Incorporate edits	<b>MWQI Program SWPCA</b>	<b>TBD</b>	<b>TBD</b>
Submit Draft Report to DWR Editors for formatting and editorial review	<b>MWQI Program SWPCA</b>	<b>TBD</b>	<b>TBD</b>
Final report published	<b>MWQI Program SWPCA</b>	<b>TBD</b>	<b>TBD</b>

**7.3. San Joaquin River Watershed Sanitary Survey—Lead Investigator: Sonia Miller and Jason Moore with Project Partner – Elaine Archibald**

Since 1990, the water agencies treating water from the SWP have been required to conduct a watershed sanitary survey every five years. This is a requirement based on the California Surface Water Treatment Rule, and is administered by the California Department of Public Health (CDPH). In Title 22 of the California Code of Regulations, a sanitary survey is defined as “a physical and hydrogeological description of the watershed, a summary of source water quality

monitoring data, a description of activities and sources of contamination, a description of any significant changes that have occurred since the last survey which could affect the quality of the source water, a description of watershed control and management practices, an evaluation of the system's ability to meet requirements of this chapter, and recommendations for corrective actions.”

Initially, the SWC, and more recently the SWPCA, has assumed responsibility for conducting the Watershed Sanitary Survey of the SWP. The California State Water Project Watershed Sanitary Survey, 2011 Update (2011 Update) was conducted by a Consultant under contract to the DWR and was overseen by the MWQI Program Sanitary Survey Subcommittee.

Although a sanitary survey is required to be completed every five years, this year marks the beginning of a new format for the State Water Project Watershed Sanitary Survey. In prior years, one survey was completed to satisfy the mandated requirement in the 5<sup>th</sup> year. This was a tremendous effort each time the survey was completed. CDPH, MWQI Program staff, and SWPCA have agreed to an approach that will make the sanitary surveys more useful to CDPH and the SWP Urban Water Contractors, and will not require an inordinate amount of staff time in one year. The new format will consist of annual sanitary surveys. The first four sanitary surveys will focus on a particular issue or region of interest. The fifth survey will be a review of water quality data for the entire SWP. The five annual reports will be submitted to CDPH as they are completed and will be packaged together in the 5<sup>th</sup> year. This new format has been developed with the approval of CDPH, and will satisfy the requirement of a sanitary survey every 5 years.

This will be the first annual survey using the new format. The focus will be an analysis of the San Joaquin River watershed upstream of the Vernalis water quality station. The survey will be a classical sanitary survey in that it will evaluate the water quality of the San Joaquin River, identify contaminant sources, evaluate vulnerabilities, and develop key findings and recommendations. The area that is within the scope of the project is bounded on the south by the watersheds that contain the San Joaquin River, on the west by the coastal range mountains, on the east by the major reservoirs, and on the north by the Vernalis water quality station (Figure 2). The Vernalis station is the legal boundary for the Sacramento-San Joaquin River Delta.

The tasks for report development are:

- **Conduct Regulatory and Policy Review-** this task will describe the regulatory framework in the San Joaquin River watershed. It will include a description of regulatory programs, and programs to manage and control agricultural drainage. It will also include information on policies that pertain to water quality in the watershed.
- **Describe the Watershed-** this task will involve characterizing the watershed on the basis of hydrology, geology, climate, and land use.
- **Conduct Analysis of Potential Contaminant Sources-** this task will characterize water quality vulnerabilities that pertain to drinking water quality in the watershed. The major sources that will be investigated are waste water treatment plants, urban runoff, agricultural drainage and discharges from confined animal facilities.
- **Evaluate and Analyze Water Quality Data-** water quality data will be analyzed within the context of water year classification, season, regulatory threshold, geographic location and source water fingerprinting (where available). Constituents included in the analysis are total and dissolved organic carbon, dissolved bromide, total dissolved solids, electrical conductivity, total nitrogen, dissolved nitrate, dissolved ammonia, total phosphorus, turbidity, total and fecal coliforms, Escherichia Coli, Cryptosporidium spp., Giardia spp., and the top 5 pesticides, by pounds applied, that have drinking water MCLs. Water quality data will be collected from the Water Data Library, the California Data Exchange Center, the California Environmental Data Exchange Network, the Central Valley Regional Water Quality Control Board's (CVRWQCB) Irrigated Lands Program, and from National Pollution Discharge Elimination system (NPDES) permits. The data will be collected for sites at or near the mouth or major tributaries, and upstream and downstream of major tributaries to the San Joaquin River.
- **Develop Key Findings and Recommendations-**this task will develop findings and recommendations based on the analysis, and will result in a list of action items that will help to guide future work in the MWQI Program.
- Prepare Report; the sections of the report will be as follows:
  - I. Executive Summary
  - II. Introduction
  - III. Regulatory Environment

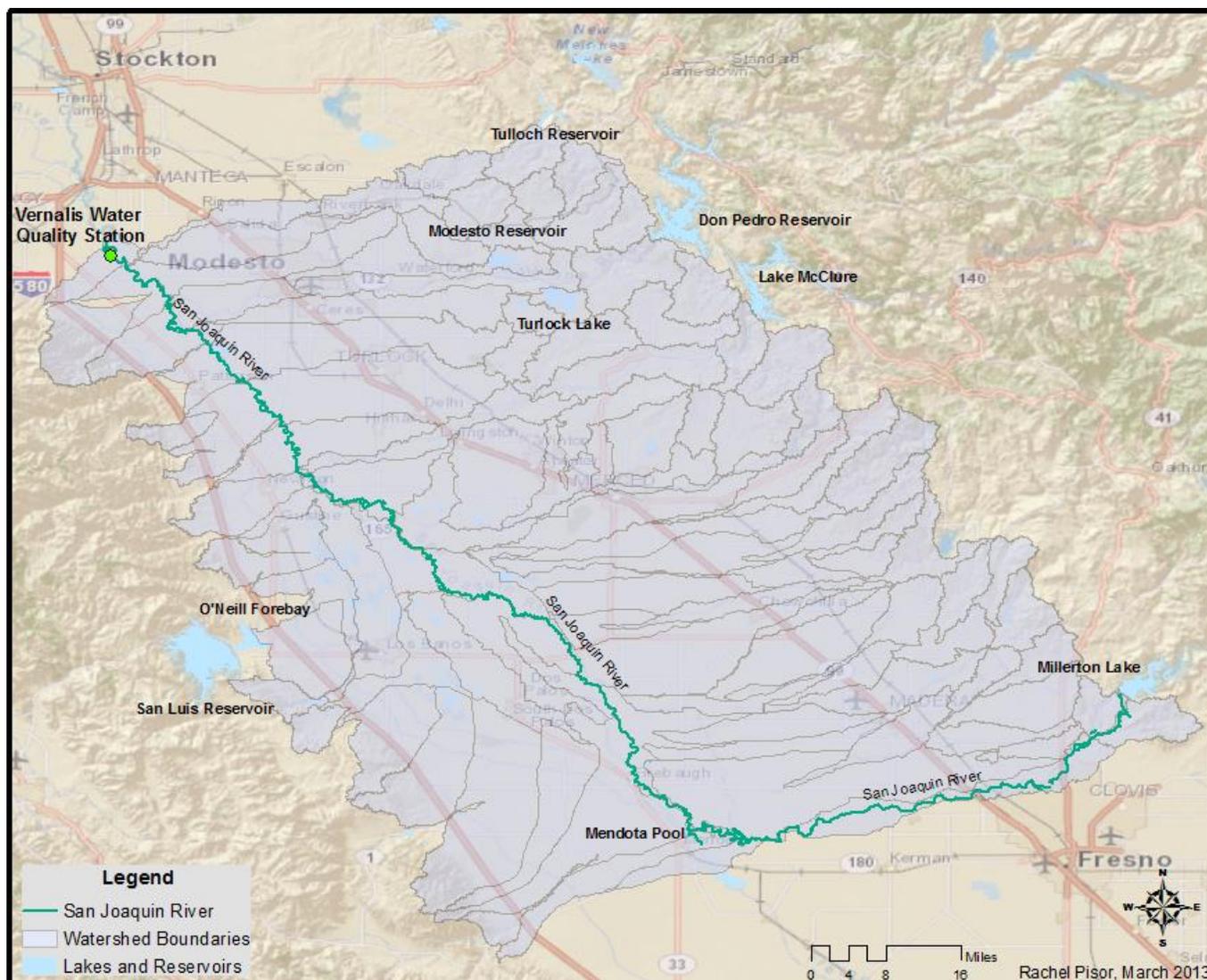
- IV. Watershed Description
- V. Potential Contaminant Sources
- VI. Water Quality
- Key Findings and Recommendations

The San Joaquin River Watershed Sanitary Survey deliverables and timelines are shown below in Table 16. Project management documentation for this study can be found in Appendix 3.

**Table 16. Watershed Sanitary Survey Deliverables and Timelines**

<b>Deliverables</b>	<b>Participants</b>	<b>Estimated Start Date</b>	<b>*Estimated Completion Date</b>
Obtain data for analysis	<b>MWQI Program &amp; SWPCA</b>	July 2013	September 2013
Submit draft report to Sanitary Survey Subcommittee for review	<b>MWQI Program</b>	December 2013	January 2014
Submit draft report to DWR Editors for formatting and editorial review	<b>MWQI Program &amp; Project Services Office</b>	February 2014	March 2014
Submit draft to Sanitary Survey Subcommittee for final review	<b>MWQI Program</b>	March 2014	April 2014
Submit draft-final report to CDPH	<b>MWQI Program</b>	April 2014	May 2014
Incorporate comments	<b>MWQI Program</b>	June 2014	June 2014
Final report published	<b>MWQI Program</b>	June 2014	June 2014

Figure 2. Watershed Sanitary Survey Study Area



#### 7.4. Fluorescence of Dissolved Organic Matter (FDOM) Proof of Concept— Lead Investigator: Shaun Rohrer with Project Partner – Alex Rabidoux

Organic carbon, bromide, chloride, and salinity are all constituents of concern for drinking water purposes in the SWP. The MWQI Field Support Section currently maintains equipment measuring data in real-time at five locations in the Delta: Banks and Jones Pumping Plants, the San Joaquin River at Vernalis, and the Sacramento River at Hood. The goal of this project is to use a custom built fluorometer to measure dissolved organic matter at Banks Pumping Plant and compare those values with the DOC, TOC, and UVA values from the same station, as well as to test if there are differences between filtered and unfiltered water. A quinine sulfate solution will be used to calibrate the FDOM instrument upon initial installation, as well as once a

month to test for drift in the data (if the standards are available for the project's duration). Monthly visits to the Banks Pumping Plant will be made to administer the quinine sulfate standards while bi-weekly will be made to clean the FDOM sensor thus avoiding any biofouling. Also, visits will be made when situations arise where emergency maintenance must be made. The sensor will be placed out at the study site for one year and the data will be downloaded monthly.

The data received from this study can also be compared to the data that was gathered using the same procedures in 2011-2012. However, the data gathered in 2011-2012 is not consistent and many data gaps exist. This new effort of measuring DOM will hopefully supply a full year of data with little to no gaps and will aid in the comparisons mentioned above. In addition to the comparisons mentioned above at Banks Pumping Plant, fluorescence will also be compared at two separate locations in the Delta through a joint effort of the MWQI Program and the Solano County Water Agency (SCWA). The SCWA currently has a FDOM sensor placed in the field collecting filtered water samples at Barker Slough. It is being proposed to add an additional sensor which will be placed directly in the slough itself where it will collect data on unfiltered water. This data set along with the data set collected from Banks Pumping Plant will be used to not only see the difference of FDOM values between filtered and unfiltered water, but also from two different locations with very different water sources. The FDOM Proof of Concept project deliverables and timelines are shown below in Table 17. Project management documentation for this study can be found in Appendix 3.

**Table 17. FDOM Study Deliverables and Timelines**

<b>Deliverables</b>	<b>Participants</b>	<b>Estimated Start Date</b>	<b>Estimated Completion Date</b>
FDOM installation	<b>MWQI Program</b>	May 2013	May 2014
Monthly standard administration/maintenance	<b>MWQI Program Bryte Laboratory MWD Laboratory Weck Laboratory</b>	May 2013	May 2014
Progress report to MWQI-SPC	<b>MWQI Program SWPCA</b>	November 2013	December 2013
Submit draft report to DWR management and SWPCA for review	<b>MWQI Program SWPCA</b>	May 2014	July 2014
Incorporate comments	<b>MWQI Program</b>	July 2014	August 2014
Submit draft-final report to DWR Editors for formatting and editorial review	<b>MWQI Program</b>	August 2014	September 2014
Incorporate comments	<b>MWQI Program</b>	October 2014	October 2014
Final report published	<b>MWQI Program</b>	October 2014	November 2014

### **7.5. Urban Sources and Loads Investigation—Lead Investigator: Rachel Pisor**

This is an ongoing study that began in the FY08-09 work plan. The study duration was extended for a third year to allow for 2 full years of stormwater sampling using flow weighted sampling and to ensure that a first flush event was captured.

Urban stormwater is an issue of increasing focus and concern for the SWP Urban Water Contractors. As urbanization of the Delta and its tributary watersheds continues, the volume of stormwater discharged is expected to increase, potentially causing increased water quality degradation. In February 2008, MWQI published a report that summarized their multi-year study quantifying a significant portion of Delta urban loading to the Sacramento River ([http://www.wq.water.ca.gov/docs/mwqi\\_pubs/Steelhead%20Creek%20rpt%20FINAL.pdf](http://www.wq.water.ca.gov/docs/mwqi_pubs/Steelhead%20Creek%20rpt%20FINAL.pdf)). This current study examines Delta urban loading to the San Joaquin River, by evaluating stormwater discharge from the city of Lathrop. Lathrop, though small (approximate population of 17,000), was a rapidly growing city prior to the recession, with agricultural land being converted for urban uses. Land conversion, from agricultural to urban, will likely continue once the economy and housing market recover. Quantifying Lathrop’s current effects on the water quality of the San

Joaquin River will provide valuable information on the impacts of similar urban areas and will provide a baseline for further study.

The tasks that will be completed in this work plan cycle consist of the editing and reviewing processes that occur prior to publication of the final report. Prior to this work plan, the draft report was reviewed by DWR management and SWPCA. The work in this work plan consists of an editorial review by technical writers in the Project Services Office, incorporation of their comments, a final review from DWR management, incorporation of management comments, and the approval to print process. The Urban Sources and Loads Investigations project deliverables and timelines are shown below in Table 18.

**Table 18. Urban Sources and Loads Investigations Deliverables and Timelines**

<b>Deliverables</b>	<b>Participants</b>	<b>Estimated Start Date</b>	<b>Estimated Completion Date</b>
Send draft report to DWR Editors for formatting and editorial review	<b>MWQI Program &amp; Project Services Office</b>	July 2013	August 2013
Send draft-final for review by DWR management	<b>MWQI Program</b>	September 2013	October 2013
Incorporate comments	<b>MWQI Program</b>	September 2013	September 2013
Final Report Published	<b>MWQI Program</b>	October 2013	November 2013

**7.6. O’Neill Forebay Mixing Study—Lead Investigator: Jason Moore**

This study was initiated during the FY08-09 work plan to investigate the amount of mixing that occurs in O’Neill Forebay between the various source waters. A preliminary report was drafted by MWQI staff in the 3<sup>rd</sup> quarter of 2012. The scope of the project was expanded to include a spreadsheet modeling approach in the 1<sup>st</sup> quarter of 2013.

Drafting of the revised report will begin shortly. The O’Neill Forebay Mixing Study project deliverables and timelines are shown below in Table 19.

**Table 19. O’Neill Forebay Mixing Study Deliverables and Timelines**

<b>Deliverables</b>	<b>Participants</b>	<b>Estimated Start Date</b>	<b>Estimated Completion Date</b>
Develop Draft Report	<b>MWQI Program</b>	2008-2009 work plan	September 2013
Send draft report to DWR Editors for formatting and editorial review	<b>MWQI Program &amp; Project Services Office</b>	October 2013	November 2013
Incorporate comments	<b>MWQI Program</b>	November 2013	November 2013
Send draft for final review by DWR management	<b>MWQI Program</b>	December 2013	January 2014
Incorporate Comments	<b>MWQI Program</b>	February 2014	March 2014
Final Report Published	<b>MWQI Program</b>	March 2014	April 2014

**7.7. Spectrofluorometer Study—Lead Investigator: Ted Swift with Project Partner – Stuart Krasner & Jim Sickman**

This is an ongoing study that began in the FY09-10 work plan. This research was identified as an area of expertise needed by the MWQI Program. This study evaluates the utility of spectrofluorometry as a method of rapidly quantifying COCs such as DOC, and organic nitrogen as a source of DBP precursors by correlating spectral peaks in the fluorescence excitation-emission matrix (EEM) with lab analyses for DOC, nutrients, and DBP precursors, using samples from 12 stations within and around the Delta. This study also seeks to identify distinctive characteristics of Delta source waters to provide “fingerprints” that could be used to validate Delta water quality models. The spectrofluorometer deliverables and timelines are shown below in Table 20.

**Table 20. Spectrofluorometer Study Deliverables and Timelines**

<b>Deliverables</b>	<b>Participants</b>	<b>Estimated Start Date</b>	<b>Estimated Completion Date</b>
Develop draft Report	<b>MWQI Program</b>	June 2013	July 2013
Send draft report to DWR management and SWPCA for review	<b>MWQI Program &amp; MWQI-SPC</b>	August 2013	September 2013
Incorporate Comments	<b>MWQI Program</b>	September 2013	October 2013
Send draft-final report to DWR Editors for formatting and editorial review	<b>MWQI Program &amp; Project Services Office</b>	October 2013	December 2013
Incorporate Comments	<b>MWQI Program</b>	January 2014	January 2014
Final report published	<b>MWQI Program</b>	January 2014	February 2014

### **7.8. Tidal Marsh Restoration Literature Review—Lead Investigator: Sonia Miller with Project Partner Alex Rabidoux**

This is an ongoing special study started in the FY10-11 work plan. The purpose of this study is to review, compile, and summarize existing research on the impact of tidal wetlands in the Delta and better quantify production rates and seasonality of tidal marsh DOC because state, federal, and local agencies will be adding thousands of acres of tidal marsh to the Delta. Several examples include the most recent draft of the Bay Delta Conservation Plan (BDCP) which proposes creation or restoration of 65,000 acres of tidal wetland in the Delta, including the Suisun Marsh. The recent Delta Smelt Biological Opinion also calls for the restoration of 8,000 acres of intertidal and subtidal wetlands.

One negative impact from wetland restoration is the production of dissolved organic carbon (DOC) which at high concentrations can cause disinfection by products (DBPs) during the chlorination process of water treatment. DBPs are carcinogenic, highly regulated, and can lead to increased scrutiny and regulation of water treatment plant operations. A few important components of the study are outlined below.

Literature review and follow up of existing USGS research on DOC production in the Delta.

Determine what areas of the Delta are likely to be restored first and would allow for a good study area.

Provide recommendations on restoration activities that could affect drinking water quality and suggestions for future study.

It is anticipated when the literature review is complete, MWQI Program management and interested SWP Urban Water Contractors will meet and begin determining the final products to emerge from this particular work plan special study. One option to consider is combining a tidally influenced wetland study with the wetland restoration Prospect Island Project that is currently in the pre-project planning phase by the Division of Environmental Services Mitigation and Restoration Branch. Combining these two studies will be beneficial in ensuring that the Prospect Island Project study design includes drinking water quality constituents.

The deliverables and timelines are shown below in Table 21. Project management documentation for this study can be found in Appendix 3.

**Table 21. Tidal Marsh Literature Review Deliverables and Timelines**

<b>Deliverables</b>	<b>Participants</b>	<b>Estimated Start Date</b>	<b>Estimated Completion Date</b>
Revise the draft report and send it to management for review	<b>MWQI Program</b>	July 2013	July 2013
Receive & incorporate Comments	<b>MWQI Program</b>	August 2013	August 2013
Develop the draft report and send to DWR management and SWPCA for review	<b>MWQI Program SWPCA</b>	September 2013	September 2013
Incorporate Comments	<b>MWQI Program</b>	October 2013	October 2013
Send draft-final report to DWR Editors for formatting and editorial review	<b>MWQI Program &amp; Project Services Office</b>	November 2013	November 2013
Incorporate Comments	<b>MWQI Program</b>	December 2013	December 2013
Final report published	<b>MWQI Program</b>	December 2013	January 2014
Investigate study potential	<b>MWQI Program</b>	TBD	TBD

### **7.9. MWQI Pathogen Study Write-up—Lead Investigator: Jason Moore with Project Partner – Elaine Archibald**

This is an ongoing study from the FY10-11 work plan that combined water quality sample collections for nitrosamines along with *Cryptosporidium* and *Giardia* from wastewater treatment plant (WWTP) discharges in the Delta. Samples were collected for two years in the Sacramento River near the discharge from the Sacramento Regional Wastewater Treatment Plant, which

discharges disinfected secondary treated effluent immediately below the Freeport Bridge, and from the effluent of the City of Stockton Regional Wastewater Control Facility, which discharges tertiary treated wastewater into the San Joaquin River. Samples were also collected in the rivers upstream and downstream of the two discharge locations. The samples were analyzed by BioVir Laboratories using the EPA method 1623 for detection of *Giardia* and *Cryptosporidium*, and by American Water laboratory for infectivity of *Cryptosporidium*.

Due to the cost of *Cryptosporidium* genotyping and concerns that the upstream (West Sacramento WTP Intake) and downstream (Hood) samples were collected too far from the discharge location to provide useful information on the impacts of the WWTP discharge, the MWQI-SPC decided to forgo further sampling and analyses at this point in time, but instead requested that a summary report examining the sample results be prepared. Therefore, a brief summary report will be prepared and the deliverables and timelines are shown below in Table 22.

**Table 22. MWQI Pathogen Study Write-up Deliverables and Timelines**

<b>Deliverables</b>	<b>Participants</b>	<b>Estimated Start Date</b>	<b>Estimated Completion Date</b>
Develop Draft Summary Report	<b>MWQI Program</b>	September 2013	October 2013
Send draft report to DWR Management & MWQI-SPC for review	<b>MWQI Program</b>	November 2013	November 2013
Incorporate Comments	<b>MWQI Program</b>	December 2013	December 2013
Send draft-final report to DWR Editors for formatting and editorial review	<b>MWQI Program &amp; Project Services Office</b>	December 2013	January 2013
Incorporate Comments	<b>MWQI Program</b>	February 2013	February 2013
Final Report Published	<b>MWQI Program</b>	March 2013	April 2013

### **7.10. MWQI Summary Report—Lead Investigator: Sonia Miller**

This is a special study from the FY10-11 and FY11-12 work plan. The year 2010 marked the 20-year anniversary for the MWQI Program. In 2012, DWR has been conducting studies of Delta drinking water quality for 30 years. This special study developed a document summarizing the accomplishments of the MWQI Program (and DWR efforts pre-dating the MWQI Program) over the last 30 years. This report could provide an introductory resource for new MWQI Program and water agency staff, and provide water agency managers with justification for continued program funding. The report includes:

1. History of the program
2. Special Studies
3. RTDF Program
4. Findings from past projects
5. Bibliography – all program reports and publications

The deliverables and timelines are shown below in Table 23.

**Table 23. MWQI Program Summary Report Deliverables and Timelines**

<b>Deliverables</b>	<b>Participants</b>	<b>Estimated Start Date</b>	<b>Estimated Completion Date</b>
Prepare draft report	<b>MWQP</b>	September 2010	Completed
Prepare final report	<b>MWQP</b>	January 2012	Completed
Incorporate comments from SWPCA	<b>SWPCA</b>	April 2013	July 2013
Send draft-final report to DWR Editors for formatting and editorial review	<b>MWQI Program &amp; Project Services Office</b>	August 2013	September 2013
Incorporate Comments	<b>MWQI Program</b>	September 2013	September 2013
Final report published	<b>MWQP</b>	October 2013	October 2013

### **7.11. California Integrated Water Quality System (CIWQS) Database Search—Lead Investigator: Shaun Rohrer with Project Partner – Elaine Archibald**

The DSM2 is a river, estuarine, and land modeling system used by the DWR to calculate many different elements of the Delta, including factors such as flow, river stage, salinity, temperature, and many others. The data that is supplied by the DSM2 can be used by many different groups and organizations to predict and plan for ever changing environmental conditions in the Delta. A D2M2 nutrient model was developed by BDO and refined by Resource Management Associates. Additional data on the quantity and quality of wastewater discharges are needed to improve the model.

This project will be an internet based database query from the CIWQS to collect the available data on constituents included in the DSM2 nutrient model. The CIWQS database will be queried for effluent flow, dissolved oxygen, electrical conductivity, temperature, nitrate, nitrite, ammonia, total Kjeldahl nitrogen, carbonaceous biochemical oxygen demand, biochemical oxygen demand, orthophosphate, total phosphorus, chlorophyll a, and pheophytin for all wastewater treatment plants discharging to the Delta. The project may also include conducting file searches at the CVRWQCB office for data that are not in CIWQS.

Once all data has been gathered and organized, it will be sent to the modelers for incorporation into the DSM2 nutrient model. A memorandum report will be prepared documenting the sources of the data and the rationale for the period of record for each wastewater discharger. The rationale for the period of record is needed because many Delta wastewater treatment plants have been upgraded in the last ten years so older data would not be representative of the quality currently discharged to the Delta. The deliverables and timelines are shown below in Table 24. Project management documentation for this study can be found in Appendix 3.

**Table 24. CIWQS Database Search Study Deliverables and Timelines**

<b>Deliverables</b>	<b>Participants</b>	<b>Estimated Start Date</b>	<b>Estimated Completion Date</b>
Investigate data available from CIWQS and other databases	<b>MWQI Program &amp; SWPCA</b>	TBD	TBD
Identify data gaps	<b>MWQI Program</b>	TBD	TBD
Send data and memorandum report to modelers in the Bay-Delta office	<b>MWQI Program</b>	TBD	TBD
Assist with any issues in regards to the data	<b>MWQI Program</b>	TBD	TBD
Finalize project	<b>MWQI Program</b>	TBD	TBD

### **7.12. Feasibility Study for MWQI Portable Water Quality Monitoring Station—Lead Investigator: Arin Conner**

This is an ongoing study from the FY10-11 work plan, and timelines associated with this study continue to remain flexible to accommodate field staff’s primary responsibilities associated with real-time station operations and maintenance. Meanwhile, using a self-contained, portable monitoring station continues to provide the benefit of allowing for the collection of real-time water quality data without committing to the construction cost normally associated with a permanent facility. Moreover, portable stations, much like the one installed at the Gianelli pumping plant could potentially be used as a semi-permanent installation with the addition of security devices, ample electrical supply, and some simple preparations. Ready-made portable stations are now currently available at reasonable cost, are cost-effective alternatives to the cost of permanent buildings, and can be pre-ordered and outfitted to the specifications required by the client. This study will investigate the feasibility of using a ready-made portable station

including features necessary to outfit a portable water quality station using minimal staff time and cost. Actual construction of the portable station would be dependent upon approval by the MWQI Program and the MWQI-SPC. The acquired information including design specification and quotes will be summarized in a draft report and provided to the MWQI-SPC.

The deliverables and timelines are shown below in Table 25.

**Table 25. Portable Water Quality Monitoring Station Deliverables and Timelines\***

<b>Deliverables</b>	<b>Participants</b>	<b>Estimated Start Date</b>	<b>*Estimated Completion Date</b>
Investigate the design and cost of constructing a portable water quality station	<b>MWQI Program</b>	June 2012	August 2012
Identify alternatives of ready-made prefabricated portable buildings	<b>MWQI Program</b>	August 2012	November 2012
Investigate options to design specifications	<b>MWQI Program</b>	November 2012	December 2012
Identify alternatives of power sources, HVAC systems, and exterior and interior lighting	<b>MWQI Program</b>	February 2013	March 2013
Obtain quotes	<b>MWQI Program</b>	June 2013	June 2013
Summarize information in a draft report	<b>MWQI Program</b>	Depends upon MWQI Field Unit schedule	Depends upon MWQI Field Unit schedule
Publish final report	<b>MWQI Program</b>	TBD	TBD

\*subject to change.

## **8. OTHER MWQI FUNDED PROGRAM ACTIVITIES**

DWR is a matrix management organization therefore infrequently staff will be requested to support departmental activities in addition to their MWQI Program work at the expense of the MWQI Program. The MWQI Program staff will be responsible for providing technical support, writing and conducting reviews; reviewing and revising plans; and providing any necessary support or information that improves workplace safety practices. Such assistance by the MWQI Program staff may directly or indirectly benefit the MWQI Programs Stakeholders and SWP Urban Water Contractors; therefore, this work is funded by the MWQI budget.

The following activities are conducted by MWQI staff and their time is charged to the MWQI Program budget. MWQI will continue to coordinate its activities in many of these areas with the TAC and MWQI-SPC members as it has done in the past. MWQI will achieve this through periodic updates during the monthly TAC meetings, by providing details in this and future work plans, and by tracking and presenting expenses in the Program's quarterly expenditures reports provided prior to certain TAC meetings.

### **8.1. Administration Work**

As necessary, MWQI management and staff may continue to attend meetings to provide technical input and stay current on drinking water issues and activities. These meetings may include MWQI meetings (RTDF, TAC, ES Workshop, etc.). Also as necessary, MWQI management and staff will participate in both internal and public forums that are focused on drinking water quality issues, and may attend meetings associated with storm water and wastewater treatment plant discharge permit renewals and will review EIR/EIS documents for projects with the potential to affect drinking water quality in the Delta. The MWQI Program staff will also attend workshops and training classes that are focused on drinking water quality, emergency response, and safety issues.

Other required program activities include staff training; administrative work including preparation of training request forms and travel expense claims; assisting with preparation of MWQI meeting agendas, handouts, and meeting minutes; preparing equipment maintenance contracts; gasoline and oil for the field support vehicles; staff time spent on work plans, contracts, funding agreements, and the environmental scientist workshop; and services that are charged to the MWQI Program through SAP (DWR overhead assessments), but are not necessarily linked to

specific program elements. These are costs that are often divided between all Branches in the Division of Environmental Services. These costs often result from DWR-required, job related or career advancement activities and tasks.

## **8.2. Field Unit Office Duties**

The MWQI Field Support Section staff will charge the expenses incurred while conducting their routine office duties to this MWQI program budget. This information will be a valuable planning tool for the senior staff member leading the Field Support Section.

## **8.3. O&M Water Quality Other Duties**

The MWQI Program funds 1 full-time equivalent position within O&M that is managed under a resource agreement (an agreement between the two divisions explaining work to be performed). The work performed under the resources agreement provides a direct benefit to the SWP Urban Water Contractors because this work includes operating and maintaining the Gianelli water quality auto station, preparing and maintaining all station safety equipment and records, assisting with the development of the O&M water quality annual report that includes groundwater turn in project information, and participating in the MWQI monthly meetings.

## **8.4. MWQI Annual Work Plan**

The cost of staff time spent developing portions of, then reviewing and producing the final annual workplan will be tracked within the MWQI Program so that management and the MWQI-SPC can gain an understanding of the time and cost involved in producing this document. This information will provide a valuable tool for planning, organizing, managing, and controlling the production of future work plans.

## **8.5. DWR's Bulletin B132, Chapter 4 - Water Quality**

- The MWQI Program staff will actively participate in writing the appropriate portions of the DWR Bulletin 132, Chapter 4 - Water Quality for versions 132-09 through 132-13. Bulletin 132, Management of the California State Water Project, is a series of annual reports that describe the status of SWP operations and water deliveries. Each annual

report updates information regarding project costs and financing, water supply planning, power operations, and significant events that affect the management of the SWP. Each also presents hydrologic information for the water year, capital construction information for the fiscal year, and water delivery, operations, maintenance, and other activities for the calendar year.

The cost of staff time spent authoring and reviewing specific sections within chapter 4-water quality that pertain to the MWQI Program will be tracked so that management and the MWQI-SPC can gain an understanding of the time and cost involved in producing our contributions to this document that is required by DWR to be provided annually to the SWP Urban Water Contractors. This information will provide a valuable management tool for planning, organizing, managing, and controlling staff's work time on the production of future bulletins.

## **8.6. MWQI Agreement**

If MWQI Program staff assist with developing any future MWQI agreements their work time and thus costs will be tracked and reported through the quarterly expenditures reports. It is not anticipated that staff will spend much time assisting with any future funding agreements so any impacts to their routine workloads should be minimal.

## **8.7. Workplace Safety**

Per the Resources Agency Secretary, DWR developed a DWR Safety Office and recently hired a Chief Safety Officer that will be responsible for leading DWR's implementation of a world-class Workplace Safety System. The Workplace Safety System will provide flexible uniformity for implementation DWR-wide and involves every staff member contributing to a safer workplace. DES is committed to supporting DWR's Workplace Safety System with its total quality management approach; commitment to the safety and health of its employees, partners and visitors; and values workplace safety through leadership, recognition, and education.

DES created a Safety Support Workgroup to enhance and refine its comprehensive Workplace Safety Program's policies and procedures both in the office and in remote field locations; ensure compliance with all applicable federal, State, and local laws and regulations; provide the required inspections, assessments, corrective actions, training, and reporting; and make

recommendations that will elevate the DES Workplace Safety Program to meet DWR’s goals of a world-class level.

MWQI Program staff may contribute to the workplace safety effort, but with minimal impact to their projects and deadlines

### 8.8. Emergency Response

Any staff involvement with emergency response during this work plan cycle will include: attending ER meetings, restocking of drinking water quality ER kits, providing emergency assistance for drinking water quality monitoring as requested by emergency responders and assisting the DWR’s EMC as needed in the development of a DWR Drinking Water Quality ER Plan. Tasks and deadlines for ER are given below in Table 26.

**Table 26. Emergency Response Deliverables and Timelines**

<b>Deliverable</b>	<b>Participants</b>	<b>Estimated Start Date</b>	<b>Estimated Completion Date</b>
Participate in any ER meetings	<b>MWQI Program</b>	November 2008	Ongoing

### 8.9. Miscellaneous Meetings Attended by Staff

Finally, the MWQI Program staff have historically contributed to numerous DWR support activities that pertain to the MWQI Program and will continue to provide support as needed. The cost of staff time spent on these support activities will be tracked so that management and the MWQI-SPC can gain an understanding of the time and cost involved. This information will provide a valuable management tool for planning, organizing, managing, and controlling staff’s workloads, project time allocations, and overall costs to the MWQI Program.

The following information provides a brief description where staff may be requested to provide their drinking water quality expertise:

- California Water Quality Monitoring Council (CWQMC) - (Per Senate Bill 1070, the MWQI Program staff will actively participate in the CWQMC collaboration network that requires the boards, departments and offices within the California Environmental Protection Agency (Cal/EPA) and the California Natural Resources Agency to integrate and coordinate their water quality and related ecosystem monitoring, assessment, and

reporting. MWQI Program staff will assist in improving the coordination and cost-effectiveness of water quality and ecosystem monitoring and assessment, enhance the integration of monitoring data across departments and agencies, and increase public accessibility to monitoring data and assessment information by participating in meetings, and providing technical support and water quality data.

- State Water Resources Control Board (SWRCB) - The MWQI Program staff will actively continue to support data dissemination activities to the California Environmental Data Exchange Network (CEDEN) data portals, and provide technical support in the development of the Regional Monitoring Programs (RMP).
- DWR California Water Plan - The MWQI Program staff will actively participate in writing the appropriate water quality portions of the CA Water Plan and any updates to future Plans.
- DWR's GIS efforts - The MWQI Program staff will participate occasionally in the monthly GIS meeting because GIS is a powerful tool that is used in some instances on special studies to help us visualize, analyze, interpret, and understand data to reveal relationships, patterns, and trends. The MWQI Program staff may also occasionally participate in GIS training classes and the annual GIS conference.
- MWQI Annual Meeting
- DWR's annual Environmental Scientist Workshop
- Interagency Ecological Program (IEP) for their strategic plan efforts
- Delta Conservancy educational outreach events
- Delta Stewardship Council's Delta Plan
- The State Water Resources Control Board for their CEDEN database development efforts
- The California Water Quality Monitoring Council for their "My Water Quality" web portal development efforts
- The DWR Safety Office for workplace safety efforts
- Support DWR's emergency response efforts, if needed and where possible
- Support DWR's annual effort in producing Bulletin 132, Chapter 4 – Water Quality

## **9. PROGRAM MANAGEMENT - STATUS REPORTING**

The MWQI Program Senior Environmental Scientists are responsible for these following specific management tasks:

- Supervise and direct the work of the MWQI Environmental Scientists and scientific aides among other technical staff assisting with MWQI projects.
- Fulfill administrative responsibilities by providing: support to the DWR's Chief Safety Officer; develop various written technical reports and surveys; and coordinate and reviewing staff's various studies.
- Assign and distribute staff work then monitor staffing levels, project schedules, monitor and evaluate work performance, and conduct staff workload assessments to improve efficiency, save time, resources and money.
- Conduct routine staff meetings, prepare staff's annual appraisal and development (A&D) reports, determine staff training needs, approve staff's training and time-off requests, and verify and approve staff attendance.
- Supervise staff work on and provide technical reviews of Bulletin 132 reports, Sanitary Surveys, various technical reviews of BDCP plans and chapters, and workplace safety efforts.
- Conduct monthly program status teleconferences for members of the MWQI TAC.
- Coordinate the preparation, or prepare and provide the appropriate MWQI Program meeting agendas, monthly status report, budget expenditure reports, and meeting minutes.
- Coordinate the annual meeting for 2013.
- Ensure MWQI TAC members continue to receive all draft materials, and members of that committee continue to have the opportunity to participate in any technical meetings of interest.
- Develop the FY14-15 MWQI Program work plan.
- Monitor progress on MWQI Program elements outlined in work plan.
- Address personnel, contracted services, and equipment related issues for the MWQI Program.
- Conduct interviews and hire qualified staff to backfill vacancies.

- Provide technical support to management for meetings, conference and workshops related to drinking water quality issues.
- Assist with the development of the new MWQI Agreements, when needed.
- Assist with implementation of the RTDF-CP.
- Prepare correspondence as needed to provide information to the MWQI-SPC.

## **10. NON-MWQI FUNDED PROGRAM MANAGEMENT**

As stated previously, since DWR is a matrix management organization staff may be requested to assist with supporting various DWR activities by providing technical support, evaluations and analysis of data, timely document and plan reviews, and may occasionally attend meetings. Some of these support activities are not funded by the MWQI Program budget for example, the MWQI Program staff who assist with writing, evaluating data pertaining to drinking water related research, or conducting reviews of BDCP project chapters, environmental documents, and plans will charge the BDCP budget. Also, the MWQI Program staff who assists with the DWR Water PIE efforts will charge the Water PIE budget.

The amount of work time that staff spend on these types of non-MWQI funded activities is infrequent, and rarely impacts their normal workloads. Since the MWQI Program staff is DWR's technical drinking water quality experts any assistance staff provide for these types of departmental required work will indirectly benefit the MWQI Program stakeholders, but directly provides multiple mutual benefits to DWR.

## **11. OTHER REQUIRED PROGRAM COSTS**

The DWR Project Services Office (PSO) provides technical reviews, evaluations, analysis and presentation of data pertaining to water related research projects and programs and is used by the MWQI Program staff for technical reviews of special studies and reports prior to publication. The cost of PSO support services has historically been covered by the DWR monthly overhead assessments which are spread out amongst DWR Divisions' budgets. On July 1, 2013 the PSO services will no longer be covered by DWR's overhead assessments. As of the writing of this work plan, the PSO has not yet made available the cost of their technical review and

support services, but the MWQI Program allocated \$3000 for this work plan cycle to cover costs incurred for any technical reviews of the special studies.

DWR's Mobile Equipment Operation's (MEO) provides insurance and fuel to support for the vehicles used by the Field Support Section staff for their routine water quality assessment efforts. The MEO office staff will continue to support the MWQI Program by providing customer support through cost effective fleet management and maintenance of mobile equipment owned by DWR. The MWQI Program allocated \$1000 for this work plan cycle to cover costs incurred for this support.

Expenditures for these types of services not assigned to any specific program element will be tracked and reported in the column entitled "Operating Equipment and Expenses", on the quarterly expenditure reports that will be provided as handouts prior to the TAC meetings. The quarterly expenditure reports will be provided according to the following schedule:

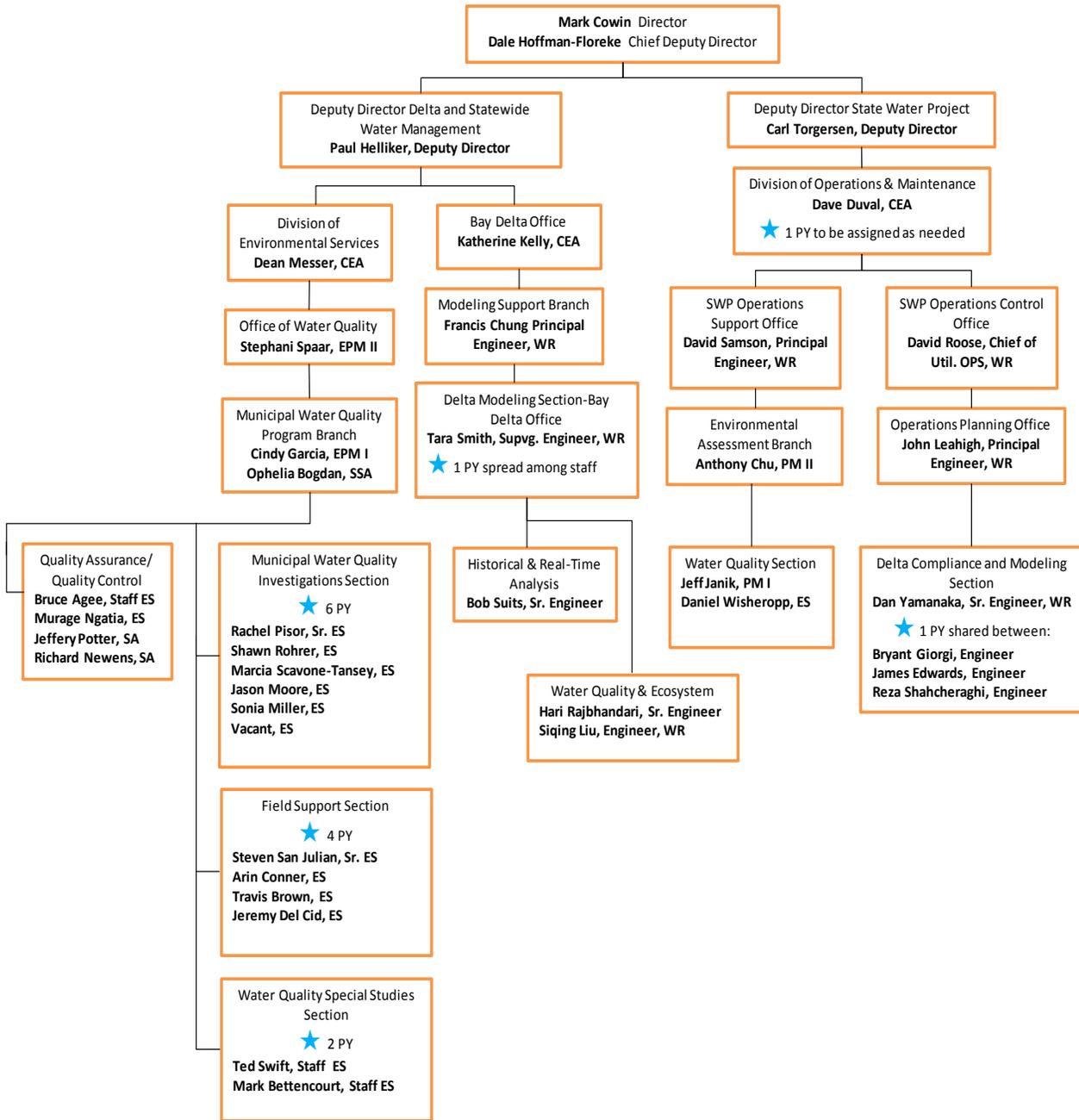
- First Quarter Report (July-September) is provided prior to the October TAC meeting
- Second-Quarter Report (October-December) is provided prior to the January TAC meeting
- Third-quarter Report (January-March) is provided prior to the April TAC meeting
- Fourth-Quarter Report (April-June) is provided prior to the July TAC meeting

Another expenditure previously mentioned in this work plan that is not assigned to specific program element is the project proposed by SWPCA entitled the Artificial Neural Network or ANN project. \$95,000 is budgeted to cover phase 1 of the development of the ANN model. This project has been split into two components: model development is the first phase and the second phase of spill modeling will be considered after the model is developed. The MWQI Program is not responsible for directly tracking expenditures of the SWPCA Fund, but Program staff will work directly with SWPCA staff to obtain the expenditure amounts periodically and will include these amounts in the quarterly expenditure reports provided prior to the TAC meetings.

On occasion, if the MWQI Program needs additional water quality monitoring equipment, laboratory services, or technical support from consulting services Program management staff will discuss the need for these types of additional services with the SWPCA Consultant and the MWQI-SPC. The cost of additional services will also be tracked and reported in the quarterly expenditure reports.

# 12. ORGANIZATION CHART

Org Chart effective 7/1/2013 of MWQI Funded Positions in The Department of Water Resources



**JOB TITLE ABBREVIATIONS**  
 CEA: Career Executive Appointment  
 ES: Environmental Scientist  
 Staff ES: 2nd level Environmental Scientist  
 WR: Water Resource  
 EPM: Environmental Program Manager  
 PM: Program Manager  
 SSA: Staff Services Analyst  
 SA: Scientific Aide

★ Indicates position(s) funded by the MWQI Program.  
 The two positions in the Division of O&M and the one position in the Bay Delta Office were among the seven new positions added to carry out the RTDF Comprehensive Program when the MWQI Program expanded in 2007/2008.

## 13. GLOSSARY OF ACRONYMS AND TERMS

<u>ANN</u>	<u>Artificial Neural Network</u>
<u>AMS</u>	<u>Accelerated Mass Spectrometry</u>
<u>BCP</u>	<u>Budget Change Proposal</u>
<u>BDCP</u>	<u>Bay Delta Conservation Plan</u>
<u>BDO</u>	<u>Bay Delta Office</u>
<u>BMP</u>	<u>Best Management Practices</u>
<u>Br</u>	<u>Bromide</u>
<u>Ca</u>	<u>Calcium</u>
<u>CBDA</u>	<u>California Bay Delta Authority</u>
<u>CBOD</u>	<u>Chemical Biological Oxygen Demand</u>
<u>CCWD</u>	<u>Contra Costa Water District</u>
<u>CDEC</u>	<u>California Data Exchange Center</u>
<u>CDPH</u>	<u>California Department of Public Health</u>
<u>CIWQS</u>	<u>California Integrated Water Quality System</u>
<u>CUWA</u>	<u>California Urban Water Agencies</u>
<u>CVP</u>	<u>Central Valley Project</u>
<u>CVDWPWG</u>	<u>Central Valley Drinking Water Policy Work Group</u>
<u>CWQMC</u>	<u>California Water Quality Monitoring Council</u>
<u>DBP</u>	<u>Disinfection by-product</u>
<u>DDT</u>	<u>Dichloro-Diphenyl-Trichloroethane (insecticide)</u>
<u>DES</u>	<u>Division of Environmental Services</u>
<u>DFG</u>	<u>California Department of Fish and Game</u>
<u>DMC</u>	<u>Delta-Mendota Canal</u>
<u>DO</u>	<u>Disolved Oxygen</u>
<u>DOC</u>	<u>Dissolved Organic Carbon</u>
<u>DOE</u>	<u>DWR Division of Engineering</u>
<u>DSIWM</u>	<u>Division of Statewide Integrated Water Management</u>
<u>DSM2</u>	<u>Delta Simulation Model 2</u>
<u>DWR</u>	<u>California Department of Water Resources</u>
<u>DWR EMC</u>	<u>Department of Water Resources Emergency Management Committee</u>
<u>EEM</u>	<u>Excitation-Emission Matrix</u>
<u>EC</u>	<u>Specific Electric Conductivity</u>
<u>EPA</u>	<u>U.S. Environmental Protection Agency</u>
<u>FDOM</u>	<u>Fluorescence of Dissolved Organic Matter</u>
<u>FRPA</u>	<u>Fish Restoration Program Agreement</u>

FSR Feasibility Status Report, used in information technology planning

FY Fiscal Year

GC-MS Gas Chromatography Mass Spectrophotometer

GIS Geographic Information System

HAA Haloacetic Acid

HAAFP Haloacetic Acid Formation Potential

IC Ion Chromatography, Inorganic Carbon (e.g., dissolved carbon dioxide)

IEP Interagency Ecological Program

IO Internal Order number

IT Information Technology

KHP Potassium hydrogen phthalate

LC-MS Liquid Chromatography Mass Spectrometry

MEO Mobile Equipment Operations

MWDSC Metropolitan Water District of Southern California

MGD Million Gallons per Day

MWDSC Metropolitan Water District of Southern California

MWQI Municipal Water Quality Investigations

MWQI-SPC Municipal Water Quality Investigations Specific Projects Committee

Na Sodium

NALMS North American Lake Managment Society

NEMDC Natomas East Main Drainage Canal

NDBA N-nitroso-di-n-butylamine

NDMA N-nitroso-dimethylamine

NDPA N-nitroso-di-n-propylamine

NHD National Hydrography Dataset

NMEA N-nitroso-methylethylamine

NMOR N-nitrosomorpholine

NPDES Non-Point Discharge Elimination System

NPYR N-nitroso-pyrrolidine

NMR Nuclear Magnetic Resonance (analysis)

O&M Department of Water Resources Division of Operations and Maintenance

O&M WQ Division of Operations and Maintenance Water Quality Section

OC Organic carbon

OCO Operation Controls Office (DWR O&M)

OEE Operating Expenses and Equipment

QA/QC Quality Assurance/Quality Control

P/G Pumping/Generation

PCB polychlorinated byphenyls  
PY Person Year  
QA/QC Quality Assurance, Quality Control  
QC Quality Control  
RTD Real-time Data  
RTDF Real-time Data and Forecasting Program  
RTDF-CP Real-time Data and Forecasting – Comprehensive Program  
RTM Real Time Monitoring  
SBA South Bay Aqueduct  
SCWA Solano County Water Agency  
SDIP South Delta Improvement Program  
SLDMWA San Luis Delta Mendota Water Authority  
SOP Standard Operating Procedure  
SPC Specific Project Committee  
SUVA Specific ultraviolet absorbance  
SWC State Water Contractors  
SWP State Water Project  
SWPCA State Water Project Contractors Authority  
SS Sanitary Survey Update  
TAC Technical Advisory Committee  
TBD To Be Determined  
TDS Total Dissolved Solids  
THM Trihalomethane  
THMFP Trihalomethane formation potential  
TKN Total Kjeldahl Nitrogen  
TMDL Total Maximum Daily Load  
TNC The Nature Conservancy  
TOC Total (dissolved and suspended particulate) organic carbon  
UCD University of California at Davis  
USBR U.S. Bureau of Reclamation  
USGS United States Geological Survey  
UVA *n* Ultraviolet absorbance at wavelength *n*  
VAMP Vernalis Adaptive Management Program  
WARMF Watershed Analysis Risk Management Framework  
WDL California Water Data Library  
WWTP Waste Water Treatment Plants