
# Municipal Water Quality Investigations Program
# 2010-2011 Workplan

**5/6/10**
**Final**

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# 1 Potential Municipal Water Quality Investigations Program Impacts Associated with the State's Budget Crisis

At the time of this workplan's approval, the Governor, the State Legislature and the State Employee Unions had not finalized a new contract for Environmental Scientists or a State budget for Fiscal Year (FY) 2010-2011. Given the volatility of contract and budget negotiations, this workplan approaches staffing resources conservatively. This section identifies the Municipal Water Quality Investigation Program's (MWQI) core elements that will be maintained as planned during this FY and program elements that could either be delayed or eliminated depending on how the State's 10-11 budget impacts State workers and the Department. To accommodate any reductions in staff resources and to meet routine and unforeseen demands of core Program elements, staff resources will potentially be shifted away from new program elements (as needed). Staff time may also become limited to participate in multiple meetings (both MWQI and outside agencies) and to attend non-mandatory training and conferences.

MWQI core elements that will receive the highest priority during the term of this workplan include;

a) Water quality monitoring (both real time and discrete) at existing stations and sites.
b) Modeling duties associated with real time forecasting used in the Real Time Daily Forecasting (RTDF) daily and weekly reports.
c) Production and dissemination of daily and weekly RTDF reports.
d) Data management activities pertaining to database infrastructure enhancement and development to improve long term storage and retrieval of RTDF data.
e) Program management activities listed in the MWQI funding agreement and those mandated by DWR required for health and safety of MWQI staff. This includes monthly MWQI TAC meetings and quarterly budget updates.
f) Other required Program activities that are mandated by DWR and/or essential to the MWQI Program (i.e. training, specific meetings and conferences, purchasing, contracts, budgeting, etc).
g) Special studies that are fully developed, already underway, or that only require minimal staff time in the office to complete the initial phase. These studies will continue as planned unless it becomes apparent that additional staff resources are needed for monitoring, forecasting and reporting tasks. Adjustments to timelines will be made to accommodate delays as opposed to eliminating studies.

Work on specific program elements and/or tasks that could be delayed pending budget negotiations and/or potential extension of furloughs include:

a) Report production deadlines and timelines associated with some tasks.
b) Proposed installation of the new real time water quality station at the Gianelli plant.
c) Completion of final SOP document for MWQI real-time water quality monitoring.
d) Cross-training of MWQI staff on modeling and GIS functions.
e) Delay of RTDF data management tasks when assistance is needed from either Division of Technology Services or MWQI staff. The MWQI Data Management Consultant (Dennis Huff) can continue to work regularly scheduled hours.
f) If needed, implementation of special studies will be delayed to accommodate core Program elements.
g) Implementation of recommendations in the MWQI Emergency Response document will be delayed based on the timing of input from various DWR groups and the requirement of DWR Executive Management review and approval.
h) To ensure that core functions are not affected, staff may curtail participation in MWQI related meetings.
i) Annual meetings may be limited to one, or eliminated with the consent of the MWQI TAC, if needed.

# 2 MISSION STATEMENT

The mission of the Municipal Water Quality Investigations Program (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 DWR, the State Water Project Contractors Authority-MWQI Specific Project Committee (SPC), CALFED, and other governmental entities.

**MWQI Core Competencies**

- Continuous long-term water quality monitoring (grab samples) in the Delta.
- Real time water quality monitoring (automated, high frequency data collection stations) in the Delta.
- Scientific support on Delta and SWP drinking water issues.
- Analysis of Delta drinking water quality monitoring data.
- Primary source of Delta drinking water quality historical data.
- SWP drinking water quality early warning (RTDF-CP).
- SWP drinking water quality forecasting (RTDF-CP).
- Provide drinking water quality support (data, expertise) to CALFED and other agencies.

**Customers/Regulators utilizing MWQI Program data**

- State government
- CALFED
- Central Valley Regional Water Quality Control Board
- CDPH
- US EPA
- State Water Project Contractors Authority-MWQI Specific Project Committee
- Contra Costa Water District
- DWR's Operation Control Office
- DWR's Bay Delta Office

# 3 INTRODUCTION

## 3.1 Background and Workplan Structure

This is a workplan for work to be performed under the California Department of Water Resources (DWR) Municipal Water Quality Investigations Program (MWQI) for the FY 2010-11 (July 1, 2010 to June 30, 2011). The total MWQI Program budget for FY 2010 -11 is $3.1 million. Of this total, $2.9 million is allocated directly to the MWQI Program and $200,000 is kept as part of the State Water Project Contractors Authority (SWPCA), MWQI-SPC fund to cover consultants and other expenses.

The contract agreement between MWQI, SWPCA and the 16 State Water Project (SWP) contractors who purvey drinking water expires December 2010. It is anticipated that this agreement will be renewed in this workplan cycle. Until that time, work performed under this workplan will be performed under the 2008-2010 MWQI Agreement between DWR, SWPCA, and the 16 SWP contractors. Under this current agreement, work to be performed is identified, prioritized, and approved annually by the MWQI Technical Advisory Committee (MWQI TAC). The TAC is composed of technical representatives of the participating SWC contractors, DWR, SWPCA, Contra Costa Water District, which is an invited participant associated with the TAC, and other invited members of outside agencies. Approval of the annual workplan is provided by "voting members" of the MWQI TAC, which include DWR and the 16 SWP contractors and constitutes a commitment of funding to the planned work. Some of the tasks outlined in the annual workplan may be completed using funds from a supplemental account provided under the MWQI Agreement and managed by SWPCA. Expenditures using this fund are approved annually by the MWQI SPC, which is made-up of representatives from 15 of the 16 participating SWP contractors. Representatives serving on the MWQI-SPC can differ from those serving on the MWQI TAC.

This workplan continues the format agreed between DWR and the MWQI SPC. Budget information for FY 2010-11 in section 4 is followed by the workplan elements in the MWQI program. These elements are:

- Water Quality Assessment
- The Real Time Data and Forecasting Comprehensive Program (RTDF-CP) which includes
    - Real Time Water Quality Monitoring
    - Real Time Forecasting
    - Real Time Data Dissemination

- Special Studies
- Emergency Response
- Other Water Quality Program Related Activities
- Program Management
- Other Required Program Costs

Detailed deliverables are provided for each workplan element along with estimated start and completion dates and the lead organization. Many of the workplan elements either incorporate or overlap with high priority action items identified in the 2006 Sanitary Survey Update. Some of the tasks identified in the 2006 Sanitary Survey Update are associated with groups outside of MWQI. These tasks are included in this workplan under RTDF-CP Sections 6.1.1 to help gauge their progress (for example pump-in activities in the SWP, or streamlining equipment throughout the department), but they are not necessarily related managerially to the MWQI program. Unless there is a direct connection to the MWQI program through BCP positions, accomplishments associated with these projects are as a result of the ongoing efforts of the group outside of MWQI.

In addition to the workplan, a series of stand alone appendices complement the workplan by providing more in-depth information. These appendices include:

- a Gantt chart detailing the tasks and timelines associated with the RTDF forecasting section of the RTDF-CP. (Appendix 1)

- detailed information on MWQI Special Studies (Appendix 2)

- brief summaries of completed, ongoing, and potential near and long-term projects for the MWQI program and SWPCA (Appendix 3)

- detailed information on the history of the MWQI program (Appendix 4);

These appendices allow interested parties to learn more about other aspects of the program while keeping the basic workplan document concise.

## 3.2 Program Accomplishments

Although, the previous FY was challenging, due to a 15% reduction in staff time, the MWQI Program has accomplished a number of goals listed in the FY 2009-10 workplan. These include:

- Production of a web-based, daily water quality summary report. This accomplishment allows contractors and interested parties to quickly and easily identify daily changes to water quality at key points in the Delta and Delta diversion points. This is a significant step forward towards providing contractors with the early warning system envisioned in the RTDF component of MWQI's 5 year Strategic Plan.
- Implementation of the Aqueduct model to provide seasonal forecasts.
- Completion of a multi-year management plan for the forecasting component of the RTDF program.
- Completion of DOC sampling for the DSM2 Boundary Improvement/Model Calibration special study.
- Completion by June 2010 of the 2007-2009 MWQI Biennial Report.
- Completion by June 2010 of SWP particle tracking study.
- Initiation of sample collection of urban discharge into the San Joaquin River.
- Presentation of N-nitrosodimethyamine results at an international Gordon Conference on disinfection byproducts.

## 3.3 Changes/Updates From the 2009-10 Workplan

The MWQI workplan continues to evolve to meet the changing water quality, regulatory, and State budget landscape. In this workplan cycle, a number of projects are ongoing and continue forward from the FY 2009-10 workplan. These include many of the tasks associated with the RTDF-CP as well as several special studies. Changes from the last workplan or changes approved in monthly MWQI TAC meetings include:

- Initiation of a search for a consultant to prepare the 2006-10 State Water Project Sanitary Survey update. MWQI to serve as the contract manager. All funding and contracting to go through MWQI.
- Initiate discussion regarding modification of the approach for future Sanitary Surveys from a 5 year retrospective on water quality to a yearly report focusing on one or two issues. This approach would be dependent on CA DPH and MWQI SPC approval and would be considered if it is a cost effective approach. Note that a summation and retrospective look of water quality to be produced every $5^{th}$ year.
- Approval by the MWQI TAC to continue the NDMA special study for another 2 years and add Cryptosporidium and Giardia monitoring.

- Approval by the MWQI TAC to begin a special study sampling the upper Sacramento watershed to provide DOC and other needed monitoring data for the Watershed Assessment Regional Monitoring and Forecasting Project (WARMF model).
- Purchase and installation of a Metrohm anion analyzer at the Jones Pumping Plant.
- Purchase of a new Siever's oxidation unit and trade-in of old model no longer supported.
- Approval by the MWQI TAC to discontinue THMFP/HAAFP by DWR modified method and analyze future samples via contract labs using Standard Method 5710B, however decision made to run a comparison study between the 2 methods for THM /HAA samples collected in Lathrop urban runoff study and potentially at selected sites in the Delta.
- Approval by the MWQI TAC to discontinue Bryte laboratory organic carbon combustion analyses.
- Removal of long-term trends analysis of EC from the 2009-10 Workplan. The MWQI TAC determined that, if necessary, enough EC data exists for modelers to provide this information.
- Removal of long-term trends analysis of nutrients from the 2009-10 Workplan. Although still important, the MWQI TAC determined that other special studies took precedence.
- Removal of dual-conveyance special study from the 2009-10 Workplan. Although still important, the MWQI TAC approved delaying this study until the alternate conveyance options are more clearly defined.
- Resumption of Gianelli station feasibility analysis. In FY 09-10, the O&M WQ BCP position was vacant for 6 months. In January 2010 this position was filled and tasked with assessing the feasibility of installing a station at the Gianelli Pumping/Generating Plant.
- Removal of the salinity discharge into the Old River special study from the 2010-11 Workplan. O&M WQ has assumed full responsibility for this study which complements their earlier salinity source water investigations in the South Delta.

# 4 PROGRAM FUNDING NEEDS

## 4.1 MWQI and SWPCA Funds

For Fiscal Year 2010/011, the MWQI Program Budget is $3.1 M. Funding is subdivided into a $2,900,000 MWQI DWR baseline budget and a $200,000 SWPCA managed fund. The $2,900,000 fund covers MWQI staff salaries, benefits, DWR operating expenditures, etc. The $200,000 SWPCA fund is used to acquire student assistants, hire consultants, and to purchase certain goods and services deemed necessary and desirable for station operation by both the MWQI TAC and the Specific Projects Committee. The MWQI baseline budgets are shown in Table 1.

In this FY, a consultant will be hired to complete the 2006-2010 SWP Sanitary Survey Update. Tentatively $250,000 will be used to cover consultant costs to produce the Update. This will leave an unallocated reserve of $122,655to cover unanticipated equipment costs, etc.

For FY 10-11, there are no grant funds tied to other agencies. A no cost extension has been created for the contract between the MWQI Program and the San Luis Delta Mendota Water Authority for supplemental support of the MWQI water quality monitoring equipment installed at the Jones Pumping Plant.

The FY 10/11 MWQI and SWPCA budget is presented below in Table 1 followed by an explanation of SWPCA expenditures.

# Table 1. Program Element Costs FY 2010-11 (MWQI and SWPCA Funds)

| | | MWQI Baseline Funding | | | | | | SWPCA Funding | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **No** | **Workplan Program Element** | ‡Labor PY's | ‡Labor Hours | Labor Cost | Contract/ Other Cost | Supplies/ Equip Cost | Total Cost | Labor PY's | Labor Hours | Labor Cost | Contract/ Other Cost | Supplies/ Equip Cost | Other Cost | Total Cost |
| 5 | **Water Quality Assessment** | | | | | | | | | | | | | |
| | Grab Samples Collection | 0.75 | 1,334 | $89,933 | | $139,380 | $229,313 | 0.5 | 600.5 | $9,608 | | | | $9,608 |
| 6.1 | **RTDF Monitoring-Real Time Instruments** | | | | | | | | | | | | | |
| | MWQI Real Time Stations | 1.35 | 2,400 | $182,610 | *$8,600 | $60,900 | $252,110 | 0.5 | 600.5 | $9,608 | | | | $9,608 |
| | Field Unit Office Duties | 1.2 | 2,134 | $153,865 | | $8,500 | $162,365 | | | | | | | |
| | Gianelli Feasibility Study | 0.5 | 889 | $52,029 | | $50,000 | $102,029 | | | | | | | |
| | O&M WQ other duties | 0.1 | 178 | $10,406 | | | $10,406 | | | | | | | |
| 6.2 | **Real Time Forecasting** | | | | | | | | | | | | | |
| | BDO | 1 | 1,778 | $180,418 | | | $180,418 | | | | | | | |
| | OCO | 1 | 1,778 | $201,821 | | | $201,821 | | | | | | | |
| | MWQI | 1.25 | 2,223 | $156,811 | | | $156,811 | 0.5 | 600.5 | $9,608 | | | | $9,608 |
| 6.3 | **Real Time Data Dissemination** | | | | | | | | | | | | | |
| | RTDF Data Dissemination and Reporting | 0.2 | 356 | $27,162 | | $7,100 | $34,262 | | | | | | | |
| | Administration & Database Activities | | | | | | | 1 | 1,778 | $62,400 | | | | $62,400 |
| 7 | **Special Studies** | | | | | | | | | | | | | |
| 7.1 | Urban Sources and Loads | 1.1 | 1,956 | $129,211 | | $64,205 | $193,416 | 0.5 | 600.5 | $9,608 | | | | $9,608 |
| 7.2 | NDMA/Crypto/Giardia Study | 0.9 | 1,600 | $109,194 | | $31,960 | $141,154 | | | | | | | |
| 7.3 | O'Neill Forebay Circulation Study | 0.85 | 1,511 | $104,891 | | $7,000 | $111,891 | | | | | | | |
| 7.4 | Update of Water Quality Compendium | 0.05 | 89 | $5,248 | | | $5,248 | | | | | | | |
| 7.5 | Spectrofluorometry Study | 0.55 | 978 | $91,201 | | $20,000 | $111,201 | 1 | 100 | $6,000 | | | | $6,000 |
| 7.6 | Sacramento WARMF Study | 0.6 | 1,067 | $59,188 | | $2,000 | $61,188 | | | | | | | |
| 7.7 | Portable Water Quality Study | 0.3 | 533 | $42,008 | | | $42,008 | | | | | | | |
| 7.8 | MWQI Summary Report | 0.7 | 1,245 | $70,205 | | | $70,205 | | | | | | | |
| 7.9 | Tidal Marsh Report | 0.25 | 445 | $22,037 | | | $22,037 | | | | | | | |
| 7.10 | 2006-2010 Sanitary Survey (contract & mgmnt) | 0.2 | 356 | $35,892 | $250,000 | | $285,892 | | | | | | | |
| 8 | **Emergency Response** | 0.25 | 445 | $25,394 | | | $25,394 | | | | | | | |
| 9 | **Other Water Quality Program Activities (CalFed, etc.)** | 0.2 | 356 | $21,246 | | | $21,246 | | | | | | | |
| 10 | **Program Management** | 1 | 1778 | $175,498 | | | $175,498 | 1 | | $71,600 | | | $3,000 | $74,600 |
| 11 | **Misc. Program Costs (TECs, training, MEO, IT, etc.)** | 0.5 | 889 | $62,432 | | $119,000 | $181,432 | | | | | | | |
| | | | | | | | | | | | | | | |
| | **Subtotal** | | | | $258,600 | $510,045 | **$2,777,345** | | | | | | | **$181,432** |
| | **Funds Not Assigned to Specific Program Element** | | | | | $122,655 | $122,655 | | | | | | $18,568 | $18,568 |
| | **TOTAL** | 14.8 | 26,314 | $2,008,700 | $258,600 | $632,700 | **$2,900,000** | 5 | 4,280 | $178,432 | | | $21,568 | **$200,000** |

‡All labor and salary calculations assume no furloughs in FY 10-11.

* Contract with San Luis Delta Mendota Water Authority at Jones PP.

**Specific tasks to be implemented using SWPCA Funds**

Program Element 5.1: Water Quality Assessment

a. Continue to employ student assistant for miscellaneous tasks. Annual cost for a student will be approximately **$9,608** and will utilize a new contract between the SWPCA and the CSUS Hornet Foundation.

Program Element 6.1: Real time monitoring

b. Continue to employ student assistant for miscellaneous tasks. Annual cost for a student will be approximately **$9,608** and will utilize a new contract between the SWPCA and the CSUS Hornet Foundation.

Program Element 6.2: Real time forecasting

c. Potentially employ student assistant for miscellaneous tasks. Annual cost for a student will be approximately **$9,608** and will utilize a new contract between the SWPCA and the CSUS Hornet Foundation.

Program Element 6.3: RTDF-CP Information Dissemination

d. Consultant's time to assist with continuing progress on the RTDF database, updating of the MWQI Website, assisting field staff with remote data relay and assisting with all areas of data management. Annual salary cost associated with this task is **$62,400**.

Program Element 7.1: Special Study-Urban Sources and Loads

e. Potentially employ student assistant for miscellaneous tasks. Annual cost for a student will be approximately **$9,608** and will utilize a new contract between the SWPCA and the CSUS Hornet Foundation.

Program Element 7.5: Spectrofluorometer Study

f. Consultant for special assignments such as assistance with spectrofluorometer study or collaboration on a paper assessing the impacts of agricultural conversion to urban land use using State island and NEMDC MWQI data. Annual salary cost associated with this task is **$6,000**.

Program Element 10: Program Management

g. Costs for semi-annual MWQI offsite meetings. Costs may include rental fees for facility, AV equipment and for technical assistance, refreshments, deposit for reserving dates and other miscellaneous meeting package elements. Estimated cost for offsite meeting is **$3,000.**

h. MWQI Technical Consultant to provide administrative and technical expertise on program tasks related to water quality assessment, RTDF-related activities, special studies, and serving as a member of the MWQI Technical Advisory Committee. Cost for FY 2010-11 is **$60,000**.

i. All other Program Management expenses including SWC staff services, travel and meetings, Legal, and misc. expenses. Annual cost associated with these functions are: **$11,600**

# PROGRAM ELEMENTS
# 5 WATER QUALITY ASSESSMENT

Water quality monitoring has been a key feature of the MWQI Program since its inception in 1982. Data from the Program are used extensively by DWR, State Water Project Urban Contractors, non-governmental organizations, the public, and numerous other federal, State, and local agencies, for drinking water supply planning studies. Data from this program are used to identify long-term trends of drinking water quality changes 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. In collaboration with the Department's Bay Delta Office (BDO), and DWR's Division of Operations and Maintenance, Operation Control Office (OCO), monitoring data from the Delta and California Aqueduct are being used to develop an "early warning" system having the potential to provide advance notice to Delta water users of possible drinking water quality problems.

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 FY 2010-11. Section 6.1 focuses on continuous remote real-time instrumentation monitoring.

## 5.1 Discrete Sample Collection and Analysis

The MWQI program currently collects monthly grab samples from 12 sites within the Delta. Table 2 summarizes locations, water quality parameters, and frequencies, while Figure 1 presents a map of all (grab and real time) sampling sites for the FY 2010-11 workplan period. Location, frequency, and analytes are unchanged from those listed in the FY 2009-10 workplan. In addition to monthly sampling, at the Banks Pumping Plant, Jones Pumping Plant, and the Hood and Vernalis stations, grab samples are collected bi-weekly as part of real-time instrument calibration and internal QA/QC.

This workplan element also includes a year long comparison study between trihalomethane and haloacetic acid formation potential (THMFP and HAAFP, respectively) methodologies. Since the Department's Bryte Laboratory is no longer providing the analytical support for THMFP and HAAFP analyses, it will be important to compare methods to determine if a relationship exists between the old and new methods. Samples will be collected at several key locations and analyzed for THMFPs and HAAFPs using DWR's

modified method and Standard Methods 5710B (also modified by first filtering the sample). If a robust relationship between the 2 methods exists, then MWQI's historical formation potential data can still be used to examine changes in FP over time and reasonably be used in conjunction with data collected in the future.

**Table 2. MWQI Discrete Sampling: stations, parameters, and frequency**

| Station # | Stations | WDL Stations (ID) | Analytes Collected | Frequency |
|---|---|---|---|---|
| 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 EA Fairbairn WTP Intake | American River W.T.P. (A0714010) | Std. Mineral, nutrients, TOC, DOC, UVA, turbidity, and bromide | 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 | Monthly |
| 4 | Sacramento River at Hood | Sacramento R A Hood (B9D82211312) | Std. Mineral, nutrients, TOC, DOC, UVA, turbidity, and bromide | Bi-weekly |
| 5 | Sacramento River at Mallard Island | Sacramento River @ Mallard Island (E0B80261551) | Std. Mineral, nutrients, TOC, DOC, UVA, turbidity, and bromide | Monthly |
| 6 | San Joaquin River near Vernalis | San Joaquin R. nr. Vernalis (B0702000) | Std. Mineral, nutrients, TOC, DOC, UVA, turbidity, and bromide | Bi-weekly |
| 7 | Old River at Bacon Island | Old River at Bacon Island (B9D75811344) | Std. Mineral, nutrients, TOC, DOC, UVA, turbidity, and bromide | Monthly |
| 8 | Old River near Byron Tract | Old R. nr. Bryon (st9) (Near HWY 4 Bridge) (B9D75351342) | Std. Mineral, nutrients, TOC, DOC, UVA, turbidity, and bromide | Monthly |
| 9 | ‡ Banks Pumping Plant at Headworks | Delta P.P. Headworks at H.O. Banks PP (KA000331) | Std. Mineral, Turbidity, UVA, TOC, DOC, Bromide, Total Phosphorous, Suspended Solids, Phytoplankton, Purgeable Organics, Taste and Odor, Asbestos, and Radiological, Pesticides and herbicides. | Depending on analyte, Bi-weekly, Monthly, or Quarterly |
| 10 | Contra Costa at Rock Slough | Contra Costa @ Rock Slough (B9D75861368) | 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 | Monthly |
| 12 | Jones Pumping Plant at DMC and at DMC Headworks | Canal Water Delivery in WQ Cage in Jones PP (B9C74781352) | Anions, TOC, DOC | Bi-weekly |

‡ Samples collected by DWR's Operations and Maintenance (O&M)

Figure 1. MWQI Discrete ("Grab") & Real time Sampling Locations, FY 2010-11

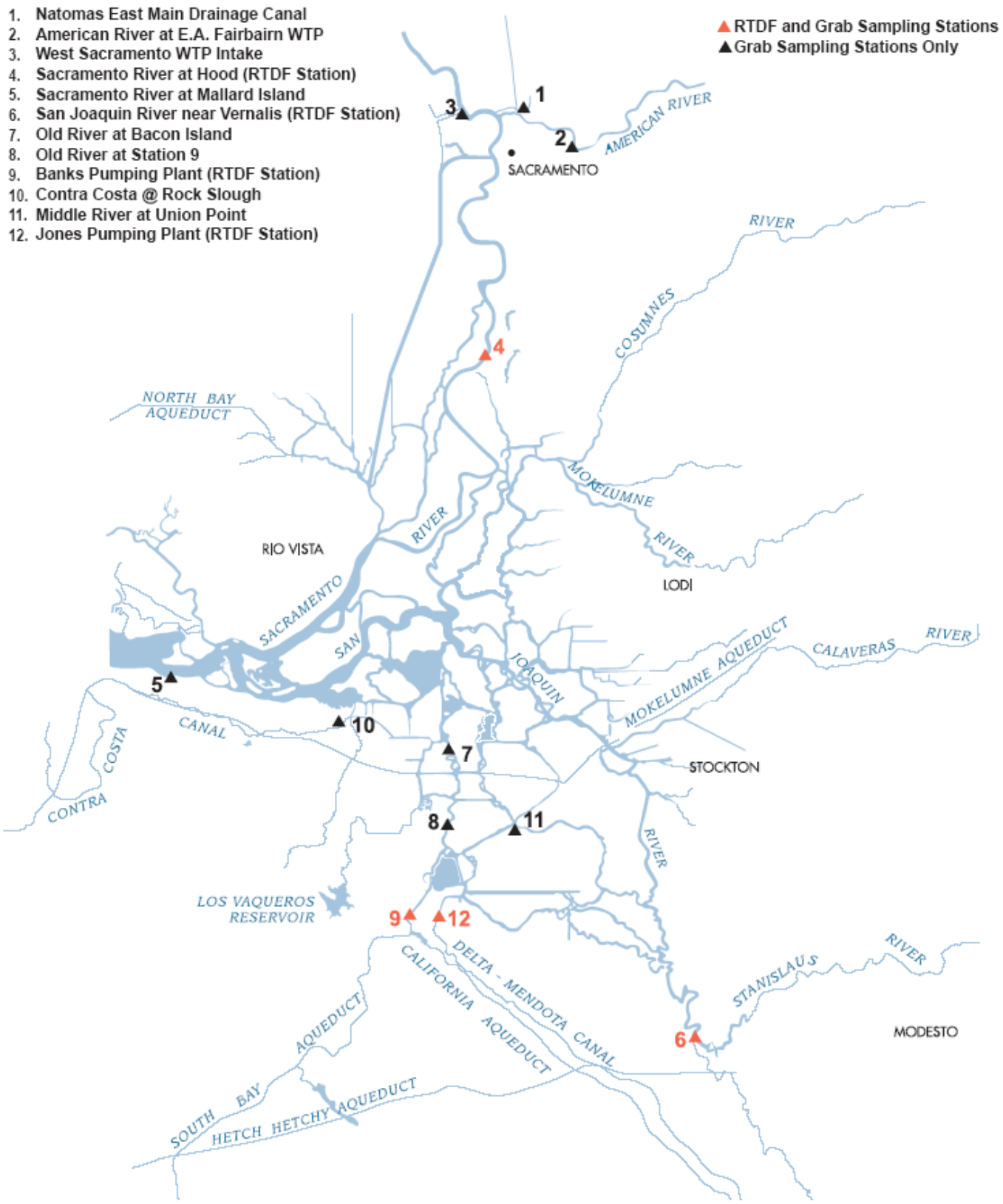


**Table 3. Discrete Grab Sample Deliverables and Timelines**

Discrete grab sample tasks and deliverables are:

| Deliverable | Participants | Estimated Start Date | Estimated Completion Date |
|---|---|---|---|
| Records of monthly and bi-weekly, monitoring data. | **MWQI** | na | Currently available upon request |
| Records of periodic calibration of field monitoring equipment | **MWQI** | na | Currently available upon request |
| Records demonstrating consistent and timely application of QA/QC procedures | **MWQI** | na | Currently available upon request |
| Timely analysis and posting of results to the Water Data Library | **MWQI** | na | Monthly Available on-line |

na = not applicable or available

# 6 REAL TIME DATA AND FORECASTING COMPREHENSIVE PROGRAM

The RTDF-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 upcoming 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 Delta Mendota Water Authority (SLDMWA).

The RTDF-CP consists of:

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 workplan.

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

In December 2009, the MWQI program reached an important RTDF goal, publishing daily web-based summaries of water quality and flow at key locations in the Delta. This is a significant milestone toward providing an early warning forecasting system for water quality. At this point, the RTDF program has in place both a robust real-time monitoring system and a data dissemination platform that automates data retrieval and data posting on MWQI's website. With these two components functioning fairly efficiently, the next step is to couple daily summaries of water quality and flow with modeling to provide the early warning system envisioned in the 5-year strategic plan. Although still requiring several years of

development, the capability being built to enable on-demand short term forecasts of Aqueduct water quality should provide the ability to provide weekly forecasts, or if needed, daily forecasts.

## 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 managing 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 urban SWP 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) field operations which ensures proper operation and maintenance of all automated sampling equipment, b) the timely transmission of real-time data, c) the documentation of Standard Operating Procedures, and d) the implementation and documentation of QA/QC of the data. Table 3 summarizes station locations, water quality parameters, and automated analyzer equipment used by the MWQI Real time Monitoring Program. Figure 1 shows the location of real-time monitoring stations.

Deliverables in the FY 2009-10 workplan focused on efficient operation of existing water quality monitoring sites and refining the operation of the newly installed Jones Pumping Plant (PP) real time instrumentation. This workplan continues that goal. With real-time stations located at Hood, Vernalis, Banks, and the Jones PP, one of the main objectives of the RTDF-CP is to have organic carbon data available to determine baseline concentrations, timing, and loading values of water entering the Delta and the State Water Project. The ultimate goal is to achieve similar results for anions, specifically bromide and nutrients. Progress on this front had been sidelined by the limited availability of instruments. In December 2009, a new anion analyzer was identified (Metrohm). Based on the recommendations of the New Technologies Subcommittee, this anion analyzer has been purchased and will be installed this FY at the Jones Pumping Plant.

In addition to increasing real-time monitoring capabilities at the Jones PP, in FY 2009-10, the BCP vacancy in the O & M WQ section, slowed investigation into installation issues associated with a water quality station at the William R. Gianelli Pumping Generating Plant (Gianelli). In January 2010, however, a new staff person was hired in O& M WQ. With this vacancy filled, it is anticipated that

significant progress will be made towards determining the feasibility of installing a water quality monitoring station at Gianelli.

The draft report on long-term trends of organic carbon and bromide data will be finished in FY 2010-11. Staff will also focus on publishing this data so the results are available to a wider audience. The MWQI TAC recommended that similar long-term trend reports outlined in the 2009-10 workplan on nutrients and EC be postponed in lieu of higher priority special studies (in the case of nutrients) or removed completely for consideration in future workplans due to modeling capabilities that can provide similar information (in the case of EC). Therefore, neither of these studies are included in this workplan.

As mentioned previously in section 3.1, some of the tasks associated with the 2006 Sanitary Survey Update are associated with groups outside of MWQI. These tasks are included in this workplan as a guide to their progress but are not related managerially to the 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 BCP positions, accomplishments associated with these projects are as a result of the ongoing efforts of the group outside of MWQI.

**Table 4. MWQI Real Time Sampling: station location, parameters, and equipment**

| Station | Parameters | Equipment |
|---|---|---|
| Sacramento River at Hood (HOOD) | TOC, DOC | Shimadzu 4100 – (combustion)<br>Sievers 900 – (oxidation) |
| San Joaquin River near Vernalis (VERNALIS) | TOC, DOC, bromide, chloride, nitrate, sulfate, fluoride | Shimadzu 4110 – (combustion)<br>Dionex DX 800 – (anions) |
| Delta P.P. Headworks (BANKS) | TOC, DOC, bromide, chloride, nitrate, sulfate, fluoride | Shimadzu 4100 – (combustion)<br>Dionex DX 800 – (anions) |
| Jones Pumping Plan(JONES) | TOC, DOC | Shimadzu 4100 – (combustion) |

**Table 5. Real Time Monitoring Deliverables and Timelines**

(Lead organization(s) are shown in bold)

| Deliverable | Participants | Estimated Start Date | Estimated Completion Date |
|---|---|---|---|
| Continue operation of automated stations at Hood, Banks, Jones and Vernalis & identify critical data gaps. | **MWQI** | na | Ongoing |
| Installation of a Metrohm anion analyzer at Jones PP. | **MWQI** | July 2010 | October 2010 |
| **A)** Development of SOPs documenting maintenance, operation and quality assurance/quality control of all in-situ equipment.<br><br>**B)** Work towards standardizing, streamlining, and consolidating DWR's in-situ: equipment, data quality control, and data dissemination. | **MWQI/ O&M Water Quality (SS)**<br><br>**b) MWQI O&M Water Quality (SS)** DPLA IEP | July 2008<br><br>July 2008 | **A)** MWQI drafts completed June 2009. Final documents available ~June 2010<br><br>**B)** Ongoing-Note that O&M has completed a datalogger upgrade project and MWQI's real-time instruments are unique to the Department. This task requires upper management support to direct water quality instrument uniformity across divisions. |
| As needed, advise SLDMWA staff on Shimadzu operation and refine instrument operations at Jones PP. | **MWQI/SLDMWA** | February 2009 | Ongoing . Finalized FY 2010-11 no cost extension of current contract. |
| Installation of real time monitoring instruments at DMC at McCabe Rd. (inlet to O'Neill Forebay). | MWQI | na | Identified by MWQI-TAC as having a low priority compared to Gianelli real-time station. Work on hold pending Gianelli's outcome. |
| Feasibility report on the installation of real time WQ stations at Gianelli plant.<br><br>**A)** Produce draft report on feasibility of installing a water | **O&M Water Quality**/SLFD/ MWQI | | **A)** August 2010 |

| | | | |
|---|---|---|---|
| quality station at Gianelli<br><br>**B)** Produce a final report on feasibility of installing a water quality station at Gianelli | | | **B)** June 2011 |
| Evaluate the need, and planning for, other installations per the RTDF-CP (together with RTDF Steering Committee). | **RTDF SC**<br>MWQI TAC | July 2008 | Ongoing |
| Provide readily accessible data and fill in TDS/EC data gaps on pump-in activities. | **O&M WQ (SS)** | July 2008 | Ongoing (TDS data posted on WDL for:<br>Check 13 = KA007089<br>Check 21 = KA017226<br>Check 23 = KA019705<br>Check 29 = KA024454<br>Check 39 = KA029021<br>Semi Tropic 2 = GKA02098<br>Semi Tropic 3 = GKA02070<br>CVC = GKA02380<br>Kern Water Bank Canal = GKA02382<br>Arvin Edison Canal = GKA02773), however see Cindy Garcia for current TDS status and sampling frequency by station. |
| Pursue alternative strategies for debris removal at Vernalis station. | **MWQI** | na | Low priority |
| Long term trends of organic carbon and bromide.<br>**A)** Produce DWR report on organic carbon and bromide LT trends<br><br>**B)** Submittal of organic carbon and bromide LT-trends report in peer reviewed journal | **MWQI** | **A)** April 2010<br><br>**B)** September 2010 | **A)** July 2010<br><br>**B)** Dependent on journal revisions. |
| Feasibility study on portable water quality station-see Special study 7.7 | **MWQI** | | |

na = not applicable or available

## 6.2 RTDF-CP-Water Quality Forecasting

Water quality monitoring provides information on current and past water quality conditions, however, it is of limited value for assessing the water quality effects of future, or proposed, changes in the Delta and

SWP. To enable future conditions to be forecasted and analyzed, this work plan element combines the use of monitoring data with mathematical modeling techniques to develop water quality forecasting tools.

MWQI collaborates with the OCO and the BDO to accomplish the RTDF-CP tasks described below. Objectives of this enhanced effort are to better incorporate Delta modeling needs in water quality monitoring and maximize the use of modeling results by water quality managers.

In FY 2009-10, one goal was to produce weekly DOC forecasts for the Delta and the Aqueduct, however achieving this was dependent on the development of the WARMF model by the California Urban Water Authority for the Sacramento River watershed upstream of the Delta. Due to State budget shortfalls, funding for the WARMF model was delayed. Additionally, throughout 2009, a series of meetings resulted in a multi-year flowchart encompassing many more tasks that those associated with the WARMF model.

The new tasks associated with this section are the culmination of an approximately 6 month effort by BDO, OCO, MWQI and interested contractors, to refine tasks and timelines associated with the modeling/forecasting component of the RTDF program process. This revision began soon after the adoption of the 2009-10 workplan. That workplan was adopted under the provision that forecasting tasks would be refined and prioritized. In December 2009, the RTDF steering committee and MWQI TAC approved a detailed Gantt chart consisting of tasks, critical paths, and estimated timelines. This Gantt chart and its prioritization of tasks represent a significant leap forward toward guiding modeling efforts over the next few years. The full Gantt chart is available in Appendix 1.

Development of improved modeling capabilities focused on four subject areas. As determined by the Gantt chart working group, the order of priority are:

- **Historical Simulations (1990-present)-** This requires collecting, processing and filling in missing flow data, water quality data, and data on project operations, running the simulation, 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 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.

Tasks within each of the above subject areas consists of a DSM2 Delta component and an Aqueduct component. Within each subarea, modeling capabilities are further subdivided into hydrology/hydraulics, EC, Br, and DOC (Table 6). Subject areas and subtasks were prioritized to provide at least minimal coverage or capability. The goal was to achieve working coverage under all subject headings, with refinement of coverage coming later. In most cases, priorities focus first on enabling modeling of Delta water quality (via DSM2), then on modeling Aqueduct water quality. With most subject areas, the ultimate goal is to link the Delta and Aqueduct models so that they can function together to provide water quality forecasts to the Contractors. 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 for forecasting purposes.

**Table 6. Example of two subject areas and associated subtasks.**
Note that a capability may already exist for some subareas.

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

In addition to the modeling component of the RTDF-forecasting section, MWQI's study examining travel time down the aqueduct was completed in 2009-10 (Smart Oranges study). Report findings are currently being finalized and will be available on the MWQI website when completed. This report will be used to refine assumptions associated with the Aqueduct model and will permit a better understanding of travel times of contaminants in the Aqueduct.

### 6.2.1 Water Quality Forecasting Deliverables and Timelines

Forecasting tasks for two of the four main subject areas are shown below in Tables 7-8. Per the Gantt chart, tasks associated with seasonal forecasts and planning studies are scheduled for future workplans. The group responsible for task completion is shown in bold after each task item. Note that tasks in this section require numerous steps and do not lend themselves to the task/deadline formats used in other sections of the workplan. For this workplan, tasks were taken directly from the Gantt chart in Appendix 1. The timelines in the Gantt chart result from identifying task interdependencies and the time required to complete various tasks. Although the group strove to identify dependencies and sequences correctly, actual time durations may still differ from Gantt chart estimates due to potential competition of staff time for tasks outside MWQI's control, etc.

## Table 7. Deliverables for Simulation of Historical Conditions, 1990 – present

| | Delta (DSM2) Component | Aqueduct Component |
|---|---|---|
| **Hydraulics** | Tasks either completed or not scheduled for this workplan cycle. | Assemble and synthesize data including system operations needed to conduct simulation of Aqueduct hydraulics for 1990 - present **(OCO)** |
| | | Conduct hydraulic simulation of historical Aqueduct hydraulics **(BDO)** |
| | | Assemble historical hydraulic data within Aqueduct system for validation **(OCO)** |
| | | Finalize simulation of historical Aqueduct hydraulics **(BDO)** |
| | | Document simulation of historical Aqueduct hydraulics, including validation **(BDO)** |
| **EC** | Tasks either completed or not scheduled for this workplan cycle. | Assemble and synthesize EC data as needed to define boundary conditions using field EC at Banks and Jones PP (MWQI) |
| | | Assemble measured data within the Aqueduct system for model validation **(MWQI)** |
| | | Produce DSM2 Aqueduct EC simulation for period 1990 to present using field EC at Banks and Jones PP **(BDO)** |
| | | Finalize historical simulation-phase 1 **(BDO)** |
| | | Document phase 1 simulation of historical EC, including validation **(BDO)** |
| | | Simulate Aqueduct EC using DSM2-simulated EC at Jones and Banks PP based on measured Delta boundary conditions **(BDO)** |
| | | Finalize historical simulation-phase 2 **(BDO)** |
| | | Document phase 2 simulation of historical EC, including validation of model **(BDO)** |
| **Bromide** | Assemble measured data at diversions and in-Delta locations **(MWQI)** | Assemble and synthesize bromide data as needed to define boundary condition, including measured or calculated bromide at Jones and Banks PP **(MWQI)** |
| | Calculate historical bromide based on EC simulation **(BDO)** | Assemble measured bromide data within Aqueduct system for validation **(MWQI)** |
| | Document validation of estimating bromide using simulated EC **(BDO)** | Produce DSM2 Aqueduct bromide simulation for period 1990 to present **(BDO)** |
| | Assemble and synthesize bromide data as necessary to define boundary conditions **(MWQI)** | Finalize historical simulation **(BDO)** |
| | | Document simulation of historical bromide, including validation **(BDO)** |
| **DOC** | Assemble DOC data to define boundary condition **(MWQI)** | Assemble and synthesize DOC data as needed to define boundary conditions, Including DOC at Jones and Banks PP **(MWQI)** |
| | Synthesize DOC data as needed to define boundary condition **(MWQI)** | Assemble historical DOC data within Aqueduct system for validation **(MWQI)** |
| | Assemble measured data at diversions and in-Delta locations for model validation **(MWQI)** | Develop ability to gather data for near immediate update of aqueduct conditions **(OCO)** |
| | Produce first DSM2 Delta DOC simulation for period 1990 to present **(BDO)** | |
| | Finalize historical simulation and document validation of simulation of DOC **(BDO)** | |

**Table 8. Deliverables for Short-Term Forecast of Water Quality Conditions**

| | Delta (DSM2) Component | Aqueduct Component |
|---|---|---|
| **Hydraulics** | Tasks either completed or not scheduled for this workplan cycle. | Tasks either completed or not scheduled for this workplan cycle. |
| **EC** | Tasks either completed or not scheduled for this workplan cycle. | Tasks either completed or not scheduled for this workplan cycle. |
| **Bromide** | Tasks either completed or not scheduled for this workplan cycle. | Develop and test methods to generate Aqueduct boundary bromide conditions other than Banks and Jones PP bromide, including pump-in bromide **(MWQI)** |
| **DOC** | Tasks either completed or not scheduled for this workplan cycle. | Develop methods to generate DOC conditions at other Delta boundaries **(BDO)** |

## 6.3 RTDF-CP-Information Management and Dissemination

This program element includes the information management and data dissemination tasks associated with grab sample and real time data. This program element involves the synthesis of real time data from a variety of federal, State and local agency water quality monitoring programs, rapid data quality control, analysis, and dissemination of results. For the Department, grab sample data is stored in the California Water Data Library (WDL) which encompasses DWR programs beyond MWQI (http://wdl.water.ca.gov/). The website is administered through DWR's Division of Planning and Local Assistance. Real time data from MWQI's real time monitoring stations are stored on a MWQI server and posted on DWR's California Data Exchange Center (CDEC) (http://cdec.water.ca.gov/), and the MWQI web site (http://water.ca.gov/waterquality/drinkingwater/rtdf_rprt.cfm).

Information management and dissemination tasks are associated with mechanisms that allow real time analytical data and modeled forecasting data to be packaged into a user friendly product. Tasks under this program element include: a) continued refinement of the California Water Data Library (i.e. fully accessible historical MWQI data, repository for O&M Water Quality and MWQI water quality data, and development of a web interface and interactive map for users), b) database management for delivery of real-time data, c) continued development and enhancement of online tools for evaluating and interpreting MWQI water quality data (scientific visualization), d) development of means to distribute daily and weekly water quality reports via the Internet, and e) database development for storage and management of real time data.

Many of the tasks associated with the 2009-10 workplan have been completed. For example, under improving and upgrading database infrastructure, completed tasks include:

- Migrating MWQI's access database to SQL server.
- Simplifying and consolidating organic carbon and anion databases into one database as well as simplifying and consolidating routine automated data transfer procedures,
- Completing the process of implementing adequate backup and restoration capabilities. Testing of these capabilities is scheduled for spring 2010.
- Enhancing database security.
- Adding error handling and logging procedures to routine, automated processes.
- Creating handling procedures for retention and archival data needs.

All tasks from the 2009-10 workplan, under the subheading-enhancing and improving water quality reports delivered to stakeholders have been completed. Completed tasks include:

- Migrating the weekly MWQI water quality report from a weekly email to a posting on its website.
- Completing all tasks associated with generating a daily water quality report posted to the MWQI website. Automatic, updated, daily water quality reports are now available on the MWQI website.
- Creation of a 1 page summary sheet useful to managers and others that provides a snapshot of water quality change at key points in the Delta and SWP. Daily, updated summary sheet available on the MWQI website.

Finally, a new real time data station (Jones PP) has been incorporated into CDEC and the daily/weekly report. As new stations are established, they will also be incorporated into the system.

Tasks and deadlines for the data dissemination portion of the RTDF program are shown below in Table 9

**Table 9. Information Management and Data Dissemination Deliverables and Timelines**
(Lead organization(s) are shown in bold)

| Task | Participants | Estimated Start Date | Estimated Completion Date |
|---|---|---|---|
| Import selected contract lab data into the WDL. | O & M WQ<br>Northern District<br>MWQI Program | July 2008 | For O& M,<br>June 2011. |
| Improve/Upgrade database infrastructure<br>This task includes:<br><br>**A**) Implement adequate backup and restoration capabilities, including testing of capabilities.<br>Note that most aspects of this task have been completed. Restoration capabilities have not been tested yet, but are in place.<br><br>**B)** Enhance routine, automated QA/QC processes to the database (takes the place of Aquarius).<br>Note that all screening tools have been completed, however | **MWQI Program** | **A)** January 2009<br><br>**B)** January 2009 | **A)** April 2010<br><br>**B)** Ongoing |

| | | | |
|---|---|---|---|
| calibration of the screening tool to our carbon and anion data is still needed.<br><br>**C)** Continue to develop desktop data management tools.<br><br>**D)** Document and maintain infrastructure. | | **C)** July 2008<br><br>**D)** July 2009 | **C)** Ongoing<br><br>**D)** Ongoing |
| Improve Field Data Communications. This task includes:<br><br>**A)** Work to eliminate use of Corsica and transfer its functions to Einstein/Heisenberg.<br><br>**B)** Enable internet connection with carbon analyzers at Banks and Vernalis. Assess the feasibility of using cellular (air card) internet connections with Hood and Jones rather than dial up. | **MWQI Program** | **A)** February 2009<br><br>**B)** May 2009 | **A)** Ongoing<br><br>**B)** Ongoing |
| Refine QA/QC post processing capabilities using Aquarius software | **MWQI Program** | na | Ongoing |
| Provide timely access to current QA/QC'd SWP operations data i.e. conduct QA/QC on historical data and remove inconsistencies and gaps. | **OCO**/Office of Reconciliations | na | Ongoing |
| Incorporation of data from new stations or new instruments at existing stations into CDEC and weekly report. | **MWQI Program** | na | Ongoing as needed |

na = not applicable or available

# 7 SCIENCE SUPPORT (SPECIAL STUDIES)

The many natural and anthropogenic processes that affect drinking water quality in the Delta, its tributaries, and the State Water Project remain poorly understood. To further improve DWR's ability to measure and forecast drinking water quality of water delivered to its customers, MWQI engages in special studies that focus on specific aspects of source waters, including contaminant loading, newly emerging contaminants of concern (COCs), assessing the application of new instrumentation, climate and hydrology. Results of these studies inform subsequent cycles of the MWQI workplan by improving the RTDF and discrete sampling programs.

At the January 2010 MWQI TAC meeting, the Special Studies subcommittee presented their recommendations of special studies for inclusion in this current workplan. The MWQI TAC agreed with the subcommittee's recommendations and several new special studies have been included in this workplan cycle. These studies include: the continuation of the NDMA study with additional monitoring for Cryptosporidium and Giardia with a focus on the 2 largest Wastewater Treatment Plants (WWTPs) in the Delta, initiation of a year-long DOC monitoring program focused on the Sacramento watershed north of the Sacramento River at Hood to provide information for refinement of the WARMF model, a portable station feasibility study, a MWQI accomplishments summary report and a literature search of focusing on the potential effects of tidal marsh restoration on drinking water quality. Completed special studies from the 2009-10 workplan include the DSM2 boundary improvement and model recalibration study.

In addition to new special studies, there are a number of continuing special studies in this workplan. Ongoing studies include the investigation of urban runoff into the San Joaquin River, the potential short-circuiting of Delta Mendota Canal water in the O'Neill Forebay, and the spectrofluorometer analysis work. The water quality compendium project remains as a special study, however, preliminary investigations suggests that other groups within the Department may have the programming expertise to complete such a project.

As mentioned in section 3.3, the Special Studies subcommittee also recommended that the dual conveyance study on the adequacy of MWQI monitoring stations, the South Delta Old River EC study, and the long-term nutrient and EC studies, either be delayed or removed from MWQI's workplan. These recommendations were also presented and approved by the MWQI TAC at the January 2010 meeting, therefore these special studies are not included in this workplan.

Summaries of the different studies within the Special Studies Element are discussed below. Budget requirements for each study are listed in Section 4 of this workplan under Program Funding Needs. When appropriate, more detailed or modified proposals are presented in Appendix 3.

## 7.1 Urban Sources and Loads Investigation—Lead Investigator: Rachel Pisor

This is an ongoing study that began in the FY 2008-09 workplan. Appendix 3 contains the detailed proposal for the FY 2010-11 workplan, the original FY 2009-10 proposal and the original FY 2008-2009 proposal for this study.

Urban stormwater is an issue of increasing focus and concern for the SWP drinking 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). 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, is likely to continue as 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 first samples of the Lathrop study were collected during the first storm event of the 2009-2010 wet season (10/13/10). The head of Old River (OH1) station was removed as a sample location due to logistical problems with boat sampling during storms. It was determined that the data required at this location could be collected from land.

One issue faced in the 09-10 sampling season was the method used to trigger autosample sampling. Liquid level actuators proved problematic, and there were delays in receiving pump information to allow direct, in-line triggering of autosamplers based on pump activity. Until near the end of the 09-10 storm season, autosamplers were programmed to collect samples based on time. Because the autosamplers were programmed to collect samples at set intervals and not on actual hydraulic conditions, samples were sometimes collected after the pumps had flushed stormwater from the stilling well. This resulted in too little water for the autosampler to sample. Towards the end of the 09-10 season, the autosamplers were wired into the SCADA system at each pumping station. The SCADA communication with the autosampler is designed to initiate autosampler sampling only when the station is pumping storm water. It is anticipated that in the 10-11 sampling season, all stormwater samples will be collected using this improved triggering mechanism.

As this study continues into its second year, storm event samples will again be collected in the 2010-2011 wet season. Storm event samples are taken along the San Joaquin River, Old River and in the pumping stations within Lathrop. Constituents monitored include minerals, metals, organic pesticides, pyrethroids, total and dissolved organic carbon, bromide, bacteria, turbidity, total dissolved and suspended solids, $UVA_{254}$, total trihalomethane formation potential and haloacetic acid formation potential. Pyrethroid samples will be collected twice a season whereas all other constituents will be collected during each sampling event. Pyrethroid samples will be sent to Weck Laboratory for analysis and bacteria samples will be sent to FGL Laboratory for analysis through a subcontract with Weck Laboratory. Additionally, replicate samples for total trihalomethane formation potential and haloacetic acid formation potential will be collected and sent to Weck Laboratory for analysis using the standard method (SM 5710B). This data will be used for a comparison study of the 2 methodologies. A baseline GIS analysis will determine current land use patterns. This baseline will be used in future analyses of land use and water quality to correlate changes in land use with changes in water quality. Tasks and deadlines for urban sources and loads study are shown below in Table 10.

**Table 10. Urban Investigations Deliverables and Timelines**

| Deliverables | Participants | Estimated Start Date | *Estimated Completion Date |
|---|---|---|---|
| Storm event sampling at 11 sites in the Lathrop study area | **MWQI Program MWQI Field Group** | Winter 2009 | July 2011 |
| Analysis of samples as indicated above by DWR | **Bryte Laboratory** | Winter 2009 | August 2011 |
| Analysis of pesticide samples as indicated above through contract with Weck | **FGL Laboratory** | Winter 2009 | August 2011 |
| Analysis of bacteria samples as indicated above through contract with Weck | **Weck Laboratory** | Winter 2009 | August 2011 |
| Final Report | **MWQI Program** | September2011 | April 2012 |

* Note that based on potential summer storm events, sample completion dates are tentative. The estimated sample completion date of July 2011 includes the possibility of rare summer storm events. Final deadlines will be adjusted based on when actual storm events end in water year 2011.

## 7.2 Nitrosamines, their Precursors and Cryptosporidium /Giardia Occurrence from Waste Water Treatment Plant Facilities in the Delta—Lead Investigator: Joe Christen and MWDSC

The N-Nitroso-dimethylamine (NDMA) special study examining occurrences of nitrosamines and their precursor in the Sacramento-San Joaquin Delta will finish in this 2010-11 workplan cycle, however, based on the Special Subcommittee's recommendation, an extension and augmentation of this study was approved by the MWQ TAC. As per the original workplan deliverables, a final report and/or a peer reviewed journal article documenting the results of the first 2 years of the original study will be finished in 2010-11

For this workplan cycle, sample design will build on information learned from the first 2 years of study. Sampling efforts will focus on the 2 largest wastewater treatment plant (WWTP) discharges into the Delta-the Sacramento Regional Wastewater Treatment Plant, which discharges disinfected secondary treated effluent immediately below the Freeport Bridge, and the City of Stockton Regional Wastewater Control Facility, which discharges tertiary treated wastewater into the San Joaquin River. Results of the previous 2 year study illustrated that NDMA precursors increase downstream of these WWTPs. Unlike the previous study, this new study will collect samples by boat to better quantify nitrosamines, their precursors and WWTP tracers in discharge effluent as well as continuing to quantify WWTP impacts in the Sacramento and San Joaquin rivers Trend analysis will continue to be examined by collecting samples upstream and downstream of the discharge point and, depending on the outcome of discussion with the 2 WWTPs, this study may include the analysis of treated effluent immediately prior to discharge to the rivers. Also new to this study is the assessment of WWTP discharges of the protozoan pathogens, Cryptosporidium and Giardia.

Study design for both the nitrosamine and pathogen portions of the study are still evolving, therefore many of these approaches may be revised, however, currently it is anticipated that sampling frequency for the NDMA portion of the study will, at a minimum, occur quarterly. During late summer/early fall, Delta outflows decrease and WWTP discharges are proportionally a larger percentage of total river flow, therefore quarterly sampling will be timed to capture changing volumetric impacts of WWTP discharges with seasonal changes in river outflow. If sampling frequency can be increased, nitrosamine sampling would increase to monthly sampling from July through September. Pathogen sampling would occur monthly

At the Sacramento Regional WWTP, it is anticipated that for the nitrosamine portion of the study, composite, trawl samples will be collected at 2 depths. One trawl would occur approximately 1 meter above and along the diffuser discharge pipe. A second trawl would occur across the width of the river approximately 2-3 meters below the surface. Sampling immediately above and along the diffuser pipe provides a sample that is as close as possible to the characteristics of treated effluent immediately prior to discharge. Since non-detects of NDMA in the previous study could have been due to potential photolysis, collecting samples 2- 3 meters below the surface should begin to address this issue.

Sample collection for pathogens requires a different sampling strategy. Because of their specific gravity (oo)cysts are expected to occur at, or slightly below, the surface, therefore in addition to analyzing the diffuser pipe sample for pathogens, a composite surface water trawl for Cryptosporidium and Giardia will be collected no more than 1 meter below the surface.

Composite samples will hopefully address any patchy occurrences of all constituents. To provide background concentrations and for trend analysis, midwater composite trawl on the Sacramento River near the West Sacramento drinking water intake will be collected for an upstream reference. For pathogens a surface trawl will occur at the same location. Downstream of the WWTP, a composite sample for nitrosamines will be collected at the outer edge of the WWTP mixing zone as determined via an EC meter. Beyond the mixing zone, a midwater trawl sample will be collected for nitrosamines, their precursors and WWTP precursors, and a surface trawl will be collected for pathogens.

Sampling on the San Joaquin River at the Stockton WWTP will follow the same general outline as those for the Sacramento river, however, more research is required before details can be determined. There is the possibility that effluent samples may be provided by the plant and MWQI still needs to determine where and how WWTP effluent is discharged into the San Joaquin River.

For this new 2 year study, the partnership between MWQI and Metropolitan Water District of Southern California (MWD) will continue. The 2 agencies will continue a cost share agreement, with MWQI providing sample collection via boat and MWD analyzing samples for nitrosamines, their precursors and WWTP tracers. Sample analyses for Cryptosporidium and Giardia will be conducted by an outside laboratory. A tentative outline of sampling frequency, etc. is provided below in Table 11. Table 12 outlines deliverables and timelines.

**Table 11. Tentative sample design and sample frequency for nitrosamines, their precursors and protozoan pathogens.**

| Sampling information | Sacramento River | | San Joaquin River | |
|---|---|---|---|---|
| | **Nitrosamines, precursors and WWTP tracers** | **Pathogens** | **Nitrosamines, precursors and WWTP tracers** | **Pathogens** |
| Sampling frequency | At least quarterly | Monthly | At least quarterly | Monthly |
| Upstream of WWTP | One composite midwater trawl | One composite surfacewater trawl 1 meter below surface | One composite midwater trawl | One composite surfacewater trawl 1 meter below surface |
| At WWTP | One composite sample immediately above diffuser. One composite sample 2-3 meters below surface. Effluent sample provided by WWTP may be substituted for diffuser sample. | One composite sample immediately above diffuser. One composite sample 1 meter below surface | One composite sample immediately above diffuser. One composite sample 2-3 meters below surface. River depth may determine if sample 2-3 meters below the surface is collected. Effluent sample provided by WWTP may be substituted for diffuser sample. | One composite sample immediately above diffuser. One composite sample 1 meter below surface |
| Mixing Zone | One composite midwater trawl sample as determined through EC | None | One composite midwater trawl sample as determined through EC. | None |
| Downstream of WWTP | One composite midwater trawl sample downstream of mixing zone | One composite surface water trawl | One composite midwater trawl sample downstream of mixing zone | One composite surface water trawl |

**Table 12. NDMA/Crypto/Giardia Deliverables and Timelines**

| Deliverables | Participants | Estimated Start Date | Estimated Completion Date |
|---|---|---|---|
| Final Report (2008-2010 NDMA study) (note due to time constraints, a journal article may be substituted for final report). | MWQI staff<br>MWDSC staff | August 2010 | December 2010 |
| Paper for Publication (2008-2010 NDMA study) (note due to time constraints, this may be substituted for final report). | MWQI staff<br>MWDSC staff | January 2011 | Submit March 2011 |
| Quarterly and monthly sampling at up to 9 sites in the Sacramento-San Joaquin Delta | MWQI staff<br>MWQI Field Group | January 2011 | January 2013 |
| Analysis of samples | Bryte Laboratory<br>MWDSC Laboratory<br>BioVir Laboratory | January 2011 | February 2013 |
| Final Report (s)<br>Nitrosamine and Pathogen studies will have separate reports. | MWQI staff<br>MWDSC staff | February 2013 | July 2013 |
| Paper(s) for Publication<br>Nitrosamine and Pathogen studies will have separate papers. (note this may be substituted for final report). | MWQI staff<br>MWDSC staff | August 2013 | Submit Nov. 2013 |

## 7.3 Investigation of O'Neill Forebay water circulation--Lead Investigator: Jason Moore/Ted Swift

This study replaces an ongoing study of the same title begun in the FY 2008-09 workplan. Although forebay circulation patterns are of interest, one key question this study will focus on is the extent of mixing between forebay water and water discharged into the forebay from the Delta Mendota Canal (DMC). Photographic evidence, provided by the San Luis Field Division, suggests that, at times, water discharged from the DMC may hug the forebay shoreline, flowing directly downstream to Check 13 and short circuit mixing in the forebay.

To examine this question, this study has adopted a phased approach. The first phase uses available historical data to analyze forebay mixing using EC readings at input and output locations to the Forebay. Depending on the outcome of the first phase, second and third phases may include direct measurements of short-circuiting via a boat in the forebay or examining real-time data using EC sensors at the proposed Gianelli water quality station.

The first phase of the study uses available historical data to address the question of DMC short circuiting in the forebay. EC data will be analyzed to find any patterns and correlations between the Banks PP, the Jones PP, the O'Neill EC station (located on the DMC, downstream of the O'Neill pumping/generating facility) and SWP Check 13. To examine the concept of short-circuiting, historical EC data from the Jones PP will be compared to the EC of SWP water entering the forebay from Banks PP. The EC of water leaving the forebay at SWP Check 13 will also be examined. If there is a large difference in EC between CVP and SWP waters, then the EC at SWP Check 13 should give an EC fingerprint indicating whether the largest source of ions is from the SWP or the CVP. If the CVP is shown to have a greater influence on EC at SWP Check 13 than the SWP, then it would indicate the presence of a short circuiting effect.

To complement and better understand the dynamics of EC in this system, the situation when water is withdrawn from O'Neill Forebay via O'Neill intake will also be examined. The dates of pump-ins to the Forebay and withdrawals from the Forebay at O'Neill intake are known since 2004. Data will be examined to see if EC at the O'Neill intake reflects SWP water quality when there is only generating occurring at the O'Neill intake. If this is the case, then water quality at the O'Neill EC station should potentially reflect fresher SWP water rather than higher DMC EC water as measured at the Jones PP.

In conjunction with the above data analysis, staff will also investigate the feasibility of studying potential short-circuiting effects by conducting transects in the Forebay using a boat and GPS linked YSI sonde unit with an EC probe. A GIS interface would be used to provide a graphical representation of the sources and patterns of water throughout the Forebay. Sharp changes in EC during certain operations would confirm the short-circuiting effect. A study plan would be created detailing sampling design, but potentially boat transects would occur monthly for 12 months. This study would require funding for boat time and a boat operator and would be dependent on DWR O&M allowing a boat in off-limit areas of the forebay. If this approach was a viable option, MWQI would summarize the dollar amounts involved and discuss with the MWQI-TAC the feasibility of using funding for this project.

The third phase of this study would be dependent on the placement of a real-time EC sensor in the Forebay of the Gianelli plant and an evaluation of whether data from sensors placed at Gianelli would provide the information required to examine short-circuiting. If the historical data analysis indicated short-circuiting, then, once the Gianelli PP WQ station was operational, at a minimum, one year of real time EC data would be analyzed from Banks PP, the Jones PP, O'Neill EC station and SWP Check 13. Data would be analyzed in a manner similar to the historical data analysis. Results of the first phase of this study would help inform the chances of success of this approach. If short-circuiting patterns could not be observed from historical data, then using real-time data, including data from Gianelli might not provide the information required. Tasks and deadlines for this circulation study are shown below in Table 13.

**Table 13. O'Neill Forebay Circulation Deliverables and Timelines**

| Deliverables | Participants | Estimated Start Date | Estimated Completion Date |
|---|---|---|---|
| Analyze historical EC patterns at Banks PP, Delta Mendota Canal station, O'Neill Intake, and SWP Check 13 | **MWQI Program** | April 2010 | July 2010 |
| Investigate feasibility of sonde study of the O'Neill Forebay and develop study plan. | **MWQI Program** | February 2010 | August 2010 |
| If warranted, conduct sonde study of the O'Neill Forebay | **MWQI Program** | Start date dependent on study plan | Completion date dependent on study plan. |
| Monitor and analyze real-time data from Gianelli P/G, Banks PP, Jones PP and Check 13 | **MWQI Program** | Start date dependent on installation of EC meter at Gianelli P/G Plant | Completion date dependent on installation of EC meters at Gianelli Pumping Plant, however, after 1 year of data collection, decide on additional study or produce report of findings. |

na = not applicable or available

## 7.4 Update of Water Quality Compendium—Lead Investigator: Jason Moore

This ongoing study began in the FY 2009-10 workplan. The water quality compendium project remains as a special study, however, preliminary investigation suggests that other groups within the Department may have the programming expertise to complete such a project, therefore, given competing priorities for staff time, it anticipated that MWQI will not provide significant resources towards the completion of this project, with the understanding that this special study may be dropped as further information is acquired.

The genesis of this special study began in November 2007, when, per SB 1070, a Memorandum of Understanding was signed between the Resources Agency and CalEPA establishing the California Water Quality Monitoring Council (Council). The legislation required the Council to maximize the efficiency and the dissemination of water quality data that is collected in the State. As part of that effort, the Council will need to document all water quality sampling conducted by the different state agencies, including DWR. The State Water Resources Control Board, the Central Valley Regional Water Quality Control and CALFED are also working towards the goal of compiling regional and statewide monitoring information and have submitted their documents to the Council.

Since the MOU has been signed, the Council has published several data/water quality portals for public use, however a statewide database of all sampling programs has not yet been created. MWQI will continue to monitor the Council's actions, however, the requirement to electronically link all DWR monitoring programs to their respective data may best be conducted by a program with a strong IT support structure and will need clear direction from DWR upper management on how DWR's data will interface with proposals by the council. One idea would be to create links between web based maps and the Department's WDL and CDEC databases. Several efforts along these lines, albeit smaller in scope, are already occurring within the Department. This approach would have the advantage of linking the majority of all DWR real time and discrete monitoring programs. Program manager contact information, however, would be missing and would require updating with personnel changes. Since MWQI does not have the IT support structure to create this linkage, and it is not clear where upper management would place the responsibility of housing ongoing maintenance of a department-wide searchable database, MWQI will continue to monitor the Council's progress and how its programs might affect MWQI and DWR. It should be noted that a Compendium project addresses goals of the RTDF CP for better coordination and collaboration within DWR water quality monitoring groups and could provide one more link towards eventual standardization of monitoring methods and data management and dissemination. Tasks and deadlines for the Compendium study are shown below in Table 14.

**Table 14. Compendium Deliverables and Timelines**

| Deliverables | Participants | Estimated Start Date | Estimated Completion Date |
|---|---|---|---|
| Serve as the information link between DWR water quality sampling groups and State and Regional Board requests for sampling information fulfill the information needs of the Water Quality Monitoring Council. | **MWQI Program** | January 2009 | Ongoing |

na = not applicable or available

## 7.5 Spectrofluorometer Study—Lead Investigator: Ted Swift

This is an ongoing study that began in the FY 2009-10 workplan. This description updates the description in the 2009-10 workplan. This research was identified as an area of expertise needed by the MWQI Program. The full proposal is given in Appendix 3.

In the Sacramento-San Joaquin River Delta, sources of dissolved and particulate natural organic matter (NOM) include tributary river flows from distinct watersheds, algae and submerged vegetation growth and decay, and organic-rich peat soils. NOM concentrations and characteristics in source waters, ultimately bound for municipal drinking water use, is of great interest to water contractors and water treatment operators because of the disinfection byproducts (DBPs) resulting from water treatment.

In 2007, the DWR QA/QC group acquired a high-performance FluoroMax 4 spectrofluorometer to, among other uses, investigate the usefulness of spectrofluorometric analysis to Delta and Delta source waters. An extensive and growing body of literature strongly suggest that this approach may provide a rapid method for accurately quantifying multiple constituents of concern (COCs), such as DBP precursors in a single measurement.

This study will evaluate the utility of spectrofluorometry as a method of rapidly quantifying COCs such as DOC, algae and organic nitrogen, as DBP precursors. This study will also seek to identify distinctive characteristics of Delta source waters to provide water "fingerprints" that would be used to, among other things, validate Delta water quality models. It will examine the feasibility of configuring a spectrofluorometer instrument to operate unattended in a real-time monitoring setting. A more detailed description appears in Appendix 3. To capture a wide range of water quality conditions and source water types while minimizing staff labor and travel costs, samples for analysis will be collected in parallel with MWQI's other field sampling programs when possible, supplemented with specific sampling and lab-prepared samples with known contents. Both whole and filtered fractions of water samples analyzed spectrofluorometerically to distinguish dissolved sources from particulate sources such as algae. UV254 absorbance will also be measured photometrically. Subsamples will also be analyzed by Bryte Laboratory for TOC and DOC. Subsamples from the NDMA special study will be analyzed spectrofluorometerically to seek out fluorescence features that correlate with nitrosamine formation potential (to date, nitrosamines have not been found in detectable concentrations in field samples). THMFP analysis will be conducted by a contract laboratory. The results will be compared to identify distinctive features in the excitation emission matrix that are highly correlated with characteristics such as

DOC and TOC concentration, THMFP, UV254 absorbance, algal biomass, and organic nitrogen species. Analytical tools will include multiple regression, parallel factor analysis, and principle component analysis. Once the methods are well characterized, its efficacy as part of the routine monitoring will be presented to the TAC with recommendations. Tasks and deadlines for the spectrofluorometer study are shown below in Table 15.

**Table 15. Spectrofluorometer Deliverables and Timelines**

| Deliverables | Participants | Estimated Start Date | Estimated Completion Date |
|---|---|---|---|
| Approximately monthly sampling at sites in the Delta study area | **MWQI Staff**<br>**MWQI Field Unit** | March 2010 | June 2012 |
| Spectrofluometric analysis of raw and filtered water samples | **MWQI Staff** | March 2010 | June 2012 |
| Analysis of samples by DWR Bryte Laboratory | **Bryte Laboratory** | March 2010 | June 2012 |
| Interim report | **MWQI Staff** | May 2011 | July 2011 |
| Final Report | **MWQI Staff** | August 2012 | October 2012 |

## 7.6 Monitoring of the Upstream Sacramento River for the Systech WARMF model- Lead Investigator: Joe Christen

This new Special Study was approved by the MWQI TAC for inclusion in the FY 10-11 workplan.

This study is designed to support the DWR Bay-Delta Modeling Office's refinement of the Sacramento watershed WARMF model developed by Systech Water Resources Inc. Working with Department modelers, MWQI will determine geographic data gaps in the WARMF model and begin a sampling program to provide data for these locations. It is anticipated that DOC would be the primary constituent of interest, but based on modeler input, other constituents could be collected as needed. Estimating and forecasting carbon values at the Sacramento River Delta boundary using a WARMF model is a deliverable in the RTDF-CP Water Quality Forecasting Gantt chart. The Bay-Delta Office is scheduled to begin incorporating the WARMF model in planning studies in 2012. By having data in place prior to this modeling task, refinement of the WARMF model's capabilities to produce values based on flows and land use practices can occur on schedule.

**Sample Design**

Based on preliminary analyses and consultation with Systech, proposed sampling locations could include:

- the Colusa Basin Drain near Knights Landing,
- the Lower Feather River at Nicolaus,
- the Sacramento River at Red Bluff

The Colusa Drain and Feather River basins have large areas of agricultural land that are potentially contributing large organic carbon loads to the Sacramento River. Collecting samples from the Sacramento River at Red Bluff would improve calibration of the Sacramento River upstream of Hamilton City.

Unless otherwise directed by the modelers or the TAC, study duration would be 1 year. Monthly grab samples would be collected in conjunction with up to 4 storm water events to better characterize the DOC inputs from the agricultural Colusa basin and the mixed land-cover Feather River basin. Sampling storm water events would help quantify DOC impacts associated with increases in flow due to storm water

runoff. Additionally, at Colusa Basin drain, sampling frequencies would increase beginning late summer/early fall to capture increased rice field discharge into Colusa Basin drain.

Sampling at Red Bluff would require the cooperation and services of DWR's Division of Integrated Regional Management (IRM). Sampling at the Colusa Basin Drain near Knights Landing and the Feather River at Nicolaus would be conducted by MWQI and MWQI Field Unit staff. It is not known yet if DWR staff in Northern District would be able to assist with the Red Bluff samples, however if they were not available, this would impact estimates of MWQI staff time. Potentially using MWQI's proposed real-time portable sampling station could be used at this location. Tasks and deadlines for monitoring date for the Sacramento WARMF study are shown below in Table 16.

**Table 16. Monitoring Upstream Sacramento River Deliverables and Timelines**

| Deliverables | Participants | Estimated Start Date | Estimated Completion Date |
|---|---|---|---|
| Consult with DWR and SPC modelers on location of data gaps. | **MWQI, BDO** | January 2011 | March 2011 |
| If required, work with DWR Division of IRM to determine if upper Sacramento samples could be incorporated into their sampling program. | **MWQI, Northern District** | February 2011 | March 2011 |
| Conduct monthly monitoring and up to 4 stormwater sampling events | **MWQI, Northern District** | April 2011 | April 2012 |
| Prepare final report and/or provide required data to BDO | **MWQI** | June 2012 | August 2012 |

## 7.7 Feasibility Study for Portable Water Quality Monitoring Station—Lead Investigator: Arin Conner

This new Special Study was approved by the MWQI TAC for inclusion in the FY 10-11 workplan.

Permanent water quality monitoring station are not always needed, or cost effective. Using a self-contained, portable monitoring station could allow for the collection of real-time water quality data without committing to construction costs normally associated with a permanent facility. Moreover, a portable station could potentially be used as a semi-permanent installation with the addition of security devices and some simple preparations. Such a station could also be used in an emergency response situation (similar to the Jones Tract levee breach) in which water quality data can be gathered and distributed even before pump-out begins. It is also anticipated that a portable station would be more cost and labor efficient to build because it could be constructed at the Bryte field office rather than at a remote location and because material costs should be lower.

This study will investigate the design and costs of constructing a portable water quality station. It is anticipated that the portable station would use analyzers and pumps that have a low power draw, and would use batteries, solar panels, and a small generator for power while data is transferred through a cellular connection to eliminate any hardwires. The HVAC, main pump, and other support systems would be on a direct current (DC) system to reduce power loss through conversion to alternating currents (AC). Organic carbon concentrations would be gathered using an oxidation-based analyzer (such as Sievers) and physical data (EC, DO, pH, temp., turbidity.) would be determined by a sonde unit (such as YSI) in a flow-through chamber. Depending upon the performance of the power system and the specification of the analyzer, an anion analyzer or at least a bromide probe can also be added. A simple tank built into the bypass stream of the pump can indicate the presence of mussels. All of these instruments would be housed inside a small cargo trailer that can be towed on site and secured. The intake apparatus would be customized to the site/application, and the QA/QC procedures and maintenance would be similar to the current MWQI real-time monitoring stations.

This phase of this study would consist of an investigation and report on the feasibility construction of a portable station. Actual construction of a portable station would be dependent on MWQI TAC approval. Tasks and deadlines for the feasibility study of a portable water quality station are shown below in Table 17.

**Table 17. Monitoring Upstream Sacramento River Deliverables and Timelines**

| Deliverables | Participants | Estimated Start Date | Estimated Completion Date |
|---|---|---|---|
| Feasibility and cost analysis report on portable station construction. | **MWQI** | **Late Spring 2010** (Depends upon MWQI Field Unit schedule) | **Early Fall 2010** (Depends upon MWQI Field Unit schedule) |

## 7.8 MWQI Program Summary Report—Lead Investigator: Sonia Miller

This new Special Study was approved by the MWQI TAC for inclusion in the FY 10-11 workplan.

The year 2010 will mark the 20-year anniversary for the MWQI program. By 2012, DWR will have been conducting studies of Delta drinking water quality for 30 years. This special study will develop 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 and water agency staff, provide water agency managers with justification for continued program funding, and potentially provide a clear context for future program workplans. The report could include, but would not necessarily be limited to the following key elements:

1. History of the program, including the evolution of program goals and objectives
2. Data
    a. Data collection network – grab samples and continuous stations
    b. Large historical database
    c. Key findings from data
        i. Long term trends analysis
        ii. Delta Island Drainage Investigations
        iii. Etc.
3. Special Studies – summarize findings from key special studies
4. Model Development – summarize key accomplishments and status
5. RTDF Program – describe formation, goals and status

    Bibliography – all program reports and publications

Tasks and deadlines for a MWQI summary report are shown below in Table 18.

**Table 18. MWQI Program Summary Report Deliverables and Timelines**

| Deliverables | Participants | Estimated Start Date | Estimated Completion Date |
|---|---|---|---|
| Convert all MWQI reports to pdf, | **MWQI,** | June 2010 | August 2010 |
| Compile bibliography and begin outline of program accomplishments and key findings. | **MWQI** | August 2010 | September 2010 |
| Prepare draft report and send out for comments. | **MWQI** | September 2010 | February 2011 |
| Prepare final report | **MWQI** | March 2011 | June 2011 |

## 7.9 Tidal Marsh Restoration Literature Review—Lead Investigator: Sonia Miller

This new Special Study was approved by the MWQI TAC for inclusion in the FY 2010-11 workplan, however its start date is dependent on progress on the MWQI Summary Report.

Currently state, federal, and local agencies are interested in adding thousands of acres of tidal marsh to the Sacramento – San Joaquin 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. The purpose of this study would be 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. 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.

This literature search and its recommendations would serve as a foundation for future studies, if necessary, for future workplans. Tasks and deadlines for the tidal marsh restoration literature review are shown below in Table 19. Specific tasks and deadlines will be delineated as staff finish once staff have finished tasks associated with the MWQI summary report special study.

**Table 19. Tidal Marsh Restoration Literature Review Deliverables and Timelines**

| Deliverables | Participants | Estimated Start Date | Estimated Completion Date |
|---|---|---|---|
| Gather literature for all Tidal Marsh/DBP production journal articles. | **MWQI,** | TBD | TBD |

## 7.10 2006-2010 State Water Project Sanitary Survey Update—Lead Investigator: Carol DiGiorgio

Sanitary Surveys are a federally mandated program which survey surface water and ground water under the direct influence of surface water drinking water systems to evaluate: 1) the capability of a drinking water system to consistently and reliably deliver an adequate quality and quantify of safe drinking water to the consumer, and 2) the system's compliance with federal drinking water regulations (EPA, 1999). Sanitary surveys provide a comprehensive inspection of an entire water delivery system and its operation and maintenance. The surveys determine whether a system's source, facilities, equipment, operation, maintenance, and management are effective in producing safe drinking water. Sanitary surveys also evaluate a system's compliance with federal drinking water regulations, as well as state regulations. Additionally, it evaluates water quality data, administrative issues and draws conclusion about the system's integrity and its capability to consistently and reliably deliver and adequate supply of safe drinking water.

Although the Department does not provide finished drinking water directly to consumers, as the supplier of drinking water for approximately 25 million Californians, an assessment of the Department's State Water Project and the watershed that provides project water is an important element for indentifying and preventing contamination of drinking water supplies and ensuring that the quality and delivery of surface water delivered to utilities and wholesalers is maintained. The completed survey will be used by MWQI drinking water agencies to meet their regulatory requirements for a Sanitary Survey of their SWP source waters. In California the California, Department of Public Health oversees the State's sanitary survey program. By law, non-community water systems and community water systems with outstanding performance based on prior sanitary surveys must be surveyed every 5 years.

Because of the size of the undertaking, the MWQI TAC agreed that the 2006-2010 Sanitary Survey (SS) Update would be contracted out to a consultant. MWQI will serve as the project lead in securing a consultant and overseeing the consultant's progress. As shown in section 4, Table 1, all contracting and consulting costs will be paid through DWR's MWQI baseline funding.

Tasks and deadlines for the SS update are shown below in Table 20. Specific tasks and deadlines will be further delineated as timelines are defined by the Sanitary Survey Subcommittee.

**Table 20. Sanitary Survey Update Deliverables and Timelines**

| Deliverables | Participants | Estimated Start Date | Estimated Completion Date |
|---|---|---|---|
| Determine SS update topics drinking water contractors want in the update | **MWQI/Sanitary Survey Subcommittee** | February 2010 | February 2010 |
| Meet with DPH to propose contractor topics and determine topics DPH wants investigated in update. | **MWQI/Sanitary Survey Subcommittee/CADPH** | March 2010 | March 2010 |
| Sanitary Survey Subcommittee determine format for RFP or RFQ | **MWQI/Sanitary Survey Subcommittee** | April 2010 | April 2010 |
| Prepare RFP or RFQ | **MWQI**/Sanitary Survey Subcommittee | April/May 2010 | June 2010 |
| Send out RFP or RFQ | **MWQI**/Sanitary Survey Subcommittee | July 2010 | July 2010 |
| Selection process | **MWQI**/Sanitary Survey Subcommittee | August 2010 | September 2010 |
| Contract negotiation (if RFQ) and contract iniation | **MWQI/Sanitary Survey Subcommittee** | October 2010 | November 2010 |
| Consultant prepares SS update | **MWQI/Sanitary Survey Subcommittee** | December 2010 | June 2012 |
| Consultant submits publication to CDPH | **MWQI/Sanitary Survey Subcommittee** | na | June 2012 |

# 8 EMERGENCY RESPONSE ACTIVITIES

Although a component of the RTDF-CP, this element is broken out separately because its scope goes beyond the program and includes tasks identified in the 2006 Sanitary Survey Update. The goals of this element are to: 1) develop and encourage policies to define the role of drinking water quality in DWR's Emergency Response (ER) actions; 2) incorporate drinking water quality components, (including monitoring and involving the MWQI Program), into DWR's established ER plans; and 3) improve dissemination of drinking water quality information between DWR and other stakeholders (i.e. State Water Project contractors, Department of Public Health, State and Regional Water Boards, Office of Spill Prevention Response, etc.) during emergency events (Sanitary Survey Action Item).

Currently MWQI has fulfilled the tasks originally set-forth in the FY 2008-09 workplan. An internal document has been prepared that assesses the effectiveness of DWR's Emergency Response plans in addressing drinking water quality protection during emergency events. MWQI staff have performed a review of the Department's existing emergency response documents to: 1) identify how drinking water quality is addressed by the Department during an emergency; 2) make recommendations as to how drinking water quality can better be addressed within the Department during emergency events; and 3) make recommendations for more effective lines of communication between the Department's emergency response managers, drinking water quality experts, and affected stakeholders during emergency events.

The first draft of the emergency response document was returned to MWQI staff from upper DES management in November 2009. New information warranted an inquiry into the role of SWRCB during emergencies. The second draft of the emergency response document was prepared in early 2010 and was resubmitted for internal review in March 2010. At the time this workplan was prepared, the Emergency Response document was still in internal review. Once this document completes the second round of internal editing/approval process, an implementation strategy has been established for moving the ideas in this document forward for consideration by Departmental executive management. MWQI staff have also created 4 stocked emergency kits for gathering drinking water quality data during an emergency. A manual of how to use the kits was completed in the FY 2008-09. In March of 2010 a training demonstration for MWQI staff illustrated the use of these kits. The O&M WQ section have reviewed the SWP emergency response plans (Red Binders) and with the assistance of Bryte Lab have also developed emergency response kits to be kept in water technician vehicles from each field division. O&M WQ staff will provide onsite training on the use of these kits.

Many of the recommendations presented in the MWQI document cannot move forward without approval from DWR upper management to direct the Department's Emergency Management Committee (EMC) to implement these recommendations. Therefore, until there is approval from DWR upper management, ongoing efforts under this element will include: emergency response meeting attendance, restocking of drinking water quality ER kits, providing emergency assistance for drinking water quality monitoring as requested by emergency responders and assisting the Department's EMC as needed in the development of a Department Drinking Water Quality Emergency Response Plan. Tasks and deadlines for Emergency Response are shown below in Table 21.

**Table 21. Emergency Response Deliverables and Timelines**

| Deliverable | Participants | Estimated Start Date | Estimated Completion Date |
|---|---|---|---|
| Identify and review all DWR emergency response plans and processes that should consider potential drinking water quality impacts during an emergency. | **MWQI Program**<br>O&M WQ<br>O&M Field Divisions<br>DPLA | November 2008 | Original Draft completed Dec 2008. Management reviewed and returned to staff Oct 2009. During 2nd revision new information was found. An inquiry into SWRCB roles during emergencies started in Dec 2009. 2nd revision draft sent to internal organizations by end of Mar. 2010. Recommendations will be submitted for consideration of Executive Management. |
| Identify water quality staff and material resources for responding to various emergency scenarios. | DWR Emergency Management Committee (EMC) | November 2008 | Ongoing-Dependent on DWR EMC contacting appropriate division heads to direct the assignment of their staff and resources to this effort |
| Participate in emergency response meetings (i.e. CUWA emergency spill taskforce). | **MWQI program** | November 2008 | Ongoing |

# 9 OTHER WATER QUALITY PROGRAM-RELATED ACTIVITIES

MWQI management and staff will continue to attend outside meetings of the following groups as necessary to provide technical input and stay current on issues and activities that could affect drinking water. These groups may include;

CALFED Drinking Water Program

CALFED Water Quality Subcommittee

Central Valley Regional Board's Drinking Water Policy Work Group

CUWA Sewage Spills Work Group

Delta Sustainability Activities

Delta Watershed Monitoring Council

Bay-Delta Conservation Plan

Pelagic Organism Decline Workgroup

San Joaquin River Basin Monitoring Partnership

South Bay Aqueduct Task Force (quarterly meetings)

State Water Resources Control Board

Delta Conveyance

DWR and other agency climate change activities

Special Aquatic Species Workgroups or Meetings (Delta Smelt, Splittail Smelt, Salmon, etc.)

MWQI will continue to coordinate its activities in these areas with the MWQI SPC members as it has done in the past. MWQI will achieve this through the tasks detailed in this and future workplans and participation in both internal and public forums that are focused on drinking water quality issues. As necessary, MWQI management and staff will also 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 Sacramento-San Joaquin Delta.

For this fiscal year, MWQI assistance is not required to comment and assess the impacts of the proposed mercury TMDLs that affecting the Department. The responsibility for this issue has been moved to the Department's Environmental Studies and Compliance Section. In the future, MWQI may be asked to participate regularly and assist with the development of a monitoring plan and determination of possible sampling locations, however, at this point, monthly attendance and assistance for mercury TMDL meetings are not required.

## Sanitary Survey

As discussed in section 4, the 2010 Sanitary Survey update will be funded using MWQI funds. MWQI program management will assume the lead for this project. Note that a subcommittee composed of interested contractors and DWR has been created and it is anticipated that a Request for Proposals will go out for bid the summer of 2010 with work to begin on the survey in early 2011. All contracting and funding will be handled by MWQI. A detailed discussion and timeline is provided in section 7.10

# 10 PROGRAM MANAGEMENT

**Specific MWQI management tasks for FY 2010-11 for this program element include:**

A. Conduct monthly program status teleconferences for members of the MWQI TAC. Provide appropriate program and budget updates and meeting minutes during these calls.

B. Coordinate up to two comprehensive program conferences for MWQI TAC participants during the fiscal year, one of which may include a Delta or SWP facility tour for new TAC program participants. An update of MWQI's 5 year Strategic Plan may be the content of one of these comprehensive meetings.

C. As needed, conduct Sanitary Survey and Special Studies Subcommittee meetings as well as other MWQI/contractor meetings. As needed, participate in technical meetings of the RTDF-CP Steering Committee, the New Technologies work group and other subcommittees or working groups as may be formed from time to time to address specific drinking water quality issues that arise.

D. Coordinate and finalize the Request for Proposals and contract for the 2010 Sanitary Survey update.

E. Complete ratification of a new Specific Funding Agreement between MWQI, SWPCA and the SPC members.

F. Along with MWQI staff, attend various technical and management meetings, conference and workshops related to drinking water quality issues.

G. Along with MWQI staff, attend relevant CALFED meetings and various workshops including the CALFED Science Conference.

H. 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.

I. Develop the FY 2011-12 MWQI Program Work Plan.

J. As data becomes available in SAP, finalize MWQI Program budget for FY 2010-11 including identifying needs for the SWPCA Fund. If information is available, begin rough estimates of FY 2011-2012 MWQI budget.

K. Coordinate implementation of the RTDF-CP.

L. Monitor progress on MWQI program elements outlined in workplans.

M. Address personnel and safety related issues for MWQI Program.

# 11 OTHER REQUIRED PROGRAM COSTS

**Description of costs**

There are numerous program costs for labor, supplies, equipment and services that are charged to the MWQI Program through SAP, 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 Department-required, job related or career advancement activities and tasks. Examples of miscellaneous labor costs include staff time to:

- Attend training
- Attend conferences, workshops, meetings
- Develop and track contracts, purchase orders, training requests, travel expense claims
- Conduct facility maintenance (West Sacramento Field Unit)
- Accommodate other high priority Departmental programs and outside programs with data collection and analysis as directed by management
- Personnel management including hiring, training, and taking disciplinary actions
- Write memos and other forms of non-technical communication
- Enter and approve time
- Develop Program budget and other SAP-related tasks

Examples of miscellaneous costs associated with supplies, equipment, general facility maintenance and services include:

- IT support (DWR IT personnel maintaining staff computers, servers)
- IT hardware and software (purchasing staff computers, mandatory software)
- Office equipment maintenance (copy and fax machines)
- Office supplies
- Janitorial services
- Moving and general facility services
- Staff training (required and job related)
- Travel costs for meetings, conferences
- Registration costs for mandatory conferences (Environmental Scientists workshop)
- Out-of-State travel costs for conferences, meetings, workshops

- Vehicle maintenance, operation, fuel
- Uniform allowance (shoes, sun glasses)

# 12 CHALLENGES AND OPPORTUNITIES

The following is a description of challenges and opportunities associated with management of the MWQI Program.

### DWR Staffing and State Budget Actions

Between February 2009 and June 2009, all DWR employees were furloughed 2 days a month. Beginning July 2009, all state employees were furloughed 3 days a month with furloughs continuing through June 2010. This workplan was completed prior to approval of the State's 2010-11 budget, therefore it is difficult to anticipate how this fiscal's year's budget crisis will impact DWR personnel. Given the uncertainty surrounding the State budget, there may be unforeseeable delays to some projects. Any impacts will require creative adjustments. Although there is no desire for delays, until the 2010-11 State budget is finalized, and its impacts fully vetted, deadlines may have to become more flexible, the number of meetings reduced and/or lengths expanded to meet several previously individual meeting requirements. DWR travel to and from meetings has also been severely curtailed, and several SWP contractors have indicated that travel is becoming an issue within their agencies. Until budget issues improve, this may necessitate fewer face to face meetings. The MWQI program should be fully staffed in FY 10-11, therefore, unless vacancies arise during the new FY, State hiring issues may not impact the Program. Because of the continuing need for a full-time IT person, MWQI will monitor the success of another DES unit's newly created IT position that organizationally resides within DWR's IT section but with duties associated with the DES unit providing funding. If this arrangement proves successful, it is anticipated that a future MWQI vacancy would be reclassified to an IT position operationally housed within the Department's IT section but with duties assigned by MWQI. The challenge of retention and future recruitment still remains, especially in light of salary discrepancies for State scientists.

### DWR Overhead Rates

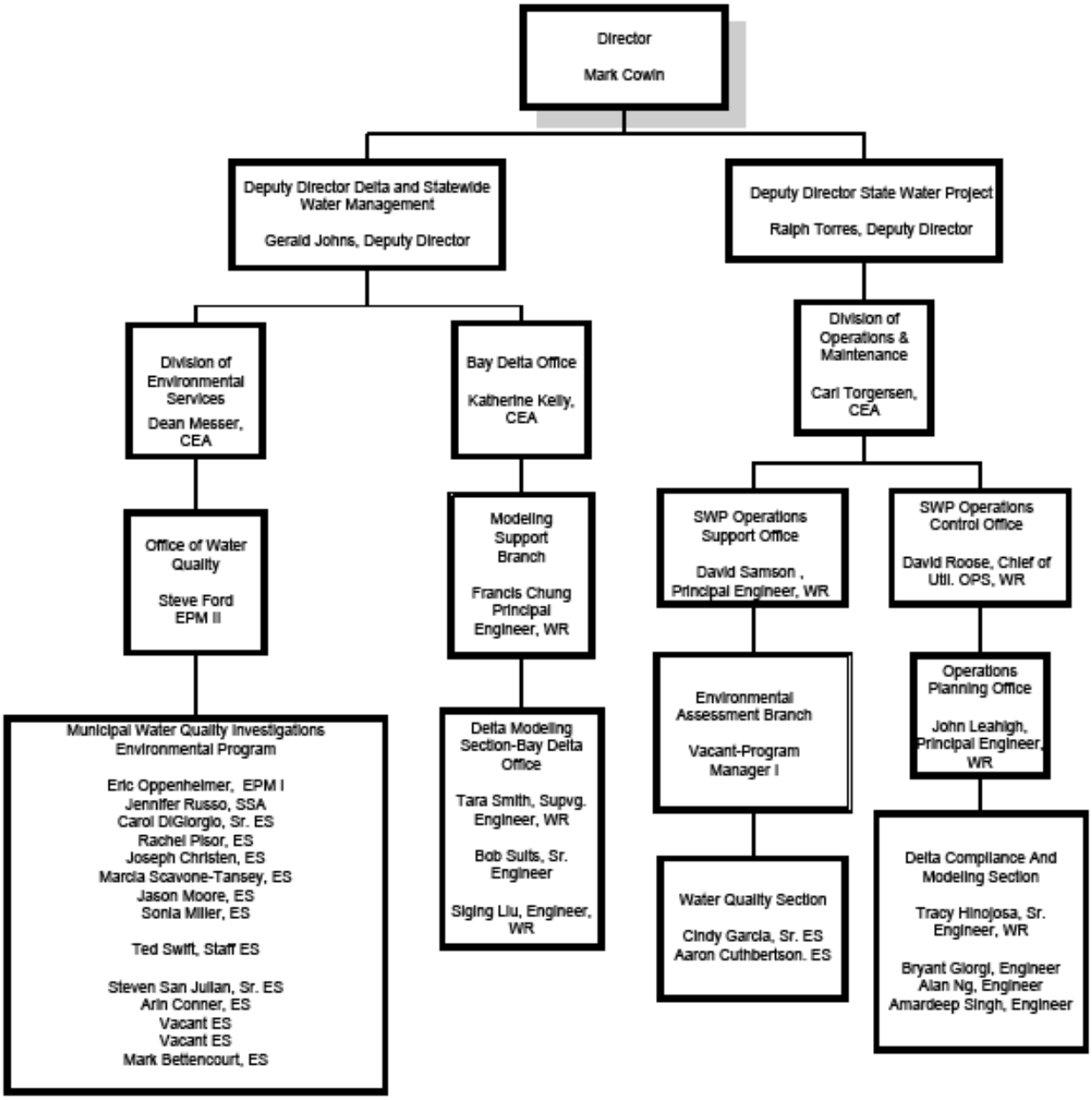
Overhead rates for the Department continue to rise steadily with each new fiscal year. Hourly rates for permanent staff currently used in this workplan may not accurately reflect predicted increases for FY 2010-11. As overhead rates increase and the scopes of the MWQI Program and RTDF-CP broaden, adjustments to the overall program budget may need to be made on an annual cycle.

### Journal Submissions

With the time and financial investment that has been dedicated to the MWQI program, it is important to create validated and referenced studies. The MWQI program will continue to use the DWR

reports/publications process, but more emphasis will be put on publishing in scientific journals. This insures that the professional effort expended by the MWQI scientists is showcased in a peer-respected venue. Additionally this elevates the individual staff in their own professional career. With the evolution of more scientific entities in the CALFED process, MWQI findings need to be presented on equal footing with other drinking water research project results.

# 13 ORGANIZATION CHART



# 14 GLOSSARY OF ACRONYMS AND TERMS

AMS Accelerated Mass Spectrometry

BCP Budget Change Proposal

BLM U.S. Bureau of Land Management

BMP Best Management Practices

Ca Calcium

CBDA California Bay Delta Authority

CCWD Contra Costa Water District

CDEC California Data Exchange Center

CDPH California Department of Public Health

CUWA California Urban Water Agencies

CVP Central Valley Project

DBP Disinfection by-product

DCC Dry Creek Conservancy

DDT Dichloro-Diphenyl-Trichloroethane (insecticide)

DFG California Department of Fish and Game

DMC Delta-Mendota Canal

DO Dissolved Oxygen

DOC Dissolved Organic Carbon

DOE DWR Division of Engineering

DPLA California Department of Water Resources, Division of Planning and Local Assistance

DSM2 Delta Simulation Model 2

DU Ducks Unlimited

DWR California Department of Water Resources

DWR EMC Department of Water Resources Emergency Management Committee

EC Specific Electric Conductivity

EPA U.S. Environmental Protection Agency

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

IT Information Technology

KHP Potassium hydrogen phthalate

LC-MS Liquid Chromatography Mass Spectrometry

LLNL Lawrence Livermore National Laboratory

MWDSC Metropolitan Water District of Southern California

MGD Million Gallons per Day

MWQI Municipal Water Quality Investigations

Na Sodium

NEMDC Natomas East Main Drainage Canal

NDBA N-nitroso-di-n-butylamine

NDMA N-nitroso-dimethylamine

NDPA N-nitroso-di-n-propylamine

NMEA N-nitroso-methylethylamine

NMOR N-nitrosomorpholine

NPYR N-nitroso-pyrrolidine

NMR Nuclear Magnetic Resonance (analysis)

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

OC Organic carbon

OCO Operation Controls Office (DWR O&M)

OEE Operating Expenses and Equipment

PCB polychlorinated byphenyls

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

SBA South Bay Aqueduct

SDIP South Delta Improvement Program

SLDMWA San Luis Delta Mendota Water Authority

SOP Standard Operating Procedure

SPC Specific Projects Committee

SUVA Specific ultraviolet absorbance

SWC State Water Contractors

SWP State Water Project

SWPCA State Water Project Contractors Authority

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 |
| UCSB | University of California at Santa Barbara |
| UNO | University of New Orleans |
| USBR | U.S. Bureau of Reclamation |
| USGS | United States Geological Survey |
| UVA *n* | Ultraviolet absorbance at wavelength *n* |
| VAMP | Vernalis Adaptive Management Program |
| WDL | California Water Data Library |
| WWTP | Waste Water Treatment Plants |