F1-252

ALIFORNIA—THE RESOURCES AGENCY
PETE WILSON, Governor
MENT OF WATER RESOURCES
3374 E. Shields Avenue
Fresno, CA 93726

July 24, 1997

DWR WAREHOUSE
97 JUL 28 PM 3:52

Ms. Kate Hansel
CALFED Bay-Delta Program
1416 Ninth Street, Suite 1155
Sacramento, California 95814

Dear Ms. Hansel:

Enclosed are ten copies each of two proposals to CALFED for Category III funding. The first, *San Joaquin River Real-time Water Quality Management Program*, proposes to use telemetered stream stage and salinity data and computer models to simulate and forecast water quality conditions along the lower San Joaquin River. The second, *A Pilot Test of Industrial Denitrification Technology in the Treatment of Agricultural Drainage for the Removal of Selenium*, proposes a short-term field test of proven industrial denitrification technology to evaluate its effectiveness in removing selenium from agricultural drainage.

If you have any questions, please call Jo Anne Kipps at (209) 445-5071.

Sincerely,

Louis A. Beck, Chief
San Joaquin District

Enclosures

# San Joaquin River Real-time Water Quality Management Program

(Other Service — water quality monitoring and modeling)

Proposed by

**California Department of Water Resources**
**San Joaquin District**
3374 East Shields Avenue
Fresno, CA 93726

**In collaboration with**

San Joaquin River Management Program (SJRMP)
California Regional Water Quality Control Board, Central Valley Region (CRWQCB-CVR)
California State Water Resources Control Board (SWRCB)
California Department of Fish and Game (DFG)
United States Bureau of Reclamation, Central Valley Operations (USBR-CVO)
United States Geological Survey (USGS)
Lawrence Berkeley National Laboratory (LBNL)
Local SJR basin stakeholders (reservoir operators, water and drainage districts)

**Program Co-Investigators**
San Joaquin River Management Program
Water Quality Subcommittee

Earle W. Cummings / DWR Wetlands Coordinator / Subcommittee Chairman
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**July 1997**

**SAN JOAQUIN RIVER REAL-TIME WATER QUALITY MANAGEMENT PROGRAM**
proposed by
**California Department of Water Resources**
**San Joaquin District**

## EXECUTIVE SUMMARY

**Project Description and Primary Biological/Ecological Objectives.** The San Joaquin River Real-time Water Quality Management Program uses telemetered stream stage and salinity data and computer models to simulate and forecast water quality conditions along the lower SJR. The primary stressor addressed by the Program is contaminants entering the SJR, and its primary goal is to increase the frequency of meeting SJR water quality objectives for salinity, thereby reducing the number and/or magnitude of high quality releases made specifically for meeting SJR salinity objectives. The water saved could be used to increase SJR basin streamflow for anadromous fish restoration efforts.

Since the January floods, many key SJR stream stage monitoring sites have been equipped with satellite-telemetered data collection platforms. The proposed work would equip these sites with sensors that monitor streamflow temperature and salinity as electrical conductivity. The Program's temperature data would be useful in the calibration of streamflow temperature models throughout the lower SJR basin. These models, in turn, may be part of adaptive management strategies to reduce streamflow temperature. Species that would benefit from such activities include white and green sturgeon, chinook salmon, steelhead trout, and American shad. The Program's salinity database can also be used to monitor critical splittail habitat in the lower SJR.

**Approach/Tasks/Schedule.** The Program shall take a collaborative approach that encourages and facilitates SJRMP participants to voluntarily reduce water quality impacts on one another. One Program goal is to reduce the number of days salinity levels exceed water quality objectives at the key compliance point along the SJR near Vernalis. Program work shall involve: (1) expansion of the SJR Real-time Water Quality Monitoring Network, (2) operation and maintenance of Network sensors, (3) continuous sampling of water quality at key Network sites, and (4) data assessment and water quality modeling and management activities. A draft memorandum of understanding (MOU) to express commitment to the operation, maintenance and expansion of the Network is now circulating among SJR stakeholders. One MOU provision is to actively pursue funds to support full implementation of the Network and the Program's water quality modeling and management activities. This proposal asks CALFED to fund the Program for three years. Network expansion would be completed within the first year.

**Justification for Project and Funding by CALFED.** Current SJR water quality monitoring and management is in a state of flux. Past interest in SJR water quality monitoring has been intermittent and sporadically funded. Decreasing support of the cooperative DWR/USGS water quality and quantity monitoring program has caused several key water quality monitoring stations to be discontinued. Some stations at the base of the lower SJR were reinstated by the interim USBR Grassland Bypass Compliance Monitoring Program. With the real-time data generated by these stations, plus the Merced River station near Stevinson, the SJRMP Water Quality

Subcommittee developed and demonstrated the capabilities of real-time SJR water quality monitoring and management. Since February 1996, weekly forecasts of the SJR discharge and salinity near Vernalis have been a regular feature of this collaborative effort. The demonstration project also provided a forum for exchanging information on SJR water quality management activities, especially with USBR-CVO staff operating New Melones Reservoir. Water saved as a result of future Program forecasts and information exchange can be used to increase SJR basin streamflow to enhance anadromous fish restoration efforts Program data can be used to monitor adaptive management strategies that concern or affect SJR basin water quality, such as efforts to reduce streamflow temperature and improve habitat conditions for chinook salmon and steelhead trout. The Program could assist other CALFED efforts to improve the overall water quality of Bay-Delta water supplies for agricultural, municipal, industrial, environmental, and recreational beneficial uses.

**Budget Costs and Third Party Impacts.** Full implementation and operation of the Program for at least three years is expected to cost approximately $1.35 million. This estimate includes a first-year expenditure of $102,000 for Network expansion, and operation expeditures of approximately $415,000 per year. Funds for full implementation shall not replace funds provided by existing programs. Major Program costs are for Network expansion and maintenance and SJR water quality modeling and management activities. Program staff shall interact frequently with SJR stakeholders and consult with SJRMP participants on opportunities to improve SJR water quality. By providing this forum for information exchange, the Program should help reduce conflicts among reservoir operators, wetlands managers, and agricultural drainage dischargers in meeting SJR water quality objectives.

**Applicant Qualifications.** DWR, a CALFED participant, has monitored SJR water quality over the past several decades. While DWR is the designated applicant, actual Program implementation and management shall be overseen by the SJRMP Water Quality Subcommittee. Key Program personnel consists of staff from DWR, CRWQCB-CVR, and USBR/LBNL. This inter-departmental staff collaborated on a recently-completed two-year grant to demonstrate the feasibility of a real-time water quality management program for the lower SJR.

**Monitoring and Data Evaluation.** The Program's primary function is water quality monitoring and data evaluation. Signatories of the pending MOU shall receive the Program's custom-designed software that graphically depicts current and forecasted SJR discharge and salinity and transmits water management schedules and model run output over the Internet. Program work shall be posted regularly on the SJRMP web site. Progress reports shall be provided annually to CALFED on Network expansion and/or operation, and on the past year's real-time and forecast data, water management activities, public outreach activities and in-kind services (e.g., staff time contributed by participating agencies for Program operation not funded by the current proposal).

**Program Support and Compatibility with CALFED Objectives.** The Program shall provide a forum for entities with an interest in managing SJR water quality to exchange information. Major Program goals include improving the overall water quality of Bay-Delta water supplies for beneficial uses (e.g., agricultural, municipal, industrial, environmental, and recreational) and increasing lower SJR basin streamflow.

## SAN JOAQUIN RIVER REAL-TIME WATER QUALITY MANAGEMENT PROGRAM

**Project Description and Approach.** The Program relies on telemetered stream stage and salinity data and computer models to estimate current overall water quality conditions in the lower SJR basin. Program implementation involves four tasks: expansion of the SJR real-time water quality monitoring network, operation and maintenance of Network features, continuous sampling of water quality at key Network sites, and data assessment and water quality modeling and management. The Program shall rely on a collaborative approach that encourages and facilitates participants in the San Joaquin River Management Program (SJRMP) to voluntarily reduce water quality impacts on one another and reduce the number of days salinity exceeds water quality objectives at the key compliance point along the lower SJR near Vernalis.

Several proposals for interrelated projects in the lower SJR basin shall be submitted to CALFED. *Real-time Water Quality Management of Wetland Discharge to the San Joaquin River* proposes to monitor wetland discharges in conjunction with adaptive management actions to reduce the adverse impacts from wetland discharge on lower SJR water quality. *Assessment of the Stanislaus River Corridor Below Goodwin Dam* proposes to identify the processes that contributed to the river's existing condition and to evaluate how such conditions affect the adaptive management of fall run chinook salmon. *San Joaquin River Salinity and Boron Basin Plan Amendment* proposes to document the adverse impact of salt and boron on beneficial uses in the SJR and southern Delta. *Expansion of a Decision Support System for Real-time Water Quality Management of the Lower San Joaquin River Basin* proposes to expand the Program's modeling capabilities to include the simulation and forecast of streamflow temperature for the lower SJR and its tributaries, and extend the model domain downstream to the Stockton shipping channel. Figure 1 depicts the linkage between the Program and these proposed projects. Activities of these individual programs will be coordinated by members of the San Joaquin River Management Program Water Quality Subcommittee. Data will be freely exchanged between the participating agencies and duplication of effort will be minimized.

**Location and/or Geographic Boundaries of Project.** The geographic area encompassed by the Program is the lower SJR basin, including east- and west-side tributaries, in San Joaquin, Stanislaus, and Merced counties. One important Program output is daily simulations and forecasts of Vernalis water quality just upstream from the SJR's entrance to the South Delta. The Program's geographic setting and Network station locations are depicted in Figure 2.

**Expected Benefits.** The primary stressor addressed by the Program is contaminants entering the lower SJR. Program benefits include (1) collection and distribution of telemetered stage, electrical conductivity (EC) and temperature data at key monitoring stations; (2) modeling of lower SJR EC and discharge; and (3) the presence of a knowledgeable staff to coordinate water quality management activities of SJRMP participants and assist them to voluntarily reduce water quality impacts on one another. By increasing the frequency of meeting Vernalis EC objectives,

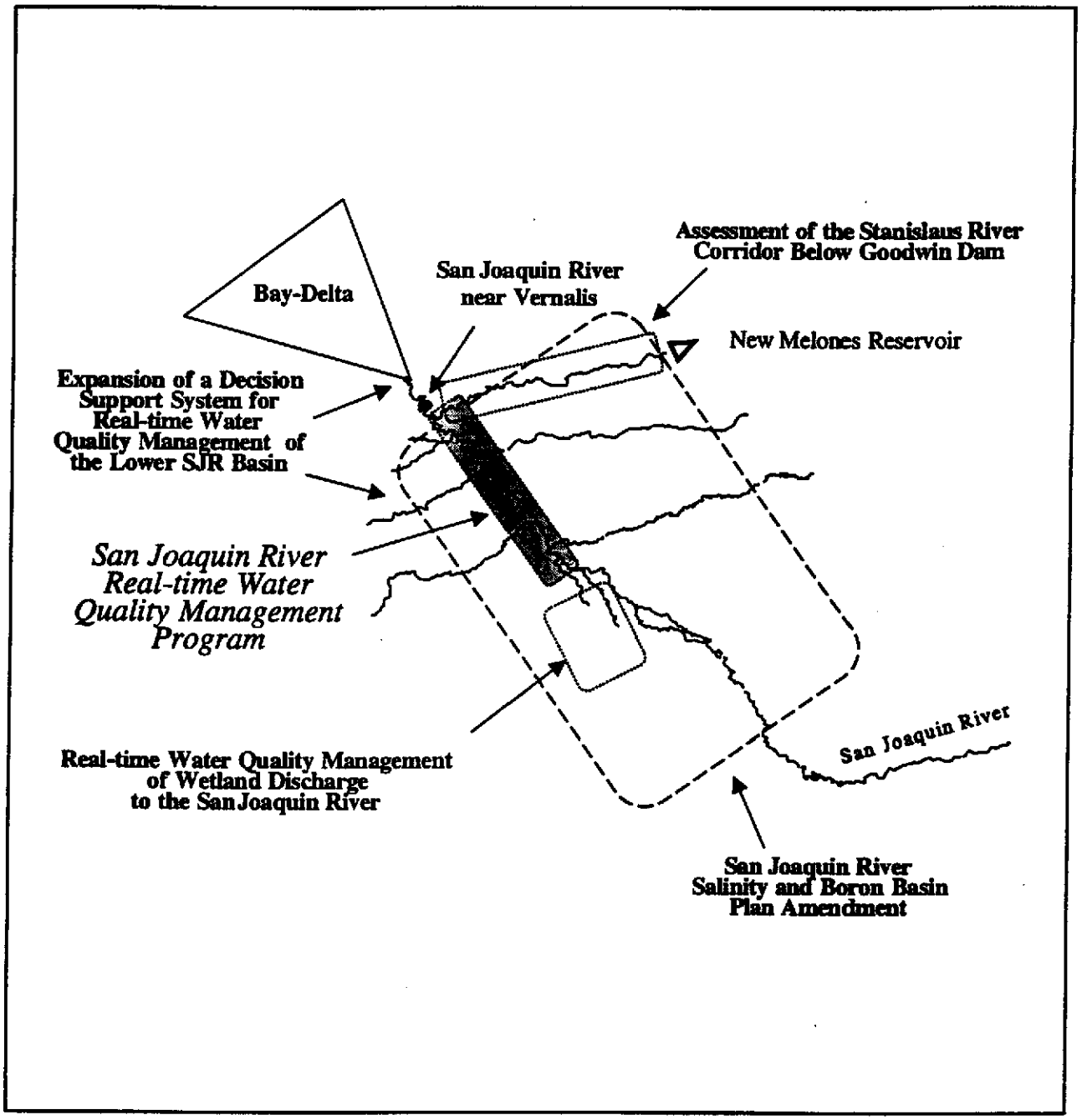


**Figure 1.** Linkage between San Joaquin River Real-time Water Quality Management Program with other CALFED proposals in the lower San Joaquin River Basin

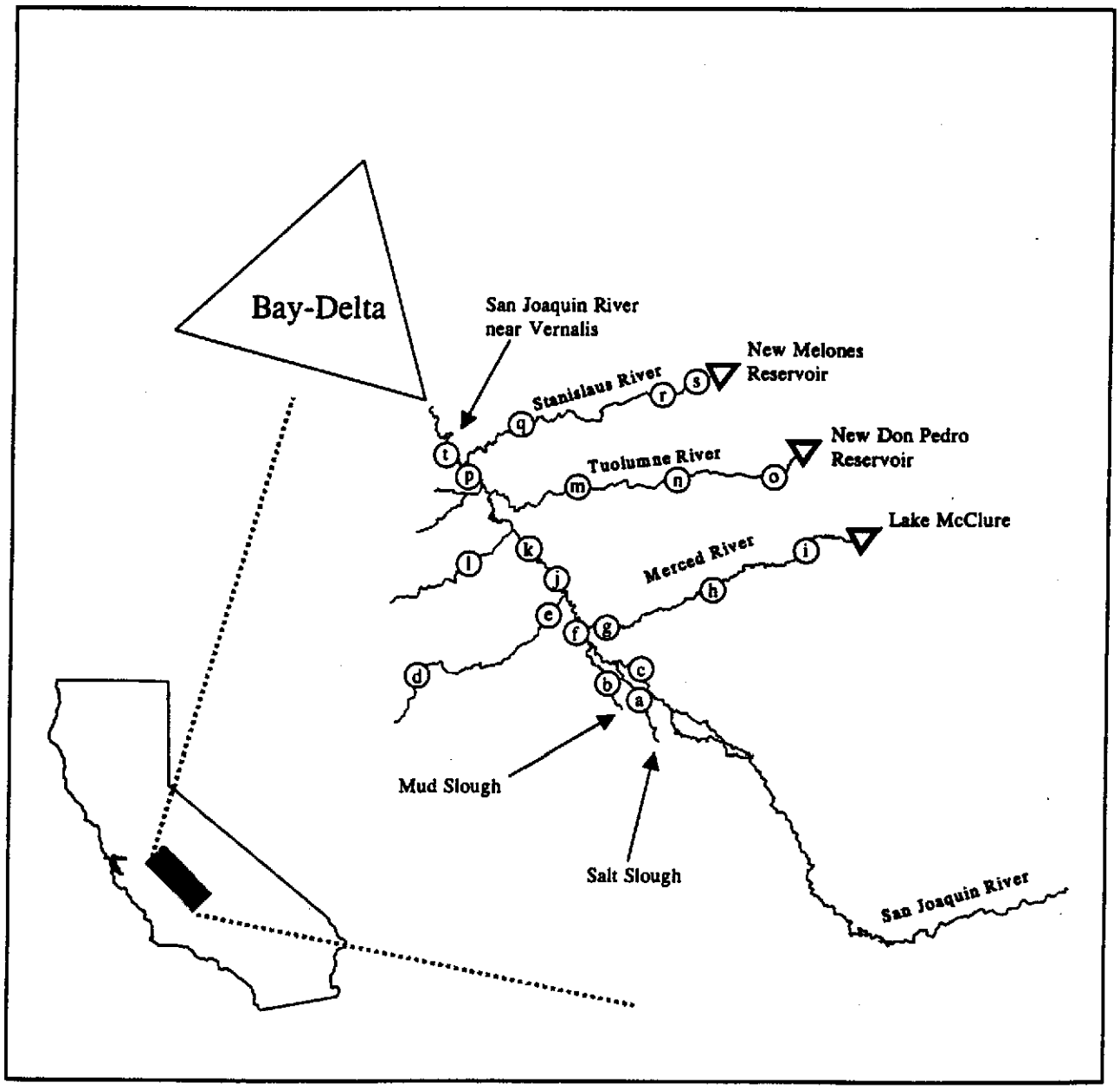


**Figure 2.** San Joaquin River Real-time Water Quality Monitoring Network

the Program could reduce the number and/or magnitude of high quality releases (e.g, releases of Stanislaus River flows from New Melones Reservoir) made specifically for meeting Vernalis EC objectives. The water saved could be used to increase SJR basin streamflow during critical periods for anadromous fish restoration efforts. Besides chinook salmon and steelhead trout, species and species groups benefiting from increased SJR streamflow include delta smelt, longfin smelt, splittail, white and green sturgeon, striped bass, marine and estuarine fishes, large invertebrates, and Bay-Delta aquatic foodweb organisms.

The Program shall upgrade key Network stations with telemetered streamflow temperature and EC sensors. Streamflow temperature data from these stations will be instrumental in the calibration of SJR basin streamflow temperature models. Species benefiting from adaptive streamflow temperature management (e.g., possible modifications to reservoir facilities and stream channels), include white and green sturgeon, chinook salmon, steelhead trout, and American shad. Additionally, EC data may be employed in monitoring adaptive management strategies that deal with use of the lower SJR by splittail.

The Program shall enhance existing and proposed water quality projects that require the monitoring of aquatic contaminants (e.g., selenium and agricultural chemicals) that may cause acute toxicity and mortality or long-term toxicity and associated detrimental physiological responses. The discharge into the SJR of agricultural drainage high in selenium is a serious contaminant problem in the lower SJR basin and Bay-Delta. Because it bioaccumulates in plant and animal tissue to levels that can be toxic to higher trophic organisms, selenium has caused reproductive failure in sensitive fish species and developmental deformities in waterfowl and shorebirds. The Program plans continuous sampling for selenium and boron at ten key sites. The Program's water quality monitoring component shall be enhanced by the purchase of portable water sampling and quality monitoring units that could be used in short-term investigations of lower SJR basin water quality by SJRMP participants (e.g., *Assessment of the Stanislaus River Corridor Below Goodwin Dam*).

Telemetered stage data are adjusted according to shifts in the relationship between stage and discharge established at each gaging station to generate preliminary estimates of stream discharge. Preliminary discharge data, such as those posted on the Internet by DWR's California Data Exchange Center, are often significantly affected by the subsequent determination of such shifts. The Program would facilitate the dissemination of shift and rating table data for Network stations, and would generate preliminary estimates of SJR discharge at Network sites along the lower SJR to help verify the accuracy of preliminary real-time discharge data posted by CDEC.

The Program's water quality monitoring and modeling activities can increase the understanding and management of activities that affect SJR water quality. A secondary benefit would be to assess the impact of adaptive management strategies that attempt to reduce the pollutant load into the lower SJR and Bay-Delta. Species and species groups benefiting from reductions in contaminants entering the Bay-Delta are delta smelt, longfin smelt, splittail, white and green

sturgeon, striped bass, resident fish species, marine and estuarine fishes, large invertebrates, Bay-Delta aquatic foodweb organisms, and waterfowl.

The Program shall facilitate the control and timing of wetland and agricultural drainage to coincide with periods when dilution flow is sufficient to achieve Vernalis salinity objectives. Potential third-party benefits include the reduction in conflicts between reservoir operators, wetlands managers, and agricultural drainers in meeting these objectives. Non-ecological CALFED objectives addressed by the Program include improving SJR and Bay-Delta water quality for agricultural, municipal, industrial, and recreational beneficial uses. Under its authority, the Program shall be managed to dovetail with CALFED's Water Quality Program, the geographic scope of which is limited to the legally defined Delta.

**Background and Biological/Technical Justification.** Interest in SJR water quality management has been intermittent, as evidenced by the many water quality monitoring stations established, operated, and maintained when specific needs arose, then discontinued as specific studies were completed and interests and funds shifted elsewhere. Some key water quality sites are located along streams that provide little additional discharge during flood conditions but are critical to understanding SJR water quality. Operation of two of these sites, Mud Slough near Gustine and Salt Slough near Stevinson, had been funded in the past by both State and federal agencies. In 1992, the cooperative DWR/USGS water quality and quantity monitoring program was cut by about 80 percent. As a result, the USGS discontinued water quality monitoring at the following stations: Salt Slough near Stevinson, Mud Slough near Gustine, Merced River near Stevinson, Orestimba Creek at River Road, SJR at Patterson Bridge, Tuolumne River near Modesto, and Stanislaus River at Ripon. Finally, while the USBR Grassland Bypass Compliance Monitoring Program currently funds the USGS to operate stations at Mud Slough, Salt Slough, and the SJR at Crows Landing, once the Grassland Bypass Project concludes (as early as October 1998), these three stations will cease operation unless other sources of funding are found.

Among the issues concerning SJR water quality addressed by the Program are:

- Establishment of CRWQCB-CVR water quality objectives for SJR salinity near Vernalis, just upstream from the SJR's entrance into the South Delta. Current SJR salinity management involves releasing water stored in New Melones Reservoir to lower Vernalis EC and maintain compliance when Vernalis salinity objectives are exceeded.

- Operation of wetlands that discharge brackish water into Mud Slough and Salt Slough from the periodic drawdown of specially managed ponds.

- Operation of the USBR's Grassland Bypass Channel Project that regulates agricultural drainage discharging into Mud Slough near its confluence with the SJR. This project, which began in September 1996 and is scheduled to last up to five years, has a monitoring program that establishes monthly load limits for salt and selenium.

- Implementation of the Anadromous Fish Restoration Program Release resulting in the release of spring and fall pulse flows that temporarily enhance the SJR's assimilative capacity for salt, thereby increasing the volume of brackish wetland and/or agricultural drainage that can be discharged into the lower SJR basin without exceeding Vernalis salinity objectives.

In June 1997, the SJRMP Water Quality Subcommittee concluded a project that demonstrated the capabilities of real-time SJR water quality management. This project — funded by a USBR Challenge Grant of $250,000 — demonstrated the feasibility of monitoring and modeling the salinity of the lower SJR on a daily basis (see Attachment 1 for references on this and related work). The demonstration project accomplished the following:

- Expanded the number of monitoring sites temporarily providing telemetered stage and water quality data, and reinstated full operation of the gaging station along the Merced River near Stevinson (the USGS discontinued this station in 1995).

- Developed analytical tools to collect, process, and display daily streamflow and salinity data (and by extension, SJR assimilative capacity).

- Executed a $50,000 service contract with Systech Engineering, Inc. to develop a Windows™-based graphical user interface (GUI) computer program to display forecast model input and results (discharge, salinity, and remaining assimilative capacity) along a 60-mile reach of the lower SJR. The GUI has Internet upload and download capabilities that expedite collection of model inputs and dissemination of water quality forecasts. The demonstration project established an Internet file transfer protocol site on the DWR San Joaquin District local area network used exclusively for GUI operation.

- Developed weekly water quality forecasts of daily Vernalis discharge and salinity since February 1996, and posted forecasts on an electronic bulletin board maintained by the USBR (sjrwqop@sacto.mp.usbr.gov).

- Drafted a memorandum of understanding (MOU) to express a commitment to Network expansion, operation, and maintenance (Attachment 2).

The demonstration project successfully provided an information-exchange for entities with an interest in managing SJR water quality. On several occasions, model estimates of SJR flow and/or salinity have been more accurate than real-time monitoring data due to the delayed recognition of rating curve shifts and/or EC sensor drift. This increased accuracy occurs because spurious data from a single source of real-time data usually does not greatly affect computed water quality. Since the USBR-CVO bases its release of dilution flows from New Melones Reservoir on real-time Vernalis EC, independent confirmation of these preliminary data by the Program's water quality forecasting model can be very important.

## COSTS AND SCHEDULE TO IMPLEMENT PROPOSED PROJECT

**Budget Costs**. Full Program operation for three years is expected to cost approximately $1,350,000. This estimate includes a first-year expenditure of $102,000 for Network expansion, and annual Program operation costs of approximately $415,000. Program budget costs not funded by existing programs are identified in Table 1. While direct labor in Task 3 is for work performed by the CRWQCB-CVR, direct labor in the other three remaining tasks pertains exclusively to DWR staff. The labor cost of Network expansion and operation provided by the USGS (Tasks 1 and 2) shall be reimbursed by a service contract with DWR (see Table 2 for details on work to be performed under Tasks 1 and 2). A separate service contract between DWR and CRWQCB-CVR shall reimburse staff and direct costs (i.e., water analysis costs) incurred by the CRWQCB-CVR in work required by Task 3 and Task 4. Another DWR service contract shall reimburse USBR for staff work required by Task 4. The cost of these interdepartmental service contracts includes overhead labor costs. The service contract with for Systech Engineering, Inc., is to maintain a $3,000 / year department service authorization for software maintenance. Material and acquisition costs cover the purchase of Network water quality sensors, one CDEC-compatible data collection platform, two portable water sampling units, and two portable mulitsensor water quality sensors with data collection capabilities. Other direct costs are for spare parts for Network operation, spare parts and expendable items for water quality sampling work, and software upgrades for modeling staff.

### TABLE 1

### Program Cost Breakdown (three-year operation)

| Project Task | Direct Labor (hours) | Direct Salary and Benefits ($) | Overhead Labor ($) | Service Contracts ($) | Material and Acquisition Costs ($) | Miscell-aneous and other Direct Costs ($) | Total Cost ($) |
|---|---|---|---|---|---|---|---|
| 1 | 552 | 16,500 | 12,500 | 19,000 (USGS) | 50,000 | 4,000 | 102,000 |
| 2 | 4,800 | 151,350 | 114,650 | 29,500 - USGS | 4,500 | 8,000 | 308,000 |
| 3 | 8,400 | 97,440 | 24,360 | 120,500 - CRWQCB | 2,700 | 3,000 | 248,000 |
| 4 | 5,160 | 213,600 | 156,400 | 310,000<br>(196,000 - CRWQCB)<br>(102,000 - USBR)<br>(9,000 - Systech)<br>(3,000 - misc) | 7,000 | | 687,000 |

Justification for CALFED funding of Network expansion and Program operation include the many benefits resulting from Program output, including improvement of overall water quality in the lower SJR and the possible increase in SJR streamflow at critical periods. Furthermore, the Program will be managed to dovetail with the CALFED Water Quality Program, the geographic scope of which is limited to the legally defined Delta. CALFED funding for Program operation shall ensure the expansion and continuation of lower SJR water quality monitoring efforts and shall support a trained interdepartmental staff to perform water quality modeling and management tasks. The forum for information exchange created by Program operation should help reduce conflicts between reservoir operators, wetlands managers, and agricultural drainage dischargers in meeting SJR water quality objectives.

The draft MOU for Network expansion, operation, and maintenance does not commit signatories to financial support. Rather, support of the Program's Network may be in the form of cost-sharing or in-kind services and shall be established by separate agreements between DWR and each MOU signatory.

Some water quality monitoring shall continue at sites funded by the interim Grassland Bypass Channel Project, and funds to operate and maintain the gaging station along the Merced River near Stevinson may be secured temporarily from existing programs (e.g., SJRMP). Water quality modeling and management activities may be supported temporarily from existing programs until a long-term funding source is secured.

**Schedule Milestones.** Work on Tasks 1 through 4 shall begin once a funding agreement is in place. Task 1, Network expansion, would be completed within the first year of Program operation. Tasks 2 through 4 involve ongoing activities that shall continue throughout the three-year duration of Program funding. A preliminary payment schedule, and associated milestones and/or deliverables, is as follows:

| Month | Payment | Task Completed/Deliverable |
|---|---|---|
| 12 | $ 515,000 | Completion of Network expansion and First Annual Program Status Report |
| 24 | $ 415,000 | Completion of Second Annual Program Status Report |
| 36 | $ 415,000 | Completion of Third Annual Program Status Report |

**Third Party Impacts.** No negative third party impacts are anticipated as a result of Program implementation.

## TABLE 2

### San Joaquin River Real-time Water Quality Monitoring Network Stations[1]

| Map Letter | Station Name (CDEC Code) | Data | Proposed Work Under Tasks 1 and 2 |
|---|---|---|---|
| a | Salt Slough near Stevinson | d*c*t* | |
| b | Mud Slough near Gustine | d*c*t* | |
| c | SJR near Stevinson (SJS) | d*c*t* | DWR SJD install and operate c/t sensor |
| d | Orestimba Creek near Newman (ORE) | d* | |
| e | Orestimba Creek near River Road | d*c*t* | |
| f | SJR near Newman (NEW) | d* | |
| g | Merced River near Stevinson (MST) | d*c*t* | DWR SJD maintain discharge station and install and operate c/t sensor |
| h | Merced River near Cressy (CRS) | d* | DWR SJR install and operate c/t sensor |
| i | Merced River near Snelling (MSN) | d* | DWR SJD install and operate c/t sensor |
| j | SJR at Crows Landing Bridge | d*c*t | |
| k | SJR near Patterson (SJP) | d | DWR SJD install and operate c/t sensor |
| l | Del Puerto Creek near Patterson | d* | |
| m | Tuolumne River near Modesto (MOD) | d* | USGS install and operate c/t sensor |
| n | Tuolumne River at Hickman Bridge | d | DWR SJD upgrade to real-time status and install and operate c/t sensor |
| o | Tuolumne River near La Grange (LGN) | d*t | USGS install c/t sensor |
| p | SJR at Maze Road Bridge (MZB) | d* | DWR SJD install and operate c/t sensor |
| q | Stanislaus River at Ripon (RPN, RIP) | d*ct | USGS replace c/t sensor |
| r | Stanislaus River at Orange Blossom Bridge (OBB) | d* | DWR SJD install and operate c/t sensor |
| s | Stanislaus River below Goodwin Dam (SKF) | d*t | USGS install c/t sensor |
| t | SJR near Vernalis (VER,VNS) | d*c*ts | USGS replace c/t sensor |

[1]Abbreviations: discharge (d), conductivity (c), temperature (t), * indicates data is telemetered (e.g., either satellite-telemetered to CDEC or telemetered by modem), c/t (combination conductivity and temperature).





I-005554

## APPLICANT QUALIFICATIONS

The Program shall be managed by members of the SJRMP Water Quality Subcommittee, who will act as co-principal investigators to conduct and/or supervise the work necessary to complete Tasks 1 through 4. Additional Program oversight shall be provided by DWR San Joaquin District and CRWQCB-CVR management personnel, as well as SJRMP's Advisory Council and Action Team. DWR shall reimburse CRWQCB-CVR, USBR, and USGS for work performed under this Program. The role of CRWQCB staff shall be limited to activities related to monitoring, modeling, and evaluating proposed management changes.

The following is information pertaining to the Program's key personnel, and includes anticipated participation (stated as percent of full-time employment), duties and responsibilities, and brief biographical profiles.

***Earle W. Cummings*** (DWR Wetlands Coordinator) (10%)

Duties and responsibilities: (1) review Program water quality forecast postings, (2) consult stakeholders on opportunities to improve SJR water quality, (3) participate in workshops to solicit stakeholders' interest and participation in Program activities, (4) help document Program activities and accomplishments by preparing annual status reports to CALFED.

Cummings has earned a B.A. with distinction in Biology and a M.S. in Biology. He also has technical training in chemistry, biological sciences, and wildlife ecology. He has worked in the chemical industry, non-profit sector, academia, local government, and several State natural resource management and regulatory agencies. He recently coordinated DWR's Urban Streams Restoration Program, worked as relief supervisor at the Flood Information Center during the January 1997 floods, and administered grant contracts which led to the completion of over 150 stream restoration projects statewide. He now works in DWR's Environmental Services Office as a recreation and wildlife resources advisor and DWR's wetlands coordinator. Cummings has chaired the SJRMP Water Quality Subcommittee since its inception in 1990.

***Jo Anne Kipps, P.E.*** (DWR Associate Engineer, Water Resources) (50%)

Duties and responsibilities: (1) oversee the assembly and processing of real-time monitoring data, (2) regularly poll stakeholders on upcoming river management activities, (3) run the forecasting model and post results on the Internet, (4) consult stakeholders on opportunities to improve SJR water quality, (5) conduct workshops to solicit stakeholders' interest and participation in Program activities, (6) instruct stakeholders on how to use the Program's GUI software, and (7) oversee the documentation of Program activities and accomplishments on the Internet through the SJRMP web site and through annual status reports to CALFED.

Kipps earned her B.A. and M.A. in Anthropology and worked in the private sector as a contract archaeologist before returning to college in 1985 to earn a B.S. in Civil Engineering. She joined

DWR in 1989. There her work in water resource endeavors has included designing biological reactors for removing selenium from agricultural drainage water, retrofitting a seawater desalting unit for drought emergency use at San Simeon State Historic Park (Hearst Castle), and conducting groundwater modeling studies for long-term Kern Water Bank operation (for which she received a DWR Meritorious Service Award in 1995). For the past two years, she has managed SJR real-time water quality monitoring activities for the SJRMP Water Quality Subcommittee, and since May she has been program manager of the San Joaquin River Management Program.

***Leslie Grober*** (CRWQCB-CVR Associate Land and Water Use Analyst) (50%)

Duties and responsibilities: (1) run the forecasting model and review DWR's forecasting model results, (2) supervise staff conducting water quality sampling described under Task 3, (3) participate in workshops to solicit stakeholders' interest and participation in Program activities, and (4) help document Program activities and accomplishments on the Internet by updating the SJRMP web site and preparing annual status reports to CALFED.

Grober has earned a B.S. in Geology and a M.S. in Hydrologic Science. He is currently pursuing a Ph.D. in Hydrologic Science from the University of California, Davis. He has extensive background in hydrologic, hydraulic, and water quality modeling. He currently provides flow and water quality monitoring support for the CRWQCB program that monitors agricultural discharges in the SJR basin and updates and maintains the San Joaquin River Input Output water quality model. Grober also provides modeling support to State and local agencies to evaluate the impact of management strategies on SJR water quality (e.g., to the SJRMP Water Quality subcommittee for the SJR Real-time Water Quality Management Demonstration Project and to the SWRCB to evaluate programmatic alternatives in the SWRCB's draft Environmental Impact Report to implement requirements in the *1995 Bay-Delta Plan*.)

***Nigel Quinn, P.E., Ph.D.*** (USBR/LBNL Geological Scientist) (25%).

Duties and responsibilities are: (1) review DWR's forecasting model results, (2) consult stakeholders on opportunities to improve SJR water quality, (3) participate in workshops to solicit stakeholders' interest and participation in Program activities, (4) instruct stakeholders on how to use the Program's GUI software, (5) help document Program activities and accomplishments on the Internet by updating the Grassland Bypass Monitoring Program's web site and preparing annual status reports to CALFED.

Quinn earned a B.S. degree with Honors in Irrigation Engineering and Hydrology from the Cranfield Institute of Technology in England and spent the early part of his career as an irrigation engineer for Tate and Lyle Inc., designing and troubleshooting irrigation systems in England and in Africa. He left England for the United States in 1978, where he taught agricultural water management and surveying courses for three years in Iowa. There he conducted research in soil erosion under crop canopy and earned a M.S. in Agricultural and Civil

Engineering. In 1981, he took a position at Cornell University where he worked on various projects (e.g., pesticide model development and water supply and sanitation policy in developing countries) and earned a Ph.D. from Cornell in Water Resources Systems Engineering in 1987. He then joined the San Joaquin Valley Drainage Program, retaining a faculty affiliation with Cornell, and has developed groundwater and drainage models to support the drainage program's planning effort. Now, at the sunset of the drainage program, he has continued his work with USBR and divides his time between monitoring efforts in support of the Grasslands Bypass project, developing real-time SJR water quality forecasting tools, and conducting selenium fate and transport research. He has been affiliated with Lawrence Berkeley National Laboratory for the past six years. Quinn is the author of over 50 articles on various aspects of water resources and drainage engineering.

## COMPLIANCE WITH STANDARD TERMS AND CONDITIONS

DWR agrees and will comply with the terms and conditions of the attached non-discrimination compliance form, and the terms and conditions of STANDARD CLAUSES - CONTRACTS WITH PUBLIC ENTITIES, which will be submitted with the contract package.

## NONDISCRIMINATION COMPLIANCE STATEMENT

COMPANY NAME

California Department of Water Resources, San Joaquin District

The company named above (hereinafter referred to as "prospective contractor") hereby certifies, unless specifically exempted, compliance with Government Code Section 12990 (a-f) and California Code of Regulations, Title 2, Division 4, Chapter 5 in matters relating to reporting requirements and the development, implementation and maintenance of a Nondiscrimination Program. Prospective contractor agrees not to unlawfully discriminate, harass or allow harassment against any employee or applicant for employment because of sex, race, color, ancestry, religious creed, national origin, disability (including HIV and AIDS), medical condition (cancer), age, marital status, denial of family and medical care leave and denial of pregnancy disability leave.

### CERTIFICATION

*I, the official named below, hereby swear that I am duly authorized to legally bind the prospective contractor to the above described certification. I am fully aware that this certification, executed on the date and in the county below, is made under penalty of perjury under the laws of the State of California.*

OFFICIAL'S NAME

Louis A. Beck

DATE EXECUTED

July 24, 1997

EXECUTED IN THE COUNTY OF

Fresno

PROSPECTIVE CONTRACTOR'S SIGNATURE

L.A. Beck

PROSPECTIVE CONTRACTOR'S TITLE

Chief, San Joaquin District

PROSPECTIVE CONTRACTOR'S LEGAL BUSINESS NAME

Not Applicable



I-005559

# ATTACHMENT 1

## Linkage with Other CALFED Proposals in the Lower SJR Basin

**in progress**

## ATTACHMENT 2

### References on Program Development and Operation


Chen, C. W., J. Herr, L. E. Gomez, N. Quinn, J. Kipps, P. J. Landis, E. W. Cummings. 1996. Design and Development of Graphic Interface for Real-time Water Quality Management of San Joaquin River. Final Report to DWR San Joaquin District. Systech Engineering, Inc.

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Kratzer, C. R., P. J. Pickett, E. A. Rashmawi, C. L. Cross, K. D. Bergeron. 1987. An Input-Output Model of the San Joaquin River from the Lander Avenue Bridge to the Airport Way Bridge. Appendix C of California State Water Resources Control Board Order No. WQ 85-1 Technical Committee Report.

Pickett, P. J. and C. R. Kratzer. 1988. An Evaluation of Drainage Reduction as a Method for Meeting Recommended Water Quality Objectives For Selenium, Salinity and Boron in the San Joaquin River: A report to the San Joaquin Valley Drainage Program.

Rashmawi, E. A., L. F. Grober, M. E. Grismer and C. R. Kratzer. 1989. Data Refinements and Modeling Results for the Lower San Joaquin River Basin, A Report to the State Water Resources Control Board. University of California, Davis.

San Joaquin River Management Program Water Quality Subcommittee. 1997. Demonstration of the San Joaquin River Real-time Water Quality Monitoring Network. DWR San Joaquin District Office Report to the United States Bureau of Reclamation.

State Water Resources Control Board. 1987. Regulation of Agricultural Drainage to the San Joaquin River. Final Report, SWRCB Order No. WQ 85-1.

## ATTACHMENT 3

## MEMORANDUM OF UNDERSTANDING
## SAN JOAQUIN RIVER MONITORING PROGRAM

## REAL-TIME WATER QUALITY MONITORING NETWORK
**July 1997**

The purpose of this Memorandum of Understanding is to express the commitment of the undersigned parties to the operation, maintenance and expansion of the San Joaquin River Real-Time Water Quality Monitoring Network. The MOU is designed to allow for parties to be added over time. Support of the program may be in the form of cost-sharing services and will be established by separate agreements between the Department of Water Resources and each signatory consistent with the understandings contained herein.

### Preamble

The San Joaquin River is the dominant environmental feature of the San Joaquin Valley. The San Joaquin River is a major hydrologic component of the Delta and at times is the dominant environmental influence on the Delta. Its many uses have resulted in a significant degrading of water quality, fish and wildlife habitat, flood protection capabilities and recreation opportunities. In 1990, AB 3603 authorized establishment of the San Joaquin River Management Program, established an advisory council, and mandated that the council identify the problems facing the river system and further, prepare a plan that would identify solutions to improve, restore and enhance current degraded conditions.

A Final Report was prepared and distributed in 1995, identifying almost 80 actions that could significantly improve conditions in the San Joaquin River system. One of those action items was a real-time water quality monitoring network. Through a USBR Challenge Grant, the SJRMP Water Quality Committee installed and demonstrated a San Joaquin River Real-Time Water Quality Management Network on a pilot scale. We, the signatories of this MOU, are committed to maintaining and expanding the Real-Time Water Quality Monitoring Network so that it can be used by interested parties to monitor water quantity and quality in the Lower San Joaquin River. Interested parties include State and federal water agencies, wildlife managers, irrigation and drainage districts, flood control interests and other entities that are interested in improving SJR water quality.

### Real-Time Water Quality Monitoring Network

The San Joaquin River Real-Time Water Quality Monitoring Network is a tool that enables interested parties to make informed water management decisions in the San Joaquin River Basin. The Network comprises water quality and quantity instrumentation, as well as a computer model and graphical user interface that facilitates interpretation of the raw data collected. The Network

is currently maintained by members of the San Joaquin River Management Program Water Quality Subcommittee. The objective of this subcommittee is to operate and maintain the Network so that it can be used beneficially by many interested parties to improve water management, thereby benefitting water quality, water supply, fisheries and flood protection in the Lower San Joaquin River. This MOU is designed to coordinate the activities of interested parties in reaching this objective.

**Activities**

The Real Time Water Quality Monitoring Network is composed of the following three main activities:

DATA COLLECTION AND PROCESSING:

•Maintain and upgrade equipment needed to provide real time stage and water quality information at critical sites in the lower San Joaquin River basin; make frequent flow measurements to maintain accurate rating tables for stage information.

•Add equipment to new sites and existing sites to allow for improved reliability of water quality forecasts by narrowing gaps in current data collection network; currently, only the bare minimum number of sites are operational and data for some monitored sites must be estimated.

•Coordinate monitoring activities of local, state and federal agencies; stage and water quality monitoring equipment are currently maintained by several different agencies.

•Assemble the collected data at one central location: this includes all raw stage and water quality data from real time monitoring sites as well as information obtained from other interested parties in the Basin.

•Check raw data for errors and process to obtain daily average flow and water quality conditions.

•Store raw and processed data in a centralized workstation.

DATA ANALYSIS:

•Analyze processed data using SJRIODAY, a simple mass balance hydrologic-routing model, to forecast discharge and water quality along a 60-mile reach of the lower San Joaquin River for base case conditions.

•Identify potential water quality, water supply, fisheries and flood protection concerns raised during data analysis.

•Identify operational changes that can be made to improve water quality conditions in the river.

•Make additional SJRIODAY model runs to analyze the impact of various operational changes on San Joaquin River water quality.

DATA DISSEMINATION

•Make numerical and graphical information available to interested parties through the Graphical User Interface.

•Post water quality forecasts and issues of concern on the Internet. Real time water quality forecasts posted to the Internet will initially be made one years; actual real time forecasts will be made available only to signatories to this MOU.

•Solicit interested parties for additional information so that future water quality forecasts can be further improved.

•Provide opportunities for public input.

•Publish annual operations reports.

**Estimates of Funding Requirements**

Initial purchase of equipment, development of software and operations costs have been borne by a combination of grant funds and budget allocations by USBR, RWQCB, and DWR. Annual operation of the forecast model and real-time station operation and maintenance is $300,000. An additional $[illegible]0 one-time cost is needed to expand the system to secure more accurate information through installation of additional stations and additional parameters.

**Policy and Principles**

1. The parties hereto agree that, subject to the availability of appropriations and in accordance with their respective authorities, they will cooperate in establishing and maintaining the SJR Real Time Water Quality Monitoring Network which will carry out the activities described above.

2. The parties hereby commit to participate in the Network and to actively pursue raising funds to support the Network.

3. The field and office work pertaining to this Network will be subject to periodic review by the SJRMP Water Quality subcommittee to provide Program oversight.

4. The sites or areas to be included in the Network will be determined by mutual agreement between the parties hereto or their authorized representatives. The data collection and analytical methods employed in the field and office will be those adopted by mutual agreement to insure they comply with the more restrictive quality assurance and quality control standards, subject to modification by mutual agreement if the data collection and analysis authority or responsibility of either party is changed.

5. During the progress of work all operations of any party pertaining to this Network will be open to the inspection of any other party; and if work is not carried out in a mutually satisfactory manner, any party may terminate their participation in this agreement upon days written notice to all the other parties.

6. The original records and documents providing the data and analysis used by will be maintained by the office originating those records and documents. Upon request, arrangements will be made to allow copying of the original records by any signatory of this MOU requesting the documents.

7. The records and forecasts resulting from this Network will be made available to the public as promptly as possible. All records, reports or forecasts published will contain a statement of the cooperative relationship between the parties.

8. DWR will enter into separate cost-share agreements with each of the signatories to this MOU, which will contain terms, conditions and funding responsibilities.



Director, Regional Director
California Department ofUnited States
Water Resources Bureau of Reclamation

Executive DirectorExecutive Officer
State Water ResourcesRegional Water Quality Control
Control BoardBoard, Central Valley Region

Others