

STATE OF CALIFORNIA  
STATE WATER RESOURCES CONTROL BOARD  
DIVISION OF WATER RIGHTS

**INVESTIGATION ORDER WR 2011-0003 - EXEC**

MERCED IRRIGATION DISTRICT

MERCED RIVER HYDROELECTRIC PROJECT

The State Water Resources Control Board (State Water Board), Division of Water Rights (Division) finds:

**Party Responsible:**

1. Merced Irrigation District (Merced ID) owns and operates the Merced River Hydroelectric Project (Project), Federal Energy Regulatory Commission (FERC or Commission) Project No. 2179, located on the Merced River that is comprised of McSwain Dam (River Mile (RM) 56<sup>1</sup>), which impounds McSwain Reservoir, and New Exchequer Dam (RM 62), which impounds Lake McClure. Merced ID also owns and operates Crocker-Huffman Diversion Dam (RM 52) situated downstream of Pacific Gas and Electric Company's (PG&E) Merced Falls Dam (RM 55), a run-of-the-river hydroelectric power generation facility located immediately downstream of McSwain Dam. The Project is currently undergoing relicensing with the Commission, and the Project's current license expires on February 28, 2014.

**Regulatory Authority and Need for Information:**

2. The State Water Board is designated as the state water pollution control agency for all purposes stated in the Federal Water Pollution Control Act (33 U.S.C. § 1251, et seq.). (Wat. Code, § 13160.) The State Water Board is authorized to provide water quality certification under Section 401 of the Clean Water Act and to exercise any powers delegated to the state by the Federal Water Pollution Control Act. (*Ibid.*) Water Code section 13383 authorizes the State Water Board to establish monitoring and reporting "for any person who discharges, or proposes to discharge, to navigable waters" pursuant to the authority defined under section 13160. The operation of Merced ID's Project involves a discharge into navigable waters. In addition to the authority provided under Water Code section 13383, the State Water Board has authority to require submission of monitoring and technical reports under sections 1051, 13165 and 13267 of the Water Code.
3. Renewal of the Commission license for the Merced River Hydroelectric Project is a federal action that requires water quality certification. (33 U.S.C. § 1341.) Before the Commission can issue a new license for the Project, a Section 401 water quality certification issued by the State Water Board or a waiver of Section 401 authority is required. The State Water Board needs sufficient information to show that operation of the Project under a new Commission license is consistent with both water quality objectives and the protection of the beneficial uses designated for the Merced River and the San Joaquin River in the Water Quality Control Plan for the Sacramento and San Joaquin River Basins, and those designated in the Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta Plan).

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<sup>1</sup> RM denotes the River Mile location increasing upstream from RM 0 at the confluence of the Merced and San Joaquin Rivers.

4. Beneficial uses designated for the Merced River downstream of McSwain Reservoir to the confluence with the San Joaquin River include municipal and domestic supply, agricultural supply (stock watering), industrial process supply, industrial service supply, contact and non-contact water recreation, warm freshwater habitat, cold freshwater habitat, migration of aquatic organisms (both warm and cold), spawning (both warm and cold) and wildlife habitat. The beneficial uses designated for the Merced River from the headwaters to Lake McClure and within Lake McClure and McSwain Reservoir include agricultural supply (irrigation), contact and non-contact water recreation, warm freshwater habitat, cold freshwater habitat, and wildlife habitat. Municipal and domestic supply is designated as a potential use for this segment of the river.
5. Merced ID's Project operations, through water releases from New Exchequer and McSwain Dams, influence water quantity and water quality throughout the lower Merced River extending downstream into the San Joaquin River to the Delta (see Attachment A). Specifically, the Project controls the amount of water released into the Merced River below New Exchequer Dam, and is therefore capable of influencing both water quality and freshwater habitat conditions downstream of the Project to the Sacramento-San Joaquin Delta. For this reason, the information requested in this Order covers a geographic scope that extends downstream into the San Joaquin River to the boundary of the Delta at Vernalis.
6. McSwain Dam, New Exchequer Dam, and the Crocker-Huffman Diversion Dam are part of a multi-purpose water project operated for consumptive uses in addition to hydroelectric power purposes and flood control. Appropriation for irrigation, domestic use and other non-hydropower uses is authorized under Licenses 2865, 6047, and 11395 (Applications 1274, 10572 and 16186, respectively). Merced ID also holds the following water rights licenses that authorize the use of water for power production: License 2684 (Application 1222), License 990 (Application 1221) and License 11396 (Application 16187). Merced ID also has filed Statements of Water Diversion and Use Nos. 15475 and 15476 for riparian claims for use of the natural flow of the Merced River at McSwain and New Exchequer powerhouses.
7. The technical information obtained through compliance with this Order will be used to develop the conditions for inclusion in the water quality certification for Merced ID's Project. The information may also be useful for purposes of water right administration, to inform the review of and potential amendments to the Bay-Delta Plan and for the preparation of Total Maximum Daily Load (TMDL) amendments to the Water Quality Control Plan for the Sacramento and San Joaquin River Basins (Basin Plan). The State Water Board has consulted with the Regional Water Quality Control Board, Central Valley Region (Central Valley Water Board) and determined that the Order does not duplicate efforts of the Central Valley Water Board.

### **Background Information**

8. Portions of the Merced River within and downstream of the Project and the San Joaquin River downstream of the confluence with the Merced River are currently listed under Section 303(d) of the Clean Water Act as impaired for a variety of pollutants and stressors. The following table provides a summary of water quality impairments based on the 2006 303(d) list and the sections of the Merced and San Joaquin Rivers to which they apply. Also included in the table is a listing for impairment due to unknown toxicity for Ingalsbe Slough, a tributary that enters the Merced River just upstream of Shaffer Bridge.

Together, these 303(d) impairment listings indicate that water quality objectives are not being met both in the Merced River and in the San Joaquin River downstream of the confluence with the Merced River. Although the State Water Board adopted the 2010 Integrated Report (Clean Water Act Section 303(d) List/305(b) Report) on August 4, 2010, the final version of the 2008-2010 303(d) list has not yet been finalized by the United States Environmental Protection Agency (US EPA). The US EPA has recommended additional listings for temperature for the Merced and San Joaquin Rivers and electrical conductivity for portions of the San Joaquin River. US EPA is currently receiving public comment on these listings and a final decision is anticipated in early 2011.

River Reach	Water Quality Impairments												
	**alpha BHC	Boron	***Group A Pesticides	Chlopyrifos	Diazinon	E. coli	Unknown Toxicity	DDT	DDE	Mercury	E C	Temp	Diuron Toxaphene
Merced River, Lake McClure										√			
Merced River, McSwain Reservoir to S.J. River			√	√	√	√	√			√		*	
San Joaquin River, Merced River to Tuolumne River	√	√	√	√			√	√	√	√	*	*	
San Joaquin River, Tuolumne River to Stanislaus River			√	√	√		√	√		√	*	*	
San Joaquin River, Stanislaus River to Delta		√	√	√			√	√	√		*	*	√
Ingalsbe Slough (tributary to Merced River)							√						

\* Additional listings recommended by the US EPA.

\*\* alpha-1,2,3,4,5,6-hexachlorocyclohexane

\*\*\* Group A Pesticides include the following: aldrin, dieldrin, chlordane, endrin, heptachlor, heptachlor epoxide, hexachlorocyclohexane (including lindane), endosulfan, and toxaphene

9. The Project, due to its influence on water quantity in the lower Merced River and in the San Joaquin River, as described at No. 16 below, affects water quality downstream of the hydroelectric facilities due to the relationship between streamflow and contaminant concentrations and the influence water quantity has on water temperature. Hydrology data provided in the Pre-Application Document prepared for the Commission proceeding indicates that return flows from Merced ID's Livingston, Garibaldi and Main canals may at times comprise more than 25 percent of total flow in the Merced River below Crocker-Huffman Diversion Dam.

10. Anadromous fish populations in the San Joaquin River watershed have been in decline in recent years and efforts are underway to restore and improve their population status. In the Merced River, the escapement of fall-run Chinook salmon, which rebounded after the 1986 through 1992 drought period to peak at 13,076 fish in 2000, had declined 84 percent to 2,150 fish by 2006<sup>2</sup>. In more recent years (between 2007 and 2009), adult escapement of fall-run Chinook salmon dropped to an average of 547 fish per year<sup>3</sup>.

<sup>2</sup> Marston, D. 2007. San Joaquin River Fall-run Chinook Salmon and Steelhead Rainbow Trout Historical Population Summary: A report from the California Department of Fish and Game to the Central Valley Regional Water Quality Control Board, p. 21.

<sup>3</sup> California Department of Fish and Game, Fisheries Branch Anadromous Assessment Grand Tab compiled March 9, 2010.

In addition, the Merced River is designated as critical habitat for the Central Valley Steelhead Distinct Population Segment, which is currently listed as Threatened under the Federal Endangered Species Act<sup>4</sup>. The National Marine Fisheries Service (NMFS) Draft Recovery Plan released in October 2009<sup>5</sup> includes recovery actions for steelhead in the Merced River such as developing and implementing steelhead protection and maintenance flow standards for the Merced River and various activities to increase water quality monitoring to ensure that the water quality criteria established in the Basin Plan are met.

11. Previous fish health surveys conducted in the Merced River by the U.S. Fish and Wildlife Service (USFWS) indicate there is a high incidence of Proliferative Kidney Disease (PKD) in both wild and hatchery-reared Chinook salmon<sup>6</sup>. PKD is a progressive disease that impairs fish health due to kidney damage and leads to anemia. Incidence of the disease is associated with infection with the parasite *Tetracapsula bryosalmonae*, the causative agent of PKD. Chinook salmon reared at the Merced River Hatchery, including those used in the Vernalis Adaptive Management Program studies, are often found to be infected with *T. bryosalmonae*. The life cycle of *T. bryosalmonae*, which involves two phases that infect two different host species, includes a life stage that infects the bryozoan host, *Fredericella browni*. Bryozoans are commonly-found filter-feeding aquatic invertebrates that inhabit both freshwater and marine environments and occur in rivers, streams and lakes. Nutrient input and the absence of scouring flows are factors that would tend to favor the bryozoan host. No information exists to describe the geographic distribution of bryozoans in the Merced River or what proportion may be infected with *T. bryosalmonae*.
12. Additional fish health concerns that may be affecting survival or the physiological condition of anadromous fish in the Merced River are related to impacts associated with poor water quality, which can act as a sub-lethal stressor. The combined effects of elevated water temperature and exposure to pesticides due to their presence in agricultural run-off during rain events and/or irrigation return flows have the potential to reduce fish survival or physiological performance in out-migrating juvenile salmonids.

### **Commission Relicensing Proceeding**

13. Division staff have participated in the Commission relicensing proceeding and have provided input regarding the information that will be needed to develop the water quality certification. The study plans proposed by MID did not address the full range of information needed by the State Water Board to develop the certification. The Study Determination issued by the Commission's Director of Energy Projects on September 14, 2009, was likewise deficient by not requiring that MID implement additional studies or study modifications requested by the State Water Board and other participating agencies and non-governmental organizations, in particular those that deal with resource issues downstream of Crocker-Huffman Diversion Dam.

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<sup>4</sup> Endangered and Threatened Species; Designation of Critical Habitat for Seven Evolutionarily Significant Units of Pacific Salmon and Steelhead in California, September 2, 2005, Federal Register, Vol. 70, No. 170, p. 52488.

<sup>5</sup> National Marine Fisheries Service. October 2009. Public Draft Recovery Plan for the Evolutionarily Significant Units of Sacramento River Winter - run Chinook Salmon and Central Valley Spring-run Chinook Salmon and the Distinct Population Segment of Central Valley Steelhead. Sacramento Protected Resources Division.

<sup>6</sup> Fish health surveys in the Merced River have been conducted during several years in the recent past for which reports are available either from the USFWS California-Nevada Fish Health Center website at <http://www.fws.gov/canvfhc/reports.asp>, or from the USFWS Anadromous Fish Restoration Program website at <http://www.fws.gov/stockton/afrp/documents.cfm>

Although the Commission's Study Dispute Resolution Process led to the adoption of some additional study plans and study plan revisions<sup>7</sup> beyond those proposed by MID, the current set of study plans approved by the Commission still does not provide for the collection of the information needed for issuance of the Section 401 Water Quality Certification. Likewise, there is no assurance that the Commission will order the implementation of the four "phased studies" that were supported by the Study Dispute Panel and are called for in the Director's Formal Study Dispute Resolution Determination. These include an instream flow study downstream of Crocker-Huffman, a Chinook salmon egg viability study, a salmonid floodplain rearing study and a reservoir water temperature management feasibility study. As the Commission has provided little guidance to the relicensing participants regarding what the Commission will consider as evidence sufficient to require these additional studies, there is no assurance that these studies will be implemented to provide information necessary for the Commission proceeding. Consequently, the State Water Board finds that the information requested in this Order is needed to address impacts of MID's Project on water quality and the protection of beneficial uses, in particular those related to fisheries resources, in the lower Merced River downstream of the Crocker-Huffman Diversion Dam.

14. Merced ID has repeatedly asserted that the Commission proceeding is not the appropriate venue to address anadromous fisheries resources and instream flow in the Merced River; however, it is incumbent upon the State Water Board, as the designated water pollution control agency, to ensure that operation of the Project under a new Commission license will comply with water quality objectives for the protection of the beneficial uses designated for the waters affected by the Project. The Commission-required instream flows contained in the current Project license<sup>8</sup> are the only flow requirements currently in effect in the Merced River between April 1 and September 30. After 2017, when the Davis-Grunsky contract<sup>9</sup> expires, no flow requirements will exist for the Merced River other than those required in a new Commission license, except for a requirement for additional flow in the month of October<sup>10</sup>. Although the State Water Board maintains continuing authority to impose limitations on the diversion and use of water authorized under Merced ID's water rights licenses for non-hydroelectric power purposes to protect public trust uses, inclusion of stream flow requirements in the water quality certification that are protective of water quality will likely be necessary to assure that the Project complies with the Clean Water Act.

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<sup>7</sup> Two additional studies were required, including an instream flow study for the segment of the Merced River between Merced Falls Dam and Crocker-Huffman Diversion Dam and a study to be conducted collaboratively with PG&E to determine Project impacts associated with channel armoring downstream of Crocker-Huffman. Revisions were also made to the water temperature modeling and water operations modeling studies to extend the geographic scope for to Shaffer Bridge at RM 32.5.

<sup>8</sup> The current Commission license for the Project expires on February 28, 2014 and includes instream flow requirements for the lower Merced River measured at Shaffer Bridge, which is located over 23 miles downstream of the Project.

<sup>9</sup> The Davis-Grunsky Contract for State Funds is an agreement between Merced ID and the State of California that provided funding for recreational facilities at the Project that requires the release of 180 to 220 cubic feet per second (depending on two water year types) from October 31 through March 31 with compliance at Shaffer Bridge.

<sup>10</sup> Amendments made to Merced ID's water rights Licenses 2685, 6047, and 11395 require the release of 12,500 acre-feet of water in October in addition to releases required by the Commission license. These flows are based on the October flow releases called for in the Memorandum of Understanding between California Department of Fish and Game and Merced ID.

## CDFG-Merced ID Memorandum of Understanding

15. Merced ID holds water rights that authorize the diversion of water for power production at New Exchequer Dam and McSwain Dam as well as consumptive water rights for storage in Lake McClure and Lake McSwain and the rediversion of water out of the Merced River into the Northside Canal at Merced Falls Dam, into the Main Canal at Crocker-Huffman Diversion Dam and into Duck Slough. Merced ID is also petitioning the State Water Board to modify the current place of use in its water rights licenses Nos. 2685 and 11395 to include additional acreage and additional points of rediversion downstream of Crocker-Huffman Diversion Dam to allow Merced ID to deliver stored water to downstream users with riparian and senior claims of entitlement per the Cowell Agreement<sup>11</sup>.
16. In 1992, Merced ID petitioned the State Water Board to expand the place of use for water rights Licenses 2685, 6047 and 11395 to include the service area of the El Nido Irrigation District. CDFG filed a protest to the petition due to concerns that the requested action could adversely impact anadromous fisheries resources. The protest was eventually resolved in 2002 through the execution of a Memorandum of Understanding (MOU) between Merced ID and CDFG, which provides the State Water Board with jurisdiction to review the implementation of the MOU. The MOU acknowledges that "through its operations, Merced's Project, as licensed by the Commission, can materially affect the quality, timing and quantity of instream flow available below Crocker-Huffman Diversion Dam (lower Merced River), thereby potentially affecting the welfare of salmon stocks and other fisheries resources in that stretch of the Merced and San Joaquin Rivers."<sup>12</sup> The MOU defines a set of studies that were meant to occur over a 10-year period and were designed to provide information necessary to identify instream flow requirements and establish cold water management alternatives for the Merced River. Although not originally intended for this purpose, the MOU study results will also provide information needed to establish conditions for the water quality certification for Merced ID's Project and will aid the State Water Board in potentially amending the Bay-Delta Plan's San Joaquin River flow objectives.
17. Merced ID agreed to fund specific elements of the 10-year study program, with additional funding expected from other sources including the California Department of Fish and Game and the Central Valley Project Improvement Act. Certain elements of the MOU studies are either ongoing or have been completed, although not all of the data have been analyzed nor have final reports been completed. State Water Board staff consulted with CDFG to prioritize the remaining MOU study plan elements.
18. In response to concerns raised by participants in the Commission relicensing proceeding that insufficient information is available to assess impacts of the Project on anadromous fish in the Merced River, the Merced ID Board of Directors authorized funding to implement a subset of the MOU studies in the next two years<sup>13</sup>. At the time, Merced ID did not consult with CDFG to determine which of the remaining MOU studies were the most critical to complete or to determine whether current conditions necessitate a refocusing on other areas that could require study.

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<sup>11</sup> The Cowell Agreement is an agreement between Merced ID and downstream water users that assures that adequate flow is provided downstream of Crocker-Huffman Diversion Dam to fulfill riparian and/or Pre-1914 water rights for the signatories to the agreement.

<sup>12</sup> Memorandum of Understanding between California Department of Fish and Game and Merced Irrigation District regarding October Instream Flows, Other Interim Instream Flows and Fisheries Studies in the Lower Merced River, August, 2002, Page 2.

<sup>13</sup> Additional information regarding the fisheries studies funded by Merced ID's Board of Directors can be found at the following website: <http://www.mercedid.org/fisheries/?L=mid.view&id=fisheries>

## **Rationale for Specific Information Requests**

19. Information requested in this Order is required to assess direct, indirect and cumulative impacts of Merced ID's Project on water quality and fisheries habitat in the Merced and San Joaquin River watershed. In the event that monitoring is required of other parties within the watershed in the future, modifications may be made to this Order to reduce or prevent redundant monitoring efforts.
20. Water quality data requested in this Order are needed to determine whether water quality objectives are being met in the Merced River and downstream in the San Joaquin River and to provide information regarding the relationship between water quality and instream flow. This Order includes a phased approach to water quality data collection where initial sampling is limited to the river reaches where MID Project operations have the greatest impact (i.e., within the Merced River and in the San Joaquin River upstream of major tributary inflows from the Tuolumne and Stanislaus Rivers). However, additional sampling sites will be required downstream of the tributaries if results from the initial sampling effort indicate any exceedance of water quality objectives. The water quality data will be used to develop conditions in the water quality certification and may be used by the Central Valley Water Board to establish baseline conditions and develop load allocations for the purpose of TMDL development. For example, dissolved oxygen data is needed to determine whether conditions in the Merced River support the beneficial uses assigned to the river for the protection of fisheries resources. Water temperature data for the Merced River, which have been collected in recent years by CDFG, are needed to assess whether conditions are protective of cold freshwater habitat, cold spawning and cold migration beneficial uses.
21. The information obtained from implementation of the fisheries studies required in this Order will be used to assess the status of fisheries resources and habitat conditions in the Merced River. Improved knowledge of fish survival, fish health, salmon egg incubation and migration timing will aid in the development of instream flow conditions for the 401 water quality certification and other conditions that may be required to improve or enhance fisheries habitat or fish populations. The information requested on steelhead distribution and abundance in the Merced River will be used to develop conditions that protect the habitat and water quality needs of steelhead.
22. Some instream flow studies have been conducted for portions of the lower Merced River, though recent studies are limited to certain salmonid life stages and short segments of the river. Moreover, channel conditions may have changed due to high flow events and on-going restoration activities. Consequently flow recommendations obtained from previous studies may not adequately reflect the current condition. In general, this assessment of the applicability of using older, potentially outdated instream flow studies to set flow standards was also voiced in a comment letter submitted on behalf of the San Joaquin River Group Authority, of which Merced ID is a member, in response to the recent Instream Flow Study Report produced by the State Water Board<sup>14</sup>. Additionally, the Merced River is ranked as No. 12 on CDFG's most current list of 22 priority streams that require instream flow assessments and was also included on the State Water Board's draft prioritized list for instream flow studies on California rives and streams<sup>15</sup>.

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<sup>14</sup> A November 9, 2010 comment letter from Kenneth Petruzzelli on behalf of the San Joaquin River Group Authority regarding the prioritization of California streams that require instream flow assessments states that: "As for existing studies, in 2008 the Department of Fish and Game submitted a list of instream flow recommendations to the SWRCB, pursuant to Public Resources Code 10000. However, all of the studies are at least 10 years old and for some streams nearly 30 years old and potentially based on outdated methodologies."

<sup>15</sup> The Draft Prioritized Schedule and Estimate of Costs to Complete Instream Flow Studies Pursuant to the Sacramento-San Joaquin Delta Reform Act of 2009, a draft report prepared for the California Legislature, was presented at the November 16, 2010 State Water Board meeting.

A requirement to conduct a new instream flow study will provide a more accurate representation of the relationship between fisheries habitat and instream flow that will, in turn, aid in the development of instream flow conditions for the 401 water quality certification.

23. The requested fish tissue mercury data and related water quality data will be used to screen for potential risks to human health and wildlife associated with mercury bioaccumulation in the Merced River watershed. The sampling strategy contained in this Order is designed to provide data that are comparable with other watersheds and to aid the Central Valley Water Board in establishing baseline conditions and developing load allocations for the purpose of TMDL development.
24. A requirement for Merced ID to develop, in coordination with USFWS and CDFG, and to provide funding for a fish health survey will provide information on the health status of anadromous fish in the Merced River that can provide insight into the relationship between water quality and habitat conditions and the impact these have on the health status of Merced River fish.



**IT IS HEREBY ORDERED**, that Merced ID shall furnish the following information required by the State Water Board, Division of Water Rights:

1. Water quality data shall be collected at the locations listed below in the Merced River downstream of Crocker-Huffman Dam and in the San Joaquin River. The data collected shall include the set of constituents in the Commission-approved Water Quality Study Plan for the Project relicensing as shown in Attachment B. Data for additional constituents shall also be collected at specific sampling locations as identified below.

Sample collection shall take place during the spring high flow period (March – April) and the summer low flow period (August – September) beginning in 2011 and continuing through 2013. For diazinon and chlorpyrifos, sample collection should occur in association with at least one storm event per year with a 24 hour rainfall total of  $\geq 0.5$  inches that takes place after these pesticides have been applied on lands in the vicinity of the Merced River. Information regarding the timing of pesticide application can be obtained from the Merced County Agriculture Commission office.

If either Merced ID or any other entity in the vicinity of the Project will be collecting water quality data at the same locations and within the same general time frame as required by this Order, Merced ID may furnish that data to the State Water Board in lieu of collecting additional data.

The locations for which water quality data shall be collected during the first year include the following sites:

**Merced River water quality sample sites:**

- Merced River at River Road
  - Group A pesticides
  - Boron
  - Pyrethroids (bifenthrin, cyfluthrin, lambda-cyhalothrin)
  - Suspended sediment concentration
- Merced River at McDonnell State Recreation Area
  - *E. coli*
- Merced River at Shaffer Bridge
  - Group A pesticides
  - Boron
  - Pyrethroids (bifenthrin, cyfluthrin, lambda-cyhalothrin)
  - Suspended sediment concentration
  - *E. coli*
- Merced River at Snelling Road Bridge
  - Suspended sediment concentration
  - *E. coli*

**San Joaquin River sites**

- San Joaquin River upstream of Merced River Confluence ( Hills Ferry Bridge)
  - Group A Pesticides
  - Boron
  - DDE & DDT (only during high flow sampling)
  - Pyrethroids (bifenthrin, cyfluthrin, lambda-cyhalothrin)
- San Joaquin River at Crows Landing (Turlock Sports Club)
  - Group A Pesticides
  - Boron

- DDE & DDT (only during high flow sampling)
- Pyrethroids (bifenthrin, cyfluthrin, lambda-cyhalothrin)
- San Joaquin River at Patterson Fishing Access
  - Group A Pesticides
  - Boron
  - DDE & DDT (only during high flow sampling)
  - Pyrethroids (bifenthrin, cyfluthrin, lambda-cyhalothrin)

If results from the first year of water quality sampling indicate that water quality objectives are not being met at the San Joaquin River site downstream of the confluence with the Merced River, water quality sampling during the following years shall include two additional sites and the constituents shown below:

- San Joaquin River at Highway 132 (Maze Blvd)
  - Group A Pesticides
  - Boron
  - DDE & DDT (only during high flow sampling)
  - Pyrethroids (bifenthrin, cyfluthrin, lambda-cyhalothrin)
- San Joaquin River at Airport Way
  - Group A Pesticides
  - Diuron
  - Boron
  - DDE & DDT (only during high flow sampling)
  - Pyrethroids (bifenthrin, cyfluthrin, lambda-cyhalothrin)

Water quality data for the constituents in Attachment B shall also be collected once each year during the irrigation season from the water that is returned to the Merced River via the Northside, Garibaldi and Livingston canals. Merced ID shall provide flow data for the water returned to the river from Merced ID's canals during the years 2011, 2012 and 2013.

A Water Quality Sampling Plan and a Quality Assurance – Quality Control (QA/QC) Plan shall be developed and submitted to the Deputy Director for Water Rights for approval to assure that data quality standards are met. The QA/QC Plan shall follow guidelines provided for the State Water Board's Surface Water Ambient Monitoring Program.

See the following website for more information regarding data quality standards: [http://www.waterboards.ca.gov/water\\_issues/programs/swamp/tools.shtml#qa](http://www.waterboards.ca.gov/water_issues/programs/swamp/tools.shtml#qa). At a minimum, the plan should describe how the following elements related to field sampling will be addressed:

- Quality assurance objectives
- Sample container preparation, labeling and storage;
- Chain-of-custody tracking;
- Training of field personnel
- Sample collection and use of field blanks to assess field contamination;
- Sample preservation and filtration requirements;
- Sample storage and transportation to laboratory

Merced ID shall provide evidence that the analytical laboratory selected to analyze the water samples has a QA/QC plan in place for laboratory operations. In addition, QA/QC information associated with the laboratory analysis of the water samples shall be submitted together with the water quality data. If water quality data collected by other parties is provided to the State Water Board, the same QA/QC information shall also be provided.

2. One 96-hour acute and one 7-day chronic toxicity bioassay using the water flea, *Ceriodaphnia dubmia*, shall be conducted annually during 2011 and 2012 with water collected in the Merced River during: 1) a rainstorm event between January 15 and March 15; and 2) the summer low flow period (August – September). The water samples shall be collected from the Merced River at Shaffer Bridge:
  - Acute toxicity shall be analyzed using the methods described in EPA-821-R-02-012 (Methods for Measuring the Acute Toxicity of Effluents and Receiving Waters to Freshwater and Marine Organisms)
  - Chronic toxicity shall be analyzed using the methods described in EPA/821-R-02-013, October 2002 (Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms)
3. Merced ID shall obtain and compile water temperature data collected by DFG in the Merced River from 2007 through the date of this Order at the following locations:
  - RM 1 near confluence with San Joaquin River
  - RM 12 near Hagaman Park
  - RM 31 near Shaffer Bridge
  - RM 42 near J-59 Bridge
  - RM 47 near Snelling Road Bridge
  - Below Crocker-Huffman Diversion Dam near Merced River Hatchery

MID shall also install recording thermographs to measure water temperature in the return flow entering the Merced River from the Northside and Livingston canals during the irrigation season, when water is being diverted into Merced ID canal. Water temperature data collected in the canal return flow shall be submitted within 45 days of the end of the irrigation season.

4. Dissolved oxygen data shall be collected for a 2-week period each in summer (July or August) and fall (October or early November) beginning in 2011 and continuing through 2013 with a continuous dissolved oxygen monitor installed at two locations: 1) Shaffer Bridge and 2) at River Road, upstream of the confluence with the San Joaquin River. All data will be provided to the State Water Board within 30 days of data collection.

5. Merced ID shall provide the State Water Board with all study results and reports from the CDFG/Merced ID MOU studies within 30 days of completion and shall assist CDFG staff to compile and analyze data collected previously during implementation of the MOU studies. In addition, Merced ID shall develop, provide to the Deputy Director for Water Rights for approval, and implement detailed study plans for the following MOU study plan elements that have not yet been completed:

- Monitoring of temperatures during salmon egg incubation – Water temperature data shall be collected near Chinook salmon spawning areas between late September and early March during 2011-2012 and 2012-2013. This information will be combined with information supplied by CDFG from spawning surveys and fish hatchery records to evaluate the relationship between temperature and egg development and mortality.
- Determine the distribution and abundance of steelhead in the Merced River; a combination of weirs, fyke nets, electrofishing and visual observation surveys shall be used to identify and count steelhead in the Merced River.

Merced ID shall consult with USFWS, CDFG and the State Water Board during the development of the study plans for these tasks to assure that they meet the objectives described in the MOU or as otherwise determined through this consultation process.

6. The MOU studies approved for implementation by the Merced ID Board of Directors on August 4, 2009, shall be completed in a timely manner, but no later than February 1, 2013, to assure that the results are available for use in the relicensing proceeding and development of the water quality certification. If the study report will not be complete by February 1, 2013, Merced ID should notify the Deputy Director for Water Rights to request an extension of time and provide information regarding the reason completion of the studies will be delayed. The MOU studies are those listed below:

- Migration Timing of Adult Chinook Salmon into the Merced River
- Evaluation of Anadromous Salmonid Spawning Habitats in the Lower Merced River
- Evaluation of Anadromous Salmonid Rearing Habitats in the Lower Merced River
- Evaluation of Juvenile Chinook salmon Outmigration and Survival in the Lower Merced River
- Water Temperature Monitoring in the Merced River (Required only if CDFG is not able to continue the current water temperature monitoring)

The study plans approved by the Merced ID Board outline the primary objectives and study methods to be employed. Merced ID shall consult with CDFG, US Fish and Wildlife Service, National Marine Fisheries Service and the State Water Board to develop final study plans for approval by the Deputy Director for Water Rights that include additional objectives related to juvenile salmon outmigration and survival as follows:

- Examine environmental and physiological factors associated with juvenile salmon survival and fitness in relation to conditions in the Merced River and the San Joaquin River to determine the appropriate timing, magnitude and duration for spring pulse flows for juvenile salmon outmigration
- Create a map that shows the location of potential predator habitat and identifies the locations where predator sampling occurred

- Evaluate the relationship between streamflow and connectivity with predator habitat located outside the main channel
7. Merced ID shall develop and implement a study plan to assess the relationship between instream flow and fish habitat in the Merced River. The study plan will focus on the following target species and life stages: steelhead (*Onchorhynchus mykiss*) adult, juvenile (including smolt outmigration), fry and spawning; fall-run Chinook salmon (*Onchorhynchus tshawytscha*) adult, juvenile (including smolt outmigration), fry and spawning, and hardhead (*Mylopharodon conocephalus*) adult and juvenile. The study area shall include the lower Merced River between the Crocker-Huffman Diversion Dam and the confluence with the San Joaquin River with the following four subreaches:
- Crocker-Huffman Diversion to the Snelling Road Bridge
  - Snelling Road Bridge to the Highway 59 Bridge
  - Highway 59 Bridge to Shaffer Bridge
  - Shaffer Bridge to confluence with San Joaquin River

The study plan shall be submitted to the Deputy Director for Water rights for approval, and should include the collection of the following information:

- Preparation of habitat mapping of the lower Merced River
- Selection of study sites and 1-D transect locations
- Development of habitat suitability criteria for target species and lifestages
- Field measurement of physical parameters required for modeling
- Calibration of hydraulic models
- Development of flow versus habitat relationships

The target calibration flows will be determined in consultation with the State Water Board and CDFG.

8. Merced ID shall collect in summer/fall 2011 non-anadromous resident fish from the four locations listed below for the analysis of tissue mercury concentrations. Water samples shall be collected at the same time and place where the fish are collected for the analysis of total mercury and methylmercury, chlorophyll a, and suspended sediment concentrations.
- Merced River at Snelling Road Bridge
  - Merced River at Shaffer Bridge
  - Merced River at McDonnell State Recreation Area
  - Merced River at George Hatfield State Recreation Area

Sampling shall occur in the follow manner:

- Sampling efforts shall target largemouth bass with the objective of obtaining ten individuals covering a range of sizes between 150 to 500 mm in length.
- In addition to largemouth bass, composite samples for two other species shall be collected. Two or three composite samples for each additional species should be comprised of 3 to 5 individual fish with lengths that are within 10% of each other. Potential target species for the composite samples include: channel and white catfish, bluegill, redear sunfish, carp, Sacramento sucker, Sacramento pike minnow and rainbow trout.
- If largemouth bass are not encountered at a sampling location, sampling should focus on collecting two or three composite samples for three individual species.

Each composite sample should be comprised of 3 to 5 individual fish with lengths that are within 10% of each other.

Merced ID may elect to contract with CDFG's Marine Pollution Studies Laboratory to collect the fish and analyze muscle tissue for levels of mercury.

9. Merced ID shall develop and implement a fish health assessment of salmonids in the Merced River. Merced ID should consult with the staff at the USFWS California-Nevada Fish Health Center regarding the proper set of fish health assays and analyses that should be conducted to assess the health status and physiological condition of juvenile salmonids during spring outmigration in the Merced River. The set of analyses or assays shall be chosen to determine, among other things, the extent of infection with PKD in Merced River fish (and other pathogens, as determined to be necessary) and to examine potential impacts on fish health associated with poor water quality, in particular elevated water temperature. Collection of the fish to be used for the health assessment should be coordinated with USFWS and CDFG staff and with on-going fish monitoring activities, such as the rotary screw trapping that Merced ID intends to conduct during the years 2011 to 2014. Assistance in collecting fish samples for the purpose of the fish health assessment may also involve fish collection activities, such as seining or other methods conducted by CDFG staff.
10. Merced ID shall follow the schedule provided in Table 1 below that indicates the dates for the submittal of study plans and study plan results to the State Water Board.

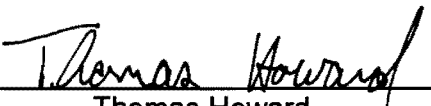
Table 1 Schedule of Deliverables		
Information Request	Required Submittal	Submittal Date
Water Quality Monitoring	Sampling and QA-QC Plan	90 days from issuance of Order
	Monitoring Report	December 15 of each monitoring year
Toxicity Bioassays	Bioassay Results	December 15 of each monitoring year
Dissolved Oxygen Monitoring	Monitoring Data	30 days after each monitoring effort
Temperatures monitoring during salmon egg incubation	Study Plan	120 days from issuance of Order
	Study Report	June 30, 2012 (1 <sup>st</sup> year) June 30, 2013 (2 <sup>nd</sup> year)
Steelhead study in No. 5 and studies in No. 6	Study Plan	120 days from issuance of Order
	Study Reports	February 1, 2013
Instream Flow Study	Study Plan	90 days from issuance of Order
	Study Report	90 days from completion of final test flow
Fish Tissue Mercury Study	Sampling Plan	90 days from issuance of Order

Table 1 Schedule of Deliverables		
Information Request	Required Submittal	Submittal Date
	Study Report	March 1, 2012
Fish Health Assessment	Study Plan (based on consultation with USFWS)	60 days after consultation with USFWS
	Study Report	90 days after results obtained from USFWS

11. Failure to comply with this Order may result in civil liability of a maximum amount of \$25,000 per day of violation as described in Water Code, § 13385. Examples of non-compliance include, but are not limited to, failure to timely submit a required plan or report or failure to submit an adequate plan or report. Any request to amend the requirements of this Order must be set forth in writing. Any approval of such a request will be made by the Deputy Director for Water Rights in writing.

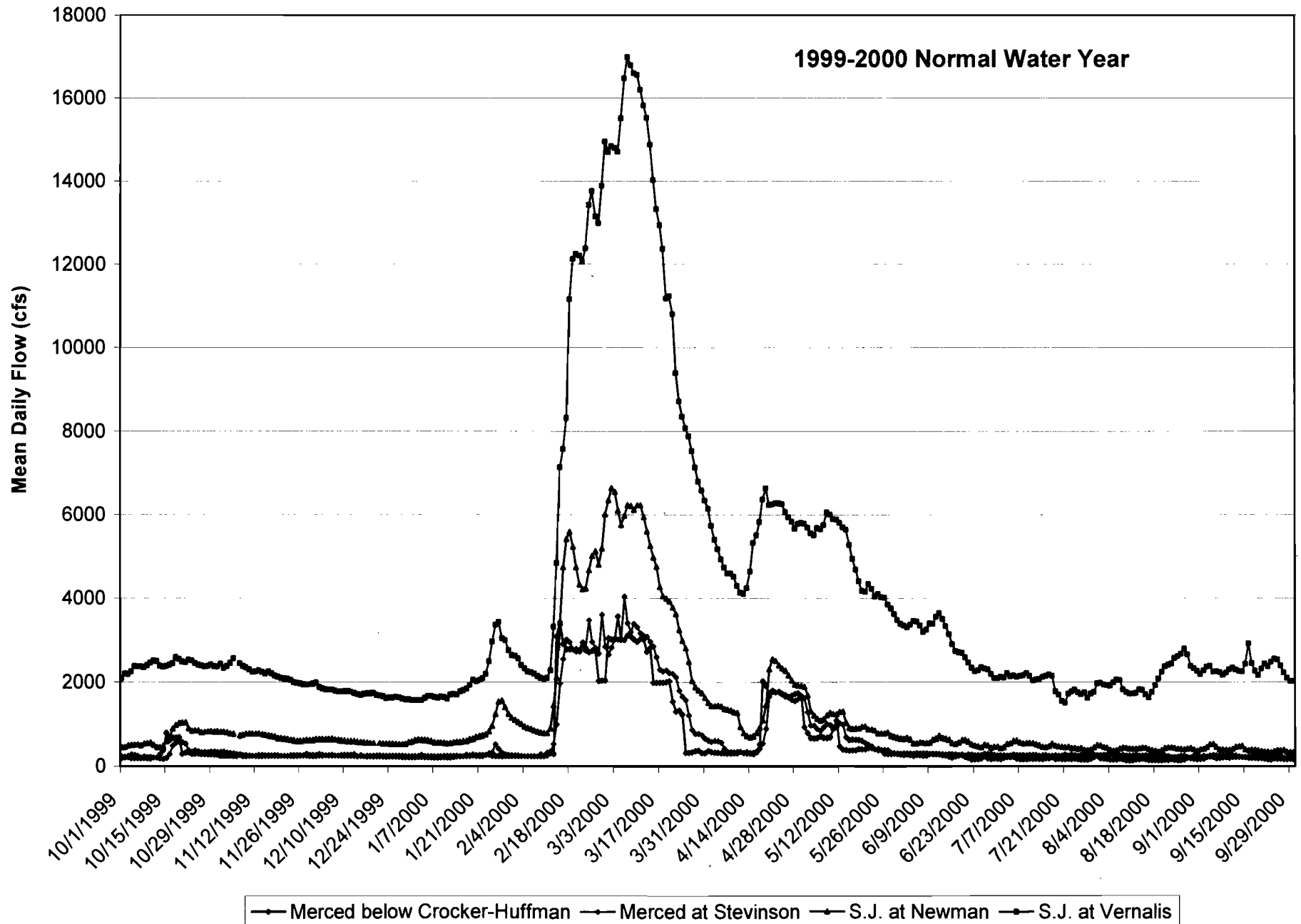
STATE WATER RESOURCES CONTROL BOARD

Dated: JAN 28 2011

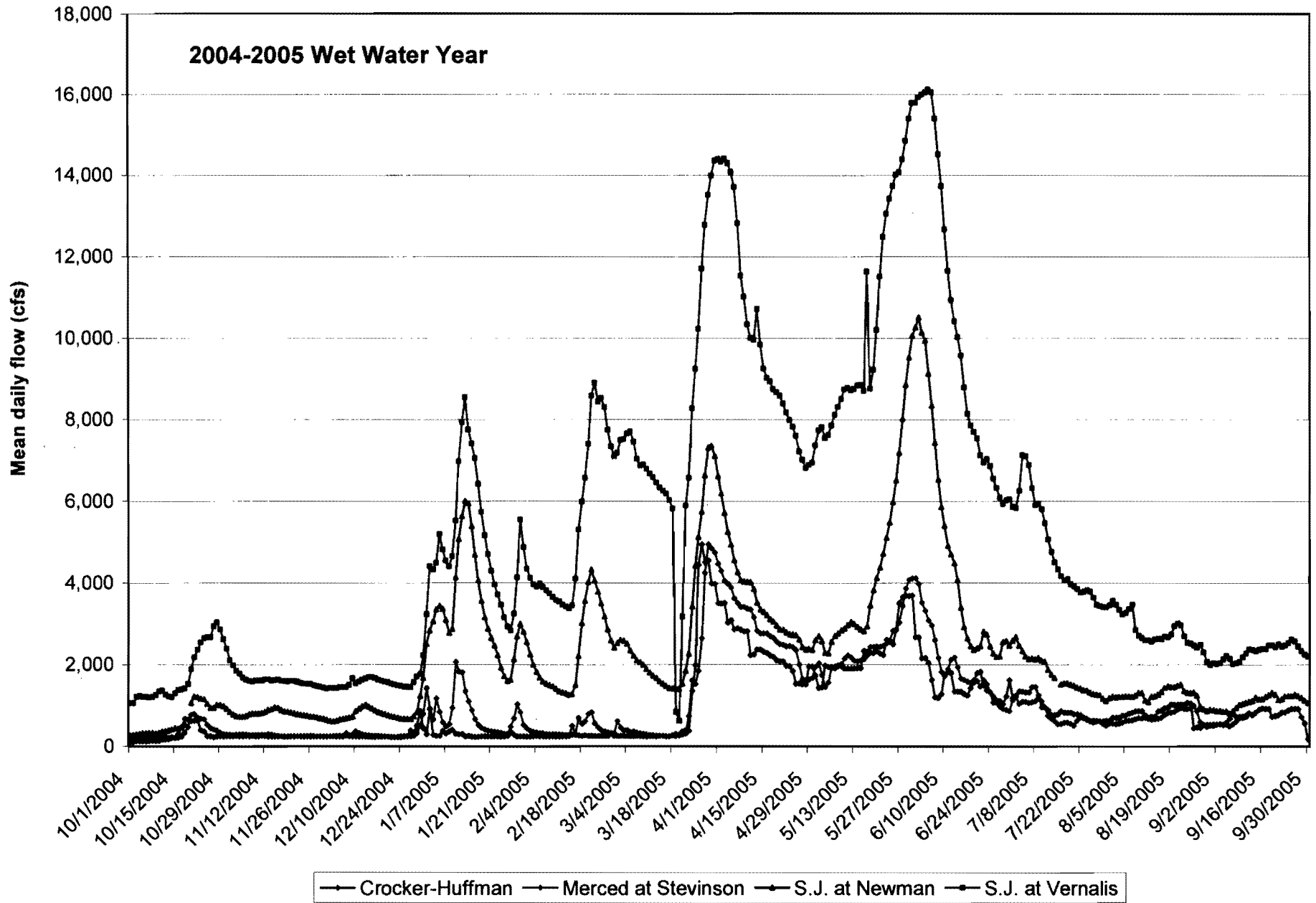
  
 Thomas Howard  
 Executive Director

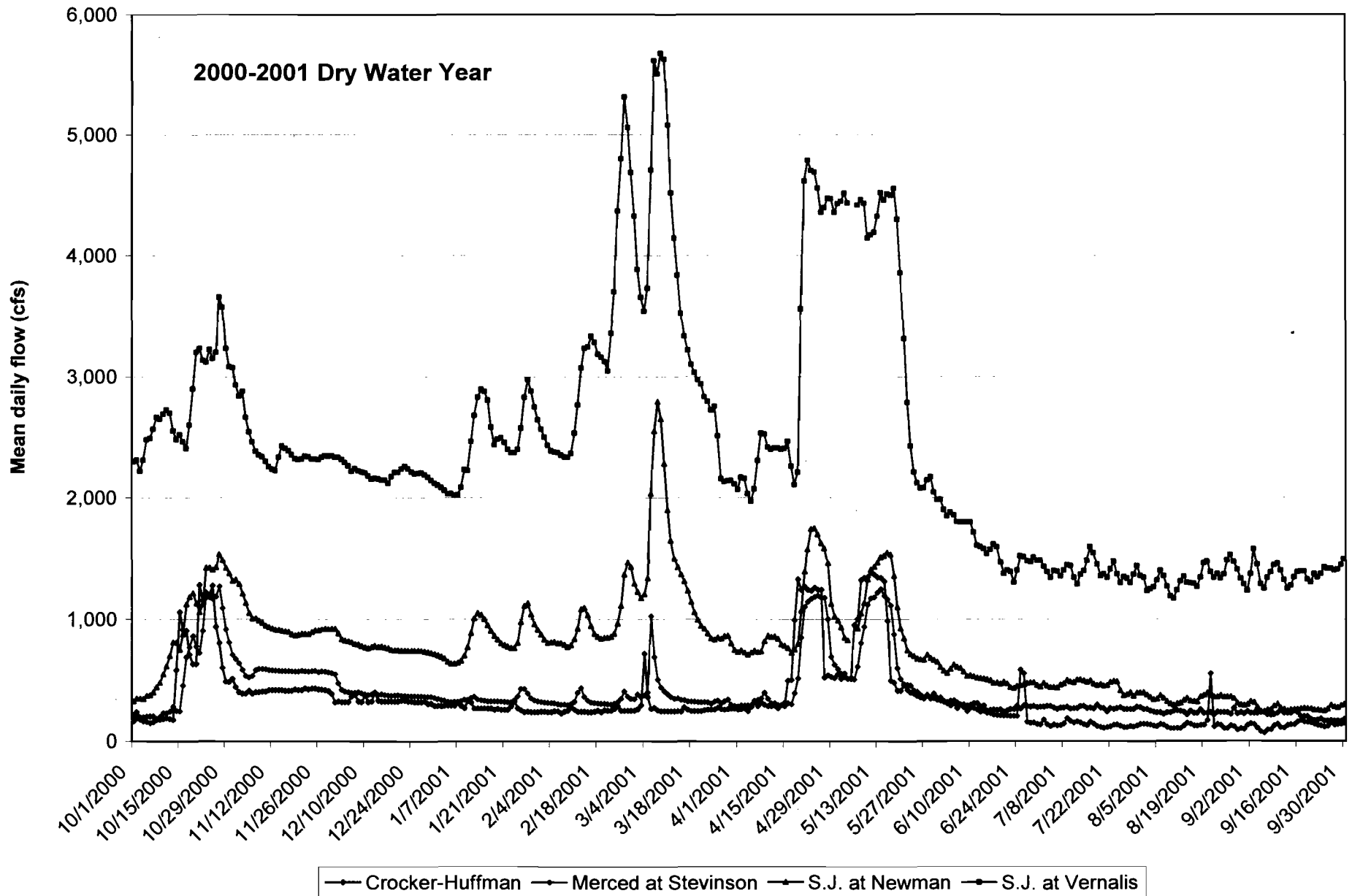
Attachment A: Merced and San Joaquin River Flow for Normal, Wet and Dry Water Years

Attachment B: Water Quality Sampling Constituents









## Attachment B

## Water Quality Sampling Constituents

Analyte		Method	Target Reporting Limit ug/L (or other)	Hold time
<b>BASIC WATER QUALITY- IN SITU</b>				
Dissolved Oxygen	DO	SM 4500-O	0.1 mg/L	Field
Specific conductance	-----	SM 2510A	0.001 µmhos	Field
pH	-----	SM 4500-H	0.1 su	Field
Turbidity	-----	SM 2130 B	0.1 NTU	Field
<b>BASIC WATER QUALITY--LABORATORY</b>				
Total Organic Carbon <sup>2</sup>	TOC	SM 5310	0.2 mg/L	28 d
Dissolved Organic Carbon	DOC	EPA 415.1 D	0.5/0.1	28 d
Total Dissolved Solids	TDS	EPA 2540 C SM 2340 C	1 mg/L	7d
Total Suspended Solids	TSS	EPA 2520 D SM 2340 D	1 mg/L	7d
Chlorophyll a	Chla	EPA 445.0 (modified)		
<b>INORGANIC IONS</b>				
Total Alkalinity	-----	SM 2340 B	2000	14 d
Hardness (measured value)	-----	EPA 2340 B SM 2340 C	1 mg/L as CaCO <sub>3</sub>	
Calcium	Ca	EPA 6010 B	30	180 d
Magnesium	Mg	EPA 6010 B	1	
Potassium	K	EPA 6010 B	500	180 d
Sodium	Na	EPA 6010 B	29	180 d
Chloride	Cl	EPA 300.0	20	28 d
<b>NUTRIENTS</b>				
Nitrate-Nitrite	-----	EPA 300.0	2	28 d <pH 2
Total Ammonia as N	-----	EPA 4500-NH <sub>3</sub> SM 4500-NH <sub>3</sub>	0.02	28 d <pH 2
Total Kjeldahl Nitrogen as N	TKN	SM 4500 N	100	28 d <pH 2
Total phosphorous	TP	SM4500 P	20	28 d <pH 2
Dissolved Orthophosphate	PO <sub>4</sub>	EPA 365.1 EPA 300.0	0.01	48 h at 4 °C
<b>METALS (total and dissolved)</b>				
Arsenic (total and dissolved)	As	EPA 200.8/1632	53/0.004	180 d
Cadmium (total and dissolved)	Cd	EPA 200.8/1638	3.4/0.003	180 d
Copper (total and dissolved)	Cu	EPA 200.8/1638	5.4/0.01	180 d
Iron (total and dissolved)	Fe	EPA 200.8/1638	6.2/2.2	180 d
Lead (total and dissolved)	Pb	EPA 1638	0.005	180 d
Mercury (total)	Hg	EPA 1631	0.0002	28 d
Methylmercury (total and dissolved)	CH <sub>3</sub> Hg	EPA 1630	0.00005/0.00002	90 d
Selenium (total)	Se	EPA 200.8/1638	75	180 d
Silver (total and dissolved)	Ag	EPA 200.8/1638	7/0.03	180 d
Zinc (total and dissolved)	Zn	EPA 200.8/1638	1.8/0.3	180 d
<b>HERBICIDES AND PESTICIDES</b>				
Aldrin	----	EPA 8081A	0.05/0.01	7d
Alpha-BHC	----	EPA 8081A	0.05/0.01	7d
Beta-BHC	----	EPA 8081A	0.05/0.008	7d
Chlordane	----	EPA 8081A	0.5/0.08	7d
Chlorpyrifos	----	EPA 8141A	0.005/0.0024 mg/L	7d
Delta-BHC	----	EPA 8081A	0.05/0.017	7d
Dieldrin	----	EPA 8081A	0.05/0.01	7d
Diazinon	----	EPA 8141A	0.005/0.0029 mg/L	7d
Endosulfan I	----	EPA 8081A	0.05/0.005	7d
Endosulfan II	----	EPA 8081A	0.05/0.01	7d
Endrin	----	EPA 8081A	0.05/0.0118	7d
Gamma-BHC	----	EPA 8081A	0.05/0.02	7d
Heptachlor	----	EPA 8081A	0.05/0.007	7d
Heptachlor Epoxide	----	EPA 8081A	0.05/0.02	7d

Analyte		Method	Target Reporting Limit ug/L (or other)	Hold time
Toxaphene	----	EPA 8081A	2/0.3	7d
<b>PETROLEUM HYDROCARBONS</b>				
Total Petroleum Hydrocarbons (gasoline range)	TPH-g	SW 8015B	50	14 d
Oil & Grease	O&G	Visual Observation	----	----