Appendix E

Flow Monitoring and Management Plan for Water Year 2010 Interim Flows

Water Year 2010 Interim Flows Project
Final
Environmental Assessment/Initial Study

September 2009

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List of Abbreviations and Acronyms

Act	San Joaquin River Restoration Settlement Act
cfs	cubic foot per second
EA/IS	Environmental Assessment/Initial Study
Secretary	Secretary of the U.S. Department of the Interior
Settlement	Stipulation of Settlement in *NRDC, et al., v. Kirk Rodgers, et al.*
SJRRP	San Joaquin River Restoration Program
WY	Water Year

1.0 Introduction

This Flow Monitoring and Management Plan describes management objectives for Water Year (WY) 2010 Interim Flows and various approaches for measuring Interim Flows, evaluating conditions indicating that management objectives have been attained, and implementing actions that could be taken to address nonattainment of the WY 2010 Interim Flow objectives. The guidelines and monitoring approach described in this plan are included in the Proposed Action for the San Joaquin River Restoration Program (SJRRP) – WY 2010 Interim Flow Environmental Assessment/Initial Study (EA/IS).

1.1 Overview

Quantification of WY 2010 Interim Flows throughout the Restoration Area is an integral part of the Settlement-specified research program, as described in Paragraph 15 of the Settlement.

The intention of this plan is to identify the approach for flow monitoring and management, but not to provide design details of flow monitoring activities (e.g., engineering information for gage installation). Table 1-1 summarizes the content discussed in this plan.

Table 1-1.
Components of the Flow Monitoring and Management Plan for WY 2010 Interim Flows

Monitoring and Management Components	Application of Component to the Flow Monitoring and Management Plan
SJRRP Management Objective for Restoration Flows Within the Restoration Area	Comply with WY 2010 Interim Flow release requirements to the extent that flows do not exceed existing channel capacities.
Associated Physical Condition Monitoring Within the Restoration Area	Measure and record surface water stage and flow for quantification of WY 2010 Interim Flows.
Conditions Indicating Attainment of SJRRP Management Objectives	WY 2010 Interim Flows are released from Friant Dam in accordance with the Settlement, but limited to existing channel capacities.
Potential Actions to Address Nonattainment of Management Objectives	Unlike Restoration Flows, WY 2010 Interim Flows are intended for data collection. A release of any flow, regardless of which flow is measured at downstream locations, complies with WY 2010 Interim Flow requirements and potential actions are not required under WY 2010 Interim Flows.

Key:
SJRRP = San Joaquin River Restoration Program
WY = water year

1.2 Definition of Key Terms

Key terms defined in the Stipulation of Settlement (Settlement) include the following:

- **Interim Flows** – Water releases from Friant Dam consistent with Restoration Flow Schedules specified in the Settlement, but subject to channel capacity limitations, commencing no later than October 1, 2009, for the purpose of collecting relevant data concerning flows, temperatures, fish needs, seepage losses, recirculation, recapture, and reuse.

- **Restoration Flows** – Collectively, base flows, buffer flows, and any additional water acquired by the Secretary of the U.S. Department of the Interior (Secretary) from willing sellers to meet the Restoration Goal of the Settlement.

- **Base Flows** – Releases from Friant Dam made in accordance with Exhibit B of the Settlement. Together, the base flows, buffer flows, and any additional water acquired by the Secretary from willing sellers to meet the Restoration Goal of the Settlement are collectively referred to as the "Restoration Flows."

- **Buffer Flows** – Releases of up to an additional 10 percent of applicable base flows, as provided in Paragraph 18 and Exhibit B of the Settlement. Together, the base flows, buffer flows, and any additional water acquired by the Secretary from willing sellers to meet the Restoration Goal of the Settlement are collectively referred to as the "Restoration Flows."

- **Flushing Flows** – A block of water averaging 4,000 cubic feet per second (cfs) from April 16 through 30 in Normal-Wet and Wet years (see Restoration Year Type, below) that could be needed to perform geomorphic functions such as flushing spawning gravels, in accordance with Exhibit B of the Settlement.

- **Restoration Year Type** – Exhibit B of the Settlement identifies six year types based on October-to-September unimpaired runoff (inflow) at Friant Dam. These are (in order of increasing "wetness") as follows: Critical-Low, Critical-High, Dry, Normal-Dry, Normal-Wet, and Wet. Except the lowest water year type (Critical-Low), water years are defined as falling in a defined range on an exceedence curve of the unimpaired runoff. The Settlement defines year types based on their occurrence in an 83-year period, from 1922 through 2004, without using a conventional threshold approach. While the associated year type for each year within the 83-year period is clear, extrapolation of such a Restoration Year Type definition for years outside this period is not. To be consistent with Exhibit B, a threshold was defined using a practical point, near the average of the unimpaired runoff amounts, of 2 years that bracket the transition. Therefore, classification of Restoration Year Types was recommended for the SJRRP based on annual October-through-September unimpaired flow below Friant Dam threshold levels, as shown in Table 1-2.

Table 1-2.
Water Year Types and Associated Threshold Levels Based on the Settlement

Total Annual Inflow to Millerton Lake	Exceedence Level	Restoration Year Type
Equal to or greater than 2,500,000 acre-feet	Wettest 20%	Wet
Equal to or greater than 1,450,000 acre-feet	Next 30% (20 to 50%)	Normal-Wet
Equal to or greater than 930,000 acre-feet	Next 30% (50 to 80%)	Normal-Dry
Equal to or greater than 670,000 acre-feet	Next 15% (80 to 95%)	Dry
Equal to or greater than 400,000 acre-feet	Remaining 5% (95 to 100%)	Critical-High
Less than 400,000 acre-feet		Critical-Low

Key:
Settlement = Stipulation of Settlement

- **Hydrographs** – A chronological graphic record of stream discharge or water level (stage) at a given point on a stream (i.e., a graph of discharge or stage versus time). Hydrographs for various reaches of the San Joaquin River for each water year type are contained in Exhibit B of the Settlement.

- **Settlement** – *NRDC, et al., v. Kirk Rodgers, et al.*

- **Legislation** –San Joaquin River Restoration Settlement Act (Act) (Public Law 111-11)

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2.0 Interim Flow Management

This section describes the flow management plan for WY 2010 Interim Flows. This plan includes monitoring flow for the WY 2010 Interim Flow releases, as specified by the Settlement and the Act. This section provides a framework for the monitoring plan, discussed in Section 3.0.

2.1 Pertinent Language from the Act

Line 3, Page 9423, Paragraph (h) INTERIM FLOWS

(1) STUDY REQUIRED – Prior to releasing any Interim Flows under the Settlement, the Secretary shall prepare an analysis in compliance with the National Environmental Policy Act of 1969 (42 U.S.C 4321 et seq.), including at a minimum –

[…]

(D) a description of the associated flow monitoring program;

2.2 Pertinent Language from the Settlement

The Secretary is directed by the Settlement to provide varying levels of Restoration Flows at six monitoring locations within the Restoration Area. Specific goals and conditions for Restoration Flows are described by the Settlement in Paragraphs 13(f), 13(g), 13(j) and in Exhibit B.

Line 17, Page 14, Paragraph 13

(f) The Parties agree to work together in identifying any increased downstream surface or underground diversions and the causes of any seepage losses above those assumed in Exhibit B and in identifying steps that may be taken to prevent or redress such increased downstream surface or underground diversions or seepage losses. Such steps may include, but are not limited to, consideration and review of appropriate enforcement proceedings.

Line 23, Page 14, Paragraph 13

(g) The Restoration Flows will be measured at not less than the following six locations between Friant Dam and the confluence of the Merced River, and the measurements will be monitored to ensure compliance with the hydrograph releases (Exhibit B) and any other applicable flow releases (e.g., Buffer Flows): (i) at or immediately below Friant Dam (designated as "Friant Release" on the applicable hydrograph);

(ii) Gravelly Ford (designated as "Reach 2" on the applicable hydrograph); (iii) immediately below the Chowchilla Bifurcation Structure (designated as "Reach 3" on the applicable hydrograph); (iv) below Sack Dam (designated as "Reach 4" on the applicable hydrograph); (v) top of Reach 4B (designated as "Reach 5" on the applicable hydrograph); and (vi) at the confluence of the Merced River (designated as "Confluence" on the applicable hydrograph).

Line 25, Page 16, Paragraph 13

(j) Prior to the commencement of the Restoration Flows as provided in this Paragraph 13, the Secretary, in consultation with the Plaintiffs and Friant Parties, shall develop guidelines, which shall include, but not be limited to: (i) procedures for determining water-year types and the timing of the Restoration Flows consistent with the hydrograph releases (Exhibit B); (ii) procedures for the measurement, monitoring and reporting of the daily releases of the Restoration Flows and the rate of flow at the locations listed in Paragraph 13(g) to assess compliance with the hydrographs and any other applicable releases (e.g., Buffer Flows); (iii) procedures for determining and accounting for reductions in water deliveries to Friant Division long-term contractors caused by the Interim Flows and Restoration Flows; (iv) developing a methodology to determine whether seepage losses and/or downstream surface or underground diversions increase beyond current levels assumed in Exhibit B; (v) procedures for making real-time changes to the actual releases from Friant Dam necessitated by unforeseen or extraordinary circumstances; and (vi) procedures for determining the extent to which flood releases meet the Restoration Flow hydrograph releases made in accordance with Exhibit B. Such guidelines shall also establish the procedures to be followed to make amendments or changes to the guidelines.

Line 23, Page 21, Paragraph 15

Prior to the commencement of full Restoration flows pursuant to this Settlement, the Parties agree that the Secretary shall begin a program of interim flows, which will include releases of additional water from Friant Dam commencing no later than October 1, 2009, and continuing until full Restoration Flows begin. Flows released according to the provisions of this Paragraph 15 shall be referred to as "Interim Flows." The Restoration Administrator, in consultation with the Technical Advisory Committee, the Secretary, and other appropriate federal, State and local agencies, shall develop and recommend to the Secretary implementation of a program of Interim Flows in order to collect relevant data concerning flows, temperatures, fish needs, seepage losses, recirculation, recapture and reuse. Such program shall include releasing the flows indentified in Exhibit B for the appropriate year type to the extent that such flows would not impede or delay completion of the measures specified in

Paragraph 11(a), or exceed existing downstream channel capacities. To the extent that gauging locations identified in Paragraph 13(g) are not available to measure flows due to in-channel construction related to Paragraph 11 improvements and until such gauging locations are installed, Interim Flows will be measured by establishing any necessary temporary gauging locations or by manual flow measurements for the purposes of collection of relevant data.

Paragraph 5, Page 2, Exhibit B

Flushing Flows – In Normal-Wet and Wet Years, the stair-step hydrographs, Exhibits 1A-1F, include a block of water averaging 4,000 cfs from April 16-30 to perform several functions, including but not limited to geomorphic functions such as flushing spawning gravels ("The Flushing Flows"). Therefore, unless the Secretary, in consultation with the Restoration Administrator, determines that Flushing Flows are not needed, hydrographs in Normal-Wet and Wet years will also include Flushing Flows during that period. Working within the constraints of the flood control system, the Restoration Flow releases from Friant Dam to provide these Flushing Flows shall include a peak release as close to 8,000 cfs as possible for several hours and then recede at an appropriate rate. The precise timing and magnitude of the Flushing Flows shall be based on monitoring of meteorological conditions, channel conveyance capacity, salmonid distribution, and other physical/ecological factors with the primary goal to mobilize spawning gravels, maintain their looseness and flush fine sediments, so long as the total volume of Restoration Flows allocated for Flushing Flows for that year is not changed. Nothing in this Paragraph 5 is intended to limit the flexibility to move or modify the Flushing Flows as provided in Paragraph 4 above, so long as the total volume of Base Flows allocated during the Spring Period is not changed.

Paragraph 6, Page 3, Exhibit B

Riparian Recruitment Flows – In Wet Years, in coordination with the peak Flushing Flow releases, Restoration Flows should be gradually ramped down over a 60-90 day period to promote the establishment of riparian vegetation at appropriate elevations in the channel. The precise timing and magnitude of the riparian recruitment release shall be based on monitoring of meteorological conditions, channel conveyance capacity, salmonid distribution and other physical/ecological factors with the primary goal to establish native riparian vegetation working within the constraints of the flood control system, so long as the total volume of Restoration Flows allocated for the Riparian Recruitment for that year is not exceeded.

2.3 Flow Monitoring Information

Information used for the Flow Monitoring and Management Plan will include streamflows measured at seven locations within the Restoration Area. In accordance with Paragraph 15 of the Settlement, to the extent that any of the seven gages required in the Settlement are not available to measure flows, Interim Flows will be measured by establishing temporary gaging locations or by conducting manual flow measurements for the purposes of collecting relevant data.

2.4 Attainment of Flow Requirement Objective

During the first year of Interim Flows, attainment of the flow objective is achieved through (1) releasing WY 2010 Interim Flows from Friant Dam, up to existing downstream channel capacity, and (2) measuring flow, or no flow, at any or all specified monitoring locations.

2.5 Potential Actions to Address Nonattainment

There are no requirements for continuity of flows from Friant Dam to each of the monitoring locations under WY 2010 Interim Flows. Similarly, there are no provisions for changing releases because of lower-than-assumed flows at downstream locations under WY 2010 Interim Flows. Consequently, no actions are proposed to address nonattainment under WY 2010 Interim Flows or any other Interim Flows. Under the Settlement, nonattainment is interpreted as a condition when measured flows are less than the expected Restoration Flows at one or more monitoring locations during the Restoration Flow Program.

3.0 Monitoring for Interim Flows

This section describes monitoring of Interim Flows for WY 2010, and provides a framework for the SJRRP monitoring program for the first year of Interim Flows. The Monitoring Program for WY 2010 Interim Flows is attached to Appendix D.

The flow monitoring program will obtain streamflow data. Paragraph 13 and Exhibit B of the Settlement specify WY 2010 Interim Flow measurements on the San Joaquin River at the first six locations listed below. In addition to the six gages identified by the Settlement, a seventh gage is scheduled for installation to monitor potential Interim Flows to the Eastside Bypass. The SJRRP gage locations will be monitored and calibrated by the U.S. Geological Survey, which uses recognized standards for measuring flows.

The following is a complete list of intended flow monitoring locations for WY 2010 Interim Flows:

1. Below Friant Dam
2. At Gravelly Ford
3. Below Chowchilla Bypass Bifurcation Structure
4. Below Sack Dam
5. At the head of Reach 4B1
6. Above the Merced River confluence
7. At the head of the Sand Slough Bypass

Details about the accuracy of each gage are available online, will be summarized and published with each annual calibration, will be publicly available, and will be factored into the analyses conducted using the data (including analysis and computation of seepage losses).

Data collected at these gages will be made publically available. Information on the design of monitoring gages (including locations, type of measurement, monitoring and recording equipment, means of installation, and "operations and maintenance") is provided in the Installation and Rehabilitation of Stream Gages on the San Joaquin River Environmental Assessment and FONSI (Reclamation 2009).

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4.0 References

U.S. Department of the Interior, Bureau of Reclamation (Reclamation). 2009. Installation and Rehabilitation of Stream Gages on the San Joaquin River, Fresno, Madera, Merced, and Stanislaus Counties California Environmental Assessment and Finding of No Significant Impacts. January. Sacramento, California.

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