Restoration Flows Guidelines

SAN JOAQUIN RIVER
RESTORATION PROGRAM

December 2013

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Abbreviations and Acronyms

AF	acre-foot
ATR	Annual Technical Report
CDEC	California Data Exchange Center
cfs	cubic feet per second
DWR	California Department of Water Resources
Guidelines	Restoration Flows Guidelines
NMFS	U.S. Department of Commerce, National Marine Fisheries Service
NWS	National Weather Service
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
RWA	Recovered Water Account
Secretary	Secretary of the Interior
Settlement	Stipulation of Settlement in *NRDC, et al. v. Kirk Rodgers, et al.*
Settling Parties	Signatories to the Settlement
SJRRP	San Joaquin River Restoration Program
TAC	Technical Advisory Committee
TAF	thousand acre-feet
USFWS	U.S. Department of the Interior, Fish and Wildlife Service

Purpose

This document describes procedures and guidelines developed to comply with Paragraph 13(j) of the Stipulation of Settlement in *NRDC, et al. v. Kirk Rodgers, et al.* (Settlement). This includes additional provisions of the Settlement that address the management of Restoration Flows, which includes, but not limited to, Paragraphs 13(a), (c), (e), (f), and (i). This document generally follows the structure of the Settlement, being organized into chapters related to specific paragraphs and subparagraphs therein.

In the event of inconsistencies between these Restoration Flows Guidelines (Guidelines) and the Settlement or its implementing legislation, the Settlement and implementing legislation shall govern.

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Paragraph 13(a) – Buffer Flows

> *… releases of water from Friant Dam to the confluence of the Merced River shall be made to achieve the Restoration Goal as follows:*
>
> *1. All such additional releases from Friant Dam shall be in accordance with the hydrographs attached hereto collectively as Exhibit B (the "Base Flows"), plus releases of up to an additional ten percent (10%) of the applicable hydrograph flows (the "Buffer Flows") may be made by the Secretary, based upon the recommendation of the Restoration Administrator to the Secretary, as provided in Paragraph 18 and Exhibit B. The Base Flows, the Buffer Flows and any additional water acquired by the Secretary from willing sellers to meet the Restoration Goal are collectively referred to as the "Restoration Flows." Additional water acquired by the Secretary may be carried over or stored provided that doing so shall not increase the water delivery reductions to any Friant Division long-term contractor beyond that caused by releases made in accordance with the hydrographs (Exhibit B) and the Buffer Flows.*

This section discusses the release of Buffer Flows, as provided for in Paragraphs 13(a) and 18, and Exhibit B of the Settlement.

Additional Settlement Text, Relevant to Buffer Flows

From Paragraph 18:

> *… Consistent with Exhibit B, the Restoration Administrator shall make recommendations to the Secretary concerning the manner in which the hydrographs shall be implemented and when the Buffer Flows are needed to help in meeting the Restoration Goal. In making such recommendations, the Restoration Administrator shall consult with the Technical Advisory Committee, provided that members of the Technical Advisory Committee are timely available for such consultation. The Secretary shall consider and implement these recommendations to the extent consistent with applicable law, operational criteria (including flood control, safety of dams, and operations and maintenance), and the terms of this Settlement. Except as specifically provided in Exhibit A, the Restoration Administrator shall not recommend changes in specific release schedules within an. applicable hydrograph that change the total amount of water otherwise required to be released pursuant to the applicable hydrograph (Exhibit B) or which increase the water delivery reductions to any Friant Division long-term contractors in accordance with the hydrographs (Exhibit B) and the Buffer Flows.*

From Exhibit B:

This Exhibit B sets forth the hydrographs which constitute the "Base Flows" referenced in paragraph 13 of the Stipulation of Settlement. For purposes of implementing the hydrographs, the following provisions shall apply:

1. <u>Buffer Flows.</u> Paragraph 13 of the Stipulation of Settlement provides for the Base Flows to be augmented by Buffer Flows of up to 10% of the applicable hydrograph included in this Exhibit B. Except as provided in Paragraph 4 of this Exhibit B, such Buffer Flows are intended to augment the daily flows specified in the applicable hydrograph. For purposes of this Exhibit, Base Flows and Buffer Flows shall collectively be referred to as Restoration Flows.

,,,

4. <u>Flexibility in Timing of Releases</u>

a. In order to achieve the Restoration Goal and to avoid material adverse impacts on existing fisheries downstream of Friant Dam, the Parties agree to the following provisions to provide certain flexibility in administration of the hydrographs and Buffer Flows.

,,,

c. The process for determining and implementing Buffer Flows is set out in Paragraphs 13 and 18 of the Settlement, as implemented by this Exhibit B. The Restoration Administrator, in consultation with the Technical Advisory Committee, may recommend to the Secretary that the daily releases provided for in the hydrographs, or as modified pursuant to Paragraph 4(b) above, be augmented by application of the Buffer Flows up to 10% of the daily flows. From October 1 through December 31, the Buffer Flows shall be defined as 10% of the total volume of Base Flows during that period, and may be managed flexibly as a block of water during the Fail Period and four weeks earlier or later, as provided in Paragraph 4(b) above. Up to 50% of the Buffer Flows available from May 1 to September 30 not to exceed 5,000 acre feet may be moved to augment flows during the Spring or the Fall Periods.

Recommendation for Release

The release of Buffer Flows is subject to a written recommendation from the Restoration Administrator to U.S. Department of the Interior, Bureau of Reclamation (Reclamation). The recommendation shall include, at a minimum, the purpose and need for such additional flows, the daily schedule, and the total volume of Buffer Flows requested. Reclamation will first verify consistency with the Settlement and these Guidelines, and then implement the Buffer Flows schedules through the operation of Friant Dam. Reclamation shall account for the volumes of Buffer Flows released each day, for each year, and for use of flexible management provisions. As described in Paragraph 16(b)(1) of the Settlement, the use of Buffer Flows in any year will be applied to the calculation of reductions in water deliveries in Paragraph 13(j)(iii) of these Guidelines.

Volume of Buffer Flows Available

Paragraph 13 of the Settlement provides for the Base Flows to be augmented by Buffer Flows up to 10 percent of the applicable hydrograph flows provided in the then-current Restoration Flow Schedule, as shown in Table 1. Except as provided in Paragraph 4(c) of Exhibit B to flexibly manage the Buffer Flows, as described below, such Buffer Flows are intended to augment the daily flows specified in the applicable schedule for releases from Friant Dam. Augmentation of the Base Flows does not extend to any volumes released pursuant to Paragraph 13(c). Buffer Flows are not available in the Critical-Low Restoration Year Type, as shown in Table 1.

Table 1
Volumes of Buffer Flows Available

Restoration Year Type	Buffer Flows Available Between October 1 and December 31 (acre-feet)	Buffer Flows Available Between May 1 and September 30 (acre-feet)	
		Maximum Volume Available	Volume Available for Flexible Management
Wet	7,081	30,585	5,000
Normal-Wet	7,081	10,621	5,000
Normal-Dry	7,081	10,621	5,000
Dry	7,081	10,621	5,000
Critical-High	2,769	7,284	3,642
Critical-Low	0	0	0

Flexible Management of Buffer Flows

Paragraph 4 of Exhibit B provides two periods to flexibly manage Buffer Flows.

Provision for Moving Volumes from October through December

The full volume of Buffer Flows available between October 1 and December 31 may be released from Friant Dam at a time and rate recommended by the Restoration Administrator between September 2 and January 28.

Provision for Moving Volumes from May through September

Up to 50 percent, not to exceed 5 thousand acre-feet (TAF), of the volume of Buffer Flows available between May 1 and September 30 may be released from Friant Dam at a time and rate recommended by the Restoration Administrator during the Fall Flexible Flow Period, October 1 through November 30, and the Spring Flexible Flow Period, February 1 through May 28.

Any volume of May-through-September Buffer Flows remaining may be scheduled between May 1 and September 30, so long as it does not exceed either 10 percent of the Restoration Flow Schedule for any day.

Example Availability and Flexibility of Buffer Flows

Table 1 presents the volume that would be available for flexible management for each provision of the Settlement that specifically allows for flexible management of Buffer Flow volumes, for each of the six Restoration Year flow schedules identified in Exhibit B.

The volumes available for flexible management and periods available for management are illustrated for a Wet Restoration Year in Figure 1.

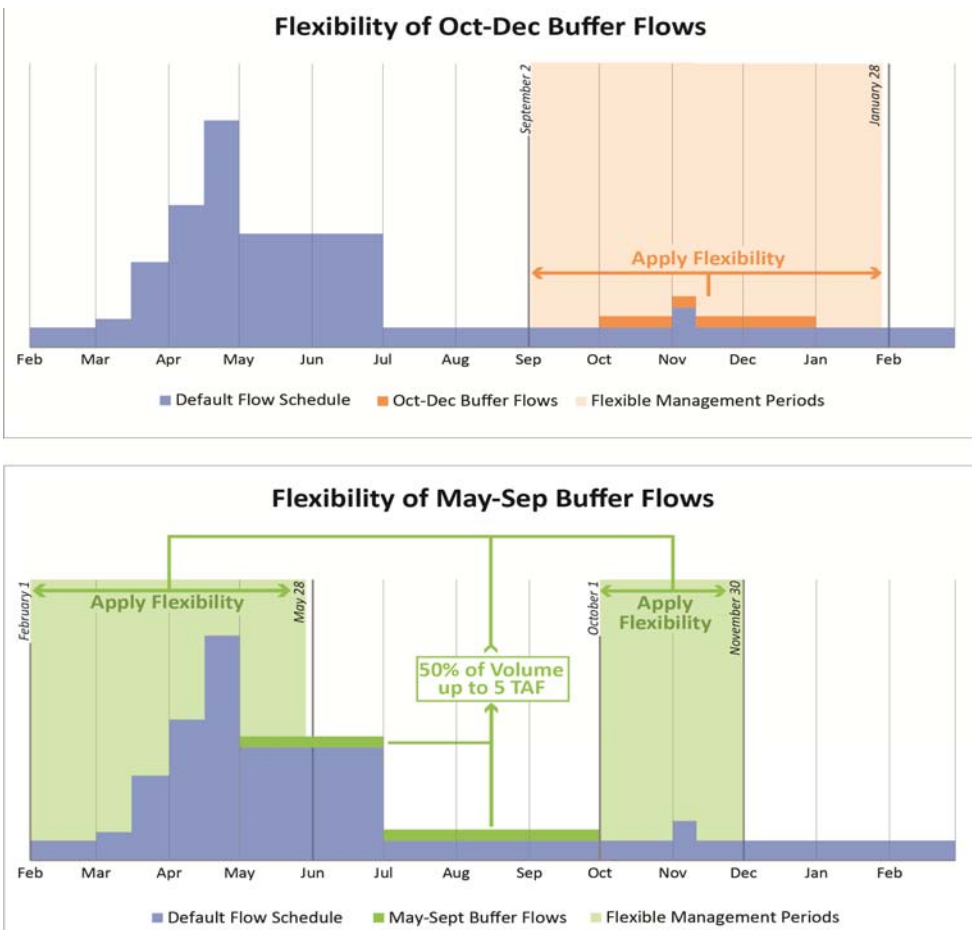

Figure 1
Volumes and Periods Available for Flexible Management of Buffer Flows

Paragraph 13(c) – Releases for Unexpected Seepage Losses

In the event that the level of diversions (surface or underground) or seepage losses increase beyond those assumed in Exhibit B, the Secretary shall, subject to Paragraphs 13(c)(1) and 13(c)(2) relating to unexpected seepage losses, release water from Friant Dam in accordance with the guidelines provided in Paragraph 13(j) such that the volume and timing of the Restoration Flows are not otherwise impaired. With respect to seepage losses downstream of Gravelly Ford that exceed the assumptions in Exhibit B ("Unexpected Seepage Losses"), the Parties agree that any further releases or transfers within the hydrograph required by this Paragraph 13(c) and implementation of the measures set forth in Paragraphs 13(c)(1) and 13(c)(2) shall not increase the water delivery reductions to any Friant Division long-term contractor beyond that caused by releases made in accordance with the hydrographs (Exhibit B) and Buffer Flows. The measures set forth in Paragraphs 13(c)(1) and 13(c)(2) shall be the extent of the obligations of the Secretary to compensate for Unexpected Seepage Losses. The Secretary shall follow the procedures set forth in Paragraphs 13(c)(1) and 13(c)(2) to address Unexpected Seepage Losses:

(1) In preparation for the commencement of the Restoration Flows, the Secretary initially shall acquire only from willing sellers not less than 40,000 acre feet of water or options on such quantity of water prior to the commencement of full Restoration Flows as provided in Paragraph 13(i), which amount the Secretary shall utilize for additional releases pursuant to this Paragraph 13(c)(1), unless the Restoration Administrator recommends that a lesser amount is required.

(2) The Secretary shall take the following steps, in the following order, to address Unexpected Seepage Losses:

a. First, use any available, unstorable water not contracted for by Friant Division long-term contractors;

b. Next, use water acquired from willing sellers, including any such water that has been stored or carried over, until it has been exhausted. This Paragraph 13(c)(2)(B) shall be implemented as follows:

i. The Secretary shall first use water acquired pursuant to Paragraph 13(c)(1) until such water is exhausted. Thereafter, as of January 1st of each year, the Secretary shall have available at least 28,000 acre feet of water acquired only from willing sellers, or options on such *quantity of water from willing sellers, which amount the Secretary shall utilize for additional releases pursuant to this Paragraph 13(c)(2)(B)(i). However, the Restoration Administrator may recommend that an additional amount, not to exceed 10,000 acre feet is needed; and the Secretary shall acquire up to that amount recommended by the Restoration Administrator only from willing sellers, or options on such quantity of water from willing sellers;*

ii. Any water acquired from willing sellers pursuant to this Paragraph 13(c)(2)(ii) that is not used in a given year shall be stored, to the extent such storage is reasonably available, to assist in meeting the Restoration Goal;

iii. In the event the Secretary has acquired water from willing sellers under this Settlement that the Restoration Administrator recommends is no longer necessary to address Unexpected Seepage Losses, such water shall be available to augment the Restoration Flows;

iv. The Secretary shall provide notice to the Plaintiffs and Friant Parties not later than December 1 of each year regarding the status of acquisitions of water from willing sellers pursuant to the provisions of this Paragraph 13(c);

c. Next, if the Restoration Administrator recommends it and the Secretary determines it to be practical, acquire additional water only from willing sellers, in an amount not to exceed 22,000 acre feet;

d. Next, in consultation with the Restoration Administrator and NMFS and consistent with Exhibit B, transfer water from the applicable hydrograph for that year;

e. Next, in consultation with the Restoration Administrator, use any available Buffer Flows for that year.

This section covers the purchase and release of water for Unexpected Seepage Losses. The water acquired and used for Unexpected Seepage Losses shall be designated as Unexpected Seepage Water and accounted for by Reclamation. Paragraph 13(j)(iv) of these Guidelines describes the methods used to identify Unexpected Seepage Losses.

Acquisition Needs

In preparation for the commencement of the Restoration Flows, Reclamation initially shall acquire only from willing sellers not less than 40,000 acre feet of water or options on such quantity of water prior to the commencement of full Restoration Flows as provided in Paragraph 13(i), which amount Reclamation shall utilize for additional releases pursuant to Paragraph 13(c)(1), unless the Restoration Administrator recommends that a lesser amount is required.

Reclamation shall first use the 40 TAF of water acquired, or other amount as recommended by the Restoration Administrator, until such water is released from Friant Dam or past the term on the options agreements. Thereafter, as of January 1 of each year, Reclamation shall have available at least 28 TAF of water acquired only from willing sellers, or options on such quantity of water from willing sellers. Each year, the Restoration Administrator shall recommend whether or not an additional amount, not to exceed 10 TAF is needed, and Reclamation shall acquire that water as soon as practical only from willing sellers additional water, or options on such quantity of water from willing sellers.

Next the Restoration Administrator shall recommend whether or not Reclamation should acquire additional water only from willing sellers, in an amount not to exceed 22 TAF. Reclamation shall determine if the additional acquisition is practical and acquire water only from willing sellers.

In the event that full Restoration Flows cannot be released after January 1, 2014, the water banked, transferred, and stored under the provisions of Paragraph 13(i) can be used to meet acquisition requirements for Unexpected Seepage Losses.

Procedures for Acquisition

Reclamation shall solicit proposals for the acquisition of water or options from willing sellers pursuant to Federal rules and regulations for contract and financial assistance agreements. Proposals may be prioritized using one or more of the following criteria:

1. **Cost –**Procedures that provide for the lowest net cost of water.
2. **Flexibility –** Options and the ability to exercise options at different times of the year, during different year types, or over multiple years.
3. **Reliability –** The ability to use water on a defined schedule.
4. **Compatibility with Paragraph 13(i) –** Procedures that provide for the ability to bank, store, or sell water consistent with provisions in Paragraph 13(i).

Release of Unexpected Seepage Water

Unless otherwise recommended by the Restoration Administrator:

- To the extent diversion or losses increase beyond those assumed in Exhibit B, Reclamation will release additional water from Friant Dam such that the volume and timing of the Restoration Flows are not otherwise impaired.

- To the extent that accretions in Reach 5 are less than those assumed in Exhibit B, Reclamation will not release additional water from Friant Dam.

Reclamation will determine that the volume and timing of the Restoration Flows are impaired according to the difference between scheduled and measured flows as determined by Paragraph 13(j)(iv) for Unexpected Seepage Losses downstream from Gravelly Ford. Reclamation shall release water from Friant Dam in the following order:

1. Use any available unstorable water not contracted for by Friant Division long-term Contractors. After Reclamation declares the availability of water from Friant Dam made available pursuant to Section 215 of the Act of October 12, 1982 (215 Water) to Friant Long-Term Contractors that have executed 215 Water Contracts, Reclamation shall make releases of the remaining available unstorable water, as necessary, for Unexpected Seepage Losses. Such releases shall not require the use of acquired Unexpected Seepage Water.

2. If available, use acquired Unexpected Seepage Water.

3. If Reclamation determines that Unexpected Seepage Water will not be available at required levels during any period of the Restoration Year, Reclamation shall modify the hydrograph to transfer water from the applicable hydrograph for that year according to Method 3.1 Gamma, as described in Appendix G of the SJRRP PEIS/R (Reclamation, 2012). The modified hydrograph shall be transmitted to the Restoration Administrator and U.S. Department of Commerce, National Marine Fisheries Service (NMFS), for comments in writing within a specified review period sufficient to make timely releases. Upon receipt of comments, Reclamation will modify the default schedule and transfer water within the hydrograph, provided that the modifications will not increase the water delivery reductions to Friant Division long-term contractors by the rescheduling of water to a later date under conditions when a spill is reasonably foreseeable, as determined by Reclamation.

4. If the water cannot be transferred, Reclamation will use any available Buffer Flows for that year, in consultation with Restoration Administrator.

Accounting of Unexpected Seepage Water

As soon as practical after the end of each month, Reclamation shall report:

1. The release of water under each of the steps to address Unexpected Seepage Losses.

2. The volume of Unexpected Seepage Water remaining.

3. The volume of Restoration and/or Buffer Flows remaining and the corresponding revised flow schedule if Restoration Flows have been transferred within the year or Buffer Flows have been released to meet Unexpected Seepage Losses.

Disposal of Unexpected Seepage Water

As soon as practical, the Restoration Administrator shall recommend to Reclamation as to whether the additional water acquired pursuant to Paragraph 13(c)(2)(B)(i) is no longer necessary to address Unexpected Seepage Losses. Reclamation shall then make such water available to the Restoration Administrator to augment Restoration Flows.

Any water acquired from willing sellers pursuant to Paragraph 13(c)(2)(b)(i) that is not used in a given year shall be stored, to the extent such storage is reasonably available, to assist in meeting the Restoration Goal. Rights and priorities for the storage of such water, if any, shall be those rights and priorities of the willing seller.

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Paragraph 13(e) – Release Changes for Maintenance on Friant Division Facilities

> *Notwithstanding Paragraphs 13(a), (b), and (c), the Secretary may temporarily increase, reduce, or discontinue the release of water called for in the hydrographs shown in Exhibit B for the purpose of investigating, inspecting, maintaining, repairing, or replacing any of the facilities, or parts of facilities, of the Friant Division of the Central Valley Project (the "CVP"), necessary for the release of such Restoration Flows; however, except in cases of emergency, prior to taking any such action, the Secretary shall consult with the Restoration Administrator regarding the timing and implementation of any such action to avoid adverse effects on fish to the extent possible. The Secretary shall use reasonable efforts to avoid any such increase, reduction, or discontinuance of release. Upon resumption of service after any such reduction or discontinuance, the Secretary, in consultation with the Restoration Administrator, shall release, to the extent reasonably practicable, the quantity of water which would have been released in the absence of such discontinuance or reduction when doing so will not increase the water delivery reductions to any Friant Division long-term contractors beyond what would have been caused by releases made in accordance with the hydrographs (Exhibit B) and Buffer Flows.*

This section relates to actions that affect the facilities of the Friant Division of the CVP such as investigating, inspecting, maintaining, repairing, or replacing any of these facilities, or parts of facilities. These facilities are listed in Appendix A (Description of Facilities of the Friant Division of the Central Valley Project). Unreleased Restoration Flows developed due to channel capacity limitations or maintenance on non-Friant Division facilities is addressed pursuant to Paragraph 13(i) of the Settlement and the corresponding chapter of these Guidelines.

When such actions are necessary Reclamation will make reasonable efforts to avoid any increase, reduction, or discontinuance of releases while performing the actions. If changes in the release are required Reclamation will consult with the Restoration Administrator as soon as practical regarding the timing and implementation of any action to avoid adverse effects on fish to the extent possible.

Reclamation will coordinate with the Restoration Administrator after any such increase, reduction or discontinuance of releases, and shall release, to the extent reasonably practicable, the quantity of water which would have been released without these temporary changes occurring, so long as these releases will not increase the water delivery reductions to any Friant Division long-term contractors beyond what would have been caused by releases made in accordance with the then-current Restoration Flow schedule.

Paragraphs 13(f) and (h) – Coordination on Downstream Losses

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.*

Paragraph 13(h)

> *Subject to existing downstream diversion, rights, the Parties intend that the Secretary, in cooperation with the Plaintiffs and Friant Parties, shall, to the extent permitted by applicable law and to meet the Restoration Goal and Water Management Goal, retain, acquire, or perfect all rights to manage and control all Restoration flows and all Interim Flows (as provided in Paragraph 15) from Friant Dam to the Sacramento-San Joaquin Delta; provided, however, that neither the Restoration Flows nor the Interim Flows shall be credited against the Secretary's obligations under CVPIA SS 3460(b)(2), In addition, to the extent permitted by applicable law and with the cooperation of the other Parties hereto, the Secretary agrees to undertake all reasonable measures to protect such rights to manage and control Restoration Flows and Interim Flows, including requesting necessary permit modifications and initiation of any appropriate enforcement proceedings to prevent unlawful diversions of or interference with Restoration Flows and Interim Flows.*

Reclamation will support the quantification of downstream losses, for comparison to Exhibit B assumptions, through actions described in Paragraph 13(j)(iv) of these Guidelines. Each Party agrees to use their resources, as they deem necessary, to identify likely causes of increases in downstream surface or underground diversions. Each Party agrees that they have an individual obligation to identify problems and, if a problem is identified, to coordinate with the other Parties and the Restoration Administrator to determine levels of interest of each party and potential methods to address the problem.

The Parties agree that, if an issue arises that requires substantial action to appropriately address, that each interested Party will contribute to the development of protocols, separate from these RFGs, in order to address the problem. The Parties will meet annually on or about September 1 to confer on prior year and anticipated activities by each of the Parties related to observations of activities within the Restoration Area that could affect seepage and/or diversion losses in each of the reaches.

If an enforcement action is identified, Reclamation, with the cooperation of the other Settling Parties, will initiate proceedings to prevent unlawful diversions of or interference with Restoration Flows.

Paragraph 13(i) – Unreleased Restoration Flows

The Secretary shall commence the Restoration Flows at the earliest possible date, consistent with the Restoration Goal, and the Restoration Administrator shall recommend to the Secretary the date for commencement of the Restoration Flows. In recommending the date for commencement of the Restoration Flows, the Restoration Administrator shall consider the state of completion of the measures and improvements identified in Paragraph 11(a); provided, however, that the full Restoration Flows shall commence on a date certain no later than January 1, 2014. If, for any reason, full Restoration Flows are not released in any year beginning January 1, 2014, the Secretary shall release as much of the Restoration Flows as possible, in consultation with the Restoration Administrator, in light of then existing channel capacity and without delaying completion of the Phase 1 improvements. In addition, the Secretary, in consultation with the Restoration Administrator, shall use the amount of the Restoration Flows not released in any such year by taking one or more of the following steps that best achieve the Restoration Goal, as determined by the Secretary, in such year or future years:

(1) First, if practical, enter into mutually acceptable agreements with Friant Division long-term contractors to

a. bank, store, or exchange such water for future use to supplement future Restoration Flows, or

b. transfer or sell such water and deposit the proceeds of such transfer or sale into the Restoration Fund created by this Settlement; or

(2) Enter into mutually acceptable agreements with third parties to

a. bank, store, or exchange such water for future use to supplement future Restoration Flows, or

b. transfer or sell such water and deposit the proceeds of such transfer or sale into the Restoration Fund created by this Settlement; or

(3) Release the water from Friant Dam during times of the year other than those specified in the applicable hydrograph as recommended by the Restoration Administrator, subject to flood control, safety of dams and operations and maintenance requirements.

> *The Secretary shall not undertake any action pursuant to Paragraphs 13(i)(1) through 13(i)(3) that increases the water delivery reductions to any Friant Division long-term contractor beyond what would have been caused by releases in accordance with the hydrographs (Exhibit B).*

Commencement of Restoration Flows

The Secretary shall commence the Restoration Flows at the earliest possible date, consistent with the Restoration Goal, and the Restoration Administrator shall recommend to Reclamation the date for commencement of the Restoration Flows. In recommending the date for commencement of the Restoration Flows, the Restoration Administrator shall consider the state of completion of the measures and improvements identified in Paragraph 11(a); provided, however, that the full Restoration Flows shall commence on a date certain no later than January 1, 2014.

Determination of Unreleased Restoration Flows

If, for any reason, full Restoration Flows are not released in any year beginning January 1, 2014, Reclamation shall release as much of the Restoration Flows as possible, in consultation with the Restoration Administrator in light of then existing channel capacity and without delaying completion of the Phase 1 improvements. Unreleased Restoration Flows are those Restoration Flows recommended by the Restoration Administrator for release from Friant Dam, consistent with the requirements of these Guidelines, and that the Secretary is unable to release from Friant Dam for any reason.

During years when channel capacity constraints or completion of Phase 1 improvements are known to limit the full release of Restoration Flows, the Restoration Administrator shall submit two recommendations in order that the Unreleased Restoration Flows can be determined:

- **Unconstrained Recommendation –** proposed release of full Restoration Flows with no constraints.

- **Capacity Limited Recommendation –** proposed release of full Restoration Flows in consideration of known capacity constraints.

In the event that no recommendations have been provided or accepted, then consistent with Paragraph 13(j)(i) of these Guidelines, a Default Hydrograph will be applied to the two Recommendations.

Steps to Best Achieve the Restoration Goal

In order to best achieve the Restoration Goal, agreements for Unreleased Restoration Flows shall be entered into by Reclamation to accomplish the following means:

1. Stored, banked, exchanged or released to supplement future Restoration Flows; and/or

2. Sold and the proceeds of such sale deposited into the San Joaquin River Restoration Fund.

Reclamation is responsible for determining the mean(s) to manage Unreleased Restoration Flows and entering into any necessary agreements to best achieve the Restoration Goal.

Priorities for Managing Unreleased Restoration Flows

Paragraph 13(i) establishes the priority for Reclamation to bank, store, exchange, sell or release Unreleased Restoration Flows to best achieve the Restoration Goal. Reclamation will use the order identified and to the extent that it best achieves the Restoration Goal and is practical and mutually acceptable:

1. – Paragraph 13(i)(1)(A) directs the Secretary to bank, store, or exchange Unreleased Restoration Flows with Friant Contractors for future use to supplement future Restoration Flows.

2. – Paragraph 13(i)(1)(B) directs the Secretary to transfer or sell Unreleased Restoration Flows to Friant Contractors and deposit such funds into the Restoration Fund.

3. – Paragraph 13(i)(2)(A) directs the Secretary to bank, store, or exchange Unreleased Restoration Flows with non-Friant Contractors for future use to supplement future Restoration Flows.

4. – Paragraph 13(i)(2)(B) directs Secretary to transfer or sell Unreleased Restoration Flows to non-Friant Contractors and deposit such funds into the Restoration Fund.

5. – Paragraph 13(i)(3), directs the Secretary to release Unreleased Restoration Flows from Friant Dam during times of the year other than those specified in the applicable hydrograph as recommended by the Restoration Administrator, subject to flood control, safety of dams and operations and maintenance requirements.

Management of Unreleased Restoration Flows

Unreleased Restoration Flows shall be available as soon as a recommendation is provided by the Restoration Administrator and approved by Reclamation. Delivery of Unreleased Restoration Flows from Friant Dam shall be subject to the availability of water in Friant Dam, the delivery of contracted supplies to Friant Contractors, flood control, safety of dams, and operations and maintenance requirements.

Reclamation shall update the available volume of Unreleased Restoration Flows for the current year every time a new schedule is submitted by the Restoration Administrator and approved by Reclamation. As soon as practical following a flood management release, Reclamation shall update the available volume of Unreleased Restoration Flows to account for any Restoration Flows released during that flood management release.

Prior to March 15, Reclamation shall have made an initial determination of the Unreleased Restoration Flows for the year and by no later than May 1 will have in place the necessary agreements for the storage, banking, exchange, sale or release of Unreleased Restoration Flows. Reclamation shall consult with the Restoration Administrator prior to entering into any agreement for the storage, banking, exchange, and/or release of Unreleased Restoration Flows for the purposes of supplementing future Restoration Flows. Except for releases pursuant to Paragraph 13(c), only the Restoration Administrator may recommend the release of previously stored, banked, and/or exchanged Unreleased Restoration Flows to supplement Restoration Flows. Reclamation may release previously stored, banked, and/or exchanged Unreleased Restoration Flows pursuant to Paragraph 13(c) consistent with the procedures outlines in Paragraph 13(c) of this guidance document.

Exhibit B of the Settlement defines the volume of water to be released as Restoration Flows. Reclamation shall not undertake any action pursuant to Paragraph 13(i) that increases the water delivery reductions to any Friant Contractors beyond the volume of reductions beyond what would have been caused by the release of Restoration Flows in accordance with the hydrographs in Exhibit B.

Annually, commencing on March 1, 2015, Reclamation shall provide the Settling Parties with an annual report on the:

a. Volumes of Unreleased Restoration Flows delivered during the prior Restoration Year(s).

b. Volumes of Unreleased Restoration Flows available for recommendation by the Restoration Administrator for supplementing future Restoration Flows.

c. Projection of Unreleased Restoration Flows for the upcoming Restoration Year.

d. Deposit of funds from sales of Unreleased Restoration Flows during the prior Restoration Year(s).

Paragraph 13(j)(i) – Restoration Year Type and Flow Schedules

Procedures for determining water-year types and the timing of the Restoration Flows consistent with the hydrograph releases (Exhibit B);

This section describes the process to develop the volume and pattern of Restoration Flows, including guidelines for transmissions of year types and timing (default flow schedules) from Reclamation to the Restoration Administrator and guidelines for Reclamation to receive the Restoration Administrator flow schedule recommendation. The ecological basis is described in Appendix G of the SJRRP PEIS/R (Reclamation, 2012). The following section addresses Paragraph 13(j)(i) by:

- **Technical Process for Setting the Year Type and Default Flow Schedule –** This section provides technical procedures for: determining the volume of water year runoff on the San Joaquin River, identifying the Restoration Year type, and setting the default flow schedule.

- **Coordination with the Restoration Administrator on the Release of Restoration Flows –** This section provides guidance for communications between Reclamation and the Restoration Administrator, including schedules and content for the following transmissions: Reclamation determinations of year type and default flow schedules, Restoration Administrator flow schedule recommendations, evaluation of Restoration Administrator recommendations for consistency with the Settlement and Settlement Act, and management of Friant Dam for Restoration Flows.

Technical Process for Setting the Year Type and Default Flow Schedule

The full natural runoff on the San Joaquin River at Friant Dam over the course of the water year (October through September) sets the allocations and default releases for each Restoration Year (March through February). The overlap of Restoration, calendar, and water years is illustrated in Figure 2.

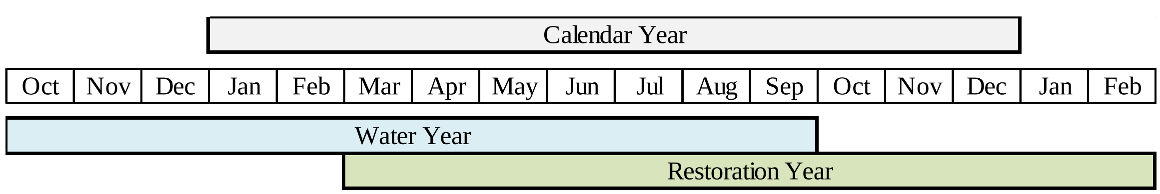

Figure 2
Overlap Among Calendar, Water, and Restoration Years

Step 1: Determining Water Year Runoff

Initial determinations of unimpaired water year runoff at Friant Dam will be conducted by Reclamation using the following:

A. San Joaquin River Water Year Forecast Breakdown, Monthly B120 Report Update, DWR.

B. April- July forecast, weekly updates to B120 Report, DWR.

C. Unimpaired runoff to Lake Millerton, reported as "Full Natural Millerton" by the Central Valley Operations Office (Reclamation) website.

Inflow estimates used for setting the volume of water to be scheduled for release as Restoration Flows (Restoration Annual Allocations) will be based on Forecast Use Option 1D, which specifies percent exceedance forecast values that vary by month and year type. Table 2 shows the forecast patterns by month and year type. Forecast Use Option 1D requires an initial pattern year type to be determined using the current forecast values. The pattern year type is used along with the forecast month to determine which forecast percentage to use for the Restoration Allocation. If the 50-percent water year exceedance forecast is greater than or equal to the threshold value of 1,831 TAF (50-year average unimpaired water year inflow), then the 50-percent exceedance forecast is used to determine the pattern year type following the boundaries defined in Table 2. If the 50-percent exceedance forecast is less than 1,831 TAF, the current 90 percent exceedance forecast is used to determine the pattern year type. The average value (1,831 TAF) is updated in the DWR Bulletin 120 approximately every 5 years. Thus the Option 1D threshold value will be adjusted every 5 years to maintain the current 50-year average unimpaired runoff. Once a pattern year type is determined, exceedance percentage for that particular month will be selected from Table 2. The corresponding unimpaired runoff shall be used to determine the Restoration Flow allocation.

Table 2
Forecast Use Option 1D Dynamic Forecast Percent Exceedance Patterns

Unimpaired Runoff to Lake Millerton (TAF)	Pattern Year Type	February (percentile)	March (percentile)	April (percentile)	May (percentile)
Below 400	Critical-Low	90	90	90	90
400 to 670	Critical-High	90	90	90	90
670 to 930	Dry	90	90	75	75
930 to 1,450	Normal-Dry	90	90	75	75
1,450 to 2,500	Normal-Wet	75	75	50	50
Above 2,500	Wet	50	50	50	50

In addition to each runoff determination, Reclamation will provide Restoration Release allocations that would result from the 10, 50 and 90th percentiles.

In addition to the above, Reclamation will consider other available information to ensure that the best available records and forecast information are being applied. Reclamation will document the sources and information used to produce runoff forecasts, which may include:

A. Raw ESP Water Supply Forecast for the Water Year, as reported by the National Weather Service (NWS) California-Nevada River Forecast Center[1]

B. Southern California Edison snowpack surveys and runoff estimates.

Appendix D outlines the procedures for using the best available information to determine the forecasted runoff if the DWR forecasts differs significantly from the NWS and SCE forecasts.

Step 2: Identifying Restoration Year Type and Calculating Annual Allocation for Restoration Flows

Table 3 identifies the Restoration annual allocation with respect to the unimpaired water year runoff, along with the ranges of Restoration Year types identified in the Settlement.

Table 3
Restoration Year Type and Allocation

Unimpaired Water Year Runoff (TAF)	Total Friant Dam Release (AF)	SJRRP Annual Allocation (AF)	Restoration Year Type (Range of Runoff, TAF)
below 400	116,866	3,620	Critical-Low (up to 400)
at 400 and up to 670	187,785	74,539	Critical-High (400 – 670)
at 670	272,278	158,953	Dry (670 – 930)
at 930	330,256	216,931	
at 1,450	400,256	286,931	Normal-Dry (930 – 1,450)
at 2,500	547,444	434,119	Normal-Wet (1,450 – 2,500)
above 2,500	673,487	560,162	Wet (2,500 +)

Reclamation will interpolate between the volumes identified in Table 3 to calculate the annual allocation for each Restoration Year to the nearest TAF. Figures 3 and 4, below, illustrates this method.

[1] http://www.cnrfc.noaa.gov/

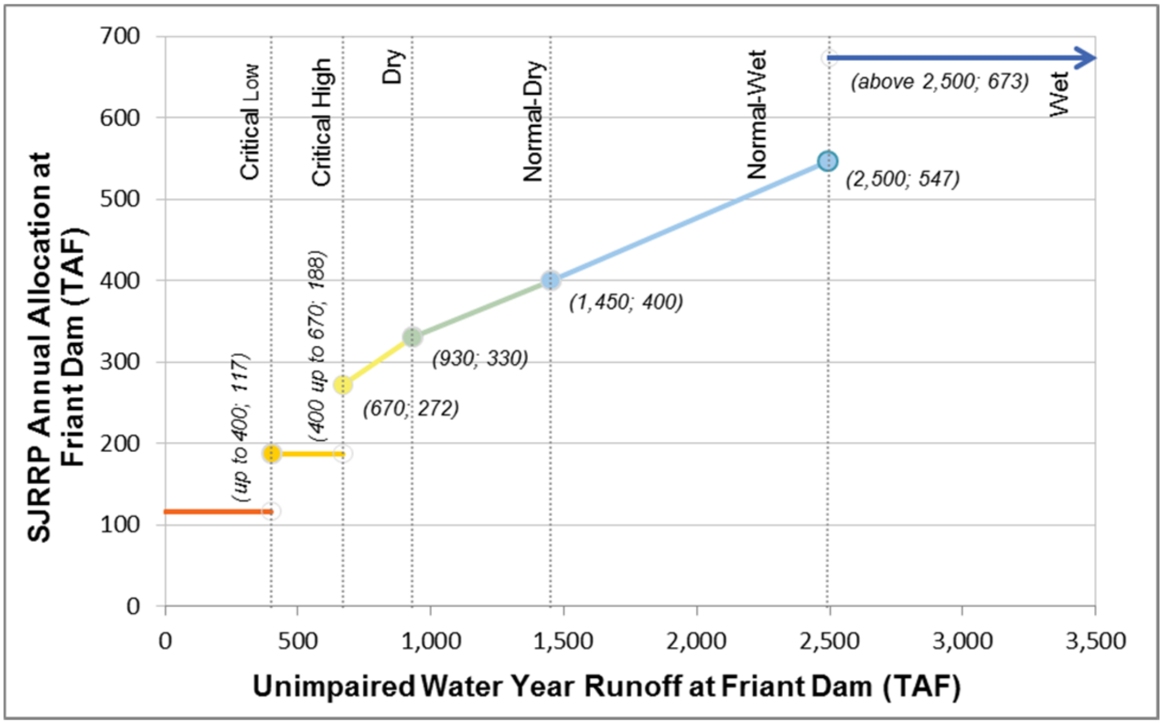

Figure 3
SJRRP Annual Allocation at Friant Dam as a Function of Unimpaired Runoff at Friant Dam

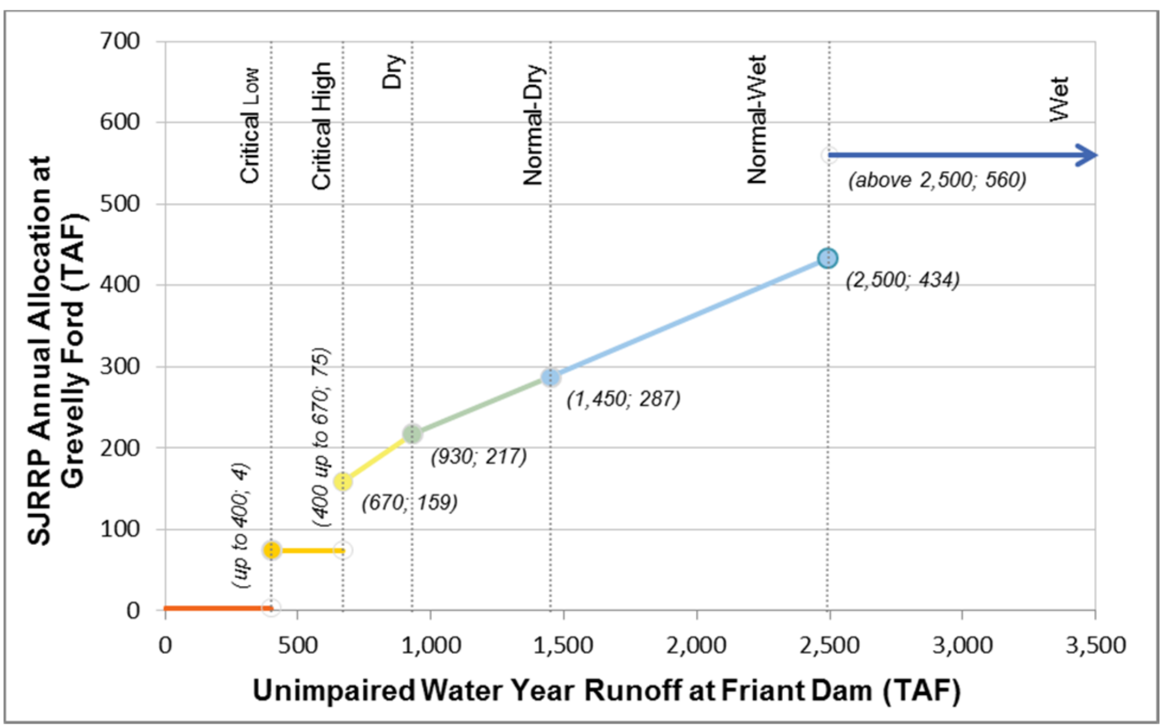

Figure 4
SJRRP Annual Allocation at Gravelly Ford as a Function of Unimpaired Runoff at Friant Dam

Step 3: Setting the Default Flow Schedule

Default flow schedules prepared by Reclamation provide an initial daily distribution of the annual allocation and a starting point for Restoration Administrator flow schedule development. Default flow schedules do not consider Settlement provisions for flexible flow shifts, real-time management of flows, use of buffer flows or the potential for releases above the requirements of the Settlement for flood management, or management of unexpected seepage losses. Following acceptance of Restoration Administrator flow schedules, the default schedules are no longer relevant. The Restoration Administrator may submit a new default flow schedule for review and acceptance by all Settling Parties.

Appendix D (Default Hydrograph Lookup Tables) provides lookup tables for identifying default flow schedules for flows at Friant Dam and Gravelly Ford. The lookup tables index flow schedules by both date and remaining allocation. The following sections describe how to calculate and use the remaining allocation to look up the default flow schedule.

The Restoration annual allocation lookup tables in Appendix B (Restoration Annual Allocation Lookup Tables), or additional tables for time periods not considered in Appendix B, can be derived from the procedures in Appendix C (Default Flow Schedules).

Calculating the Remaining Allocation

The remaining allocation is the annual allocation reduced by the volume of Restoration Flows released to date. The volume of Restoration Flows released to date is the sum of mean daily flows at Gravelly Ford less 5 cfs. Prior and anticipated releases of Buffer Flows, purchased water, other releases in excess of the Restoration Flow schedule, including releases for other contractual obligations, will not be debited against the Restoration annual allocation.

Setting Default Flow Schedules

The tables in Appendix C (Default Flow Schedules) reflect default flow schedules for each inflection point in Figure 3 – for each date considered in the tables, the portion of the default flow schedule that has passed has been subtracted from each row's total annual allocation to determine the remaining allocation for each date.

To use the tables, first identify the date in the top row. Read down the column labeled "Remaining Allocation" and identify the row corresponding to the remaining Restoration annual allocation. Read across that row to obtain the default flow schedule for the duration of the Restoration Year. In the event that the remaining allocation is not equal to one of the listed volumes, but instead falls between two listed values; the default flow schedule will be determined by linear-interpolation of the two bordering schedules.

The tables provided in Appendix D (Default Hydrograph Lookup Tables) reflect implementation of the 'gamma' transformation pathway, which is one of the four possible methods for distributing an annual allocation into a default flow schedule. The Restoration Administrator may request changes to the default flow schedule to use any of the transformations, or some hybrid thereof.

Coordination with the Restoration Administrator on the Release of Restoration Flows

On or before January 20 of each year, Reclamation will transmit the first determination of the Restoration Year Type and Default Flow Schedule for the following Restoration Year. Default flow schedules will be updated in a timely manner following each monthly release of DWR's Bulletin 120 water year runoff forecast for the San Joaquin River; or more frequently if determined necessary by Reclamation or requested by the Restoration Administrator. Reclamation will discuss forecasts with the Restoration Administrator before a declaration of default flow schedule. Monthly or more frequent updates to the allocation and schedule, monitoring data, and Friant Dam operations will continue until the Restoration Administrator and Reclamation agree that additional meetings throughout the year are no longer necessary. The final determination of Restoration annual allocation and default flow schedule will occur no later than September 30.

Within 2 weeks of each Restoration Year Type declaration the Restoration Administrator may recommend modifications to default flow schedules. Reclamation will first verify consistency with the Settlement and these Guidelines, and then implement the flow schedules through the operation of Friant Dam. In all cases, Reclamation will operate to the latest, implementable flow schedule recommendation. The following section provides guidance on the schedule and content of information transmitted by Reclamation to the Restoration Administrator to support a recommendation, and guidance on information provided to Reclamation by the Restoration Administrator in the form of a recommendation.

Transmissions to the Restoration Administrator from Reclamation

With each determination of Restoration Year Type and Default Flow Schedule update Reclamation will transmit the following to the Restoration Administrator, in writing:

- A Restoration budget, including: the annual allocation; releases counted toward the annual allocation; releases of Buffer Flows; releases of purchased water; the remaining allocation; and volumes of water banked, stored, or exchanged for future use to supplement future Restoration Flows.

- An accounting of releases of Interim and Restoration flows, including Buffer Flows and purchased water, and an accounting of total flows at each of the monitoring locations specified in the Settlement.

- Flow targets at Gravelly Ford, and the anticipated schedule of releases at Friant Dam, for the remainder of the Restoration Year.

- Operating criteria, including ramping rate constraints, channel conveyance capacity, scheduled maintenance that may restrict the release of Restoration Flows, and relevant permit requirements.

- Flow gains and losses for each reach of the river below Gravelly Ford.

Reclamation will notify the Restoration Administrator when conditions necessitate a change in operating criteria for Friant Dam. Unless immediate action is required (e.g., to provide public health and safety), Reclamation will provide the Restoration Administrator with no less than a 48-hour notice in writing and by phone of changes to the Restoration Administrator's most recent flow recommendation. Reclamation will make information publically available and notify the Restoration Administrator and Settling Parties of its availability.

Consultation with Federal Fisheries Agencies

As described in the Settlement (Exhibit D), the Restoration Administrator will consult with the U.S. Fish and Wildlife Service (USFWS) and NMFS, and these agencies are responsible for providing input on the Restoration Administrator flow recommendations for meeting the Restoration Goal through participation in the San Joaquin River Restoration Program (SJRRP) Technical Advisory Committee (TAC).

Restoration Administrator Flow Schedule Recommendations

The Restoration Administrator will consult with the TAC and make an initial flow recommendation to Reclamation by January 31 of each year following the receipt of Reclamation's initial default flow schedule. When Reclamation provides an updated forecast and the default flow schedules, the Restoration Administrator will have three days to update the then-current Restoration Flow schedule before Reclamation makes any changes in flow release from the Restoration Administrator's most recently adopted recommendation. Reclamation may request additional recommendations as necessary to assist its determination of water supply allocations, or to help manage emergency or rapidly changing hydrologic conditions. At any time, the Restoration Administrator may submit a new flow schedule or revise an existing flow schedule, provided that the recommendation is consistent with the Settlement and these Guidelines.

Restoration Administrator recommendations include the following, as appropriate:

- **Flow Schedule –** The rate and timing of Friant Dam releases for the entire annual allocation across the current Restoration Year. The schedule should demonstrate consistency with the annual allocation, and other provisions of the Settlement.

- **Pulse Flow Recommendations –** The ramping rates, time windows, and peak flow specifications for desired pulses.

- **Buffer Flows –** The recommended use of Buffer Flows.

- **Purchased Water –** The recommended acquisition and use of water purchased to support the Restoration Goal.

- **Use of Banked or Stored Water –** A recommendation regarding the use of water that has been banked or stored pursuant to Paragraphs 13(i)(1) and (2).

- **Recommendation on Unreleased Flows –** When there are Unreleased Restoration Flows, the Restoration Administrator may make recommendations regarding the management of such water.

- **Modifications to Flood Releases –** Suggestions on how ramping up to or down from a flood could improve success in meeting the Restoration Goal.

- **Additional Points of Concern –** Concerns or suggestions for consideration by Reclamation that fall outside of the sections above.

Consistency of Restoration Administrator Recommendations with Settlement and Settlement Act

Reclamation will determine the consistency of Restoration Administrator recommendations with the Settlement and Settlement Act, including the assessment of whether the Restoration Administrator Restoration Flow recommendations are consistent with the Settlement and operating criteria.

Reclamation will implement the Restoration Administrator flow schedule under the following conditions:

- The recommendation schedules a volume of water equal to the most current full allocation for Restoration, with flexible flow shifts, and additional schedules of Buffer Flow releases, recommended releases of purchased water, and releases of water pursuant to Paragraph 13(i)

- The timing of releases is consistent with provisions for flexible flow operations in Exhibit B of the Settlement, provided in Appendix D (Exhibit B of the Settlement)

- The implementation of releases will be consistent with the Settlement regarding effects on water supply reductions to Friant Division long-term contractors

- The releases do not impact public safety.

- The recommendation is otherwise consistent with the terms and conditions of the Settlement, the Settlement Act, and permit conditions

If the recommendation departs from these terms, but there is agreement among Reclamation and the Settling Parties that the changes are acceptable, then Reclamation will accept the recommended changes.

The Restoration Administrator will be notified of constraints on operating criteria with each transmission of the default flow schedule, and within 24 hours of an event or emergency condition that requires a departure from the Restoration Administrator recommendations.

Reclamation must receive a recommendation which is consistent with the Settlement and Settlement Act before implementing a change in releases. Each Restoration Administrator recommendation will be reviewed for acceptability by Reclamation within 5 days of receipt.

In the event that the Restoration Administrator submits a request for an immediate change in flows to respond to conditions in the river that affect the near-term survival of fish or otherwise negatively affects the Restoration Goal, Reclamation will respond within 24 hours by making the requested change. If the Restoration Administrator recommendation does not conform to either the Settlement or safe operating criteria, Reclamation will inform the Restoration Administrator within 24 hours of any discrepancies and request a revised recommendation.

Management of Friant Dam Releases for Flow Targets

Reclamation will release the flow schedule at Friant Dam and to meet targets at Gravelly Ford. Releases will meet channel losses and riparian diversion requirements in Reach 1, including attaining the 5 cfs of flow requirement at Gravelly Ford.

Paragraph 13(j)(ii) of this guidance document describes procedures for compliance with Gravelly Ford flow targets; Paragraph 13(j)(iv), releases for Unexpected Seepage Losses.

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Paragraph 13(j)(ii) – Measuring, Monitoring, and Reporting of Restoration Flows

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 (Exhibit B) and any other applicable releases (e.g., Buffer Flows)

Reclamation will finalize and publish flow rates for Restoration Flows and other applicable releases within 20 days of the end of the prior month. Reclamation and the implementing agencies will assist the Restoration Administrator and the TAC in the development of information needed to inform the Restoration Administrator's flow recommendations. This assistance will be guided by the development of an annual Monitoring and Analysis Plan.

Measurement, Monitoring, and Reporting of Daily Flow Rates

In addition to publishing finalized monthly flow rates and volumes, Reclamation will provide provisional telemetry data on-line, via CDEC, and publish final Quality Assurance/Quality Control mean daily flow data on-line as it becomes available. Final flow data will be made available no later than the month following the end of the reporting period for the following locations:

1. At or immediately below Friant Dam (measured at CDEC station MIL).
2. At Gravelly Ford (measured at CDEC station GRF).
3. Below the Chowchilla Bifurcation Structure (measured at CDEC station SJB).
4. Below Sack Dam (measured at CDEC station SDP).
5. At the head of Reach 4B (measured at CDEC station SWA).
6. At the San Joaquin River and Merced River confluence (measured at CDEC station SMN).

Electronic links to the online data are provided in Appendix E (Reach Definitions and CDEC Gages) for each CDEC station. Flow data collection will comply with U.S. Geological Survey guidelines for flow measurement (Buchanan and Somers, 1969).

Development and Publication of the Monitoring and Analysis Plan

The Monitoring and Analysis Plan will include the following information:

- A discussion of the Restoration Administrator recommendations and factors influencing the release of Restoration Flows (e.g., operating agreements, construction schedules, management plans, and environmental compliance coverage)

- A description of planned monitoring activities and locations for the following Restoration Year, including a plan for monitoring and determining unexpected gains and losses in reaches of the river between Gravelly Ford and the Merced River.

- A summary of actions taken during the previous year to implement the Settlement and Restoration Administrator recommendations, including an account of Restoration Flows, physical and biological monitoring results, and real-time operation decisions. The summaries will also include the following:

  - A synthesis of key findings and information needs for future efforts

  - Information needs, purpose, and objectives for monitoring and analysis activities

  - An inventory of physical and biological monitoring activities conducted or proposed for implementation

  - Limitations on the release of Restoration Flows

  - Summaries and technical data for studies and monitoring activities

- A list of technical tools for evaluating and predicting conditions in the San Joaquin River

To the greatest extent possible, the Monitoring and Analysis Plan will incorporate Restoration Administrator recommendations for monitoring and analysis. The schedule for coordination on the Monitoring and Analysis Plan is displayed in Figure 5, below.

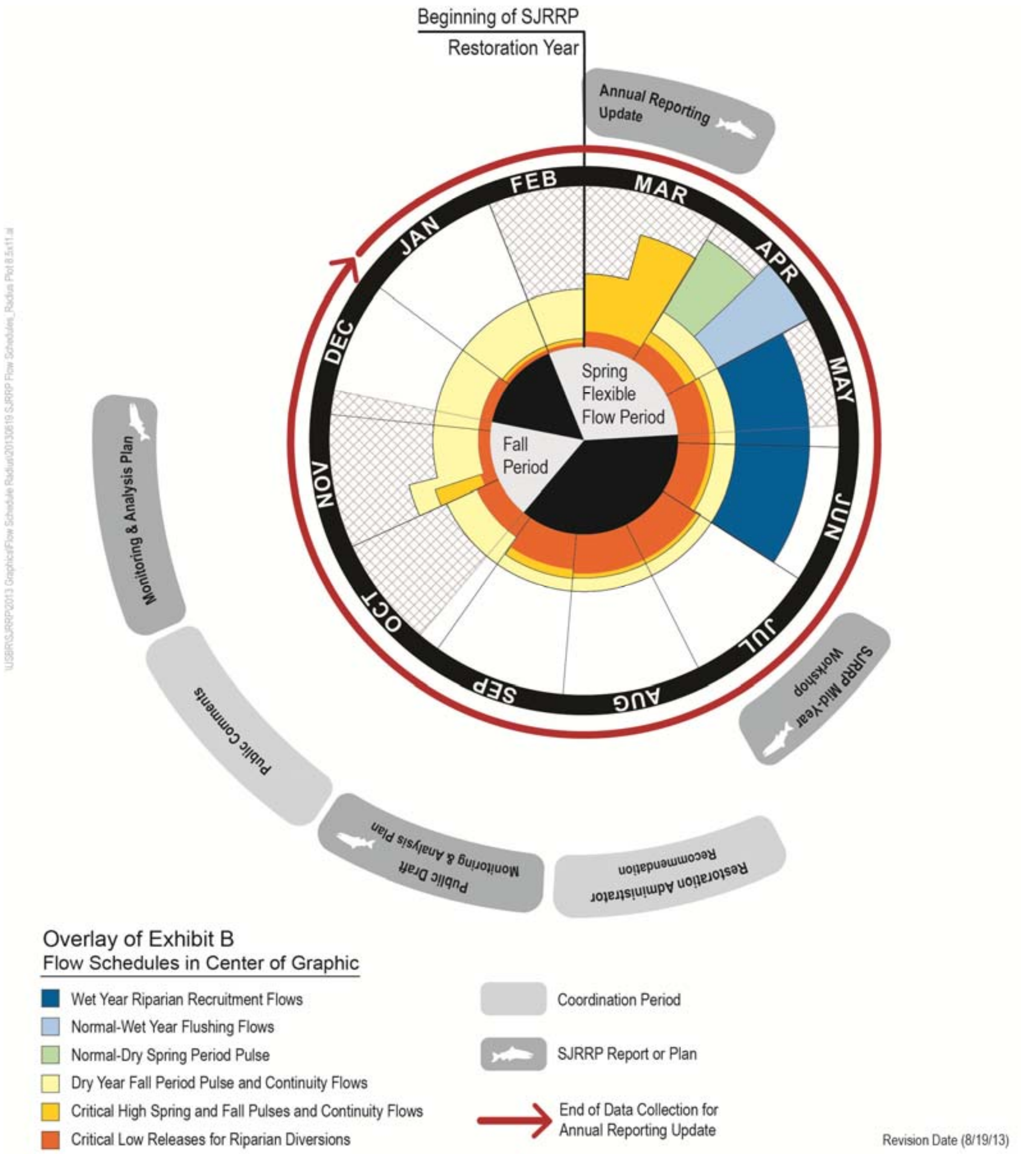

Figure 5
Publication Schedule for SJRRP Monitoring and Analysis Plan

Flow Compliance Evaluation

The following compliance protocols will meet the terms and conditions of the Settlement with respect to flows at Friant Dam and Gravelly Ford.

A. Friant Dam and Gravelly Ford Flow Targets

1. The daily targets for the Friant release and Gravelly Ford flows are those set forth in Exhibit B of the Settlement as modified by recommendation from the Restoration Administrator and implemented by Reclamation.

2. When changing the release from Friant Dam to achieve a new target value at Gravelly Ford, Reclamation shall adjust releases based on the difference between reported Gravelly Ford flows and the target at Gravelly Ford. Flow adjustments at Friant Dam shall be made any day of the week to achieve a new target value at Gravelly Ford.

B. Friant Dam and Gravelly Ford Flow Target Compliance

1. Flow values used to measure compliance will be the Friant release and the 6 a.m. Gravelly Ford discharge as reported each day in the Millerton Daily Report, averaged over the current and 2 previous days.

2. If the measured flows at Gravelly Ford are not within +/- 10 cfs of the flow target, then the Friant release shall be adjusted (increased/decreased) as follows:

   a. Weekly flow adjustments shall continue until the flow target is reached.

   b. If the measured flows at Gravelly Ford exceed the flow target, the Friant Dam release can be adjusted, but not below the flow release target from Friant Dam.

3. For compliance during times outside the Spring Pulse, Riparian Recruitment, and Fall Pulse periods, Reclamation shall evaluate losses from Friant Dam to Gravelly Ford twice a week, Mondays and Fridays, and make adjustments at Friant Dam as follows:

   a. Reclamation will determine average flow rates at Friant Dam, $\overline{MIL}_t$, and Gravelly Ford, $\overline{GRF}_t$ each day based on the average of the most recent three Millerton Daily Reports.

   b. Beginning 7 days after the conclusion of the Flexible Flow Period (or Riparian Recruitment when applicable), Reclamation will evaluate the measured losses, L_m, daily by subtracting the average Friant release 4 days prior, t-4, from the 3-day average Gravelly Ford flow calculated on the current day.

$$L_m = \overline{GRF}_t - \overline{MIL}_{t-4}$$

   c. Reclamation will determine a target loss, L_T, by subtracting the Friant Dam release in the Flow Schedule, MIL_T, from the Gravelly Ford flow target in the Flow Schedule, GRF_T.

$$L_T = GRF_T - MIL_T$$

d. Reclamation will determine the difference between target and measured losses between Friant Dam and Gravelly Ford, ΔL, by subtracting the measured loss from the target loss.

$$\Delta L = L_T - L_m$$

e. When the difference between the target and measured losses is greater than 10 cfs, Reclamation shall evaluate and adjust releases from Friant Dam.

f. Reclamation shall determine a controlling release from Friant Dam for flows at Gravelly Ford as the sum of the Gravelly Ford target and the average of the measured losses from previous four days.

$$MIL_{GRF} = GRF_T + \text{Average}\,(L_{mt-1} + L_{mt-2} + L_{mt-3} + L_{mt-4})$$

g. Reclamation shall adjust releases from Friant Dam to the larger of either the controlling release for flows at Gravelly Ford or the Friant Dam release target, but by no less than 15 cfs.

4. For compliance during the Fall Pulse Flow periods as defined by Exhibit B, the flows shall be managed as follows with respect to complying with the Gravelly Ford flow target:

   a. If flows are being increased to a release from Friant Dam which is not specified in Exhibit B, the corresponding Gravelly Ford flow requirement shall be determined by subtracting the assumed riparian release for that time period, as shown in Exhibit B;

   b. The flows from Friant Dam shall be adjusted 5 days ahead of the Fall Pulse to meet the target flow at Gravelly Ford at the beginning of the Fall Pulse.

   c. The flows from Friant Dam shall be adjusted considering the prevailing field losses to maintain the target flow at Gravelly Ford during the pulse period.

   d. The flows from Friant Dam shall be adjusted to post pulse base flow starting from the 7th day of the Fall Pulse to maintain the allocated flow volume during the pulse.

Any flow adjustment made pursuant to A(2) or B(4) of this section will be in addition to any scheduled change provided in A(1) of this section. Further details are provided in Appendix F, Gravely Ford Compliance.

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Paragraph 13(j)(iii) – Recovered Water Account

> *Procedures for determining and accounting for reductions in water deliveries to Friant Division long-term contractors caused by Interim Flows and Restoration Flows*

Paragraph 16(b)

> *A Recovered Water Account (the "Account") and program to make water available to all of the Friant Division long-term contractors who provide water to meet Interim Flows or Restoration Flows for the purpose of reducing or avoiding the impact of the Interim Flows and Restoration Flows on such contractors. In implementing this Account, the Secretary shall:*
>
> *(1) Monitor and record reductions in water deliveries to Friant Division long-term contractors occurring as a direct result of the Interim Flows and Restoration Flows that have not been replaced by recirculation, recapture, reuse, exchange or transfer of Interim Flows and Restoration Flows or replaced or offset by other water programs or projects undertaken or funded by the Secretary or other Federal Agency or agency of the State of California specifically to mitigate the water delivery impacts caused by the Interim Flows and Restoration Flows ("Reduction in Water Deliveries"). For purposes of this Account, water voluntarily sold to the Secretary either to mitigate Unexpected Seepage Losses or to augment Base Flows by any Friant Division long-term contractor shall not be considered a Reduction in Water Delivery caused by this Settlement. The Account shall establish a baseline condition as of the Effective Date of this Settlement with respect to water deliveries for the purpose of determining such reductions. The balance of any Friant Division long-term contractor in the Account shall be annually adjusted in accordance with the provisions of this Paragraph 16(b)(1) and of Paragraph 16(b)(2). Each Friant Division long-term contractor's account shall accrue one acre foot of water for each acre foot of Reduction in Water Deliveries, In those years when, pursuant to Paragraphs 13(a) and 18, the Secretary, in consultation with the Restoration Administrator, determines to increase releases to include some or all of the Buffer Flows, Friant Division long-term contractors shall accrue into their account one and one quarter acre foot of water for each acre foot of Reduction in Water Deliveries;*
>
> …

Reclamation will maintain a Recovered Water Account (RWA) and program to make water available to all of the Friant Division long-term contractors who provide water to meet Interim Flows and Restoration Flows, collectively hereinafter in this section referred to as Restoration Flows, for the purpose of reducing or avoiding the impacts of the Restoration Flows on such contractors.

Determining Reduction in Water Deliveries

To determine the reduction in water deliveries to Friant Division long-term contractors caused by Restoration Flows, Reclamation will use an operational model to calculate deliveries under a scenario with Restoration and a scenario without Restoration (baseline). The baseline model determines the potential gross reduction in Friant-wide water deliveries; to determine the net reduction in water deliveries for each contractor, a series of "tests" or comparisons are done, which are detailed in Appendix H. Appendix H describes the background and rationale for the selected methodology and a more detailed step-by-step procedure for calculating the net reduction in water deliveries, summarized below.

1. Determine Friant-wide Impacts using the daily Water Use Curve model (March through July period).
2. Determine Friant-wide Impacts using late season spill calculations (August through February period).
3. Summation of Friant-wide impacts (March through February water year).
4. Compare total Friant-wide water made available to Contractors with Restoration (from Step 1 Item 7 and Step 2 Item 10 below) to Friant-wide total contract quantity of 2.2 MAF.
5. Compare Step 3 to Step 4 and use the lesser of the two as net Friant-wide Impacts.
6. Distribution of net Friant-wide Impacts from Step 5 to each individual Contractor.
7. Compare actual total water made available to each individual Contractor to each Contractor's total contract amount.
8. Compare Step 6 to Step 7 and use the lesser of the two as the net impact to each individual Contractor.

The available water supply equals the storage in Millerton Lake above the dead pool plus the inflow into Millerton Lake. The baseline calculation will first use available water supply to meet river releases. River releases under the without-Restoration condition will simulate riparian holding contract requirements using the Exhibit B critical-low schedule. River releases with Restoration will use the Restoration Flow Schedule (i.e. Restoration Administrator recommendation accepted by Reclamation) at Friant Dam.

For water deliveries to Friant Division long-term contractors (deliveries), the baseline calculation incorporates a potential contractor water use curve composed of the daily diversion rates shown in Table 4 as the maximum demand of the Friant Division long-term contractors for Class 1 and Class 2 water supplies.

The baseline calculation will make deliveries from the remaining water supply after meeting river releases. Deliveries equal the lesser of the remaining available water supply, canal capacity, or the cumulative water use curve. Water supply in excess of river releases and deliveries accumulates as potential storage and may “spill.” The baseline calculation limits the storage to Millerton Lake capacity.

Table 4.
Water Use Curve

Month	Diversion Rate (cfs)	Monthly Volume (AF)	Percent Class 2 Contract
March	1,593.8	98,000	7
April	2,823.3	168,000	12
May	3,643.0	224,000	16
June	4,705.6	280,000	20
July	4,553.8	280,000	20

The contract supply equals deliveries plus storage up to a maximum of the full contract amounts for Class 1 and Class 2, a total of approximately 2.2 million acre-feet (AF). The baseline calculation method will determine the gross reduction in water deliveries to Friant Division long-term contractors as the difference between contract supply with Restoration Flows and contract supply without Restoration Flows.

Scheduled Restoration releases from Millerton Lake from August through February will not count as a reduction in water deliveries to Friant Division long-term contractors on days when actual releases are in excess of requirements to meet Restoration Flows as determined by Reclamation, i.e. late-season flood releases.

The reduction in water deliveries Friant-wide and for each contractor are calculated after a series of “tests” or comparisons are done as described in Appendix. This is the total RWA balance.

Reclamation will increase RWA balances by 1 AF for each AF of Reduction in Water Deliveries, except for Buffer Flows. Reclamation will increase the RWA balances by 1.25 AF for each AF of Buffer Flows that cause impacts as identified in Appendix H. Reclamation will not increase RWA balances for scheduled releases of Buffer Flows occurring when making releases for flood management in excess of the Restoration Flow Schedule.

Recirculation, Replacement or Offset Programs and Projects

After the calculation of reduction in water deliveries, water recirculated to a contractor, and then replacement or offset programs, will reduce the calculated net reduction in water deliveries.

RWA balances will be decreased for programs and projects undertaken or funded by Reclamation or other Federal agency or agency of the State of California specifically to mitigate the water delivery impacts caused by Restoration Flows. Those programs and projects are identified in Appendix G, including the amount of replacement or offset resulting from implementation of the programs and projects.

Accounting for Reductions in Water Deliveries

Reclamation will maintain an accounting for each Friant Division long-term contractors that will include: reductions in water deliveries, replacement or offset programs and projects, RWA deliveries, and transfers. Reclamation will determine the Reductions in water deliveries annually. By March 31 of each year, Reclamation will provide the Settling Parties with an accounting for the prior Restoration Year that will include reductions in water deliveries, and RWA balances as of the last day of the prior Restoration Year. Reclamation will provide the Settling Parties with a monthly update of the RWA balances that will account for applicable deliveries, transfers, and offset programs and projects. RWA balances will not reflect future anticipated impacts.

Paragraph 16(b) Deliveries

Paragraph 16(b) Deliveries are subject to a determination by Reclamation that wet hydrologic conditions exist and water is not needed for Restoration Flows as provided in the Settlement, to meet Friant Division long-term Contractor obligations, or to meet other contractual obligations of Reclamation existing on the Effective Date of the Settlement. Paragraph 16(b) Deliveries shall be made available to the Friant Division long-term contractors at the total cost of $10.00 per AF, which amounts shall be deposited into the Restoration Fund.

Paragraph 16(b) Deliveries shall be made available to all of the Friant Division long-term Contractors who experience a reduction in water deliveries as a direct result of Restoration Flows, as reflected in individual RWA balances. Eligibility to receive Paragraph 16(b) Deliveries will be determined based upon the annual update of RWA Balances. Paragraph 16(b) Deliveries will have priority over 215 Water, but a lower priority than Class 1 and Class 2 contract supplies. Friant Division long-term Contractors may exchange, bank, or transfer Paragraph 16(b) Deliveries with other Friant and non-Friant Division long-term Contractors.

Paragraph 16(b) Deliveries shall decrease the RWA balances of Friant Division long-term Contractors. Paragraph 16(b) Deliveries made available and not diverted by Friant Division long-term contractors do not decrease the RWA balances.

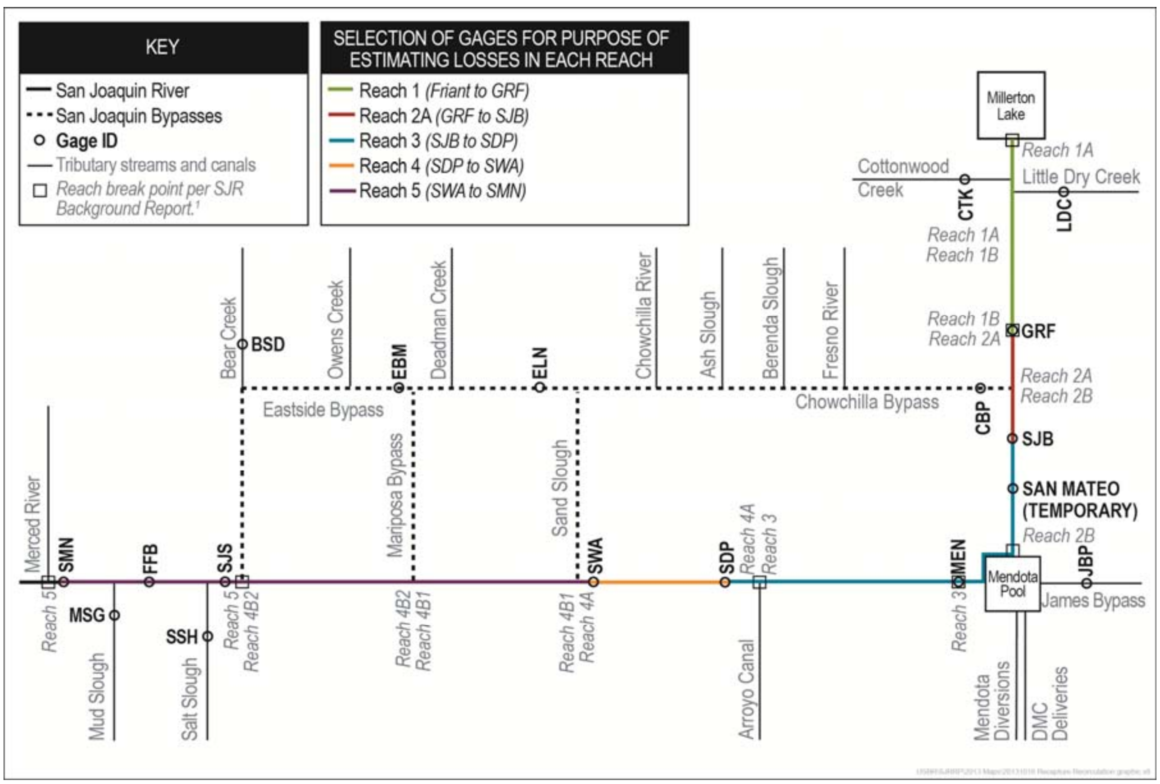
Transfers of RWA Balances

Only Friant Division long-term contractors may hold RWA accounts. Accordingly, transfers of RWA balances may only be among other Friant Division long-term contractors, although Friant contractors may make Paragraph 16(b) Deliveries to non-Friant contractors. Any Friant Division long-term contractor transferring its RWA balance shall notify Reclamation in writing, as soon as practical.

Paragraph 13.(j)(iv) – Methodology for Monitoring Seepage Losses

Developing a methodology to determine whether seepage losses and/or downstream surface or underground diversions increase beyond current levels assumed in Exhibit B.

Reclamation will assess seepage losses and/or downstream surface or underground diversions, including the reliability of the measuring station and the quality of the data, at least once a year and report results in the SJRRP Monitoring and Analysis Plan. In assessing seepage losses and/or downstream surface or underground diversions, Reclamation will use final flow records or best available information for Reaches 2 through 5, as defined in the Settlement. The availability and reliability of gaging stations were considered in determining segments of the San Joaquin River where seepage losses and/or downstream surface or underground diversions would be evaluated in Reaches 2 through 5. Figure 6 provides the relative location of these gages to each other and the reaches of the San Joaquin River.



San Joaquin River Restoration Study Background Report (McBain & Trush, Inc. [eds]), 2002)

Figure 6.
Gages and Reaches of the San Joaquin River in the SJRRP Restoration Area

Losses in Reach 1 are described and managed for under Paragraph 13(j)(ii) of these Guidelines. For the purposes of this section, the determination of seepage losses and/or downstream surface or underground diversions for Reaches 2 through 5 will be measured at gage locations, as identified below. Electronic links to the online data are provided in Appendix E (Reach Definitions and CDEC Gages) for each CDEC station.

- **Reach 2 –** Gravelly Ford gage (GRF) to below the Chowchilla Bifurcation Structure (SJB)
- **Reach 3 –** Below the Chowchilla Bifurcation Structure (SJB) to below Sack Dam (SJD)
- **Reach 4 –** Below Sack Dam (SJD) to the top of Reach 4B (SWA)
- **Reach 5 –** Top of Reach 4B (SWA) to the confluence of the Merced River (SMN)

The determination of seepage losses and/or downstream surface or underground diversions will use the following time periods for assessment based on the hydrograph component:

- **Fall Base and Spring-Run Incubation Flow –** October 1 through October 31
- **Fall-Run Attraction Flow –** November 1 through November 10 (November 6 in critical years)
- **Fall-Run Spawning and Incubation Flow –** November 11 (November 7 in critical years) through December 31
- **Winter Base Flows –** January 1 through February 28 (February 29 in leap years)
- **Spring Rise and Pulse Flows –** March 1 through April 30
- **Summer Base Flows –** May 1 through August 31
- **Spring-Run Spawning Flows –** September 1 through September 30

For each of the reaches and time periods, Reclamation will compute the cumulative volume entering and leaving the reach over the time period and compare it to the "current levels assumed in Exhibit B," as described in the following sections.

Reach 2

Exhibit B (Footnote 2 under Tables 1A through 1F) describes losses in Reach 2 as a function of flows at the Gravely Ford gage station. Table 5 summarizes the relationships between flow and loss in Exhibit B.

Table 5.
Reach 2 Losses in Exhibit B

Flow at the Gravelly Ford Gage Station (cfs)	Anticipated Reach 2 Losses (cfs)
<300	80
300-400	90
400-800	100
>800	Figure 2-4 of the Background Report

For flows greater than 800 cfs, Exhibit B footnotes reference Figure 2-4 of the *San Joaquin River Restoration Study Background Report* (McBain & Trush Inc. [eds]), 2002), provided below as Figure 7.

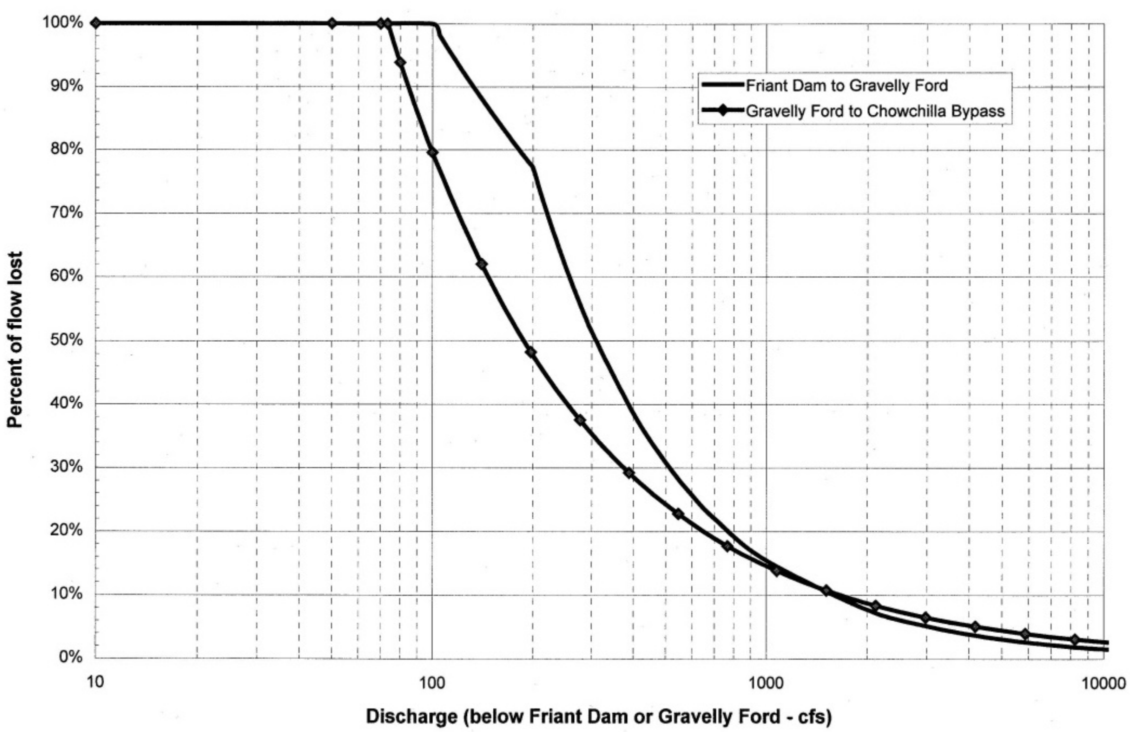


Figure 2-4. Estimated flow loss curves for the San Joaquin River between Friant Dam and Gravelly Ford, and between Gravelly Ford and the Chowchilla Bifurcation Structure.

Figure 7.
Relationship Between Flows at Gravelly Ford Gage Station and Losses in Reach 2

Exhibit B assumes no losses in Reach 2B between the Chowchilla Bypass Bifurcation Structure and Mendota Pool.

Reach 3

Exhibit B assumes no incremental losses in Reach 3, and that Reach 3 may become a gaining reach over time if the aquifer in Reach 2 becomes sufficiently recharged.

An operational loss has been assumed for Reach 3, in advance of the completion of the Mendota Pool Bypass. This loss has been calculated to be 10 cfs downstream from the Chowchilla Bifurcation Structure (SJB) gage station to San Mateo, with an additional 5-percent loss for Mendota Pool and Reach 3, pursuant to the agreement between Reclamation and the San Luis Delta Mendota Canal Authority. Changes to losses in this reach may result from future monitoring evaluations, or implementation of the Reach 2B and Mendota Pool Bypass project.

Reach 4

Exhibit B assumes seasonal losses in Reach 4A and gains in Reach 4B, with a net gain in Reach 4 flow. Future measured losses, including losses that may occur in the Eastside Bypass, will be considered Unexpected Seepage Losses.

Reach 5

Exhibit B assumes net gains from Mud and Salt sloughs in Reach 5, with no net losses. Reduction in measured gains from Mud and Salt sloughs below those assumed in Exhibit B will not be considered an Unexpected Seepage Loss.

Paragraph 13(j)(v) – Unforeseen, Extraordinary Circumstances

Procedures for making real-time changes to the actual releases from Friant Dam necessitated by unforeseen or extraordinary circumstances

Real-time changes to the actual releases from Friant Dam necessitated by unforeseen or extraordinary circumstances consist of deviations from the scheduled release of Restoration Flows or hydrograph-based flow schedules described in Exhibit B. For the purposes of this section, unforeseen or extraordinary circumstances are unlikely, pressing, and short-term in duration.

While emergency circumstances may necessitate real-time changes to the actual releases from Friant Dam, the procedures for managing those emergencies are provided in existing operational criteria and plans, and are beyond the provisions of this document. Reclamation will evaluate circumstances identified by the Restoration Administrator to see if declaration of an emergency is justified. Under emergency circumstances, Reclamation will communicate with the Settling Parties and Restoration Administrator about changes in releases at Friant Dam as soon as possible at a time and in a manner that does not interfere with responding to the emergency condition.

Reclamation or the Restoration Administrator may initiate the evaluation of circumstances requiring real-time changes to the actual releases from Friant Dam. Reclamation will determine whether a circumstance qualifies for real-time changes based on an assessment of the following factors:

Factor 1 – Identification of Extraordinary or Unforeseen Circumstance

The Restoration Administrator may recommend real-time changes to the actual-releases at Friant Dam at any time, consistent with provisions for flexibility provided in the Settlement. The recommendation shall include, at a minimum, the desired flow changes and anticipated duration, a brief explanation of the extraordinary or unforeseen circumstance, and the purpose and need for real-time changes. If approved, Reclamation will coordinate the implementation of the recommendation with the Restoration Administrator.

Circumstances requiring changes in releases at Friant Dam for the purpose of operating, maintaining or repairing infrastructure that is not part of the Central Valley Project will be managed using the procedures in this section.

Factor 2 – Duration has a Foreseeable End

The circumstances requiring real-time management shall have a foreseeable end. Long-term problems, persisting issues or maintenance activities that had been previously unforeseen do not necessarily qualify for remedy through this provision.

Circumstances must appear to affect the release of Restoration Flows for a period longer than 24-hours, or appear to jeopardize achievement of the Restoration Goal.

Factor 3 – Operational feasibility of real-time management

Reclamation will review requested real time management changes to verify the capability of Central Valley Project and other facilities to accommodate the requested real-time management, and to evaluate the likely consequences of changes to flow schedules, flows in the Restoration Area, and water supplies resulting from the request.

Approval

Following the review of the previous factors, Reclamation will make a decision on approval of the request for real-time management within 24 hours. Regardless of the decision, Reclamation will provide written notifications of the decision to the appointed representatives of the Settling Parties, the Restoration Administrator, and any other parties that are anticipated to be affected.

Commitment of Resources

Management of real-time changes shall require a commitment of all necessary resources of SJRRP, Settling Parties, and Restoration Administrator to address the circumstance requiring the real-time changes until such a time that the circumstance has been resolved. This commitment of resources is intended to bring resolution to the circumstances such that releases can return to the latest approved flow schedule as soon as possible.

Transition Between Real-Time Management and Regular Schedules

Real time management is limited to short term circumstances and will be transitioned back to the latest approved flow schedule flows as soon as possible after the requiring circumstances have been addressed. The transition will comply with all default procedures at Friant Dam for release adjustment.

Paragraph 13(j)(vi) – Restoration Flows during Flood Releases

Procedures for determining the extent to which flood releases meet the Restoration Flow hydrograph releases made in accordance with Exhibit B.

Flood releases occur as the result of an unusually large water supply not otherwise storable for Central Valley Project purposes, or infrequent and otherwise unmanaged flood flows of short duration. In the event that Reclamation determines that it is necessary to release water in excess of the Restoration Flow schedule for the purposes of flood management, the daily quantities of flow determined to meet the Restoration Flow hydrograph shall equal the daily volumes of flow provided in the most recent and adopted Restoration Flow Schedule.

Releases of riparian recruitment flows shall occur within 90 days following the peak Flushing Flow release, as identified in the Restoration Flow schedule. Riparian recruitment flows may be re-scheduled by the Restoration Administrator within the 90 day period; however, the Restoration Administrator will be limited to the total volume of riparian recruitment flows allocated for the year, less the volume of riparian recruitment flows that has already been scheduled and released for the year.

During years when Riparian Recruitment flows may be available, Reclamation shall meet as soon as practical with the other Settling Parties, Implementing Agencies, and Restoration Administrator to discuss operating conditions and objectives at Friant Dam and in the San Joaquin River for achieving riparian recruitment needs. Thereafter, the Restoration Administrator shall be responsible for determining the need and schedule for subsequent workgroups or meetings based on then-current hydrologic, operational, and ecological conditions. Reclamation, to the extent practical, shall keep the Restoration Administrator updated on changes in conditions related to flood control, and participate in subsequent workgroups and meetings as requested by the Restoration Administrator. Subject to the procedures in Paragraph 13(j)(i) of these Guidelines, the Restoration Administrator may update the Riparian Recruitment schedule as needed to ensure that the riparian recruitment can be achieved with any remaining available volumes, and within the 90-day time period.

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Revision Process

At any time, the Settling Parties, Implementing Agencies, and/or Restoration Administrator may suggest amendments and/or supplements to these Guidelines by notifying the other parties in writing of the suggested revision, including all supporting documentation. Within 30 days of receiving suggested amendments and/or supplements, Reclamation shall evaluate all suggested revisions and provide a written response to the parties as to whether the suggested revision is: Accepted; Under Review; or, Not Accepted.

"Accepted" revisions shall be evaluated by Reclamation as to whether they are a substantive or non-substantive revision to these Guidelines. Any substantive revision shall only be made after consultation by Reclamation with the Settling Parties and Restoration Administrator. Non-substantive revisions shall be made by Reclamation without consultation with the Settling Parties and Restoration Administrator.

"Under Review" revisions are those that are likely to result in a revision to these Guidelines but require additional information. Reclamation shall notify the Settling Parties and Restoration Administrator whenever a suggested revision is "Under Review" and the additional information required from the requesting party. Upon the requesting party providing the additional information, Reclamation shall consult with the Settling Parties and Restoration Administrator on the suggested revision.

"Not Accepted" revisions shall include a written explanation by Reclamation to the Settling Parties and Restoration Administrator as to the basis for not including the suggested revision into these Guidelines.

Any revised Guidelines shall be published on the SJRRP website and provided to the Settling Parties and Restoration Administrator as soon as practical. Unless otherwise provided, the revised Guidelines shall take effect immediately upon publication on the SJRRP website.

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References

Buchanan, T.J., and Somers, W.P., 1969, Discharge measurements at gaging stations: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 3, Chap A8, 65 p.

McBain and Trush (eds). 2002. San Joaquin River Restoration Study Background Report. Prepared for Friant Water Users Authority, Lindsay, California, and Natural Resources Defense Council, San Francisco, California.

U.S. Department of the Interior, Bureau of Reclamation (Reclamation). 2012. San Joaquin River Restoration Program Final Program Environmental Impact Statement/Impact Report.

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Restoration Flows Guidelines

Appendix A – Facilities of the Friant Division, Central Valley Project

SAN JOAQUIN RIVER
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Appendix A – Facilities of the Friant Division, Central Valley Project

This Appendix lists the facilities of the Friant Division, CVP that are relevant to Paragraph 13(e) of the Settlement:

- Friant Dam
- Friant-Kern Canal
- Madera Canal
- Appurtenant facilities owned by Reclamation

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Restoration Flows Guidelines

Appendix B – Restoration Annual Allocation Lookup Tables

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Appendix B– Restoration Annual Allocation Lookup Tables

Table B-1 provides look-up values for Restoration Annual Allocation in TAF per each 10 TAF increment of forecasted annual flow on the San Joaquin River. For reference, the Exhibit B Restoration Year Types are noted to the left of each increment of forecast.

Table B-1.
Friant Dam Default Restoration Flow Schedule, Spring Forecasting Period

Restoration Year Type	Unimpaired Water Year Runoff (TAF)	SJRRP Annual Allocation at Friant Dam (TA)	SJRRP Annual Allocation at Gravelly Ford (TAF)	Restoration Year Type	Unimpaired Water Year Runoff (TAF)	SJRRP Annual Allocation at Friant Dam (TA)	SJRRP Annual Allocation at Gravelly Ford (TAF)
Critical-Low	Up to 400	116.85	3.62	Normal-Dry	930	330.3	217.07
Critical-High	400 up to 670	187.79	74.56		940	331.63	218.40
Dry	670	272.28	159.05		950	332.98	219.75
	680	274.55	161.32		960	334.33	221.10
	690	276.78	163.55		970	335.67	222.44
	700	279.01	165.78		980	337.02	223.79
	710	281.24	168.01		990	338.36	225.13
	720	283.47	170.24		1000	339.71	226.48
	730	285.71	172.48		1010	341.06	227.83
	740	287.94	174.71		1020	342.4	229.17
	750	290.17	176.94		1030	343.75	230.52
	760	292.4	179.17		1040	345.09	231.86
	770	294.63	181.40		1050	346.44	233.21
	780	296.87	183.64		1060	347.79	234.56
	790	299.1	185.87		1070	349.13	235.90
	800	301.33	188.10		1080	350.48	237.25
	810	303.56	190.33		1090	351.82	238.59
	820	305.79	192.56		1100	353.17	239.94
	830	308.03	194.80		1110	354.52	241.29
	840	310.26	197.03		1120	355.86	242.63
	850	312.49	199.26		1130	357.21	243.98
	860	314.72	201.49		1140	358.55	245.32
	870	316.95	203.72		1150	359.9	246.67
	880	319.19	205.96		1160	361.25	248.02
	890	321.42	208.19		1170	362.59	249.36
	900	323.65	210.42		1180	363.94	250.71
	910	325.88	212.65		1190	365.28	252.05
	920	328.11	214.88		1200	366.63	253.40

Table B-1.
Friant Dam Default Restoration Flow Schedule, Spring Forecasting Period (contd.)

Restoration Year Type	Unimpaired Water Year Runoff (TAF)	SJRRP Annual Allocation at Friant Dam (TA)	SJRRP Annual Allocation at Gravelly Ford (TAF)	Restoration Year Type	Unimpaired Water Year Runoff (TAF)	SJRRP Annual Allocation at Friant Dam (TA)	SJRRP Annual Allocation at Gravelly Ford (TAF)
Normal-Dry	1210	367.98	254.75	Normal-Wet (contd.)	1720	438.13	324.90
	1220	369.32	256.09		1730	439.53	326.30
	1230	370.67	257.44		1740	440.93	327.70
	1240	372.01	258.78		1750	442.34	329.11
	1250	373.36	260.13		1760	443.74	330.51
	1260	374.71	261.48		1770	445.14	331.91
	1270	376.05	262.82		1780	446.54	333.31
	1280	377.4	264.17		1790	447.94	334.71
	1290	378.74	265.51		1800	449.34	336.11
	1300	380.09	266.86		1810	450.74	337.51
	1310	381.44	268.21		1820	452.14	338.91
	1320	382.78	269.55		1830	453.54	340.31
	1330	384.13	270.90		1840	454.94	341.71
	1340	385.47	272.24		1850	456.35	343.12
	1350	386.82	273.59		1860	457.75	344.52
	1360	388.17	274.94		1870	459.15	345.92
	1370	389.51	276.28		1880	460.55	347.32
	1380	390.86	277.63		1890	461.95	348.72
	1390	392.2	278.97		1900	463.35	350.12
	1400	393.55	280.32		1910	464.75	351.52
	1410	394.9	281.67		1920	466.15	352.92
	1420	396.24	283.01		1930	467.55	354.32
	1430	397.59	284.36		1940	468.95	355.72
	1440	398.93	285.70		1950	470.36	357.13
Normal-Wet	1450	400.3	287.07		1960	471.76	358.53
	1460	401.71	288.48		1970	473.16	359.93
	1470	403.11	289.88		1980	474.56	361.33
	1480	404.51	291.28		1990	475.96	362.73
	1490	405.91	292.68		2000	477.36	364.13
	1500	407.31	294.08		2010	478.76	365.53
	1510	408.71	295.48		2020	480.16	366.93
	1520	410.11	296.88		2030	481.56	368.33
	1530	411.51	298.28		2040	482.96	369.73
	1540	412.91	299.68		2050	484.37	371.14
	1550	414.32	301.09		2060	485.77	372.54
	1560	415.72	302.49		2070	487.17	373.94
	1570	417.12	303.89		2080	488.57	375.34
	1580	418.52	305.29		2090	489.97	376.74
	1590	419.92	306.69		2100	491.37	378.14
	1600	421.32	308.09		2110	492.77	379.54
	1610	422.72	309.49		2120	494.17	380.94
	1620	424.12	310.89		2130	495.57	382.34
	1630	425.52	312.29		2140	496.97	383.74
	1640	426.92	313.69		2150	498.38	385.15
	1650	428.33	315.10		2160	499.78	386.55
	1660	429.73	316.50		2170	501.18	387.95
	1670	431.13	317.90		2180	502.58	389.35
	1680	432.53	319.30		2190	503.98	390.75
	1690	433.93	320.70		2200	505.38	392.15
	1700	435.33	322.10		2210	506.78	393.55
	1710	436.73	323.50		2220	508.18	394.95

Table B-1.
Friant Dam Default Restoration Flow Schedule, Spring Forecasting Period (contd.)

Restoration Year Type	Unimpaired Water Year Runoff (TAF)	SJRRP Annual Allocation at Friant Dam (TAF)	SJRRP Annual Allocation at Gravelly Ford (TAF)
Normal-Wet (Cont'd)	2230	509.57	396.34
	2240	510.98	397.75
	2250	512.38	399.15
	2260	513.78	400.55
	2270	515.18	401.95
	2280	516.58	403.35
	2290	517.98	404.75
	2300	519.38	406.15
	2310	520.78	407.55
	2320	522.18	408.95
	2330	523.58	410.35
	2340	524.99	411.76
	2350	526.39	413.16
	2360	527.79	414.56
	2370	529.19	415.96
	2380	530.59	417.36
	2390	531.99	418.76
	2400	533.39	420.16
	2410	534.79	421.56
	2420	536.19	422.96
	2430	537.59	424.36
	2440	538.99	425.76
	2450	540.4	427.17
	2460	541.8	428.57
	2470	543.2	429.97
	2480	544.6	431.37
	2490	546	432.77
	2500	547.44	434.21
Wet	Above 2500	673.49	560.26

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Restoration Flows Guidelines

Appendix C – Default Flow Schedules

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Appendix C– Default Flow Schedules

Tables C-1 through C-8 provide lookup values to identify the Default Flow Schedule based on the remaining volume of allocated water available to distribute over the remaining months of the Restoration Year. These tables in this appendix were developed using the ‘gamma’ transformation pathway, described in the PEIS/R. The four transformation pathways differ in their treatment of Restoration Annual Allocations that fall between the Exhibit B flow schedules for Critical-High and Dry Restoration Year Types. For reference, each of the four transformation pathways covered by the PEIS/R is presented in Figures C-1 through C-4.

To use the lookup tables, select the column corresponding to the desired date for creating a Default Flow Schedule. Subtract the water released to date (provided in the Restoration Administrator’s budget) from the annual allocation to determine the remaining Restoration Annual Allocation volume. In the event that the remaining allocation is not equal to one of the listed volumes, but instead falls between two listed values; the Default Flow Schedule will be determined by linear-interpolation of the two bordering schedules.

The first table in each series covers the Spring Period. At the end of the Spring Period, the relationship of the remaining allocation volume and flow schedule is fixed and addressed by the second table. Flow released in February above Exhibit B values will be debited against the Restoration Annual Allocation made for the following Restoration Year.

The Default Flow Schedules at the confluence of the San Joaquin and Merced rivers reflect Settlement assumptions about the reduction in flow due to riparian deliveries, seepage losses in Reach 2, and inflows from Salt and Mud sloughs.

Table C-1.
Friant Dam Default Restoration Flow Schedule, Spring Forecasting Period

Date	March 1-15		March 16-31		April 1-15		April 16-30		May 1-31		June 1-30		July 1-31	
Year Type	Remaining Allocation (AF)	Default Release (ft^3/s)	Remaining Allocation (AF)	Default Release (ft^3/s)	Remaining Allocation (AF)	Default Release (ft^3/s)	Remaining Allocation (AF)	Default Release (ft^3/s)	Remaining Allocation (AF)	Default Release (ft^3/s)	Remaining Allocation (AF)	Default Release (ft^3/s)	Remaining Allocation (AF)	Default Release (ft^3/s)
wet	673,488	500	658,612	1,500	611,009	2,500	536,628	4,000	417,620	2,000	294,645	2,000	175,637	350
normal wet	473,851	500	458,975	1,500	411,372	2,500	336,991	4,000	217,983	350	196,463	350	175,636	350
normal dry	365,256	500	350,380	1,500	302,777	2,500	228,396	350	217,983	350	196,463	350	175,636	350
dry	301,289	500	286,413	1,500	238,810	350	228,396	350	217,983	350	196,463	350	175,636	350
transitional	284,955	500	270,079	1,500	222,476	350	212,062	350	201,649	215	188,429	215	175,636	350
	266,926	500	252,050	1,500	204,447	350	194,033	350	183,620	215	170,400	215	157,607	255
	258,000	500	243,124	1,500	195,521	200	189,570	200	183,620	215	170,400	215	157,607	255
	226,760	500	211,884	1,500	164,281	200	158,330	200	152,380	215	139,160	215	126,367	255
	209,207	500	194,331	1,500	146,728	200	140,777	200	134,827	215	121,607	215	108,814	255
critical high	187,785	500	172,909	1,500	125,306	200	119,355	200	113,405	215	100,185	215	87,392	255
critical low	116,866	130	112,998	130	108,873	150	104,410	150	99,947	190	88,264	190	76,959	230

Table C-2.
Friant Dam Default Restoration Flow Schedule, August Through February

Date		Aug 1-31	Sep 1-30	Oct 1-31	Nov 1-6	Nov 7-10	Nov 11 - Dec 31	Jan 1 - Feb
Year Type	Remaining Allocation (AF)	Default Release (ft^3/s)	Default Release (ft^3/s)	Default Release (ft^3/s)	Default Release (ft^3/s)	Default Release (ft^3/s)	Default Release (ft^3/s)	Default Release (ft^3/s)
wet	154,116	350	350	350	700	700	350	350
normal wet	154,115	350	350	350	700	700	350	350
normal dry	154,116	350	350	350	700	700	350	350
dry	154,115	350	350	350	700	700	350	350
transitional	154,115	350	350	350	700	700	350	350
	141,928	255	350	350	400	350	350	350
	141,927	255	350	350	400	350	350	350
	110,687	255	260	260	400	260	260	260
	93,134	255	260	260	400	260	260	110
critical high	71,712	255	260	160	400	120	120	110
critical low	62,816	230	210	160	130	120	120	100

Note: the Default Flow Schedules below Friant Dam reflect riparian release requirements and Restoration Flows.

Table C-3.
Gravelly Ford Expected Restoration Flows, Spring Forecasting Period

Date	March 1-15		March 16-31		April 1-15		April 16-30		May 1-31		June 1-30		July 1-31	
Year Type	Remaining Allocation (AF)	Default Release (ft^3/s)	Remaining Allocation (AF)	Default Release (ft^3/s)	Remaining Allocation (AF)	Default Release (ft^3/s)	Remaining Allocation (AF)	Default Release (ft^3/s)	Remaining Allocation (AF)	Default Release (ft^3/s)	Remaining Allocation (AF)	Default Release (ft^3/s)	Remaining Allocation (AF)	Default Release (ft^3/s)
wet	673,488	375	662,331	1,375	618,695	2,355	548,628	3,855	433,934	1,815	322,334	1,815	214,334	125
normal wet	473,851	375	462,694	1,375	419,058	2,355	348,991	3,855	234,297	165	224,152	165	214,334	125
normal dry	365,256	375	354,099	1,375	310,463	2,355	240,396	205	234,297	165	224,152	165	214,334	125
dry	301,289	375	290,132	1,375	246,496	205	240,396	205	234,297	165	224,152	165	214,334	125
transitional	284,955	375	273,798	1,375	230,162	205	224,062	205	217,963	30	216,119	30	214,334	125
	266,926	375	255,769	1,375	212,133	205	206,033	205	199,934	30	198,090	30	196,305	30
	258,000	375	246,843	1,375	203,207	55	201,570	55	199,934	30	198,089	30	196,304	30
	226,760	375	215,603	1,375	171,967	55	170,330	55	168,694	30	166,849	30	165,064	30
	209,207	375	198,050	1,375	154,414	55	152,777	55	151,141	30	149,296	30	147,511	30
critical high	187,785	375	176,628	1,375	132,992	55	131,355	55	129,719	30	127,874	30	126,089	30
critical low	116,866	5	116,717	5	116,559	5	116,410	5	116,261	5	115,954	5	115,656	5

Table C-4.
Gravelly Ford Default Restoration Flow Schedule, June Through February

Date		Aug 1-31	Sep 1-30	Oct 1-31	Nov 1-6	Nov 7-10	Nov 11 - Dec 31	Jan 1 - Feb
Year Type	Remaining Allocation (AF)	Default Release (ft^3/s)	Default Release (ft^3/s)	Default Release (ft^3/s)	Default Release (ft^3/s)	Default Release (ft^3/s)	Default Release (ft^3/s)	Default Release (ft^3/s)
wet	206,648	125	145	195	575	575	235	255
normal wet	206,648	125	145	195	575	575	235	255
normal dry	206,648	125	145	195	575	575	235	255
dry	206,648	125	145	195	575	575	235	255
transitional	206,648	125	145	195	575	585	235	255
	194,460	30	145	195	275	235	235	255
	194,460	30	145	195	275	235	235	255
	163,220	30	55	105	275	145	145	165
	145,667	30	55	105	275	145	145	15
critical high	124,245	30	55	5	275	5	5	15
critical low	115,349	5	5	5	5	5	5	5

Note: the Default Flow Schedules at the Gravelly Ford reflect Settlement assumptions about the reduction in flow due to riparian deliveries.

Table C-5.
Chowchilla Bifurcation, Sack Dam, and Reach 4B Headgate Expected Restoration Flows, Spring Forecasting Period

Date	March 1-15		March 16-31		April 1-15		April 16-30		May 1-31		June 1-30		July 1-31	
Year Type	Remaining Allocation (AF)	Default Release (ft^3/s)	Remaining Allocation (AF)	Default Release (ft^3/s)	Remaining Allocation (AF)	Default Release (ft^3/s)	Remaining Allocation (AF)	Default Release (ft^3/s)	Remaining Allocation (AF)	Default Release (ft^3/s)	Remaining Allocation (AF)	Default Release (ft^3/s)	Remaining Allocation (AF)	Default Release (ft^3/s)
wet	673,488	285	665,009	1,225	626,133	2,180	561,273	3,655	452,529	1,650	351,075	1,650	252,893	45
normal wet	473,851	285	465,372	1,225	426,496	2,180	361,636	3,655	252,892	85	247,666	85	242,608	45
normal dry	365,256	285	356,777	1,225	317,901	2,180	253,041	125	249,322	85	244,096	85	239,038	45
dry	301,289	285	292,810	1,225	253,934	125	250,215	125	246,496	85	241,269	85	236,211	45
transitional	284,955	285	276,476	1,225	237,600	125	233,881	125	230,162	0	230,162	0	230,162	45
transitional	266,926	285	258,447	1,225	219,571	125	215,852	125	212,133	0	212,133	0	212,133	0
transitional	258,000	285	249,521	1,225	210,645	0	210,645	0	210,645	0	210,645	0	210,645	0
transitional	226,760	285	218,281	1,225	179,405	0	179,405	0	179,405	0	179,405	0	179,405	0
transitional	209,207	285	200,728	1,225	161,852	0	161,852	0	161,852	0	161,852	0	161,852	0
critical high	187,785	285	179,306	1,225	140,430	0	140,430	0	140,430	0	140,430	0	140,430	0
critical low	116,866	0	116,866	0	116,866	0	116,866	0	116,866	0	116,866	0	116,866	0

Table C-6.
Chowchilla Bifurcation, at Sack Dam, and the Reach 4B Headgate Default Restoration Flow Schedule, June Through February

Date	Aug 1-31		Sep 1-30	Oct 1-31	Nov 1-6	Nov 7-10	Nov 11 - Dec 31	Jan 1 - Feb
Year Type	Remaining Allocation (AF)	Default Release (ft^3/s)	Default Release (ft^3/s)	Default Release (ft^3/s)	Default Release (ft^3/s)	Default Release (ft^3/s)	Default Release (ft^3/s)	Default Release (ft^3/s)
wet	250,126	45	65	115	475	475	155	175
normal wet	239,841	45	65	115	475	475	155	175
normal dry	236,271	45	65	115	475	475	155	175
dry	233,444	45	65	115	475	475	155	175
transitional	227,395	45	65	115	475	485	155	175
transitional	212,133	0	65	115	175	135	155	175
transitional	210,645	0	65	115	175	135	155	175
transitional	179,405	0	0	25	175	45	65	85
transitional	161,852	0	0	25	175	45	65	0
critical high	140,430	0	0	0	175	0	0	0
critical low	116,866	0	0	0	0	0	0	0

Note: the Default Flow Schedules below the Chowchilla Bifurcation, below Sack Dam, and at the head of Reach 4B reflect Settlement assumptions about the reduction in flow due to riparian deliveries and seepage losses in Reach 2.

Table C-7.
Merced River Confluence Default Restoration Flow Schedule, Spring Forecast Period

Date	March 1-15		March 16-31		April 1-15		April 16-30		May 1-31		June 1-30		July 1-31	
Year Type	Remaining Allocation (AF)	Default Release (ft³/s)	Remaining Allocation (AF)	Default Release (ft³/s)	Remaining Allocation (AF)	Default Release (ft³/s)	Remaining Allocation (AF)	Default Release (ft³/s)	Remaining Allocation (AF)	Default Release (ft³/s)	Remaining Allocation (AF)	Default Release (ft³/s)	Remaining Allocation (AF)	Default Release (ft³/s)
wet	673,488	785	650,133	1,700	596,182	2,580	519,422	4,055	398,777	2,050	272,728	2,050	150,744	320
normal wet	473,851	785	450,496	1,700	396,545	2,580	319,785	4,055	199,140	485	169,319	485	140,459	320
normal dry	365,256	785	341,901	1,700	287,950	2,580	211,190	525	195,570	485	165,749	485	136,889	320
dry	301,289	785	277,934	1,700	223,983	525	208,363	525	192,744	485	162,922	485	134,063	320
transitional	284,955	785	261,600	1,700	207,649	525	192,029	525	176,410	400	151,815	400	128,013	320
transitional	266,926	785	243,571	1,700	189,620	525	174,000	525	158,381	400	133,786	400	109,984	275
transitional	258,000	785	234,645	1,700	180,694	400	168,793	400	156,893	400	132,298	400	108,496	275
transitional	226,760	785	203,405	1,700	149,454	400	137,553	400	125,653	400	101,058	400	77,256	275
transitional	209,207	785	185,852	1,700	131,901	400	120,000	400	108,100	400	83,505	400	59,703	275
critical high	187,785	785	164,430	1,700	110,479	400	98,578	400	86,678	400	62,083	400	38,281	275
critical low	116,866	500	101,990	475	86,916	400	75,015	400	63,114	400	38,519	400	14,717	275

Table C-8.
Merced River Confluence Default Restoration Flow Schedule, June Through February

Date	Aug 1-31		Sep 1-30	Oct 1-31	Nov 1-6	Nov 7-10	Nov 11 - Dec 31	Jan 1 - Feb
Year Type	Remaining Allocation (AF)	Default Release (ft³/s)	Default Release (ft³/s)	Default Release (ft³/s)	Default Release (ft³/s)	Default Release (ft³/s)	Default Release (ft³/s)	Default Release (ft³/s)
wet	131,068	320	340	415	775	775	555	675
normal wet	120,783	320	340	415	775	775	555	675
normal dry	117,213	320	340	415	775	775	555	675
dry	114,387	320	340	415	775	775	555	675
transitional	108,337	320	340	415	775	785	555	675
transitional	93,075	275	340	415	475	535	555	675
transitional	91,587	275	340	415	475	535	555	675
transitional	60,347	275	275	325	475	445	465	585
transitional	42,794	275	275	325	475	445	465	500
critical high	21,372	275	275	300	475	400	400	500
critical low	-2,192	275	275	300	300	400	400	500

Note: the Default Flow Schedules below the Chowchilla Bifurcation, below Sack Dam, and at the head of Reach 4B, and at the Merced River Confluence reflect Settlement assumptions about the reduction in flow due to riparian deliveries and seepage losses in Reaches 2 and 4, and inflows from Mud and Salt sloughs.

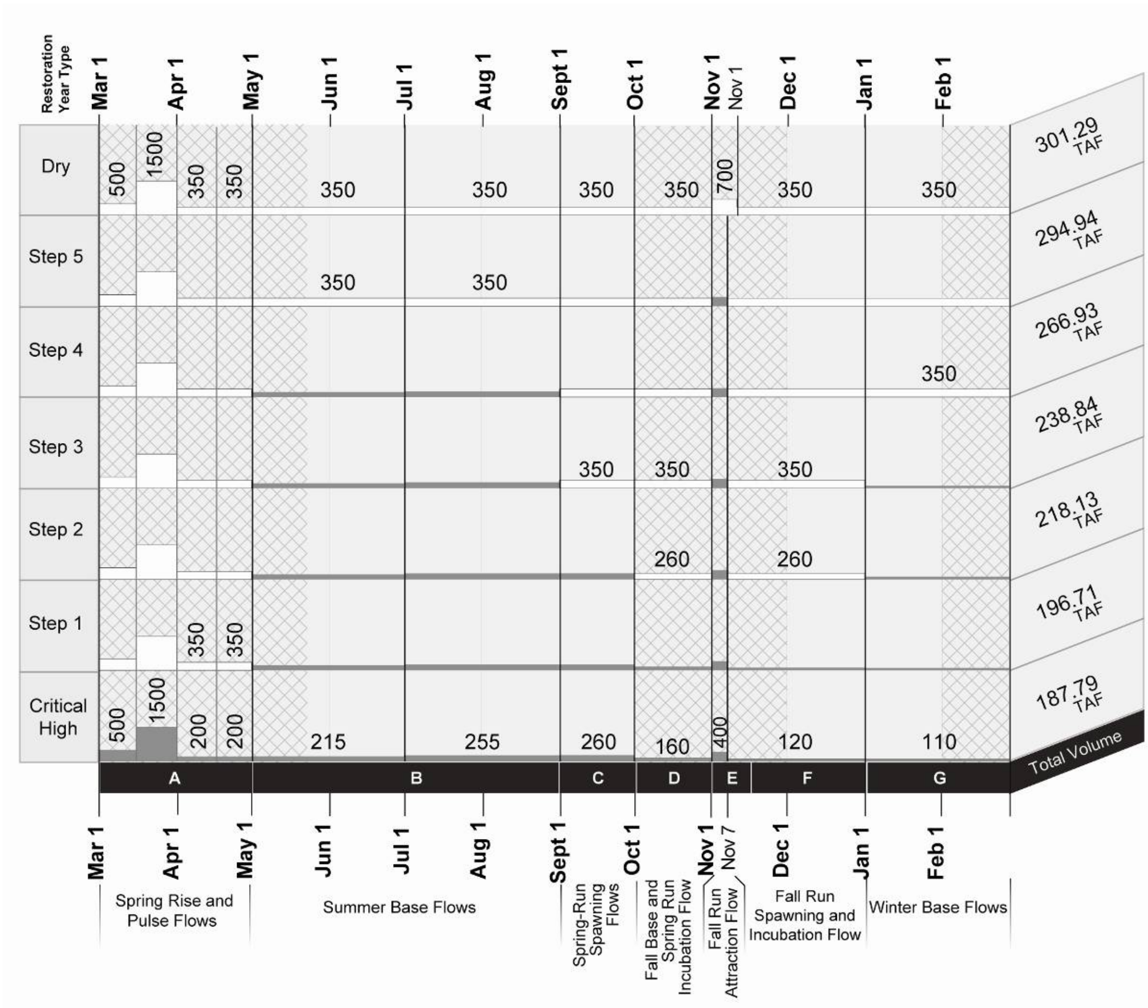

Figure C-1.
Alpha Transformation Pathway

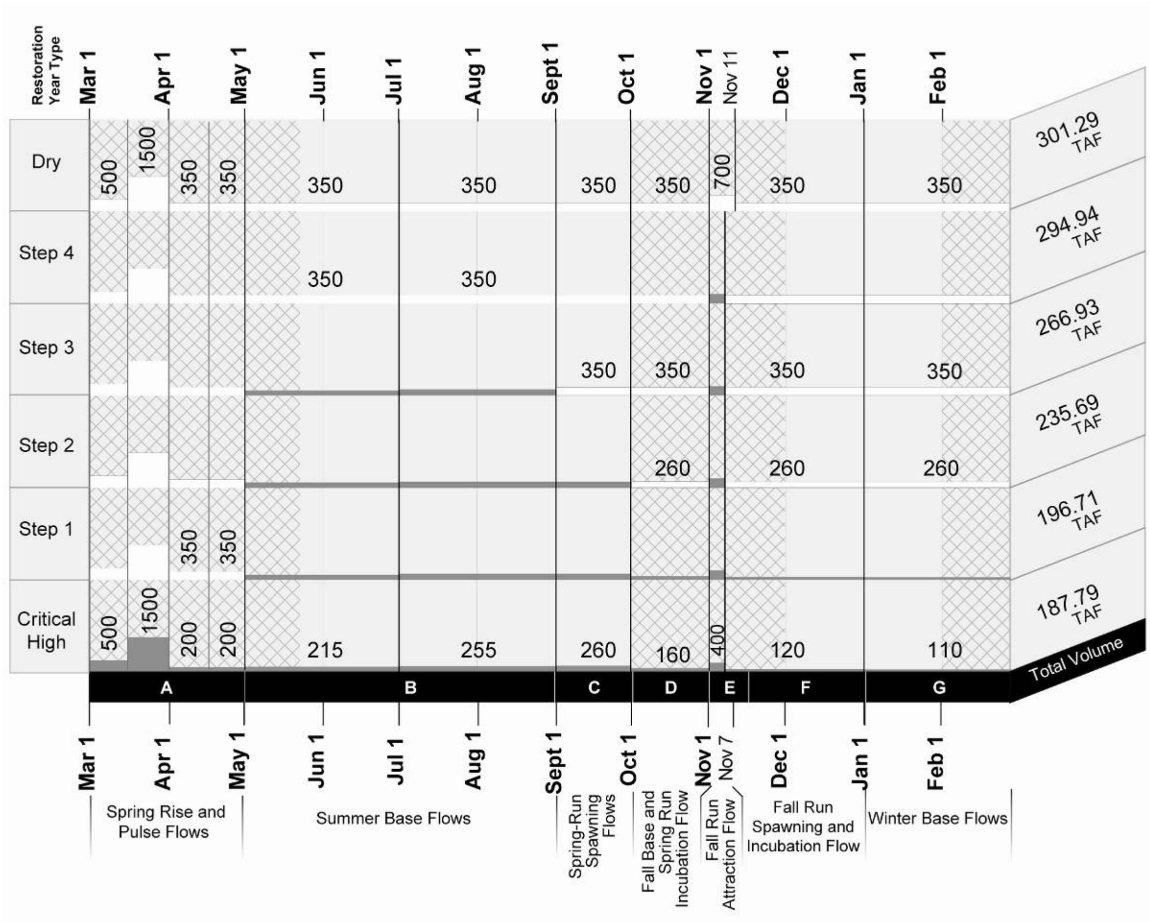

Figure C-2.
Beta Transformation Pathway

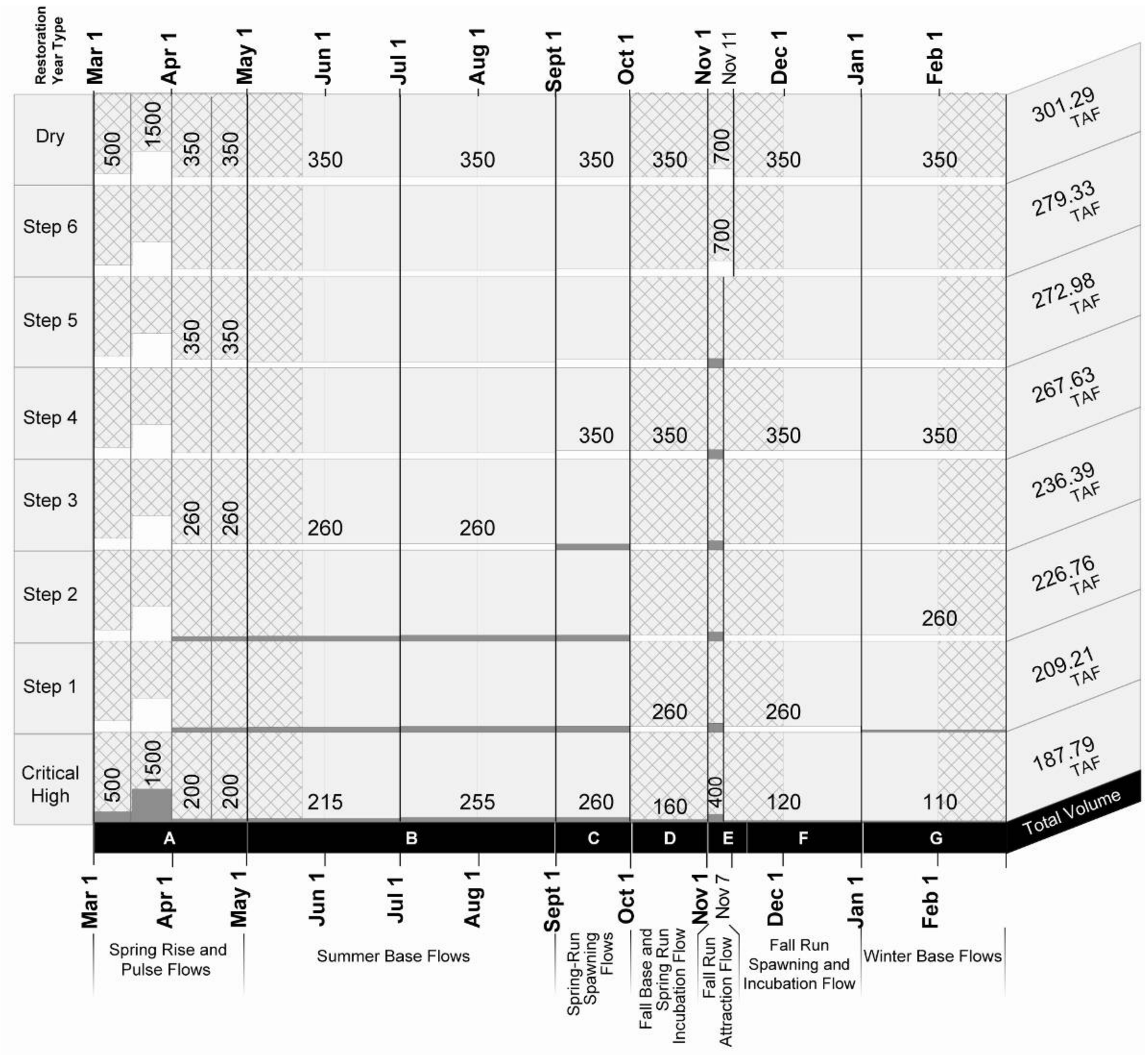

Figure C-3.
Gamma Transformation Pathway

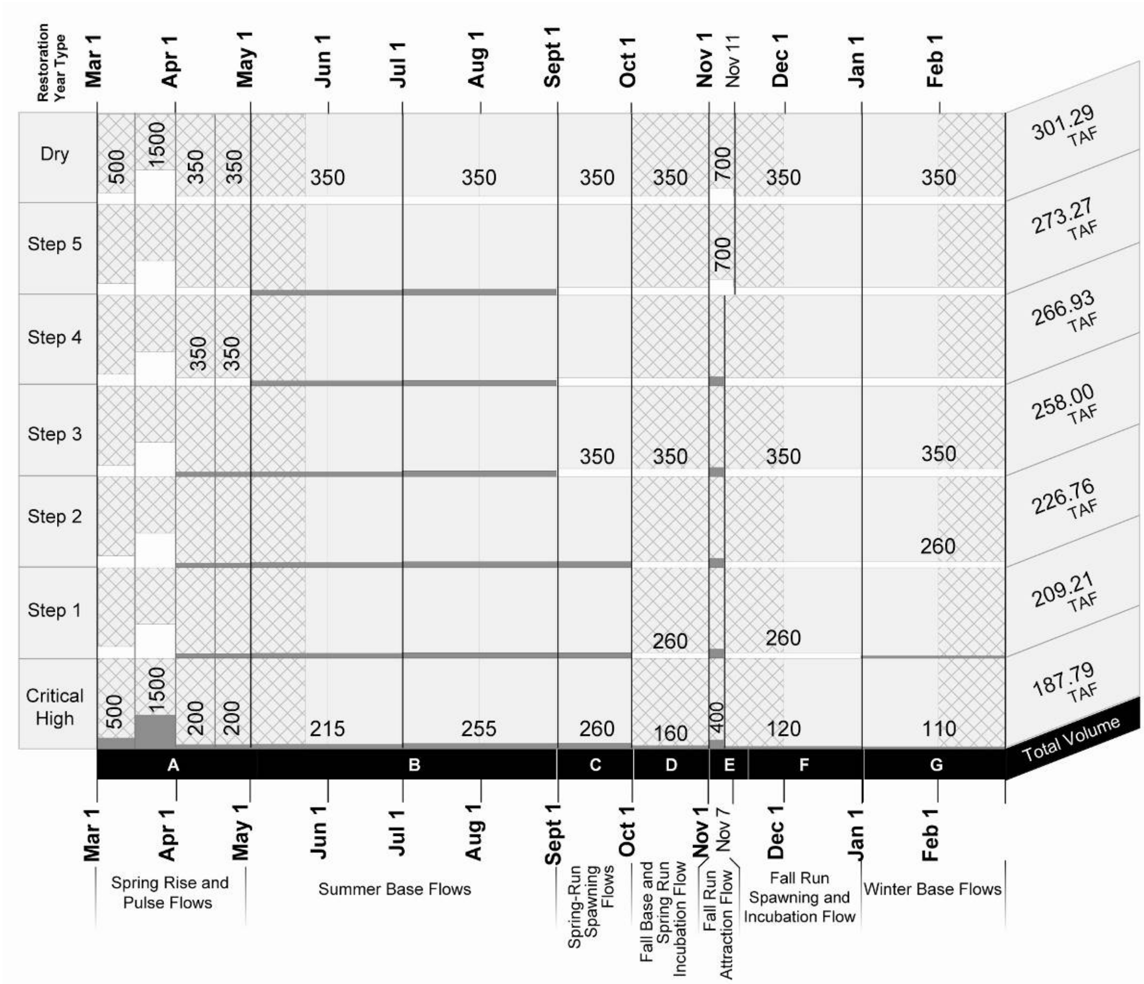

Figure C-4.
Delta Transformation Pathway

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Restoration Flows Guidelines

Appendix D – Exhibit B of the Settlement

SAN JOAQUIN RIVER RESTORATION PROGRAM

December 2013

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Appendix D – Exhibit B of the Settlement

The following pages contain Exhibit B of the Stipulation of Settlement in *NRDC, et al. v. Kirk Rodgers, et al.*, as it appears.

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STIPULATION OF SETTLEMENT NRDC v. RODGERS

EXHIBIT B

[Restoration Hydrographs]

1

This Exhibit B sets forth the hydrographs which constitute the "Base Flows" referenced in paragraph 13 of the Stipulation of Settlement. For purposes of implementing the hydrographs, the following provisions shall apply:

1. Buffer Flows.

Paragraph 13 of the Stipulation of Settlement provides for the Base Flows to be augmented by Buffer Flows of up to 10% of the applicable hydrograph included in this Exhibit B. Except as provided in Paragraph 4 of this Exhibit B, such Buffer Flows are intended to augment the daily flows specified in the applicable hydrograph. For purposes of this Exhibit, Base Flows and Buffer Flows shall collectively be referred to as Restoration Flows.

2. Water Year Types.

The Base Flows are presented in Tables 1A-1F as a set of six hydrographs that vary in shape and volume according to wetness in the basin. The six year types are described as "Critical Low", "Critical High", "Dry", "Normal-Dry", "Normal-Wet", and "Wet." The total annual unimpaired runoff at Friant for the water year (October through September) is the index by which the water year type is determined. In order of descending wetness, the wettest 20 percent of the years are classified as Wet, the next 30 percent of the years are classified as Normal-Wet, the next 30 percent of the years are classified as Normal-Dry, the next 15 percent of the years are classified as Dry, and the remaining 5 percent of the years are classified as Critical (represented by the "Critical High" hydrograph). A subset of the Critical years, those with less than 400 TAF of unimpaired runoff, are identified for use of the "Critical Low" hydrograph. The hydrographs, Tables 1A-1F, depict an annual quantity of water based upon the flow schedules identified. Components of the hydrograph are plotted for each water-year type, with various types of flows (Fall Base and Spring Run Incubation Flow; Fall Run attraction Flow; Fall-Run Spawning and Incubation Flow; Winter Base Flows; Spring Rise and Pulse Flows; Summer Base Flows; Spring-Run Spawning Flows) in specified amounts throughout the year, some of which vary in amount and duration depending upon year type classification. To avoid a moving distribution of year-type assignment, water years 1922-2004 will be used to establish year types.

3. Continuous Line Hydrographs.

The Parties agree to transform the stair step hydrographs to more continuous hydrographs prior to December 31, 2008 to ensure completion before the initiation of Restoration Flows, provided that the Parties shall mutually-agree that transforming the hydrographs will not materially impact the Restoration or Water Management Goal.

4. Flexibility in Timing of Releases.

(a) In order to achieve the Restoration Goal and to avoid material adverse impacts on existing fisheries downstream of Friant Dam, the Parties agree to the following provisions to provide certain flexibility in administration of the hydrographs and Buffer Flows.

(b) The distribution of Base Flow releases depicted in each hydrograph is intended to allow flexibility in any given year for the Restoration Administrator, in consultation with the

Technical Advisory Committee, to recommend to the Secretary appropriate ramping rates and precise flow amounts on specific dates as provided for in this subparagraph and consistent with the flow measurement and monitoring provisions of the Settlement. Base Flow releases allocated during the period from March 1 through May 1 (the "Spring Period") in any year may be shifted up to four weeks earlier and later than what is depicted in the hydrograph for that year, and managed flexibly within that range (i.e. February 1 through May 28), so long as the total volume of Base Flows allocated for the Spring Period is not changed. The Base Flows depicted in each hydrograph from October 1 through November 30 (the "Fall Period") likewise are intended to allow flexibility in any given year for the Restoration Administrator, in consultation with the Technical Advisory Committee, to recommend to the Secretary precise flow amounts on specific dates, and may be shifted up to four weeks earlier or later so long as the total volume of Base Flows allocated during that Period of the year is not changed.

(c) The process for determining and implementing Buffer Flows is set out in Paragraphs 13 and 18 of the Settlement, as implemented by this Exhibit B. The Restoration Administrator, in consultation with the Technical Advisory Committee, may recommend to the Secretary that the daily releases provided for in the hydrographs, or as modified pursuant to Paragraph 4(b) above, be augmented by application of the Buffer Flows up to 10% of the daily flows. From October 1 through December 31, the Buffer Flows shall be defined as 10% of the total volume of Base Flows during that period, and may be managed flexibly as a block of water during the Fall Period and four weeks earlier or later, as provided in Paragraph 4(b) above. Up to 50% of the Buffer Flows available from May 1 to September 30 not to exceed 5,000 acre feet may be moved to augment flows during the Spring or the Fall Periods.

(d) The Restoration Administrator may recommend additional changes in specific release schedules within an applicable hydrograph (beyond those described in subparagraphs (b) and (c) above) to the extent consistent with achieving the Restoration Goal without changing the total amount of water otherwise required to be released pursuant to the applicable hydrograph or materially increasing the water delivery reductions to any Friant Division long-term contractors.

5. 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.

6. 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 Riparian Recruitment for that year is not exceeded.

Table 1A. Proposed restoration flow release schedule and accounting for critical low year type on the San Joaquin River

Hydrograph Component		Friant Release	Gain and Loss Assumptions: Riparian Releases	Gain and Loss Assumptions: Reach 2 losses	Gain and Loss Assumptions: Salt and Mud Slough Accretions	Flow at Upstream End of Reach: Reach 2	Flow at Upstream End of Reach: Reach 3	Flow at Upstream End of Reach: Reach 4	Flow at Upstream End of Reach: Reach 5	Flow at Upstream End of Reach: Confluence
Fall Base and Spring Run Incubation Flow	Oct. 1 - October 31	160	160	80	300	5	0	0	0	300
Fall Run Attraction Flow	Nov. 1- 6 Pulse	130	130	100	300	5	0	0	0	300
Fall-Run Spawning and Incubation Flow	Nov. 7 - Dec 31	120	120	80	400	5	0	0	0	400
Winter Base Flows	Jan. 1 - Feb. 28	100	100	80	500	5	0	0	0	500
Spring Rise and Pulse Flows	March 1-15	130	130	90	500	5	0	0	0	500
	March 15-31	130	130	150	475	5	0	0	0	475
	April 1-15	150	150	80	400	5	0	0	0	400
	April 16 - 30	150	150	80	400	5	0	0	0	400
Summer Base Flows	May 1 - June 30	190	190	80	400	5	0	0	0	400
	July 1 - Aug 31	230	230	80	275	5	0	0	0	275
Spring-Run Spawning Flows	Sept. 1 - Sept. 30	210	210	80	275	5	0	0	0	275
	Total Annual (acre ft.)	116,682	116,562	60,568	276,012	3,614	0	0	0	275,466
	Assumed Riparian Release	116,682								
	Restoration Release (af)	0								

1. Riparian releases - Riparian releases for current conditions average from 117- to 126 TAF/YR. Assumed approx 117 TAF/YR to be consistent with Steiner declaration which is derived from CALSIM and WSS estimates; adjusted monthly estimates to add to approx 117 TAF and to be more consistent with data from last 5 years; rounded to nearest 10 cfs. The Nov/Dec period 120 cfs estimate is an average of the assumed 130 cfs average in Nov and 110 cfs in Dec. the May/June period average of 190 cfs is an average of 175 cfs in May and 200 cfs in June. Friant base releases in recent years (2001 - 2005 have actually average of approximately 124,000 acre feet in order to meet 5 cfs. at every diversion point during all seasons.

2. Reach 2 Losses. Determined by flow at head of Reach 2. Assumed relatively constant, steady state conditions. Flows less than 300 cfs at the head of the reach lose 80 cfs. consistent with 1995-2000 data including the 1999 pilot project. Flows between 300 and 400 cfs lose 90 cfs. Flows above 400 and below 800 cfs lose 100 cfs. Used flow loss curve at Figure 2-4 of the Background Report for flows above 1,000 cfs. That curve was based upon non-steady state flow conditions, and thus likely overestimate steady-state conditions. Assumed no losses in Reach 2B below the Bifurcation.

3. Salt and Mud Slough Accretions - From Sum of Mud and Salt Slough flow in Table 2-15 of the Background Report. Additional accretions occur in reach 4B and 5 but small (up to 50 cfs) relative to total Mud and Salt Slough inflow.

4. Reach 2 flow- Flow at head of Reach 2 is equal to Friant release minus riparian release plus Gravelly Ford base flow of 5 cfs. The Gravelly Ford base flow is usually higher in winter because of local tributary inflow, return flow and requirement to meet 5 cfs flow at every diversion point. Summer base flow is often higher than 5 cfs because of irrigation return flow and requirement to meet 5 cfs flow at every diversion point.

5. Reach 3 flow - Equal to Reach 2 flow minus Reach 2 losses. Reach 3 flow ignores contributions from Delta Mendota Canal added at Mendota Pool which is subsequently diverted at the bottom of Reach 3 at Sack Dam into the Arroyo Canal and therefore assumes no net gain. Actual inflows could be greater particularly during the irrigation season.

6. Reach 4 flows - Equal to the net Reach 3 flows. Additional flow in Reach 3 is on "top" of existing irrigation supply flows and no losses are assumed although Reach 3 appears to be a small losing reach at this time. May become gaining reach over time if losses in Reach 2 fill sufficient aquifer storage.

7. Reach 5 flow - Assume equal to Reach 4 flow. Seasonal losses in Reach 4A and gains in Reach 4B. Although likely a net gain in Reach 4 flow, assumed no gain for simplicity.

8. Confluence - Reach 5 flow plus Mud and Salt Slough. Does not include up to another 50 cfs of accretion upstream of Mud and Salt Slough that the WOST hydrograph included.

9. Riparian release total slightly different in critical years due to variations in the length of the November pulse flow and rounding of riparian release averages during the November 1-December 31 time period

Table 1B. Proposed restoration flow release schedule and accounting for critical high year type on the San Joaquin River

Hydrograph Component		Friant Release	Gain and Loss Assumptions: Riparian Releases	Reach 2 losses	Salt and Mud Slough Accretions	Flow at Upstream End of Reach: Reach 2	Reach 3	Reach 4	Reach 5	Confluence
Fall Base and Spring Run Incubation Flow	Oct. 1 - Oct. 31	160	160	80	300	5	0	0	0	300
Fall Run Attraction Flow	Nov. 1- 6 Pulse	400	130	100	300	275	175	175	175	475
Fall-Run Spawning and Incubation Flow	Nov. 7 - Dec 31	120	120	80	400	5	0	0	0	400
Winter Base Flows	Jan. 1 - Feb. 28	110	100	90	500	15	0	0	0	500
Spring Rise and Pulse Flows	March 1-15	500	130	90	500	375	285	285	285	785
	March 15-31	1500	130	150	475	1375	1225	1225	1225	1700
	April 1 15	200	160	80	400	55	0	0	0	400
	April 16 - 30	200	150	80	400	55	0	0	0	400
Summer Base Flows	May 1 - June 30	215	190	80	400	30	0	0	0	400
	July 1 - Aug 31	255	230	80	275	30	0	0	0	275
Spring-Run Spawning Flows	Sept. 1 - Sept. 30	260	210	80	275	55	0	0	0	275
	Total Annual (acre ft.)	187,457	116,662	60,568	276,012	74,408	49,352	49,352	49,352	325,364
	Assumed Riparian Release	116,662								
	Restoration Release (af)	70,795								

1. Riparian releases - Riparian releases for current conditions average from 117- to 126 TAF/YR. Assumed approx 117 TAF/YR to be consistent with Steiner declaration which is derived from CALSIM and WSS estimates; adjusted monthly estimates to add to approx 117 TAF and to be more consistent with data from last 5 years; rounded to nearest 10 cfs. The Nov/Dec period 120 cfs estimate is an average of the assumed 130 cfs average in Nov and 110 cfs in Dec; the May/June period average of 190 cfs is an average of 175 cfs in May and 200 cfs in June. Friant base releases in recent years (2001 - 2005 have actually average of approximately 124,000 acre feet in order to meet 5 cfs. at every diversion point during all seasons.
2. Reach 2 losses - Determined by flow at head of Reach 2. Assume relatively constant, steady-state conditions. Flows at head of reach less than 300 lose 80 cfs consistent with 1995-200 data including 1999 pilot project. Flows between 300 and 400 cfs lose 90 cfs; flows above 400 and below 800 cfs lose 100 cfs; consistent with 1995-2003 data. Above 1000 cfs used flow lose curve on fig 2-4 of the Background Report. That curve was based upon non- steady-state flow conditions and thus likely overestimate steady-state conditions. Assume no losses in Reach 2B below the Bifurcation.
3. Salt and Mud Slough Accretions - From Sum of Mud and Salt Slough flow in Table 2-15 of the Background Report. Additional accretions occur in reach 4B and 5 but small (up to 50 cfs) relative to total Mud and Salt Slough inflow.
4. Reach 2 flow- Flow at head of Reach 2 is equal to Friant release minus riparian release plus Gravelly Ford base flow of 5 cfs. The Gravelly Ford base flow is usually higher in winter because of local tributary inflow, return flow and requirement to meet 5 cfs flow at every diversion point. Summer base flow is often higher than 5 cfs because of irrigation return flow and requirement to meet 5 cfs flow at every diversion point.
5. Reach 3 flow - Equal to Reach 2 flow minus Reach 2 losses. Reach 3 flow ignores contributions from Delta Mendota Canal added at Mendota Pool which is subsequently diverted at the bottom of Reach 3 at Sack Dam into the Arroyo Canal and therefore assumes no net gain. Actual inflows could be greater particularly during the irrigation season.
6. Reach 4 flows - Equal to the net Reach 3 flows. Additional flow in Reach 3 is on "top" of existing irrigation supply flows and no losses are assumed although Reach 3 appears to be a small losing reach at this time. May become gaining reach over time if losses in Reach 2 fill sufficient aquifer storage.
7. Reach 5 flow - Assume equal to Reach 4 flow. Seasonal losses in Reach 4A and gains in Reach 4B. Although likely a net gain in Reach 4 flow, assumed no gain for simplicity.
8. Confluence - Reach 5 flow plus Mud and Salt Slough. Does not include up to another 50 cfs of accretion upstream of Mud and Salt Slough that the WOST hydrograph included.
9. Flows in the May 1 to June 30, July 1 to Aug 30 and Sept 1 to Sept 31st have elevated flows of 25 to 50 cfs reflecting 3TAF blocks of water to be used for riparian vegetation irrigation
10. Riparian release total slightly different in critical years due to variations in the length of the November pulse flow and rounding of riparian release averages during the November 1 December 31 time period.

Table 1C. Proposed restoration flow release schedule and accounting for dry year type on the San Joaquin River

Hydrograph Component		Friant Release	Gain and Loss Assumptions: Riparian Releases	Reach 2 losses	Salt and Mud Slough Accretions	Flow at Upstream End of Reach: Reach 2	Reach 3	Reach 4	Reach 5	Confluence
Fall Base and Spring Run Incubation Flow	Oct. 1 - 31	350	160	80	300	195	115	115	115	415
Fall Run Attraction Flow	Nov. 1 - 10	700	130	100	300	575	475	475	475	775
Fall-Run Spawning and Incubation Flow	Nov. 11 - Dec 31	350	120	80	400	235	155	155	155	555
Winter Base Flows	Jan 1 - Feb. 28	350	100	80	500	255	175	175	175	675
Spring Rise and Pulse Flows	March 1 - 15	500	130	90	500	375	285	285	285	785
	March 16 - 31	1,500	130	150	475	1,375	1,225	1,225	1,225	1,700
	April 1-15	350	150	80	400	205	125	125	125	525
	April 16 - 30	350	150	80	400	205	125	125	125	525
Summer Base Flows	May 1 - June 30	350	190	80	400	165	85	85	85	485
	July 1 - Aug 31	350	230	80	275	125	45	45	45	320
Spring-Run Spawning Flows	Sept. 1 - Sept. 30	350	210	80	275	145	65	65	65	340
	Total Annual (acre ft.)	300,762	116,741	60,727	275,221	187,635	126,908	126,908	126,908	402,128
	Assumed Riparian Release	116,741								
	Restoration Release (af)	184,021								

1. Riparian releases - Riparian releases for current conditions average from 117- to 126 TAF/YR. Assumed approx 117 TAF/YR to be consistent with Steiner declaration which is derived from CALSIM and WSS estimates; adjusted monthly estimates to add to approx 117 TAF and to be more consistent with data from last 5 years; rounded to nearest 10 cfs. The Nov/Dec period 120 cfs estimate is an average of the assumed 130 cfs average in Nov and 110 cfs in Dec; the May/June period average of 190 cfs is an average of 175 cfs in May and 200 cfs in June. Friant base releases in recent years (2001 - 2005 have actually average of approximately 124,000 acre feet in order to meet 5 cfs. at every diversion point during all seasons.

2. Reach 2 losses - Determined by flow at head of Reach 2. Assume relatively constant, steady-state conditions. Flows at head of reach less than 300 lose 80 cfs consistent with 1995-200 data including 1999 pilot project. Flows between 300 and 400 cfs lose 90 cfs; flows above 400 and below 800 cfs lose 100 cfs; consistent with 1995-2000 data. Above 1000 cfs used flow lose curve on fig 2-4 of the Background Report. That curve was based upon non- steady state flow conditions and thus likely overestimate steady-state conditions. Assume no losses in Reach 2B below the Bifurcation.

3. Salt and Mud Slough Accretions - From Sum of Mud and Salt Slough flow in Table 2-15 of the Background Report. Additional accretions occur in reach 4B and 5 but small (up to 50 cfs) relative to total Mud and Salt Slough inflow.

4. Reach 2 flow - Flow at head of Reach 2 is equal to Friant release minus riparian release plus Gravelly Ford base flow of 5 cfs. The Gravelly Ford base flow is usually higher in winter because of local tributary inflow, return flow and requirement to meet 5 cfs flow at every diversion point. Summer base flow is often higher than 5 cfs because of irrigation return flow and requirement to meet 5 cfs flow at every diversion point.

5. Reach 3 flow - Equal to Reach 2 flow minus Reach 2 losses. Reach 3 flow ignores contributions from Delta Mendota Canal added at Mendota Pool which is subsequently diverted at the bottom of Reach 3 at Sack Dam into the Arroyo Canal and therefore assumes no net gain. Actual inflows could be greater particularly during the irrigation season.

6. Reach 4 flows - Equal to the net Reach 3 flows. Additional flow in Reach 3 is on "top" of existing irrigation supply flows and no losses are assumed although Reach 3 appears to be a small losing reach at this time. May become gaining reach over time if losses in Reach 2 fill sufficient aquifer storage.

7. Reach 5 flow - Assume equal to Reach 4 flow. Seasonal losses in Reach 4A and gains in Reach 4B. Although likely a net gain in Reach 4 flow, assumed no gain for simplicity.

8. Confluence - Reach 5 flow plus Mud and Salt Slough. Does not include up to another 50 cfs of accretion upstream of Mud and Salt Slough that the WOST hydrograph included

Table 1D. Proposed restoration flow release schedule and accounting for normal-dry year type on the San Joaquin River

Hydrograph Component		Friant Release	Gain and Loss Assumptions: Riparian Releases	Reach 2 losses	Salt and Mud Slough Accretions	Flow at Upstream End of Reach: Reach 2	Reach 3	Reach 4	Reach 5	Confluence
Fall Base and Spring Run Incubation Flow	Oct. 1 - 31	350	160	80	300	195	115	115	115	415
Fall Run Attraction Flow	Nov. 1 - 10	700	130	100	300	575	475	475	475	775
Fall Run Spawning and Incubation Flow	Nov. 11 - Dec 31	350	120	80	400	235	155	155	155	555
Winter Base Flows	Jan. 1 - Feb. 28	350	100	80	500	255	175	175	175	675
Spring Rise and Pulse Flows	March 1 - 15	500	130	90	500	375	285	285	285	785
	March 16 - 31	1,500	130	150	475	1,375	1,225	1,225	1,225	1,700
	April 1-15	2,500	150	175	400	2,355	2,180	2,180	2,180	2,580
	April 16 - 30	350	150	80	400	205	125	125	125	525
Summer Base Flows	May 1 - June 30	350	190	80	400	165	85	85	85	485
	July 1 - Aug 31	350	230	80	275	125	45	45	45	320
Spring-Run Spawning Flows	Sept. 1 - Sept. 30	350	210	80	275	145	65	65	65	340
	Total Annual (acre ft.)	364,617	116,741	63,548	275,220	251,490	187,942	187,942	187,942	463,162
	Assumed Riparian Release	116,741								
	Restoration Release (af)	247,876								

1. Riparian releases - Riparian releases for current conditions average from 117- to 126 TAF/YR. Assumed approx 117 TAF/YR to be consistent with Steiner declaration which is derived from CALSIM and WSS estimates; adjusted monthly estimates to add to approx 117 TAF and to be more consistent with data from last 5 years; rounded to nearest 10 cfs. The Nov/Dec period 120 cfs estimate is an average of the assumed 130 cfs average in Nov and 110 cfs in Dec; the May/June period average of 190 cfs is an average of 175 cfs in May and 200 cfs in June. Friant base releases in recent years (2001 - 2005 have actually average of approximately 124,000 acre feet in order to meet 5 cfs. at every diversion point during all seasons.

2. Reach 2 losses - Determined by flow at head of Reach 2. Assume relatively constant, steady state conditions. Flows at head of reach less than 300 lose 80 cfs consistent with 1995-200 data including 1999 pilot project. Flows between 300 and 400 cfs lose 90 cfs; flows above 400 and below 800 cfs lose 100 cfs; consistent with 1995-2000 data. Above 1000 cfs used flow loss curve on fig 2.4 of the Background Report. That curve was based upon non- steady-state flow conditions and thus likely overestimate steady state conditions. Assume no losses in Reach 2B below the Bifurcation.

3. Salt and Mud Slough Accretions - From Sum of Mud and Salt Slough flow in Table 2-15 of the Background Report. Additional accretions occur in reach 4B and 5 but small (up to 50 cfs) relative to total Mud and Salt Slough inflow.

4. Reach 2 flow- Flow at head of Reach 2 is equal to Friant release minus riparian release plus Gravelly Ford base flow of 5 cfs. The Gravelly Ford base flow is usually higher in winter because of local tributary inflow, return flow and requirement to meet 5 cfs flow at every diversion point. Summer base flow is often higher than 5 cfs because of irrigation return flow and requirement to meet 5 cfs flow at every diversion point.

5. Reach 3 flow - Equal to Reach 2 flow minus Reach 2 losses. Reach 3 flow ignores contributions from Delta Mendota Canal added at Mendota Pool which is subsequently diverted at the bottom of Reach 3 at Sack Dam into the Arroyo Canal and therefore assumes no net gain. Actual inflows could be greater particularly during the irrigation season.

6. Reach 4 flows - Equal to the net Reach 3 flows. Additional flow in Reach 3 is on "top" of existing irrigation supply flows and no losses are assumed although Reach 3 appears to be a small losing reach at this time. May become gaining reach over time if losses in Reach 2 fill sufficient aquifer storage.

7. Reach 5 flow - Assume equal to Reach 4 flow. Seasonal losses in Reach 4A and gains in Reach 4B. Although likely a net gain in Reach 4 flow, assumed no gain for simplicity.

8. Confluence - Reach 5 flow plus Mud and Salt Slough. Does not include up to another 50 cfs of accretion upstream of Mud and Salt Slough that the WOST hydrograph included.

Table 1E. Proposed restoration flow release schedule and accounting for normal-wet year type on the San Joaquin River

Hydrograph Component		Friant Release	Gain and Loss Assumptions: Riparian Releases	Reach 2 losses	Salt and Mud Slough Accretions	Flow at Upstream End of Reach: Reach 2	Reach 3	Reach 4	Reach 5	Confluence
Fall Base and Spring Run Incubation Flow	Oct. 1 - 31	350	160	80	300	195	115	115	115	415
Fall Run Attraction Flow	Nov. 1 - 10	700	130	100	300	575	475	475	475	775
Fall-Run Spawning and Incubation Flow	Nov. 11 - Dec. 31	350	120	80	400	235	155	155	155	555
Winter Base Flows	Jan. 1 - Feb. 28	350	100	80	500	255	175	175	175	675
Spring Rise and Pulse Flows	March 1 - 15	500	130	90	500	375	285	785	285	785
	March 16 - 31	1,500	130	150	475	1,375	1,225	1,225	1,225	1,700
	April 1-15	2,500	150	175	400	2,355	2,180	2,180	2,180	2,580
	April 16 - 30	4,000	150	200	400	3,855	3,655	3,655	3,655	4,055
Summer Base Flows	May 1 - June 30	350	190	80	400	165	85	85	85	485
	July 1 - Aug 31	350	230	80	275	125	45	45	45	320
Spring Run Spawning Flows	Sept. 1 - Sept. 30	350	210	80	275	145	65	65	65	340
	Total Annual (acre ft.)	473,022	116,741	67,112	275,220	359,895	292,783	292,783	292,783	568,003
	Assumed Riparian Release	116,741								
	Restoration Release (af)	356,281								

1. Riparian releases - Riparian releases for current conditions average from 117- to 128 TAF/YR. Assumed approx 117 TAF/YR to be consistent with Steiner declaration which is derived from CALSIM and WSS estimates; adjusted monthly estimates to add to approx 117 TAF and to be more consistent with data from last 5 years, rounded to nearest 10 cfs. The Nov/Dec period 120 cfs estimate is an average of the assumed 130 cfs average in Nov and 110 cfs in Dec; the May/June period average of 190 cfs is an average of 175 cfs in May and 200 cfs in June. Friant base releases in recent years (2001 - 2005 have actually average of approximately 124,000 acre feet in order to meet 5 cfs. at every diversion point during all seasons.

2. Reach 2 losses - Determined by flow at head of Reach 2. Assume relatively constant, steady state conditions. Flows at head of reach less than 300 lose 80 cfs consistent with 1995-200 data including 1999 pilot project. Flows between 300 and 400 cfs lose 90 cfs. flows above 400 and below 800 cfs lose 100 cfs consistent with 1995 2000 data. Above 1000 cfs used flow lose curve on fig 2-4 of the Background Report. That curve was based upon non- steady-state flow conditions and thus likely overestimate steady-state conditions. Assume no losses in Reach 2B below the Bifurcation.

3. Salt and Mud Slough Accretions - From Sum of Mud and Salt Slough flow in Table 2 15 of the Background Report. Additional accretions occur in reach 4B and 5 but small (up to 50 cfs) relative to total Mud and Salt Slough inflow.

4. Reach 2 flow- Flow at head of Reach 2 is equal to Friant release minus riparian release plus Gravelly Ford base flow of 5 cfs. The Gravelly Ford base flow is usually higher in winter because of local tributary inflow, return flow and requirement to meet 5 cfs flow at every diversion point. Summer base flow is often higher than 5 cfs because of irrigation return flow and requirement to meet 5 cfs flow at every diversion point.

5. Reach 3 flow - Equal to Reach 2 flow minus Reach 2 losses. Reach 3 flow ignores contributions from Delta Mendota Canal added at Mendota Pool which is subsequently diverted at the bottom of Reach 3 at Sack Dam into the Arroyo Canal and therefore assumes no net gain. Actual inflows could be greater particularly during the irrigation season.

6. Reach 4 flows - Equal to the net Reach 3 flows. Additional flow in Reach 3 is on "top" of existing irrigation supply flows and no losses are assumed although Reach 3 appears to be a small losing reach at this time. May become gaining reach over time if losses in Reach 2 fill sufficient aquifer storage.

7. Reach 5 flow - Assume equal to Reach 4 flow. Seasonal losses in Reach 4A and gains in Reach 4B. Although likely a net gain in Reach 4 flow, assumed no gain for simplicity.

8. Confluence - Reach 5 flow plus Mud and Salt Slough. Does not include up to another 50 cfs of accretion upstream of Mud and Salt Slough that the WOSF hydrograph included.

Table 1F. Proposed restoration flow release schedule and accounting for wet year type on the San Joaquin River

Hydrograph Component		Friant Release	Gain and Loss Assumptions			Flow at Upstream End of Reach				
			Riparian Releases	Reach 2 losses	Salt and Mud Slough Accretions	Reach 2	Reach 3	Reach 4	Reach 5	Confluence
Fall Base and Spring Run Incubation Flow	Oct. 1 - 31	350	160	80	300	195	115	115	115	415
Fall Run Attraction Flow	Nov. 1 - 10	700	130	100	300	575	475	475	475	775
Fall-Run Spawning and Incubation Flow	Nov. 11 - Dec 31	350	120	80	400	235	155	155	155	555
Winter Base Flows	Jan. 1 - Feb. 28	350	100	80	500	255	175	175	175	675
Spring Rise and Pulse Flows	March 1 - 15	500	130	90	500	375	285	285	285	785
	March 16 - 31	1,500	130	150	475	1,375	1,225	1,225	1,225	1,700
	April 1-15	2,500	160	175	400	2,355	2,180	2,180	2,180	2,580
	April 16 - 30	4,000	150	200	400	3,855	3,655	3,655	3,655	4,055
Summer Base Flows	May 1 - June 30	2,000	190	165	400	1,815	1,650	1,650	1,650	2,050
	July 1 - Aug 31	350	230	80	275	125	45	45	45	320
Spring-Run Spawning Flows	Sept. 1 - Sept. 30	350	210	80	275	145	65	65	65	340
	Total Annual (acre ft.)	672,309	116,741	77,378	275,220	559,182	481,803	481,803	481,803	757,023
	Assumed Riparian Release	116,741								
	Restoration Release (af)	555,568								

1. Riparian releases - Riparian releases for current conditions average from 117- to 128 TAF/YR. Assumed approx 117 TAF/YR to be consistent with Steiner declaration which is derived from CALSIM and WSS estimates, adjusted monthly estimates to add to approx 117 TAF and to be more consistent with data from last 5 years; rounded to nearest 10 cfs. The Nov/Dec period 120 cfs estimate is an average of the assumed 130 cfs average in Nov and 110 cfs in Dec; the May/June period average of 190 cfs is an average of 176 cfs in May and 200 cfs in June. Friant base releases in recent years (2001 - 2005 have actually average of approximately 124,000 acre feet in order to meet 5 cfs. at every diversion point during all seasons.

2. Reach 2 losses Determined by flow at head of Reach 2. Assume relatively constant, steady-state conditions. Flows at head of reach less than 300 lose 80 cfs consistent with 1995-200 data including 1999 pilot project. Flows between 300 and 400 cfs lose 90 cfs; flows above 400 and below 800 cfs lose 100 cfs consistent with 1995-2000 data. Above 1000 cfs used flow lose curve on fig 2-4 of the Background Report. That curve was based upon non- steady-state flow conditions and thus likely overestimate steady-state conditions. Assume no losses in Reach 2B below the Bifurcation.

3. Salt and Mud Slough Accretions - From Sum of Mud and Salt Slough flow in Table 2-16 of the Background Report. Additional accretions occur in reach 4B and 5 but small (up to 50 cfs) relative to total Mud and Salt Slough inflow.

4. Reach 2 flow- Flow at head of Reach 2 is equal to Friant release minus riparian release plus Gravelly Ford base flow of 5 cfs. The Gravelly Ford base flow is usually higher in winter because of local tributary inflow, return flow and requirement to meet 5 cfs flow at every diversion point. Summer base flow is often higher than 5 cfs because of irrigation return flow and requirement to meet 5 cfs flow at every diversion point.

5. Reach 3 flow - Equal to Reach 2 flow minus Reach 2 losses. Reach 3 flow ignores contributions from Delta Mendota Canal added at Mendota Pool which is subsequently diverted at the bottom of Reach 3 at Sack Dam into the Arroyo Canal and therefore assumes no net gain. Actual inflows could be greater particularly during the irrigation season

6. Reach 4 flows - Equal to the net Reach 3 flows. Additional flow in Reach 3 is on "top" of existing irrigation supply flows and no losses are assumed although Reach 3 appears to be a small losing reach at this time. May become gaining reach over time if losses in Reach 2 fill sufficient aquifer storage.

7. Reach 5 flow Assume equal to Reach 4 flow. Seasonal losses in Reach 4A and gains in Reach 4B. Although likely a net gain in Reach 4 flow, assumed no gain for simplicity.

8. Confluence - Reach 5 flow plus Mud and Salt Slough. Does not include up to another 50 cfs of accretion upstream of Mud and Salt Slough that the WOST hydrograph included.

9. May - June flow of 2,000 c.f.s. is block of water for shaping as riparian recruitment recession flow.

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Restoration Flows Guidelines

Appendix E – Reach Definitions and CDEC Gages

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Appendix E – Reach Definitions and CDEC Gages

Figure 6 shows the location of gages used in 13(j)(ii) and 13(j) (iv) in the Restoration area from Friant Dam to the San Joaquin River's confluence with the Merced River. Table E-1 provides the electronic links to flow data in the Restoration Area

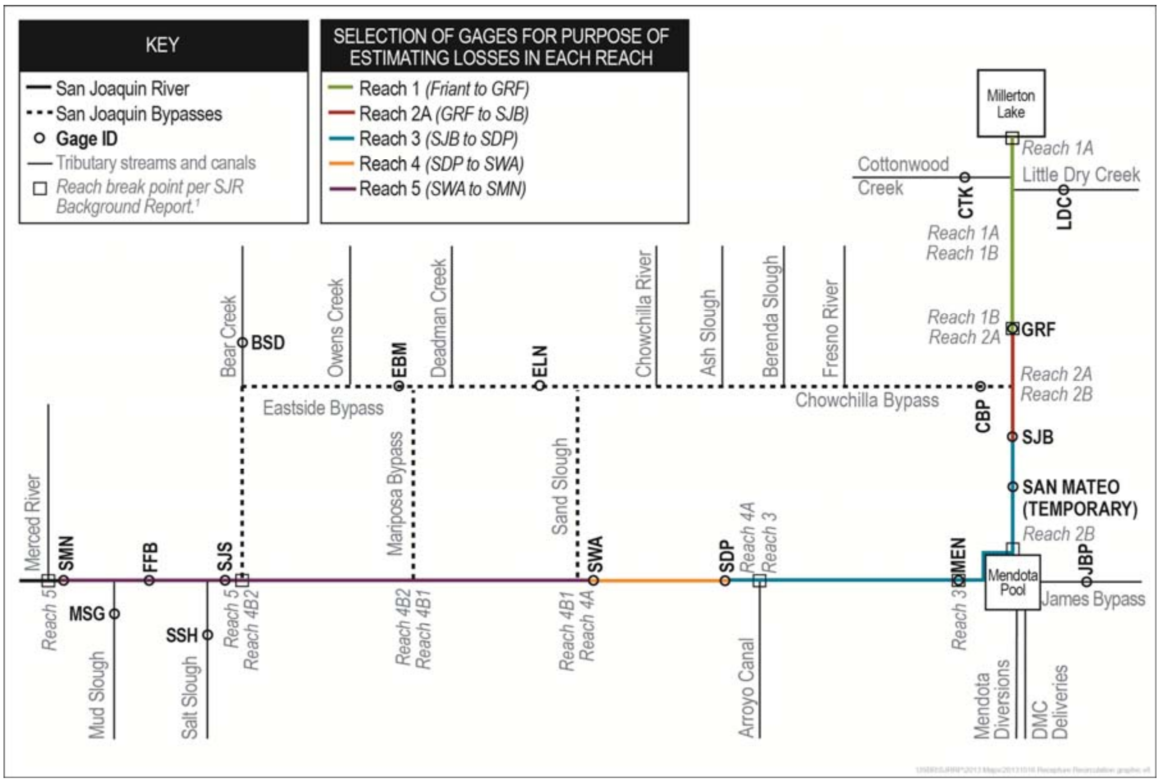

Figure 6.
Gages and Reaches of the San Joaquin River in the SJRRP Restoration Area

1 **Table E-1.**
2 **Electronic Links to Monitoring Gages on the San Joaquin River**

Physical Location	CDEC ID	Electronic Link
San Joaquin River at or immediately below Friant Dam	MIL	http://cdec.water.ca.gov/cgi-progs/stationInfo?station_id=MIL
San Joaquin River at Gravelly Ford	GRF	http://cdec.water.ca.gov/cgi-progs/stationInfo?station_id=GRF
San Joaquin River below the Chowchilla Bifurcation Structure	SJB	http://cdec.water.ca.gov/cgi-progs/staMeta?station_id=SJB
San Joaquin River below Sack Dam	SDP	http://cdec.water.ca.gov/cgi-progs/staMeta?station_id=SDP
San Joaquin River at the head of Reach 4B	SWA	http://cdec.water.ca.gov/cgi-progs/staMeta?station_id=SWA
San Joaquin River at the San Joaquin River and Merced River confluence	SMN	http://cdec.water.ca.gov/cgi-progs/staMeta?station_id=SMN
Cottonwood Creek near Friant Dam	CTK	http://cdec.water.ca.gov/cgi-progs/staMeta?station_id=CTK
Little Dry Creek	LDC	http://cdec.water.ca.gov/cgi-progs/staMeta?station_id=LDC
Chowchilla Bypass	CBP	http://cdec.water.ca.gov/cgi-progs/stationInfo?station_id=CBP
James Bypass	JBP	http://cdec.water.ca.gov/cgi-progs/stationInfo?station_id=JBP
San Joaquin River near Mendota	MEN	http://cdec.water.ca.gov/cgi-progs/stationInfo?station_id=MEN
Eastside Bypass near El Nido	ELN	http://cdec.water.ca.gov/cgi-progs/stationInfo?station_id=ELN
Eastside Bypass below Mariposa Bypass	EBM	http://cdec.water.ca.gov/cgi-progs/stationInfo?station_id=EBM
Bear Creek below Eastside Canal	BSD	http://cdec.water.ca.gov/cgi-progs/stationInfo?station_id=BSD
San Joaquin River near Stevinson	SJS	http://cdec.water.ca.gov/cgi-progs/stationInfo?station_id=SJS
Salt Slough at Highway 165 Near Stevinson	SSH	http://cdec.water.ca.gov/cgi-progs/stationInfo?station_id=SSH
San Joaquin River at Fremont Ford Bridge	FFB	http://cdec.water.ca.gov/cgi-progs/stationInfo?station_id=FFB
Mud Slough near Gustine	MSG	http://cdec.water.ca.gov/cgi-progs/stationInfo?station_id=MSG

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Restoration Flows Guidelines

Appendix F – Gravelly Ford Compliance

December 2013

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Appendix F – Gravelly Ford Compliance

Technical appendices describe the supporting information and background for the compliance procedures described in the main body.

Physical Process Data

Physical process data describe the anticipated outcomes from a change in releases from Friant Dam to assist in developing a method that achieves objectives for flows in the river.

1. Initial Response, 2 Days (Interim Flow monitoring data as reported in the 2010 ATR).
2. Stabilization, 4-5 days (Interim Flow monitoring data as reported in the 2010 ATR)
3. Measurement Accuracy, 8%-15% (USGS stream gage monitoring protocols).
4. Release Increment for a GRF change, 15 cfs (Personal communication with Friant Dam operations staff).
5. Flow Variability, 20-40 cfs (Interim Flow monitoring data as reported in the 2010 ATR).
6. Accuracy of Friant Release, 5% (Personal communication with Friant Dam operations staff).
7. River Connectivity, unknown (NRDC believes that 1 day of flows less than a threshold risks losing connectivity. No citations or studies were provided. Travel time, transient effects, and channel storage would likely require several days of depressed flows to break connectivity, but no analysis or data collection is available at this time).

The general approach seeks to avoid intentionally introducing oscillations in the releases that would result in alternating periods of measured flows over or under targets.

Operations Considerations

Operational considerations include the complexity of the method, the frequency of application, and the work schedule.

- Weekly procedures will be implemented by Staff at Friant Dam and require a method consistent with operation procedures at Friant Dam (e.g., Spreadsheet Row Calculation, schedules and measured data only)

- Weekly procedures may be implemented by the SJRRP Office and may include methods that require accounting for past releases and forecasts of future conditions.

The schedule for procedures should occur on Mondays, and Fridays. Reclamation should request a primary contact and backup (in event the primary is unavailable) so that Restoration Administrator and TAC can address unanticipated issues that may arise during evaluation and could compromise river connectivity.

Evaluation of Proposed Method

An example spreadsheet is attached including an evaluation of performance in 2012, using both daily and weekly flow adjustment methods. Weekly and daily flow adjustment methods produced similar results, meeting the flow target 26 percent and 28 percent of the times, respectively. The SJRRP will take an experimental approach to implementing flow compliance at Gravelly Ford. The proposed methodology does not consider the inability to measure flows within 10 cfs at Gravelly Ford or the historical experience of the Friant Dam staff in making changes likely to affect flows at Gravelly Ford. The method does not include smoothing the transition between target time periods and defers that decision to the TAC and Restoration Administrator. If the Restoration Administrator does not elect to smooth the transitions, most years will require a block of water at each increase in Gravelly Ford Flow targets unless diversions are less than anticipated.

We anticipate the need to revise the numbers used for thresholds in this procedure during subsequent implementation years, but Reclamation will use numbers agreeable to the Settling Parties.

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Restoration Flows Guidelines

Appendix G – Replacement or Offset Programs and Projects

SAN JOAQUIN RIVER RESTORATION PROGRAM

December 2013

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Appendix G – Replacement or Offset Programs and Projects

This appendix to the Restoration Flow Guidelines lists projects that have been undertaken or funded by the Secretary or other Federal Agency or agency of the State of California specifically to mitigate the water delivery impacts caused by the Interim Flows and Restoration Flows.

Programs and Projects will be inserted as they are developed.

Project Name	Date of Implementation

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Restoration Flows Guidelines

Appendix H – RWA Calculation Process

Appendix H - RWA Calculations and Water Use Curve Model Documentation

Purpose

This appendix to the Restoration Flow Guidelines provides the background and documents the development of the Recovered Water Account (RWA) procedures. The RWA procedures determine and account for reductions in water deliveries (i.e. water supply impacts) to Friant Division long-term contractors (Contractors) caused by Interim Flows and Restoration Flows (collectively referred to as Restoration Flows) pursuant to Paragraph 13(j)(iii) of the Stipulation of Settlement in NRDC et al. vs. Rogers et al. The objective of this appendix is to provide background regarding the discussion and rationale leading up to the selection of a RWA calculation method by the Settling Parties. Another purpose is to describe the explicit procedures for the selected modeling methodology, and associated subsequent "steps" for the complete RWA accounting. This Appendix supplements the main body of the Restoration Flow Guidelines (RFG) and provides the detail to apply the procedures for determining the reduction in water deliveries. The amount of RWA credits accrued by a contractor in a year equals the net delivery reductions (calculated with the procedures detailed in this appendix) minus any water returned by Recirculation and replacement or offset programs as described in the main body of the RFG.

Background

Reclamation, in consultation with the Settling Parties, developed a range of potential approaches for the Recovered Water Account method including:

- **Annual Settlement Model:** operation of the long-term monthly planning model developed during the Settlement negotiations, and was applied every year going forward. After comparison to specific historical years, some of the parties did not believe the long-term planning model would result in sufficient accuracy for a single year's reduction in long-term contract water deliveries in isolation when used as the RWA calculation method.
- **Water Authority Modeling Tool (WAM Tool):** Uses a hindsight estimate of the ability to sustain canal capacity. The WAM Tool was not sufficiently developed to be available for the RWA methodology, does not consider baseline conditions, and includes water supplies that may or may not be eligible for consideration as a reduction in water deliveries pursuant to Paragraph 13.(j)(iii) (e.g. 215 to non-Friant contractors).
- **One-Time Lump Sum:** allocation of total settlement estimates of reductions in water deliveries through 2026. The parties desired an annual allocation method specific to the hydrology of individual years. Particularly as real time impacts and hydrology affect Class 1 and Class 2 contracts differently and the lump sum

approach did not appear to be consistent with Settlement language in Par 16(b)(1) stating that the Secretary shall "monitor and record reductions in water supplies…".

- **Annual Lump Sum:** allocation of the average annual impacts each year. The parties desired a method specific to the hydrology of individual years.
- **Factor Approach:** allocation of impacts based on year types considering the year-type specific average impact. The parties desired a less generalized method that accounts for year-specific hydrology rather than relying on averaging over time.
- **Expert Panel:** each year a panel reviews available data to determine the RWA impacts. The parties considered the panel too subjective and raised concerns about the ability to come to resolution each year.
- **Flood Reset:** Any flood releases would negate and remove prior SJRRP releases from the calculation of RWA impacts for that year. The parties desired a method that provided a specific use of water as of 2006.

Baseline Model

The Settling Parties agreed that an approach which could calculate a pre-restoration baseline condition using the specific year inflow hydrology and which could be used with Restoration flows was preferred. Concurrent with Reclamation efforts, the Contractors developed a proposal for computing reductions in water deliveries predicated on a baseline condition defined by a combination of contractual, regulatory, legal and physical circumstances that existed prior to October 2006. This combination of factors resulted in a potential water use curve (WUC) baseline model that could be used to calculate water supplies available to be captured by Friant Districts under both a with and without Restoration scenario. The difference in available supplies between the two scenarios, as determined by the Millerton Lake inflow-based model with spill considerations, resulted in the potential reduction in contract water supply to Contractors due to Restoration Flows. The Settling Parties agreed to use the Friant WUC baseline model approach to calculate a gross water supply reduction.

In addition to a WUC baseline model the Settling Parties proposed that the net water supply reduction each year be further refined and reduced as a result of additional "tests" (including a late season spill, comparison to the maximum cumulative Friant Division contract deliveries of 2.2 MAF, and comparing to actual water availability on a district by district basis). Reclamation agreed to independently develop an inflow-based spreadsheet model based upon the Contractors WUC baseline model approach to perform the RWA calculations for use by the Plaintiffs and Contractors in developing a jointly supported RWA accounting methodology.

Coincident with the Friant proposal, the Plaintiffs and Contractors developed a December 23, 2011 list of shared principles to reach an agreement on the RWA methodology as follows:

1. Use an inflow-based operations model as proposed by Friant.
2. The model will use two Water Use Curves (WUC). One for Wet and one for Normal-Wet year types.
3. All other year types will be run against the NW WUC to capture the effects of the occasional rare spill in those drier year types.
4. Potential WUC’s are attached as placeholder curves that may need to be revised to meet the objectives of these deal points.
5. The current USBR model is not yet fully reviewed for completeness and accuracy by the parties, including USBR (draft model).
6. The draft model, when run for the Steiner USAN period of 1922-2003, using the USAN data for inflow and March 1 storage as opposed to real time data, and using the above WUCs, calculates average impacts of approximately 185,000 af/yr.
7. The parties will jointly review, modify, and complete the model consistent with the then approved model methodology.
8. Once the model is complete, the parties will make minor, joint modifications to the WUC so that impacts equal 185,000, within reasonable accuracy. This includes WUC modifications that bring impacts up should they fall below 185,000 AF/year in the final model as well as making WUC modifications to bring the impacts down should they fall above 185,000 AF/year. Any WUC modifications necessary to reduce resultant impacts will be made first to the Wet year WUC with the intent of not materially affecting the NW WUC.
9. Both parties recognize that past results do not guarantee future performance and once the WUC’s are modified, they will be finalized for use going forward, with real time data, and the 185,000 impact component used to fine tune the WUC’s will have no further significance.
10. Parties agree to review the methodology on a periodic basis.
11. The impact methodology includes a process for reducing impacts in the case of a real time spill, outside the Mar through Jul period. This may reduce impacts below that calculated above.
12. The impact methodology includes a process for individual district tests as currently described in the RFG section 13(j)(iii). This may reduce impacts below that calculated above.
13. Both parties intend to provide further joint comments to Reclamation to refine the written methodology procedures (i.e. RFG text for 13(j)(iii)) consistent with these points.
14. Both parties intend to provide further joint comments to the RWA policy paper. In that regard, the parties agree to delete the language “Reclamation believes the provisions provided in the Settlement relative to the Recovered Water Account apply only to reductions in Class 1 and Class 2 contract amounts” and replace it with a statement along the lines of “The relative distribution of the “other” canal

deliveries is not precisely known and there is a disagreement among the Settling Parties regarding whether or the extent to which reduction in 215 deliveries to long-term contractors should be included as "reductions in water deliveries". This methodology and model is not intended to promote or constrain the position of any Party and the Parties agree that, notwithstanding any previously stated positions, it is not necessary to resolve that issue in the development of the adopted methodology."

Water Use Curves

Consistent with the shared principles above, the Settling Parties asked Reclamation to refine WUC's to generate a historic average annual reduction in water deliveries of approximately 185 TAF/YR using the 1922-2003 Millerton Reservoir inflow from the CALSIM model (which are largely derived from the USAN model) and the Method 3.1 gamma transformation of the Exhibit B water year type restoration releases. In addition, in order to reflect the delivery reductions to the Contractors at the canal turnouts and to calibrate the model to derive the average reduction of 185 TAF/YR, canal losses were assumed to be 1.5% of available water at canal headworks.[2]

The "% Contract" denotes the percent of each Contractor's Class 2 contract that historically had to be delivered during Obligation periods as defined in the Contractor's prior water service contracts. Note also that the original Obligation percentage requirements were revised/reduced in subsequent Interim Water Service contracts. The following potential water use curves were investigated in Reclamation's Model:

- Historical original and revised Obligation Requirements (N and NW Years)

Month	% Contract (revised)	Diversion Rate (cfs)	% Contract (original)	Diversion Rate (cfs)
March	7	1593.8	20	4553.8
April	12	2823.3	20	4705.6
May	16	3643.0	20	4553.8
June	20	4705.6	20	4705.6
July	20	4553.8	20	4553.8

[2] The total Friant Division delivery equals the water supply less an assumed percentage identified as canal losses within the model. The inclusion of a loss factor was intended to account for the difference between diversions at Friant Dam compared to the deliveries at the individual Contractor turn-outs. Some historical studies indicated a loss factor of 3.8% based on measurements (Memo to Office of Inspector General). For the purpose of the RWA model the loss factor was used as a calibration parameter to obtain the target average reduction in water deliveries. The resulting factor of 1.5% was within the range of historically measured values and was used to calibrate the model.

- Combined Adjusted Historical Maximums

Month	% Contract	Diversion Rate (cfs)
March	12	2,672.1
April	15	3,372.9
May	18	4,191.6
June	23	5,124.2
July	24	5,360.7

- Using the revised Obligation Period applied to all year types

Month	% Contract	Diversion Rate (cfs)
March	7	1593.8
April	12	2823.3
May	16	3643.0
June	20	4705.6
July	20	4553.8

The model did not result in significant differences when using different water use curves for wet and normal-wet years. Subsequent evaluation of historical data also did not identify significant differences in operations between wet and normal-wet years. Year-specific conditions appeared more significant than overall water supply; therefore, a single set of water use curves (i.e. N and NW curves using the same parameters) were used in the Reclamation WUC baseline model and calibrated so as to generate reductions in water deliveries of 185,000 AF per year on average. The long term average reduction in deliveries results (with 1922-2003 base period, Gamma 3.1 transformation, canal losses, etc.) are shown below. The revised Obligation Period water use curve was used.

Year-Type	Reduction in Deliveries (AF)	River Demand (AF)	Percent of Releases as Impact (AF)
Critical Low	0	0	0%
Critical-High	-69,298	-70,353	98%
Dry	-185,124	-188,566	98%
Normal-Dry	-241,846	-245,723	98%
Normal-Wet	-216,975	-351,960	63%
Wet	-90,266	-556,542	16%
Average	**-185,020**	**-318,844**	**58%**

The Parties agreed that once the WUC's are chosen, (in this case the revised Class 2 obligation amounts of 7%, 12%, 16%, 20% and 20%) the 185,000 AF/year number used to calibrate the model will have no further significance and does not in any way reflect model performance going forward.

Application Going Forward

As described above, an inflow-based WUC model is utilized to calculate the difference of water made available to Contractors between the two scenarios (with and without

Restoration). The model calculates the effect of projected Millerton Lake spill releases, under both with and without Restoration scenarios. Water released for Restoration that otherwise would have spilled reduces the impacts to Contractors from Restoration flows. The model uses actual daily values (subject to final QA/QC) for the inflow to Millerton Lake and the Restoration Flow Schedule (Restoration Administrator recommended flow schedule approved by Reclamation). The process to ultimately determine the net impacts (as impacts will be potentially less than total Restoration release) to Contractors follows the following steps.

1. Determine Friant-wide Impacts using the daily WUC model (March through July period).
2. Determine Friant-wide Impacts using late season spill calculations (August through February period).
3. Summation of Friant-wide impacts (March through February water year).
4. Compare total Friant-wide water made available to Contractors with Restoration (from Step 1, Item 7 and Step 2, Item 10 below) to Friant-wide total contract quantity of 2.2 MAF.
5. Compare Step 3 to Step 4 and use the lesser of the two as net Friant-wide Impacts.
6. Distribution of net Friant-wide Impacts from Step 5 to each individual Contractor.
7. Compare actual total water made available to each individual Contractor to each Contractor’s total contract amount.
8. Compare Step 6 to Step 7 and use the lesser of the two as the net impact to each individual Contractor.

Step 1: Determine Friant-wide Impacts using the daily WUC Model (March through July period).

The WUC model is an excel spreadsheet that models daily operations for Millerton Lake for the March through July period. In order to determine water delivery reductions to Contractors due to Restoration in the March-July period, the WUC model determines the amount of water that can be captured and made available to Contractors under the without-Restoration scenario, and then again under the with-Restoration scenario. The delivery reductions to Contractors equates to the difference between the two scenarios of water captured and made available to Contractors.

The model uses actual data (D) for beginning reservoir storage, inflow, and recommended Restoration releases. All other inputs are assumed (A) or calculated (C). The same assumptions are made under the “with” and “without” scenarios except that the with-Restoration scenario includes Restoration flows. Calculations are done on a daily time step and all values are in acre-feet unless noted.

WITHOUT RESTORATION

Item 1: Millerton Lake Inflow (D). This is actual daily data for inflow into Millerton Lake as recorded and published by Reclamation (http://www.usbr.gov/mp/cvo/reports.html). The beginning storage for March 1 of each year is also used in the model and found on this website.

Item 2: Riparian releases (A). For purposes of this model, the Friant Dam releases to meet Gravelly Ford requirements will be assumed to be those amounts noted in Exhibit B of the Stipulation of Settlement totaling 116,741 AF annually. The daily flow rates are also as noted in Exhibit B for various time periods. It is noted that the critical-low and critical-high years use 116,662 AF in Exhibit B rather than 116,741 AF but this WUC model is not applicable in the driest years.

Item 3: Net Inflow without Restoration (C). Item 1 minus Item 2. This is the net amount entering the reservoir that could potentially be used or captured for use by Contractors.

Item 4: Water Use (C). Daily and cumulative water use is calculated by taking the agreed-to Water Use Curves which are based on total Class 2 contract amounts of 1,401,475 AF and applying monthly percentages of March 7%, April 12%, May 16%, June 20%, and July 20%. Subsequently, potential use for this period totals 1,051,106 AF.

Note that in the event Millerton Lake levels approach dead pool (134,054 AF), and water rates available for delivery to Contractors are reduced below the water use curve rates. The water use curve rates may be increased at a later time, up to full canal capacity of 5,925 cfs, until the cumulative water use equals that which would otherwise have occurred absent such reduction in rates due to dead pool reductions.

Item 5: Spill Conditions (C). The model tracks daily reservoir storage and in the event levels reach 520,528 AF, spill occurs, and the model takes into account going in and out of spill mode. Note that the initial spill date occurs when the cumulative net inflow (Item 3), (after filling the March 1 available storage (Item 1)), equals the cumulative water use (Item 4).

Item 6: Spill calculation (C). Once the reservoir is full, all inflow in excess of the daily water use curve becomes spill, and is therefore not available to Contractors.

Item 7: Net Water Available to Contractors (C). Subsequently, the Net Water Available to Contractors becomes the Net Inflow (Item 3) minus the Spill Calculation (Item 6) and subsequently multiplied by 98.5% to account for the 1.5% of canal losses (as a calibration parameter and to reflect the water delivered to the Contractors at the turnouts).

WITH RESTORATION

Item 8: Restoration releases (D). Restoration flows for the purposes of RWA are calculated as the Restoration Flow Schedule (i.e. Restoration Administrator recommendation accepted by Reclamation) at Friant Dam minus the Exhibit B Riparian releases. In the event of actual spill operations, including releases to avoid a spill, the Restoration flows are those previously recommended by the RA and approved by Reclamation for the period of spill operations. The daily data for Restoration releases, including those amounts due to buffer flows, as recorded and published by Reclamation can be accessed at http://restoresjr.net/program_library/04-RA_Recommends/index.html.

Item 9: Net Inflow with Restoration (C). Under the with-Restoration scenario the Restoration releases can be added to and treated similar to a riparian release. Accordingly, the net inflow now becomes the sum of Millerton Lake Inflow minus Riparian releases minus Restoration releases (Item 1 - Item 2 - Item 8).

Item 10: Net Water Available to Contractors with Restoration (C). Once Item 9 is calculated the model steps through the same steps as outlined in Items 4, 5, 6, and 7 in Step 1 thus determining the net water made available to Contractors with Restoration.

Item 11: Net impacts to Contractors (C). Subsequently, the difference between Item 7 and Item 10 is the impact to Contractors due to Restoration.

As an example, if the WUC model indicates that under a Restoration release scenario of 500,000 AF only 300,000 AF would have been captured, used, and or made available to Contractors without Restoration, but under the with-Restoration scenario only 180,000 af was likewise made available, the Step 1 calculation of impacts would be the difference of with-Restoration and without-Restoration scenarios of 120,000 AF.

Item 12: Buffer Flow impacts. Buffer flows that cause reductions to Contractors (impacts) receive an extra 0.25 AF of impact calculation. To determine the reductions due to buffer flows, simply modify the Restoration flows (Item 8) by removing the buffer flows and rerun the model. With the rerun model, if impacts are less than the modeled impacts with buffer flows (Item 11), the difference in impacts are those reductions due to buffer flows, to which the 0.25 factor is to be applied.

As an example, if the website indicates 30,000 AF of buffer flows were released and the impacts to Contractors (Item 11) totaled 120,000 AF, but rerunning the model without the 30,000 AF of buffer flows indicates impacts to Contractors was only 105,000 AF, the difference of 15,000 AF were reductions due to buffer flows. Subsequently, additional impacts would be 15,000 x 0.25 = 3,750 AF. The 3,750 AF shall then be added to the 120,000 AF calculated above for a final net impacts to contractors of 123,750 AF.

Step 2: Determine Friant-wide Impacts using Late-Season Spill Calculations (August through February period)

The WUC Model does not simulate daily operations between August 1 and the end of February as the model assumptions associated with Millerton Lake operations are highly variable and it is difficult to simulate with and without Restoration operations. Typically, all net inflow into Millerton during this period can be captured and made available to Contractors and subsequently all Restoration flows released would be a reduction in water supplies or considered an impact to Contractors. Spills may occur, however, under anomalous conditions of rainfall and/or early snowmelt, and such a spill event and associated Restoration releases would not count as an impact. It is noted that a spill includes water released into the SJR at Friant Dam, spilled over the Friant Dam, or delivered as 215/flood flows, during existing or projected spill conditions.

This RWA methodology accounts for these late season spills manually, in real-time, when calculating impacts from Restoration releases during the August-February time period. When releases are being made from Friant Dam in excess of releases to meet the approved Restoration Schedule during the period of August 1st through the end of February, Restoration releases scheduled on those days would <u>not</u> count as a water supply impact during these times of spill releases. The quantity of water spilled on those days also will not count as water captured or made available to Contractors. For example, if a total of 20,000 AF of water was spilled, that 20,000 AF would not be counted as made available to Contractors when applying the 2.2 MAF test in Step 4. For purposes of Step

4, the net water available to Contractors with Restoration shall also be calculated (Inflow less Riparian less Restoration less spill). During a late season spill the associated impact reduction number shall be the assumed Restoration release, as approved by Reclamation, *prior* to a spill, for that day.

As an example, if 108,000 AF were scheduled and released for Restoration during Aug-Feb, but spill releases were made on 5 consecutive days, and Restoration flows as scheduled by the RA for those 5 days equaled 900 AF/day, then 4,500 AF released for Restoration would not count as impacts. Subsequently, the impacts for the Step 2 calculation for this Aug-Feb period would be reduced to 103,500 af.

Buffer Flow impacts. Buffer flows that cause reductions to Contractors (impacts) receive an extra 0.25 AF of impact calculation. Accordingly, the late season spill period calculations shall include separate accounting of Restoration and Buffer flow releases. If a spill is not occurring the Restoration amount shall be multiplied by 1.00 and the Buffer flows amount shall be multiplied by 1.25. If there is a spill event both Restoration flows and Buffer flows would not count as impacts.

Step 3: Summation of Friant-wide Impacts (March through February water year)

The results from using the WUC model for March-July (Step 1), and the late season spill calculation for August-February (Step 2), shall be added together including contributions from Buffer flows to get the potential impacts for the entire Restoration year period of March-February.

As an example, impacts from Step 1 of 123,750 AF added to impacts from Step 2 of 103,500 AF results in a total of 227,250 AF of impacts for the Contract Year pursuant to Step 3.

Step 4: Compare total Friant-wide modeled water made available to Friant-wide total contract quantity of 2.2 MAF

Upon calculation of the total amount of water captured and or made available to Contractors for the entire Restoration year as stated above (Step 3), Reclamation will compare such amount to the full Friant wide contractual amount of 2.2 MAF and record the shortfall or contract deficit. This step is done on a Friant-wide basis.

As an example, while calculating the impacts in Step 1, 2, and 3, the model results show that the Contractors had 2.1 MAF available to them with Restoration. Regardless if whether Contractors actually used 2.1 MAF, that value is used to calculate the contract deficit for the year. In this case, 2.1 MAF is only 100,000 af short of full contract totals of 2.2 MAF so the results from Step 4 is 100,000 af.

Step 5: Compare Friant-wide Impacts

Compare the results from Step 3 to the results of Step 4 and use the lesser of the two values.

As an example, if calculation of a full contract year impacts were 227,250 AF (Step 3), and calculations under the 2.2 MAF Test (Step 4) indicated a potential contract deficit of only 100,000 AF, the impacts would be the lesser of the two or 100,000 AF.

Step 6: Distribution of Friant-wide Impacts to Individual Contractors

Upon completion of Step 5, Reclamation would allocate the reduction in supplies to individual districts as a proportion of the Class 1 and Class 2 contract totals. Class 1 contracts would record impacts first until, when adding to the then current year declaration, 100% of Class 1 contract totals are met (up to the first 800,000 AF). Class 2 contracts would then receive the remaining reductions in water deliveries proportional to the Class 2 contract totals. Annual water supply allocations are available at the website http://www.usbr.gov/mp/cvo/vungvari/water_allocations_historical.pdf.

As an example, if the Friant declaration is 50% Class 1, the first 400,000 AF (800,000 x 0.5) of recorded impacts shall be contributed to Class 1 contracts. Impacts greater than 400,000 AF, if any, would be distributed to Class 2 Contractors (equal ratio based on contract amounts). If Friant declaration is 100% Class 1, all recorded impacts shall be distributed to Class 2 Contractors.

Step 7: Compare actual water made available to Individual Contractor relative to its contract amount

Determine the contract deficit on an individual Contractor basis by subtracting the water made available to each Contractor from each Contractor’s individual contract amount. Recorded Friant water made available to a Contractor would include all supplies delivered to, or on behalf of a Contractor (includes transfers out and exchanges, etc), including, but not limited to, Class 1, Class 2, 215, RWA, floodwater, Warren Act, 16(b), and 13(i) supplies, including those supplies requested to be carried over/rescheduled and pre-use. Rescheduled and pre-use water is included in the impact calculation as it is water made available to the Contractor and the Contractor has determined its best use for that Contractor, i.e., to be carried over or pre-used. Water rescheduled and pre-used will only be counted for the purposes of impact calculation in the year it is first made available to a Contractor, and not when it is delivered or spilled the subsequent year (for carryover). Contractors are responsible for reviewing and verifying this information with Reclamation.

Note that the various Friant based supplies other than Class 1 and Class 2 (i.e. 215, Class 2/215, RWA, etc.) are included in the calculation as delivery of those supplies have the potential to artificially raise the calculation of impacts if a Contractor chooses to use those supplies in lieu of remaining contract supplies (Class 1/Class 2 supplies). That potential only exists until full Class 1/Class 2 supplies are delivered and then they can no longer affect the impact calculation.

As an example, if deliveries/water made available to each Contractor indicates that one Contractor had available water of 50,000 AF (for example, 30,000 AF of Class 1, 5,000 AF of Class 2, 5,000 AF of carried over Class 2, 5,000 AF of 215, and 5,000 AF of 16(b)), and a full contract total of 135,000 AF, the contract deficit for that district was 85,000 AF.

Step 8: Compare Individual Contractor Impacts

For each Contractor, the lesser of Step 6 and Step 7 shall apply. If this test reduces a Contractor's impacts, that reduction is not reallocated back among other Contractors but rather the impact has not occurred.

As an example, if calculation of individual impacts were 100,000 AF (Step 6), and calculations under the Individual contract test (Step 7) indicated a potential contract deficit of only 85,000 AF, the impacts would be the lesser of the two or 85,000 AF.

Summary of Impact determination by Steps

The following is a summary of results from each of the Steps above to determine final impacts to Contractors. For consistency of discussion, the results of the examples given above are used:

IMPACTS	STEP/ACTION
• 500,000 af	Released for Restoration
• 120,000 af	Step 1: WUC model for Mar-Jul
• 123,750 af	Step 1: include buffer flows
• 103,500 af	Step 2: Late season spills, Aug-Feb
• 0 af	Step 2: include buffer flows
• 227,250 af	Step 3: Full year impacts (Friant-wide basis)
• 100,000 af	Step 4: 2.2 Test (Friant wide basis)
• 100,000 af	Step 5: Lesser of Step 3 and Step 4
• 100,000 af	Step 6: Distribute to individual Contractors
• 85,000 af	Step 7: Individual contract deficit test
• 85,000 af	Step 8: Lessor of Step 6 and Step 7

Model Parameters

Fixed model parameters (constants) represent scalar quantities anticipated to remain unchanged in the application of the methodology. Recovered Water Account parameters include:

- Minimum Storage in Millerton (Dead-Pool), S_{min} = 134,054 thousand acre-feet
- Maximum Storage in Millerton (Capacity), S_{max} = 520,528 thousand acre-feet
- Maximum Canal Delivery, Q_{max} = 5,925 cubic feet per second
  - Friant-Kern Canal Capacity: 4,650 cubic-feet per second (Rated performance in 2006)

    - Madera Canal Capacity: 1,275 cubic-feet per second (Rated performance in 2006)

- Friant Division Total Contract Maximum, TCM = 2,201,475 million acre-feet
- Class 1 Contract Maximum = 800,000 acre-feet
- Class 2 Contract Maximum = 1,401,475 acre-feet