Restoration Flows Guidelines

Version 2.0

SAN JOAQUIN RIVER RESTORATION PROGRAM

February 2017

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Abbreviations and Acronyms

AF	acre-foot/feet
ATR	Annual Technical Report
CDEC	California Data Exchange Center
cfs	cubic feet per second
DWR	California Department of Water Resources
Guidelines	Restoration Flows Guidelines
MAF	Million Acre-feet
NMFS	U.S. Department of Commerce, National Marine Fisheries Service
NRDC	Natural Resources Defense Council
NWS	U.S. Department of Commerce, National Weather Service
PEIS/R	Program Environmental Impact Statement / Environmental Impact Report document
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
WUC	Water Use Curve

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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, including, but not limited to, Paragraphs 13(a), (c), (e), (f), and (i). This document generally follows the structure of the Settlement and is organized into sections 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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Version History

1.0 December 2013

Initial Draft approved prior to the beginning of Restoration Flows.

1.1 July 2016

Formatted with decimal headings; edited for formatting and terminology consistency; updated and corrected Appendix B, E, and G; other non-substantive changes.

2.0 February 2017

Corrected dates on Figure 1.

Section 6.1 revised: Updated list of forecast models and data sources, described collaborative forecasting between SCCAO and SJRRP, revised allocation steps and Table 2 forecast exceedances, changed date of final Restoration Allocation, added section on tracking allocation deviations, and made terminology consistent.

Section 6.2 revised: Revised contents of Restoration Allocation and Default Flow Schedule, revised contents of Restoration Administrator Recommendations, provided flexibility to Restoration Administrator to schedule flows at points downstream of Gravelly Ford, identified process for making flow adjustments outside of full Restoration Flow Schedules, and made terminology consistent.

Section 6.3 created: Addressed extent of Restoration Flow Schedule flexibility, outlined Water Supply Test, and linkages to other sections of the document. Provisional section to expire March 1, 2018 unless action taken.

Section 6.4 created: Addressed need to reschedule and potentially shift Restoration Flow volume between flow periods when Restoration Allocation changes or there is an accumulated error in Gravelly Ford flows. Provisional section to expire March 1, 2018 unless action taken.

Modified graphics in Appendix C

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1 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.

1.1 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 B, 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.

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. *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.*

,,,

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.*

,,,

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.*

1.2 Recommendation for Release

The release of Buffer Flows is initiated by 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 the 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.

1.3 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 based on Exhibit B

Restoration Year Type	Buffer Flows Available Between October 1 and December 31 (AF)	Buffer Flows Available Between May 1 and September 30 (AF)	
		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

1.4 Flexible Management of Buffer Flows

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

1.4.1 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 during the Fall Flow Period and up to four weeks earlier or later (September 3 – December 28).

1.4.2 Provision for Moving Volumes from May through September

Up to 50 percent of the volume of Buffer Flows available between May 1 and September 30, not to exceed 5 thousand AF (TAF) may be released from the Friant Dam during the Fall Flow Period (October 1 through November 30) and the Spring Flow Period (March 1 through May 1). The time and rate of release will be in accordance with the recommendation of the Restoration Administrator.

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 10 percent of the Restoration Flow Schedule for any day.

1.4.3 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 flexible management of Buffer Flow volumes, in 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.

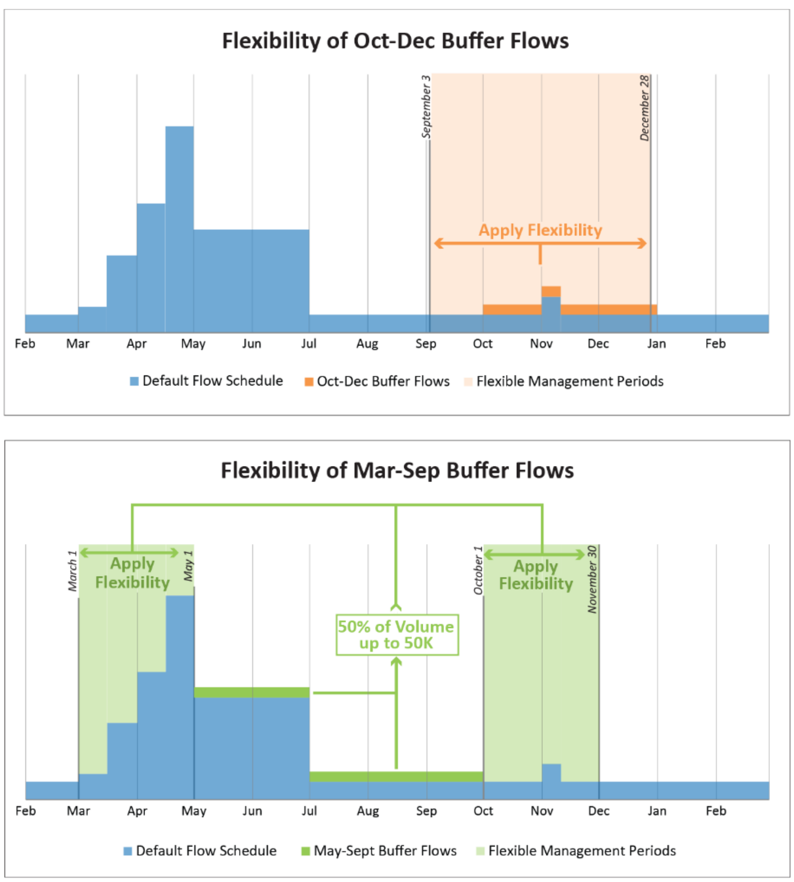

Figure 1.
Volumes and Periods Available for Flexible Management of Buffer Flows

2 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.

2.1 Acquisition Needs

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

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. Reclamation shall acquire that water as soon as practical, only from willing sellers, 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.

2.2 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).

2.3 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 if 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 Program Environmental Impact Statement / Environmental Impact Report (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.

2.4 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.

2.5 Disposal of Unexpected Seepage Water

As soon as practical, the Restoration Administrator shall recommend to Reclamation 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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3 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 section 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.

4 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 if an issue arises that requires substantial action to appropriately address, each interested Party will contribute to the development of protocols, separate from these Guidelines, 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.

5 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).*

5.1 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."

5.2 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, 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 to determine the quantity of Unreleased Restoration Flows:

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 neither recommendation has been provided or accepted, then consistent with Paragraph 13(j)(i) of these Guidelines, a Default Hydrograph derived from Exhibit B will be applied to the two Recommendations with appropriate adjustments for existing channel capacity.

5.3 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.

5.4 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 following order 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.

5.5 Management of Unreleased Restoration Flows

Unreleased Restoration Flows shall be available as soon as the Restoration Flow Schedule is 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; and flood control, safety of dams, and operations and maintenance requirements.

Reclamation shall update the available volume of Unreleased Restoration Flows for the current Restoration Year every time a new Restoration Flow Schedule is 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 Restoration Year and no later than May 1, Reclamation 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 outlined in Section 2 of these Guidelines.

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 that 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:

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

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

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

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

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

> *Prior to the commencement of the Restoration Flows as provided in this Paragraph 13, the Secretary, in consultations with the Plaintiffs and Friant Parties, shall develop guidelines, which shall include, but not be limited to: (i) procedures for determining water-year types and the timing of the Restoration Flows consistent with the hydrograph releases (Exhibit B);*

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. ,,,*
>
> *2. ,,,*
>
> *3. ,,,*
>
> *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 Page 2 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. ,,,

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.

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:

1. **Technical Process for Setting the Year Type and Default Flow Schedule**. This section provides technical procedures for: determining the unimpaired water year runoff for Millerton Lake, setting the Restoration Allocation, identifying the Restoration Year type, and setting the Default Flow Schedule.

2. **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:

   - Restoration Annual Allocation
   - Restoration Year Type
   - Default Flow Schedules
   - Restoration Administrator flow schedule recommendations
   - Evaluation of Restoration Administrator recommendations for consistency with the Settlement and Settlement Act
   - Management of Friant Dam for Restoration Flows

6.1 Technical Process for Setting the Restoration Allocation, Year Type, and Default Flow Schedule

The unimpaired runoff (also known as "natural river" or "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 water, calendar, and Restoration years is illustrated in Figure 2.

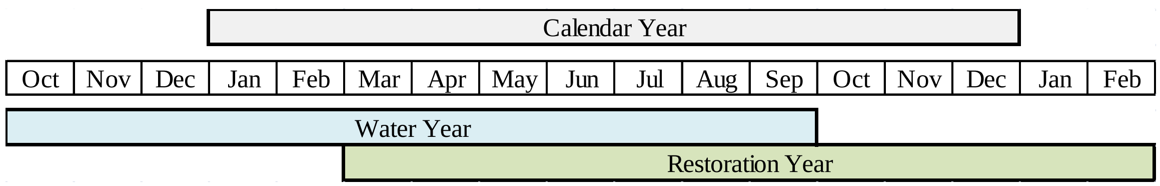

Figure 2.
Overlap of Calendar, Water, and Restoration Years

6.1.1 Step 1: Weighting Forecast Models and Data Sources

Determinations of unimpaired runoff at Millerton Reservoir for the Water Year will be conducted by Reclamation using one or more of the following sources of hydrology information (further guidance on analyzing forecasts is provided in Appendix I):

1. Computed unimpaired runoff to Millerton Reservoir, reported as "Full Natural Millerton" by Reclamation[1];

2. Water Conditions in California Report: Forecast of Unimpaired Runoff for the San Joaquin River (includes Bulletin 120 Monthly Report, Bulletin 120 Weekly Updates, and Water Supply Index), issued by the California Department of Water Resources (DWR)[2];

3. Daily Ensemble Streamflow Prediction (ESP) Water Supply Forecast for Millerton Reservoir, as reported by the National Weather Service (NWS) California-Nevada River Forecast Center[3];

4. Southern California Edison forecast model;

5. Ground-based observations, satellite observations, or aerial observations of snowpack;

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[1] http://www.usbr.gov/mp/cvo/vungvari/milfln.pdf
[2] http://cdec.water.ca.gov/snow/bulletin120/index.html
[3] http://www.cnrfc.noaa.gov/

6. Runoff regression algorithm developed by Reclamation for unimpaired runoff and other analyses of historic runoff patterns;
7. Recent accumulated precipitation and short-term forecasts for the Millerton watershed;
8. Other emerging runoff or precipitation forecasts and models as appropriate to ensure that the best available information and forecasts are being applied.

Reclamation staff from the South-Central California Area Office (SCCAO) in collaboration with SJRRP shall determine an appropriate weighting (i.e. blending) of the forecast models and data sources using professional judgment and knowledge of hydrology, climatology, and meteorology. This will result in a single set of runoff forecast exceedance probabilities (i.e. a hybrid forecast) that will be used by Reclamation to determine both the Restoration Allocation and the Friant Contractor water supply declaration (although the chosen exceedance may differ for each). The selected forecast weightings may be updated at any point in the runoff year, and may be updated numerous times as conditions warrant. SCCAO and SJRRP shall seek to use the most current available data in their forecasts.

The Restoration Allocation and Default Flow Schedule issued by SJRRP should document the sources used to forecast runoff and briefly articulate the reasoning behind the selected forecast weightings. At the request of any Settling Party or the Restoration Administrator, Reclamation shall provide a more thorough briefing explaining the selection and weighting of forecast information.

6.1.2 Step 2: Determining Forecast Exceedance

The hybrid forecast shall include the 90%, 75%, 50%, and 10% exceedance values. SJRRP shall use the percent probability of exceedance forecasts described in Table 2; the percent probability of exceedance forecast used by SCCAO may differ from those used by SJRRP (e.g. 90% vs. 75%), but both forecasts will be derived from the hybrid forecast jointly determined. The percent probability of exceedance forecast used to make the Restoration Allocation is derived by comparing the 50% exceedance forecast to the date of issuance for the Restoration Allocation (Table 2). This determination of whether to use the 90%, 75%, or 50% exceedance forecast is made each time there is a new Restoration Allocation.

Table 2.
Percent Probability of Exceedance Forecast Patterns

		Date of Allocation Issuance					
	Value (TAF)	**January**	**February**	**March**	**April**	**May**	**June[2]**
If the 50% forecast is[1]:	Above 2200	50	50	50	50	50	50
	1100 to 2200	75	75	50	50	50	50
	900 to 1099	75	75	75	50	50	50
	700 to 899	90	90	75	50	50	50
	500 to 699	90	90	75	50	50	50
	Below 500	90	90	90	90	75	50

[1] Forecasts should be articulated to the nearest thousand acre–feet when possible. This table uses divisions in unimpaired runoff that are different than Restoration Year Types, which are set in Step 3.
[2] Allocations made in early July should use the June column from Table 2

6.1.3 Step 3: Identifying Restoration Year Type and Calculating Annual Allocation for Restoration Flows

The appropriate percent exceedance and associated forecast as determined in Table 2 above is then applied to Table 3 to identify the annual Restoration Allocation and the Restoration Year Type.

Table 3.
Restoration Allocation and Year Type

Unimpaired Water Year Runoff Forecast (TAF)	Total Friant Dam Release (TAF)[1,2]	Restoration Allocation (TAF)		Restoration Year Type (Range of Runoff in TAF)
above 2,500.000	673.488	556.621	Static Allocation	**Wet** (above 2,500.000)
at 2,500.000	547.400	430.534	Interpolated Allocation	**Normal-Wet** (1,450.000 – 2,500.000)
at 1,450.000	400.300	283.434		**Normal-Dry** (930.000 – 1,449.999)
at 930.000	330.300	213.434		**Dry** (670.000 – 929.999)
at 670.000	272.280	155.414		
from 400.000 to 669.999	187.785	70.919	Static Allocation	**Critical-High** (400.000 – 669.999)
below 400.000	116.866	0		**Critical-Low** (below 400.000)

[1] Total Friant Dam Releases may be higher than this value depending on the Holding Contracts and Reach 1 channel losses.
[2] Leap years will also add a small value to this total.

Restoration Allocations for Dry, Normal-Dry, and Normal-Wet Restoration year types are interpolated between the values shown in Table 3. Interpolation shall calculate the allocation to the nearest acre-foot. Other year types have a static allocation that does not change within the year type. Figure 3 and Figure 4 depict this interpolation for the Restoration Allocation at Friant Dam and Gravelly Ford, respectively. Actual Friant Dam release volumes may be different than what is depicted because the Holding Contracts and channel losses in Reach 1 between Friant Dam and Gravelly Ford may be different from year to year or day to day as what is depicted in Exhibit B of the Settlement.

When preparing the Restoration Allocation, Reclamation will provide hypothetical Restoration Allocations that would result from the forecast probability of exceedances of 90%, 75%, 50%, and 10%. This information is useful for contingency planning or informing the Friant Division water supply declarations.

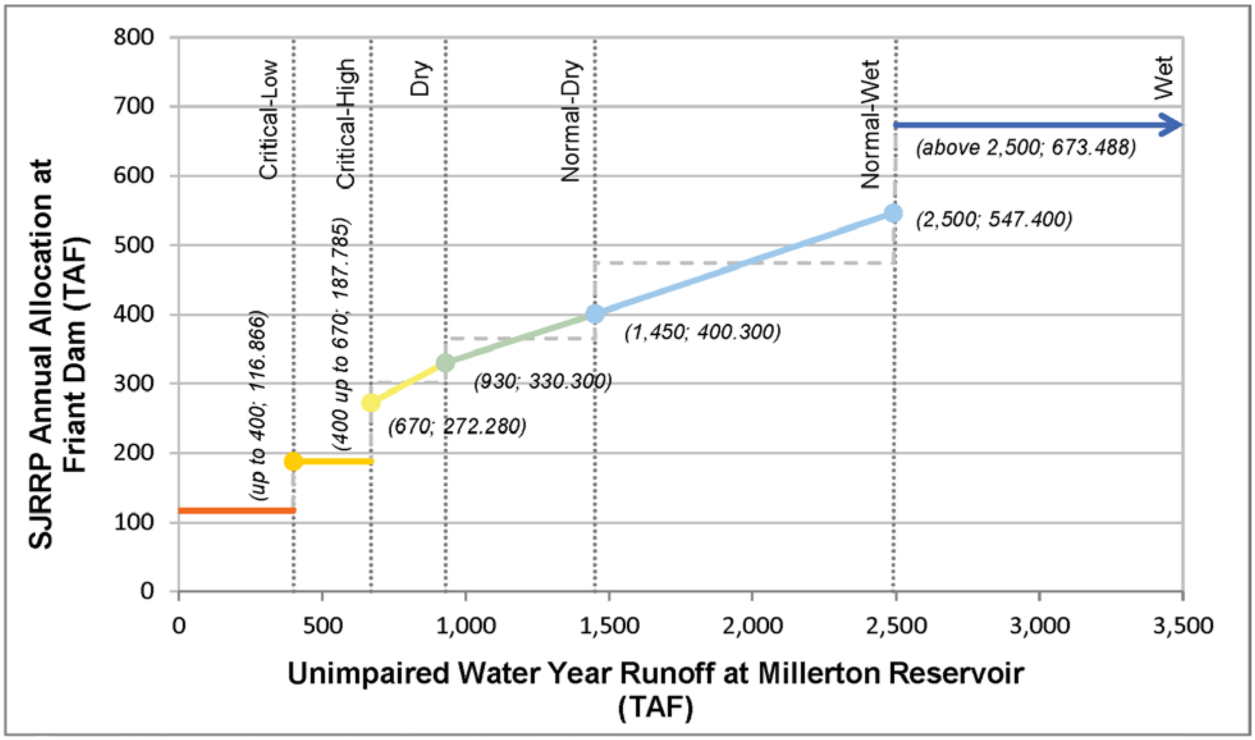

Figure 3.
SJRRP Restoration Allocation at Friant Dam as a Function of Unimpaired Runoff at Millerton Reservoir

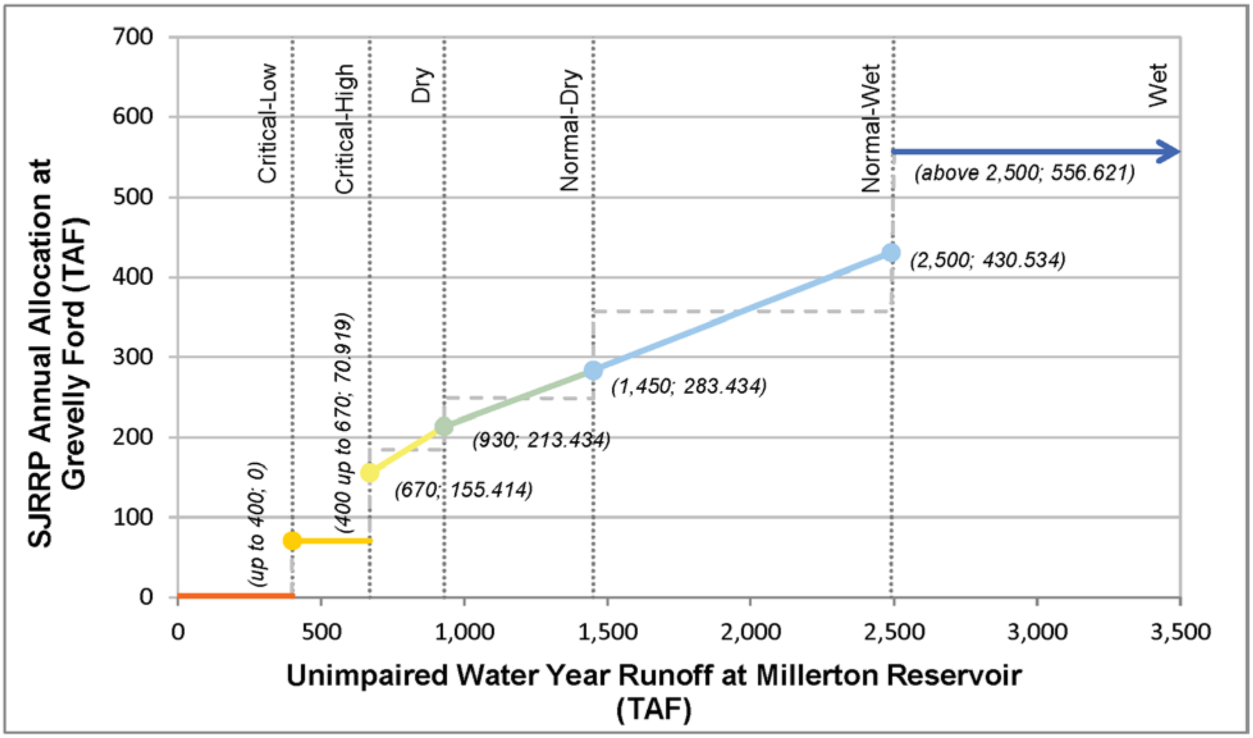

Figure 4.
SJRRP Restoration Allocation at Gravelly Ford as a Function of Unimpaired Runoff at Millerton Reservoir

6.1.4 Setting the Default Flow Schedule

The Default Flow Schedule is derived from the Exhibit B base flow hydrographs adjusted for the precise Restoration Allocation volume. Default Flow Schedules prepared by Reclamation provide an initial daily distribution of the annual Restoration Allocation and a starting point for the Restoration Administrator to develop a schedule. Following acceptance of the Restoration Administrator's recommended Restoration Flow Schedule, the recommended Restoration Flow Schedule will supersede the Default Flow Schedule at Friant Dam for that Restoration Year.

Default Flow Schedules are also used in the Water Supply Test (Section 6.3). Default Flow Schedules do not consider Settlement provisions for flexible flow shifts, real-time management of flows, use of buffer flows (Section 1), the management of unexpected seepage losses (Section 2), or the potential for releases above the requirements of the Settlement for flood management (Section 11).

Appendix D (Exhibit B of the Settlement) 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 Allocation lookup tables in Appendix B (Restoration Allocation Lookup Tables) or additional runoff values not articulated in Appendix B can be derived from the procedures in Appendix C (Default Flow Schedules).

6.1.4.1 Setting Default Flow Schedules

The tables in Appendix C 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.

The tables provided in Appendix C reflect implementation of the "gamma" transformation pathway, which is one of the four methods evaluated for distributing an annual allocation into a Default Flow Schedule. The Restoration Administrator is not bound by any transformation pathway in developing the Restoration Flow Schedule.

6.1.4.2 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, plus any Restoration Flows met by flood management operations (Section 11), less any tributary flows not originating from Friant Dam. 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 Allocation.

6.1.5 Timing of Restoration Allocations

The first Restoration Allocation and Default Flow Schedule shall be issued on or before January 20 of each year. Restoration Allocations will be updated at least monthly, typically timed with the release of DWR's Bulletin 120 monthly report, unless both Reclamation and the Restoration Administrator determine that an allocation update is not necessary. Reclamation may issue an updated Restoration Allocation more frequently as conditions warrant, or as requested by the Restoration Administrator.

The final determination of the Restoration Allocation and Default Flow Schedule shall be made based on computed unimpaired runoff to Millerton Reservoir through June 30, combined with the projected runoff for the remainder of the Water Year. The final Restoration Allocation and Default Flow Schedule shall be issued no later than July 10. The final Restoration Allocation volume and year type determination shall stand for the remainder of the Restoration Year, and will not be further adjusted at the close of the water year.

6.1.6 Tracking Restoration Allocation Deviations

Reclamation shall provide a record of final Restoration Allocation, the associated unimpaired runoff forecast, and the computed total Water Year unimpaired runoff. Because the final Restoration Allocation is made prior to the end of the Water Year, there may be a deviation between the unimpaired runoff forecast used to generate the final Restoration Allocation and the computed total Water Year unimpaired runoff on September 30. The difference between these two values and the resultant difference in

Restoration Allocation shall be tracked for the purpose of evaluating the forecasting methods in these guidelines. If allocation deviations over the long-term are found to be significant, parties will address this discrepancy through further modification of the exceedance forecast progression, last allocation date, or other means.

6.2 Coordination with the Restoration Administrator on the Release of Restoration Flows

Reclamation will discuss forecasts and operations with the Restoration Administrator before issuance of a Restoration Allocation and Default Flow Schedule. Reclamation shall indicate the likely allocation for planning purposes, whether a new allocation is warranted, discuss the forecasts being used to generate the allocation, discuss Unreleased Restoration Flow accounting and management, and provide updates to flow operations and flow accounting. In all cases, Reclamation will operate to the latest approved and implementable Restoration Flow schedule, regardless of whether the most recent schedule meets the then-current allocation.

The Restoration Administrator will be notified of constraints on operating criteria with each transmission of the Restoration Allocation and Default Flow Schedule; and within 24 hours of an event or emergency condition that requires a departure from the Restoration Administrator recommendations.

6.2.1 Transmissions to the Restoration Administrator from Reclamation

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

1. The forecast values, forecast discussion, and relevant percent exceedance used to calculate the Restoration Allocation and the Restoration Year Type.

2. Hypothetical allocations that would result from other percent exceedance forecasts (i.e. 10%, 50%, 75%, and 90%).

3. A Restoration Flow 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.

4. An accounting of Unreleased Restoration Flows distributed to date for the year, and any available URF exchanges.

5. Default Flow targets at Gravelly Ford, and associated releases at Friant Dam for the remainder of the Restoration Year.

6. Operating criteria, including ramping rate constraints, channel conveyance capacity, seepage limitations, scheduled maintenance of Reclamation facilities

that may restrict the release of Restoration Flows, other channel maintenance, and relevant permit requirements.

7. Reclamation will maintain operational flow data and calculations of reach by reach losses and make this information available to the Restoration Administrator separately.

Reclamation shall simultaneously provide the Restoration Allocation and Default Flow Schedule to the Settling Parties, and subsequently make the document available online.

6.2.2 Consultation with Federal Fisheries Agencies

As described in Exhibit D of the Settlement, the Restoration Administrator will consult with the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and other agencies as appropriate.

6.2.3 Restoration Administrator Flow Schedule Recommendations

The Restoration Administrator will make an initial flow recommendation to Reclamation by January 31 of each year following the receipt of Reclamation’s initial Restoration Allocation and Default Flow Schedule. When Reclamation provides a subsequently updated allocation, the Restoration Administrator shall provide an updated recommendation within 14 calendar days. In addition, the Restoration Administrator may submit a new Restoration Flow Schedule or revise an existing schedule at any time, provided that the recommendation is consistent with the Settlement and these Guidelines. Reclamation may request that the Restoration Administrator provide an updated recommendation or shorten the time that a recommendation is returned as necessary to assist in determination of water supply allocations, or to help manage operational issues or urgent or rapidly changing hydrologic conditions.

Reclamation shall coordinate with the Restoration Administrator on the execution of flow changes dictated by the most recently adopted Restoration Flow Schedule to occur after the most recent Restoration Allocation and Default Flow Schedule has been issued, yet prior to the time that an updated Restoration Administrator Recommendation has been approved.

Restoration Administrator recommendations include the following, as appropriate:

- **Restoration Flow Schedule –** The rate and timing of Friant Dam releases and/or flow targets at Gravelly Ford and other downstream locations across the current Restoration Year.

- **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 meet the provisions of Paragraphs 13(c).

- **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 Restoration Flows –** When Unreleased Restoration Flows are generated, the Restoration Administrator may make recommendations regarding the management of such water pursuant to paragraph 13(i) of the Settlement.

- **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.

6.2.4 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. In addition, Reclamation will assess whether the Restoration Administrator's Restoration Flow schedule is consistent with permit conditions and operating criteria.

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

- The recommended flow schedule does not exceed the most current Restoration Allocation as determined by the total remaining balance of allocation to date and pending Restoration Flow schedule.

- The recommended flow schedule is consistent with allowable flexible flow shift provisions, allowable Buffer Flow releases, and addresses recommended releases of purchased water pursuant to Paragraph 13(c).

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

- The Restoration Flows do not impact public safety.

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

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 calendar days of receipt.

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.

Once approved, Reclamation shall transmit approval and the Restoration Administrator's recommendation to Settling Parties and make it available to the public.

6.2.5 Management of Friant Dam Releases for Flow Targets

Reclamation will release the Restoration Flow Schedule at Friant Dam or otherwise make releases from Friant Dam to meet the Restoration Administrator's flow targets at Gravelly Ford and other specified locations. It is recognized that fluctuations in Holding Contract demand in Reach 1 and tributary flows may necessitate that Reclamation depart from the Restoration Administrator's scheduled releases at Friant Dam in order to meet the recommended flow targets at Gravelly Ford and other specified locations. Releases will meet channel losses and Holding Contract requirements in Reach 1, including attaining the 5 cfs of flow requirement at Gravelly Ford.

Reclamation shall also coordinate with San Joaquin River facility operators downstream of Gravelly Ford to meet the Restoration Administrator's recommended flow targets at downstream locations.

Section 7 of this guidance document describes procedures for compliance with Gravelly Ford flow targets and Section 5 regarding releases for Unexpected Seepage Losses.

6.2.5.1 Changes to Operating Criteria

Reclamation will notify the Restoration Administrator when conditions necessitate a change in operating criteria for Friant Dam or other downstream locations. Unless immediate action is required (e.g., to provide public health and safety), Reclamation will provide the Restoration Administrator with no less than a 24 hour notice in writing and by phone of changes to the Restoration Administrator's most recent approved flow recommendation. Reclamation will make Restoration Flow changes publically available and notify the Restoration Administrator and Settling Parties of any adjustments to the most recently approved Restoration Flow schedule.

6.2.5.2 Urgent Flow Changes

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.

6.2.5.3 Other Flow Adjustments

Reclamation may request, or the Restoration Administrator may submit, a written adjustment in Restoration Flows at any time to respond to changing conditions, new information, or to fine-tune a previously approved recommendation. This can be done in the absence of a new Restoration Allocation, a change to operating criteria, or an urgent situation. For example, this may be done to reschedule flows that were under or over the flow recommendation due to maintenance at Friant Dam (i.e. Paragraph 13(e)), to adaptively adjust to over or under releases at Gravelly Ford or at other target locations, to make flow changes at a more convenient time, to time flow pulses for fish migration or emigration, or other minor adjustments.

Such adjustments will be reviewed by Reclamation in 5 calendar days or less, and may be approved in writing without a full rescheduling of the annual allocation provided that: the adjustment does not result in a material increase in Restoration Flow release volume over the previously approved schedule; the adjustment is consistent with the Exhibit B flexible flow provisions without necessitating a water supply test; and such changes are documented by Reclamation and made available to the Settling Parties.

These non-material operational flow adjustments shall be in place until the next scheduled Restoration Flow change, unless otherwise described in writing. Reclamation may request that the Restoration Administrator provide an updated complete Restoration Flow schedule at a later date, and will typically do so when: the accumulated volume difference between one or more operational flow adjustments substantially exceeds the Restoration Allocation; the end of the Restoration Year is nearing; or a full and updated schedule is necessary for Restoration Flow management and accounting.

6.3 Flow Scheduling Flexibility and Water Supply Test

(Provisional section for 2017 Restoration Year — will expire March 1, 2018)

The Settlement sets forth the Base Flow hydrographs in Exhibit B, but also outlines provisions for flexibility in the scheduling of these flows. This flexibility is specifically described for flexible flow periods (Exhibit B 4(b)) and Buffer Flows (Exhibit B 4(c)), but is also broad, as described in Exhibit B 4(d);

"The Restoration Administrator may recommend additional changes in specific release schedules within an applicable hydrograph… 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"

This Exhibit B 4(d) text describes two constraints on flexibly scheduling Restoration Flows:

1. The Restoration Administrator must provide a Restoration Flow Schedule that is equal to or less than the latest Restoration Allocation volume.

2. Changes to the Restoration Flow Schedule beyond those specifically called for in the Settlement must not materially increase the water delivery reductions to any Friant Division long-term contractor.

The first constraint is addressed in Section 6.2.4, Consistency of Restoration Administrator Recommendations with Settlement and Settlement Act. Reclamation will evaluate the Restoration Administrator's recommended Restoration Flow Schedule to ensure the recommended volume scheduled does not exceed the most current Restoration Allocation. The second constraint is addressed in this section, and will be referred to as the "Water Supply Test." The Water Supply Test is distinct from Appendix H – RWA Impact Calculation and Water Use Curve Model Documentation. As discussed in Section 6.2.5.3, uncertainty in the system may result in releases which do not precisely match the Restoration Flow Schedule. Forecasting changes may also unexpectedly change the Restoration Allocation, resulting in unintended over or under releases in a given flow period.

Flexibility for Buffer Flows (Paragraph 13(a)) is provided in Section 1.4. There is no Water Supply Test for determining the release of Buffer Flows. The Water Supply Test is distinct from Appendix H, Step 1, Item 12 which calculates the RWA Impacts attributable to Buffer Flows.

Return of water that was banked, stored, or exchanged under provisions of Paragraph 13(i) does not require a Water Supply Test.

6.3.1 Flexibility Provided to the Restoration Administrator in Scheduling Flows

The Settlement outlines several specific flexibilities that are always available to the Restoration Administrator, and do not require a Water Supply Test. These include:

- Exhibit B 4(b) – the ability to flexibly schedule Restoration Flows within the Spring Flexible Flow Period and Fall Flexible Flow Period. These Flexible Flow Periods are depicted in Figure 5 below.

- Exhibit B 4(c) – the ability to flexibly schedule Buffer Flows within specific periods.

- Paragraph 13(e) – the ability to reschedule flows that were under or over the approved Flow Schedule due to investigating, inspecting, maintaining, repairing, or replacing Friant Division facilities of the Central Valley Project. In the case of 13(e), Reclamation schedules the balance of flows in consultation with the Restoration Administrator.

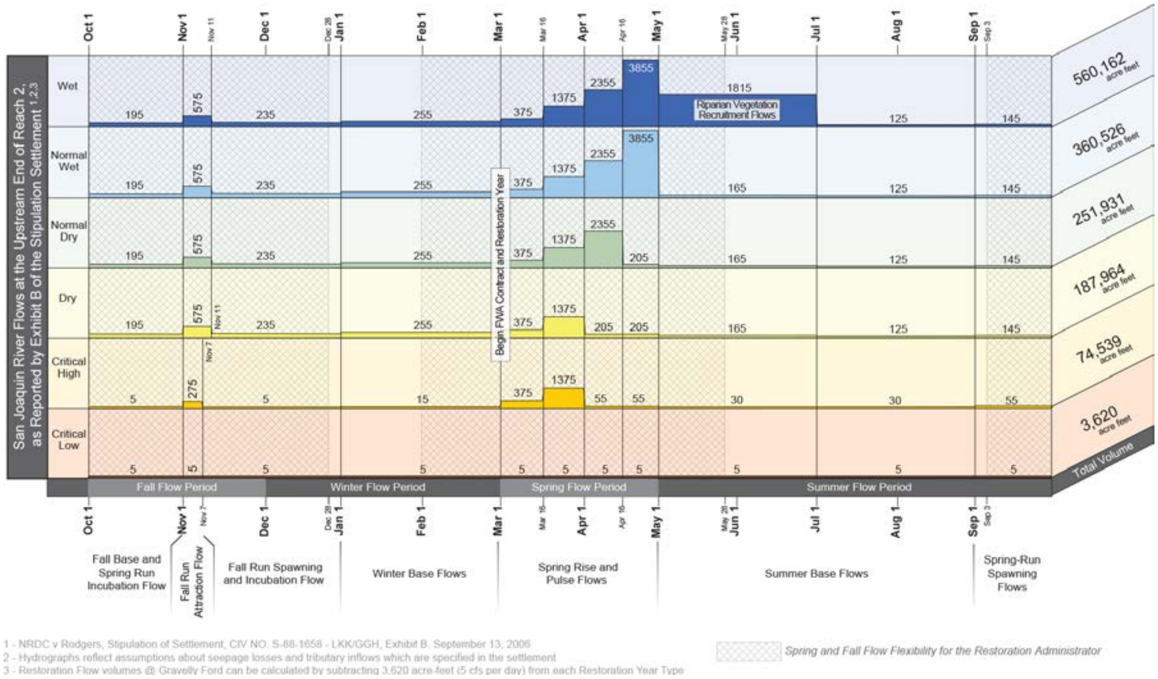

Figure 5.
SJRRP Exhibit B Default Flows at Gravelly Ford, with Spring and Fall Flexible Flow Periods are shown as cross-hatched areas.

Reclamation shall determine the consistency of the Restoration Administrator's Restoration Flow Schedule with provisions in the Settlement and Settlement Act, and if consistent, will implement the recommended Restoration Flow Schedule (including Buffer Flows and Paragraph 13(i) water). Deviations in flow period volumes between the Restoration Flow schedule and the Default Flow Schedule outside of the specific Settlement flexibilities described above are allowed, but may require a Water Supply Test. Possible Restoration Flow Schedules that may require a Water Supply Test include, but are not limited to:

- Daily or monthly variability in flow rates within the Summer and Winter Base Flow periods, provided that the total scheduled volume within that flow period is equal to the volume specified in the applicable Default Flow Schedule for that flow period.
- Transfer of water between flow periods, such that the total annual Restoration Flow volume is equal to the volume specified in the applicable hydrograph, but the volume utilized in each flow period may differ.
- Transfer of flow between Restoration Years
- Paragraph 13(i) water

These possibilities are individually addressed in the Water Supply Test.

6.3.2 Water Supply Test

Changes to the Restoration Flow Schedule pursuant to Exhibit B 4(d) beyond those specified in the Settlement are subject to a Water Supply Test to verify that, based on the most current available information, the recommended Restoration Flow Schedule is not anticipated to materially increase the water supply reductions of any Friant Division long-term contractor. Material impacts to the Friant water supply may be caused by one of the following:

- Flood Management Actions – if spills or uncontrolled season occur due to a postponement in the release of Restoration Flows, which otherwise would have been avoided using the Default Flow Schedule and flexible flow provisions in the Settlement.

- Dead pool constraints – if Millerton Reservoir will prematurely reach dead pool conditions which limit deliveries to the Friant contractors due to an advanced release of Restoration Flows, which otherwise would have been postponed using the Default Flow Schedule and flexible flow provisions in the Settlement and delivered so as not to cause dead pool conditions.

The Water Supply Test will compare the recommended Restoration Flow Schedule to the appropriate Default Flow Schedule with the flexibility provisions outlined in Exhibit B. Water Supply Tests will be conducted using reservoir operational data aggregated by month, with the ability to discern whether a) flood management actions are increased in length or advanced earlier in the year, b) release of rescheduled Restoration Flows after a flood management period would diminish residual water supplies for Friant Contractors that would have been available in the absence of the rescheduled Restoration Flows or c) if dead pool is reached earlier in the year and or made longer in duration.

Restoration Flows approved by Reclamation and subsequently released will not later be determined to be an increased water supply reduction. Once a Restoration Flow Schedule is determined to not materially increase the water delivery reductions to any Friant Division long-term contractor, it may be released unless a new Restoration Flow recommendation has been submitted and approved, or if unexpected flood management operations are required prior to the release of rescheduled Restoration Flows. In those cases, an additional Water Supply Test may be warranted based on the criteria described above.

6.3.2.1 Transfers within a Flow Period

Flows within the Spring Period (March 1 – May 1) and Fall Period (October 1 – November 30) are permitted for flexible management within the Settlement. Per Exhibit B Paragraph 4(b), the volume within these two flow periods may be shifted up to four weeks earlier or later (i.e. may be shifted atop the adjacent summer or winter base flow periods) as shown in Figure 5. However, transfers within the Summer Base Flow and Winter Base Flow periods may be subject to a Water Supply Test, and if so required, approved only if there is no material impact to the Friant Division water supply.
The Restoration Administrator may recommend daily flow rates below those found in the appropriate Default Hydrograph at any time without the application of a Water Supply Test.

6.3.2.2 Transfers between Flow Periods
This section will be developed in the future by the Settling Parties and Implementing Agencies.

6.3.2.3 Transfers between Restoration Years
This section will be developed in the future by the Settling Parties and Implementing Agencies if transfers between Restoration Years are determined to be consistent with the Settlement.

6.3.2.4 Paragraph 13(i) Water
Water pursuant to Paragraph 13(i), referred to as "Unreleased Restoration Flows," is interrelated with the Restoration Flow Schedule and may be subject to a Water Supply Test with similar concepts attributable to the management of 13(i) water. This section will be developed in the future by the Settling Parties and Implementing Agencies under Section 5.

6.4 Flow Flexibility for Allocation Management

(Provisional section for 2017 Restoration Year — will expire March 1, 2018)

The Restoration Administrator has the responsibility to provide Reclamation with a recommended Restoration Flow Schedule that is equal to or less than the Restoration Allocation volume. Changes in volume from one Restoration Allocation to another, and cumulative error in release volumes at Gravelly Ford may require the Restoration Administrator to update the then-current Restoration Flow Schedule in order to not exceed the most recent Restoration Allocation. The Restoration Administrator is provided the flexibility to adjust the Restoration Flow Schedule to the extent necessary for account balancing. This is distinct from those flow shifts recommended by the Restoration Administrator for purposes other than to more closely match the allocation (as described in Section 6.3).

6.4.1 Managing Changing Allocations
Prior to and including the final Restoration Allocation, the Restoration Administrator must submit a corresponding Restoration Flow Schedule that does not exceed the Restoration Allocation volume. Changes in the volume from one Restoration Allocation to another will necessitate changes to the flow schedule, which may require that volumes be shifted from one flow period (i.e. spring, summer, fall, winter) to another. Such changes to the Restoration Flow Schedule should be planned and executed promptly, though they may be extended in duration across the remaining Restoration Year. A Water Supply Test is not required for such changes provided that each and every flow change result in matching the Restoration Allocation as closely as possible and the total volume shifted does not exceed the most recent change in allocation.

6.4.2 Managing Release Error

Release error is defined as unintended deviation from the Restoration Flow Schedule. At any point during the Restoration Year, the Restoration Flow release at Gravelly Ford may not exactly match the Restoration Flow Schedule. These deviations are caused through operational uncertainties, and cannot all be accounted for at the time a Restoration Flow Schedule is submitted and approved. This is distinct from flow deviations due to Friant Division operation and maintenance procedures described in Paragraph 13(e), and procedures for Restoration Flows that cannot be released, as described in Paragraph 13(i).When this occurs:

1. Reclamation shall determine the difference between the released Restoration Flow volume and the Restoration Flow Schedule volume at Gravelly Ford.

$$Scheduled\ RF\ Release\ (AF) - RF\ Released\ (AF) = \Delta_{RF}\ (AF)$$

   Release error ($\boldsymbol{\Delta}_{RF}$) represents the difference between the Restoration Flow Schedule and the released volume of Restoration Flows to date. $\boldsymbol{\Delta}_{RF}$ is created through unavoidable or unintentional operational deviations.

2. Reclamation shall request the Restoration Administrator provide a new Restoration Flow Schedule when $\boldsymbol{\Delta}_{RF}$ is significant, such that the actual Restoration Flow volume released (including any volume of Restoration Flows that is not scheduled for release and has been committed for sale or exchange pursuant to Paragraph 13(i)) plus the future Restoration Flow Schedule (including any planned Restoration Flow volume that will not be released) does not exceed the Restoration Allocation.

$$\begin{aligned}[&Released\ Flows\ (AF) \\ &+ Committed\ Restoration\ Flows\ not\ scheduled\ for\ release\ (AF)\ ] \\ &+ [Scheduled\ Flows\ (AF) \\ &+ Restoration\ Flows\ not\ for\ scheduled\ release\ (AF)] \\ &\leq Restoration\ Allocation\ (AF)\end{aligned}$$

   By necessity, rescheduling $\boldsymbol{\Delta}_{RF}$ may result in changes to the daily flow rates during the Summer Base Flow and Winter Base Flow periods, and potentially between season transfers. A Water Supply Test is not required to reschedule $\boldsymbol{\Delta}_{RF}$, provided that only the volume identified as $\boldsymbol{\Delta}_{RF}$ is rescheduled.

7 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 month. Reclamation and the implementing agencies will assist the Restoration Administrator and the Technical Advisory Committee (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.

7.1 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).

7.2 Development and Publication of the Monitoring and Analysis Plan

The Monitoring and Analysis Plan will include the following information:

1. 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)

2. 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.

3. 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.

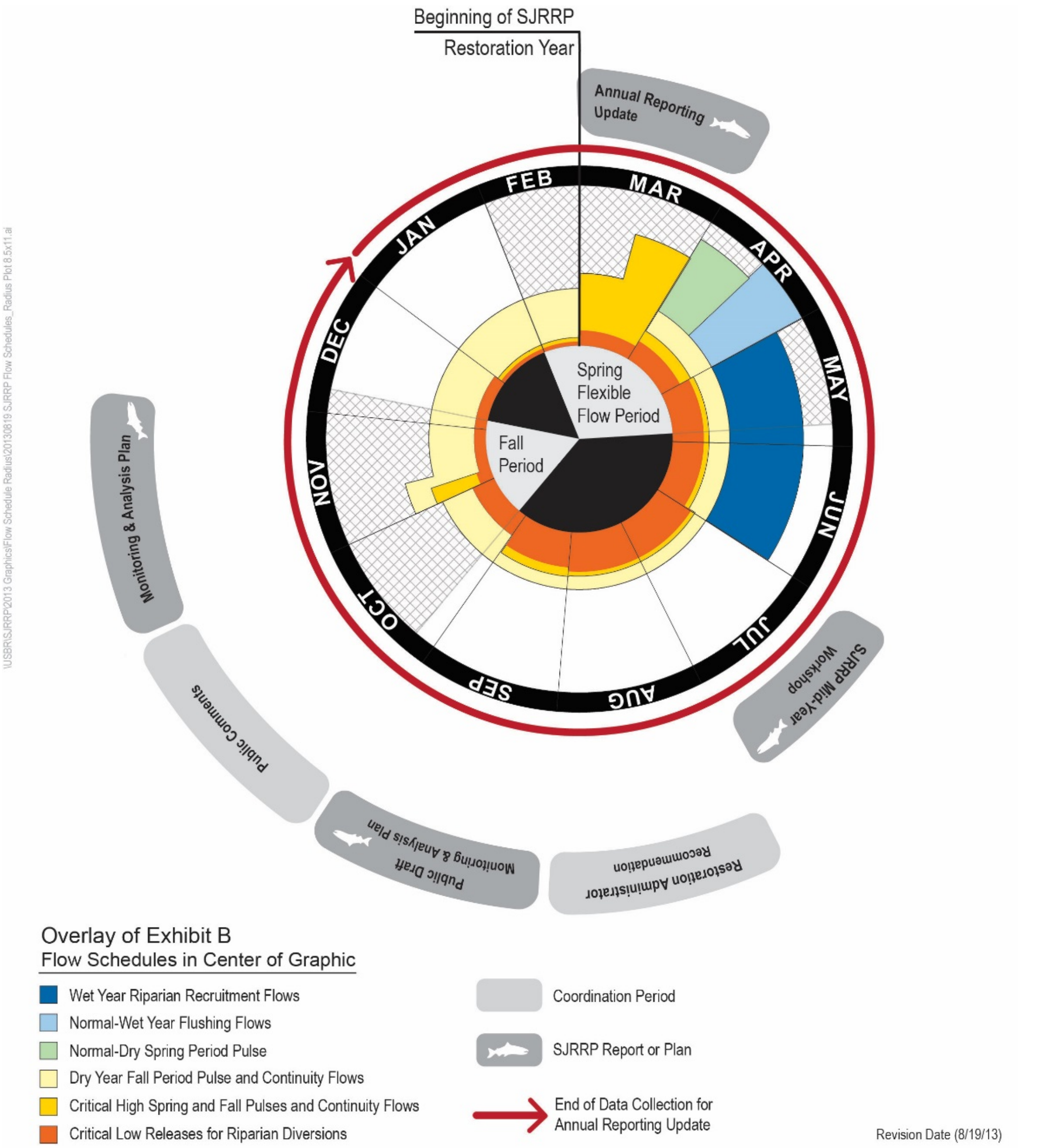

Figure 6.
Publication Schedule for SJRRP Monitoring and Analysis Plan

7.3 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 recommendations 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 6:00 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; on Mondays and Fridays, and will 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 releases 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 7^{th} 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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8 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.

8.1 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. In order 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. A more detailed step-by-step procedure for calculating the net reduction in water deliveries is 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 contract 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 is equal to 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 will 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 (TAF)	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 is equal to the deliveries plus storage up to a maximum of the full contract amounts for Class 1 and Class 2, approximately 2.2 million 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 Flow 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 H. 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 when releasing water for flood management in excess of the Restoration Flow Schedule.

8.1.1 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, the calculated net reduction in water deliveries will decrease.

RWA balances will be decreased for programs and projects undertaken or funded by Reclamation or other federal agencies or agencies 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.

8.2 Accounting for Reductions in Water Deliveries

Reclamation will maintain an accounting for each Friant Division long-term contractor 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.

8.2.1 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.

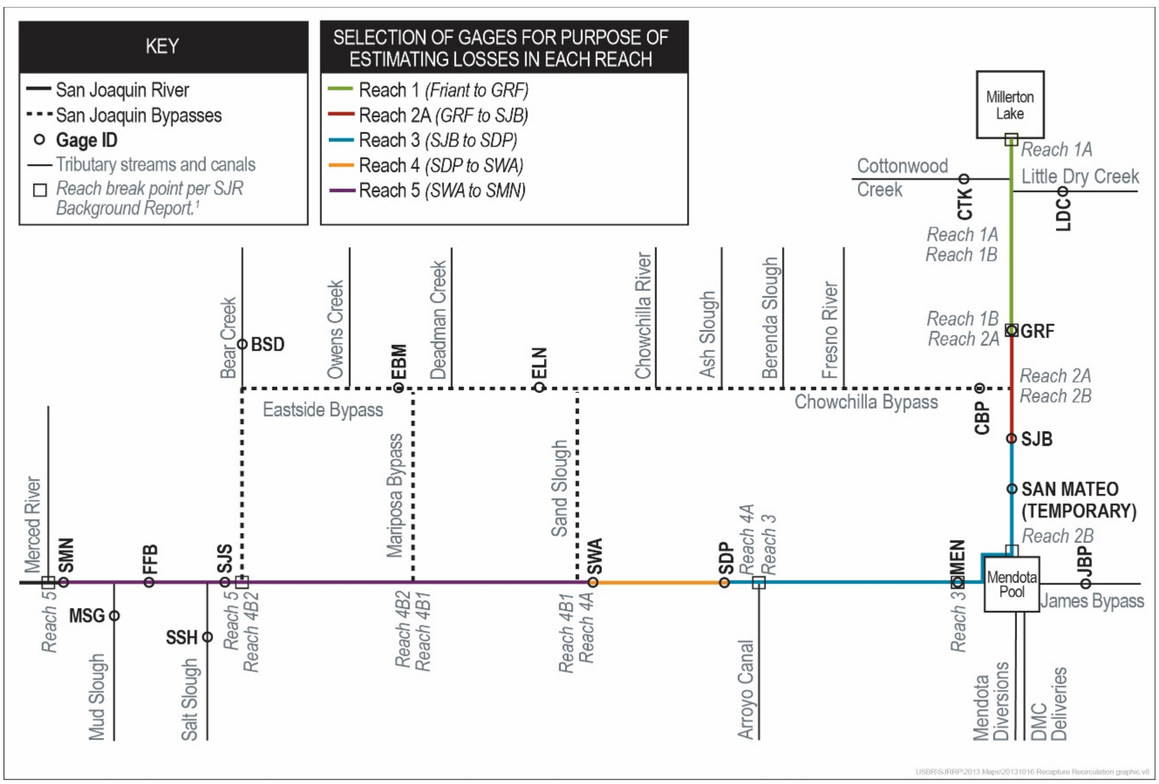
8.2.2 Transfers of RWA Balances

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.

9 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 7.
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 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 (SDP)

Reach 4 – Below Sack Dam (SDP) 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 (through November 6 in critical years)

Fall-Run Spawning and Incubation Flow – November 11 (from 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.

9.1 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.

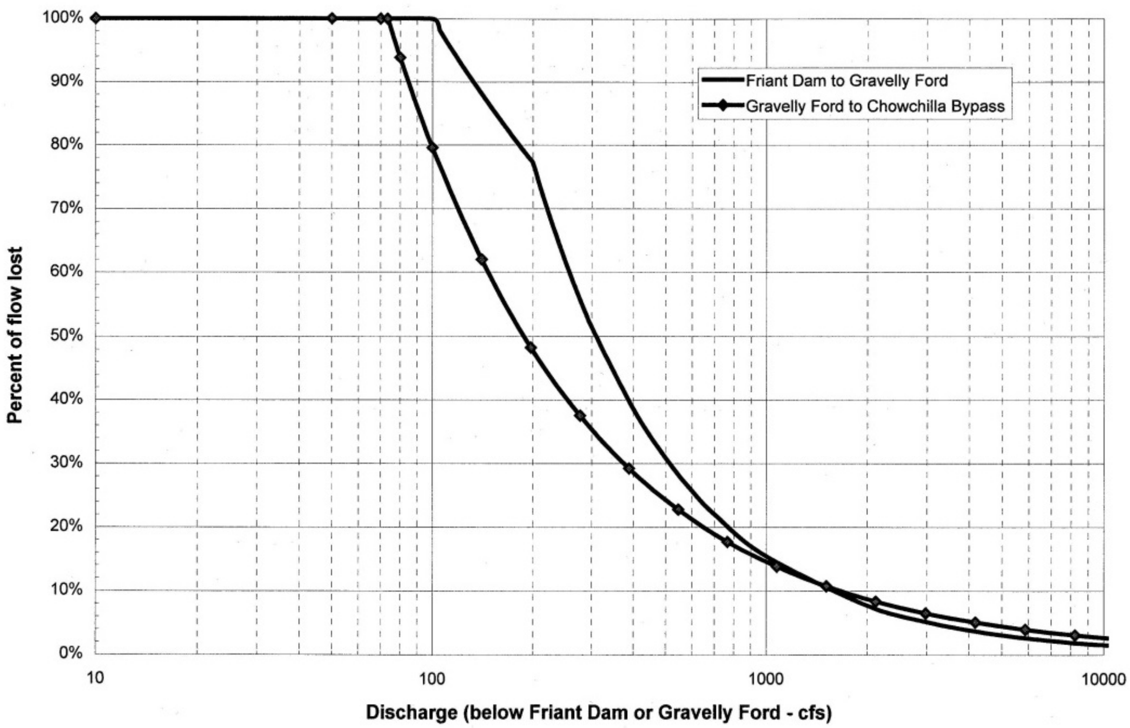


Figure 2-4. Estimated flow loss curves for the San Joaquin River between Friant Dam and Gravelly Ford, and between Gravelly Ford and the Chowchilla Bifurcation Structure.

Figure 8.
Relationship between Flows at Gravelly Ford Gage Station and Losses in Reach 2

Exhibit B assumes no losses in Reach 2B between the San Joaquin River Control Structure (at the Chowchilla Bypass) and Mendota Pool.

9.2 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.

9.3 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.

9.4 Reach 5

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

10 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 Restoration Flow Schedule or hydrograph-based flow schedules described in Exhibit B. For the purposes of this section, unforeseen or extraordinary circumstances are unlikely or 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.

10.1 Qualification Factors for Real-Time Changes

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:

10.1.1 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.

10.1.2 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.

10.1.3 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.

10.1.4 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.

10.2 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 Restoration Flow Schedule as soon as possible.

10.3 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 Restoration 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.

11 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 required 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 rescheduled 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 Restoration Year, less the volume of Riparian Recruitment flows that has already been scheduled and released for the Restoration 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 will 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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12 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 receiving the additional information from the requesting party, 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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13 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.

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

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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 thousand acre-feet (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. When possible, Unimpaired Water Year Runoff forecasts should be calculated to the nearest 1 TAF and the final Unimpaired Water Year Runoff should be calculated to the nearest 1 acre-foot. SJRRP allocations should then be calculated based on these more precise values.

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

Restoration Year Type	Unimpaired Water Year Runoff (TAF)	Friant Dam Release Volume (TAF)	SJRRP Annual Allocation at Gravelly Ford (TAF)	Restoration Year Type	Unimpaired Water Year Runoff (TAF)	Friant Dam Release Volume (TAF)	SJRRP Annual Allocation at Gravelly Ford (TAF)
Critical-Low	Up to 400	116.866	0	Normal-Dry	930	330.300	213.355
Critical-High	400 up to 670	187.785	70.919		940	331.646	214.701
Dry	670	272.280	155.335		950	332.992	216.047
	680	274.512	157.566		960	334.338	217.393
	690	276.743	159.798		970	335.685	218.739
	700	278.975	162.029		980	337.031	220.085
	710	281.206	164.261		990	338.377	221.431
	720	283.438	166.492		1000	339.723	222.778
	730	285.669	168.724		1010	341.069	224.124
	740	287.901	170.955		1020	342.415	225.470
	750	290.132	173.187		1030	343.762	226.816
	760	292.364	175.418		1040	345.108	228.162
	770	294.595	177.650		1050	346.454	229.508
	780	296.827	179.881		1060	347.800	230.855
	790	299.058	182.113		1070	349.146	232.201
	800	301.290	184.345		1080	350.492	233.547
	810	303.522	186.576		1090	351.838	234.893
	820	305.753	188.808		1100	353.185	236.239
	830	307.985	191.039		1110	354.531	237.585
	840	310.216	193.271		1120	355.877	238.931
	850	312.448	195.502		1130	357.223	240.278
	860	314.679	197.734		1140	358.569	241.624
	870	316.911	199.965		1150	359.915	242.970
	880	319.142	202.197		1160	361.262	244.316
	890	321.374	204.428		1170	362.608	245.662
	900	323.605	206.660		1180	363.954	247.008
	910	325.837	208.891		1190	365.300	248.355
	920	328.068	211.123		1200	366.646	249.701

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

Restoration Year Type	Unimpaired Water Year Runoff (TAF)	Friant Dam Release Volume (TAF)	SJRRP Annual Allocation at Gravelly Ford (TAF)	Restoration Year Type	Unimpaired Water Year Runoff (TAF)	Friant Dam Release Volume (TAF)	SJRRP Annual Allocation at Gravelly Ford (TAF)
Normal-Dry (contd.)	1210	367.992	251.047	Normal-Wet (contd.)	1720	438.126	321.180
	1220	369.338	252.393		1730	439.527	322.581
	1230	370.685	253.739		1740	440.928	323.982
	1240	372.031	255.085		1750	442.329	325.383
	1250	373.377	256.431		1760	443.730	326.784
	1260	374.723	257.778		1770	445.130	328.185
	1270	376.069	259.124		1780	446.531	329.586
	1280	377.415	260.470		1790	447.932	330.987
	1290	378.762	261.816		1800	449.333	332.388
	1300	380.108	263.162		1810	450.734	333.789
	1310	381.454	264.508		1820	452.135	335.190
	1320	382.800	265.855		1830	453.536	336.591
	1330	384.146	267.201		1840	454.937	337.992
	1340	385.492	268.547		1850	456.338	339.393
	1350	386.838	269.893		1860	457.739	340.794
	1360	388.185	271.239		1870	459.140	342.195
	1370	389.531	272.585		1880	460.541	343.595
	1380	390.877	273.931		1890	461.942	344.996
	1390	392.223	275.278		1900	463.343	346.397
	1400	393.569	276.624		1910	464.744	347.798
	1410	394.915	277.970		1920	466.145	349.199
	1420	396.262	279.316		1930	467.546	350.600
	1430	397.608	280.662		1940	468.947	352.001
	1440	398.954	282.008		1950	470.348	353.402
Normal-Wet	1450	400.300	283.355		1960	471.749	354.803
	1460	401.701	284.755		1970	473.150	356.204
	1470	403.102	286.156		1980	474.550	357.605
	1480	404.503	287.557		1990	475.951	359.006
	1490	405.904	288.958		2000	477.352	360.407
	1500	407.305	290.359		2010	478.753	361.808
	1510	408.706	291.760		2020	480.154	363.209
	1520	410.107	293.161		2030	481.555	364.610
	1530	411.508	294.562		2040	482.956	366.011
	1540	412.909	295.963		2050	484.357	367.412
	1550	414.310	297.364		2060	485.758	368.813
	1560	415.710	298.765		2070	487.159	370.214
	1570	417.111	300.166		2080	488.560	371.615
	1580	418.512	301.567		2090	489.961	373.015
	1590	419.913	302.968		2100	491.362	374.416
	1600	421.314	304.369		2110	492.763	375.817
	1610	422.715	305.770		2120	494.164	377.218
	1620	424.116	307.171		2130	495.565	378.619
	1630	425.517	308.572		2140	496.966	380.020
	1640	426.918	309.973		2150	498.367	381.412
	1650	428.319	311.374		2160	499.768	382.822
	1660	429.720	312.775		2170	501.169	384.223
	1670	431.121	314.175		2180	502.570	385.624
	1680	432.522	315.576		2190	503.970	387.025
	1690	433.923	316.977		2200	505.371	388.426
	1700	435.324	318.378		2210	506.772	389.827
	1710	436.725	319.779		2220	508.173	391.228

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

Restoration Year Type	Unimpaired Water Year Runoff (TAF)	Friant Dam Release Volume (TAF)	SJRRP Annual Allocation at Gravelly Ford (TAF)
Normal-Wet (Cont'd)	2230	509.574	392.629
	2240	510.975	394.030
	2250	512.376	395.431
	2260	513.777	396.832
	2270	515.178	398.233
	2280	516.579	399.634
	2290	517.980	401.035
	2300	519.381	402.435
	2310	520.782	403.836
	2320	522.183	405.237
	2330	523.584	406.638
	2340	524.985	408.039
	2350	526.386	409.440
	2360	527.787	410.841
	2370	529.188	412.242
	2380	530.589	413.643
	2390	531.990	415.044
	2400	533.390	416.445
	2410	534.791	417.846
	2420	536.192	419.247
	2430	537.593	420.648
	2440	538.994	422.049
	2450	540.395	423.450
	2460	541.796	424.851
	2470	543.197	426.252
	2480	544.598	427.653
	2490	545.999	429.054
	2500	547.400	430.455
Wet	Above 2500	673.488	556.542

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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. The tables in this appendix were developed using the ‘gamma’ transformation pathway, described in the PEIS/R and shown as Figure C-1. The four transformation pathways analyzed in the PEIS/R differ in their treatment of Restoration Annual Allocations that fall between the Exhibit B flow schedules for Critical-High and Dry Restoration Year Types.

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. Flows 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. The Default Flow Schedules are also shown graphically in Figures C-2 through C-7.

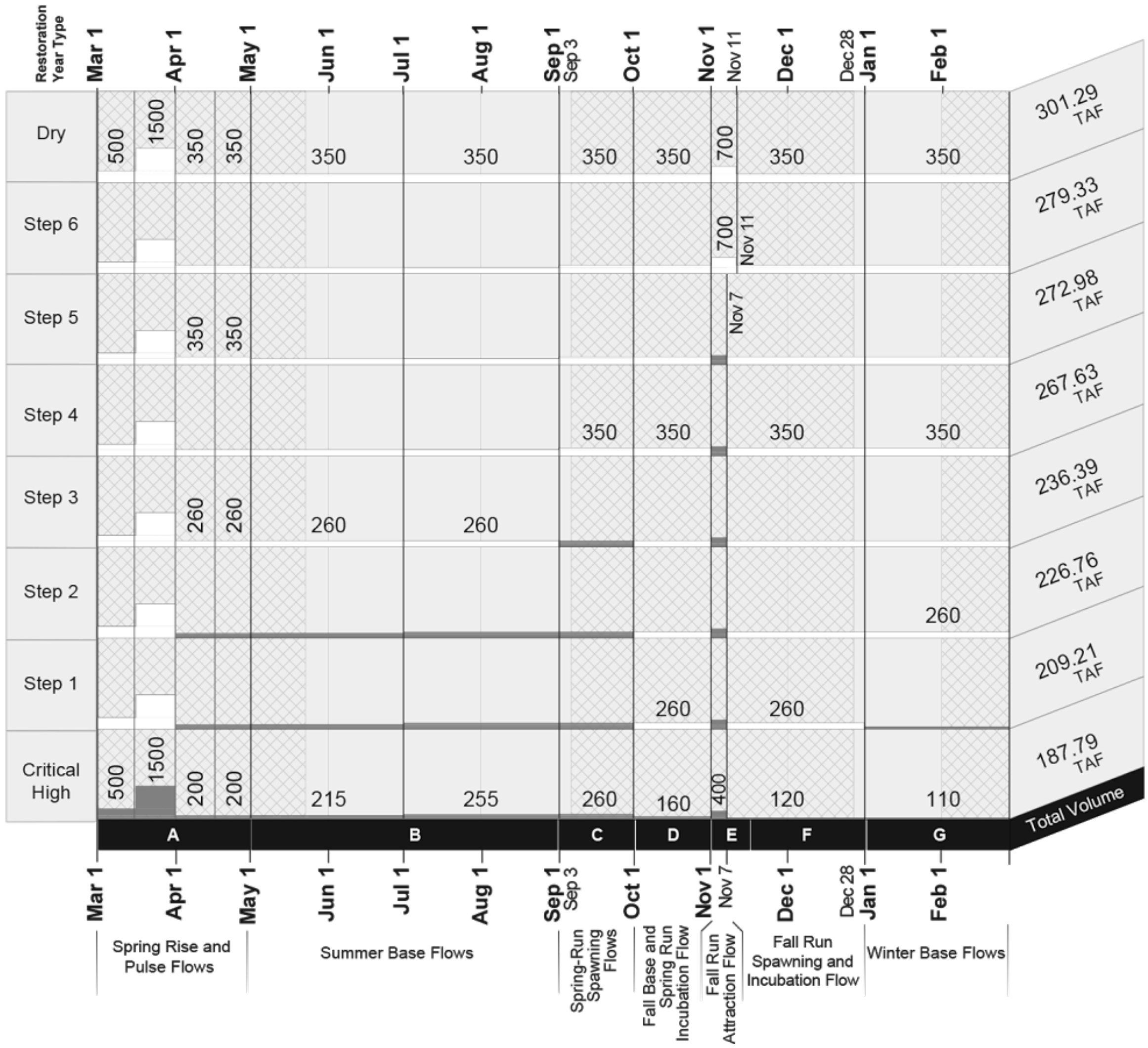


Figure C-1.
Gamma Transformation Pathway

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
transitional	266,926	500	252,050	1,500	204,447	350	194,033	350	183,620	215	170,400	215	157,607	255
transitional	258,000	500	243,124	1,500	195,521	200	189,570	200	183,620	215	170,400	215	157,607	255
transitional	226,760	500	211,884	1,500	164,281	200	158,330	200	152,380	215	139,160	215	126,367	255
transitional	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
transitional	141,928	255	350	350	400	350	350	350
transitional	141,927	255	350	350	400	350	350	350
transitional	110,687	255	260	260	400	260	260	260
transitional	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
transitional	266,926	375	255,769	1,375	212,133	205	206,033	205	199,934	30	198,090	30	196,305	30
transitional	258,000	375	246,843	1,375	203,207	55	201,570	55	199,934	30	198,089	30	196,304	30
transitional	226,760	375	215,603	1,375	171,967	55	170,330	55	168,694	30	166,849	30	165,064	30
transitional	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
transitional	194,460	30	145	195	275	235	235	255
transitional	194,460	30	145	195	275	235	235	255
transitional	163,220	30	55	105	275	145	145	165
transitional	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
	266,926	285	258,447	1,225	219,571	125	215,852	125	212,133	0	212,133	0	212,133	0
	258,000	285	249,521	1,225	210,645	0	210,645	0	210,645	0	210,645	0	210,645	0
	226,760	285	218,281	1,225	179,405	0	179,405	0	179,405	0	179,405	0	179,405	0
	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
	212,133	0	65	115	175	135	155	175
	210,645	0	65	115	175	135	155	175
	179,405	0	0	25	175	45	65	85
	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

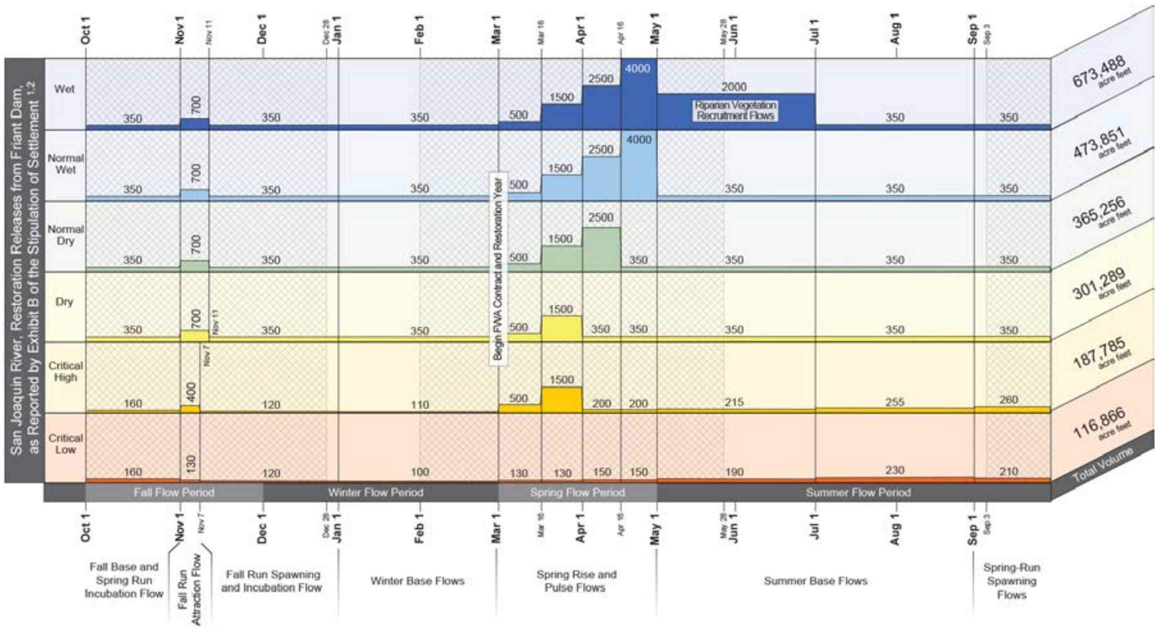
Date	March 1-15		March 16-31		April 1-15		April 16-30		May 1-31		June 1-30		July 1-31	
Year Type	Remaining Allocation (AF)	Default Release (ft^3/s)	Remaining Allocation (AF)	Default Release (ft^3/s)	Remaining Allocation (AF)	Default Release (ft^3/s)	Remaining Allocation (AF)	Default Release (ft^3/s)	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	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 (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	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.

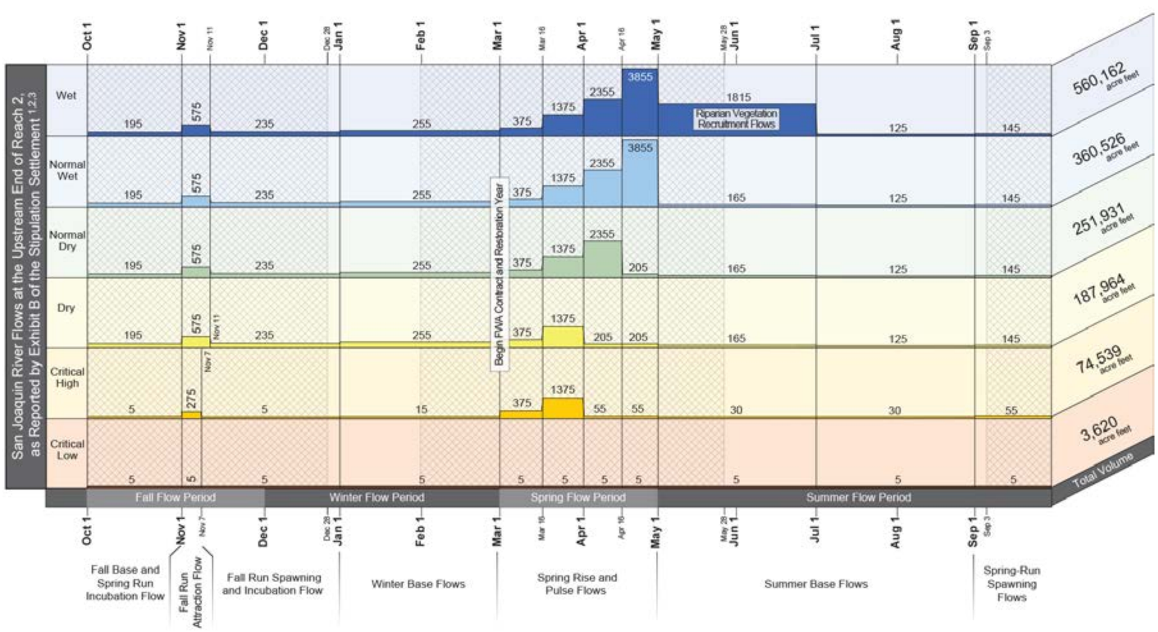
San Joaquin River, Restoration Releases from Friant Dam,
as Reported by Exhibit B of the Stipulation of Settlement[1,2]



1 - NRDC v Rodgers, Stipulation of Settlement, CIV NO: S-88-1658 - LKK/GGH, Exhibit B, September 13, 2006
2 - Hydrographs reflect assumptions about seepage losses and tributary inflows which are specified in the settlement

Spring and Fall Flow Flexibility for the Restoration Administrator

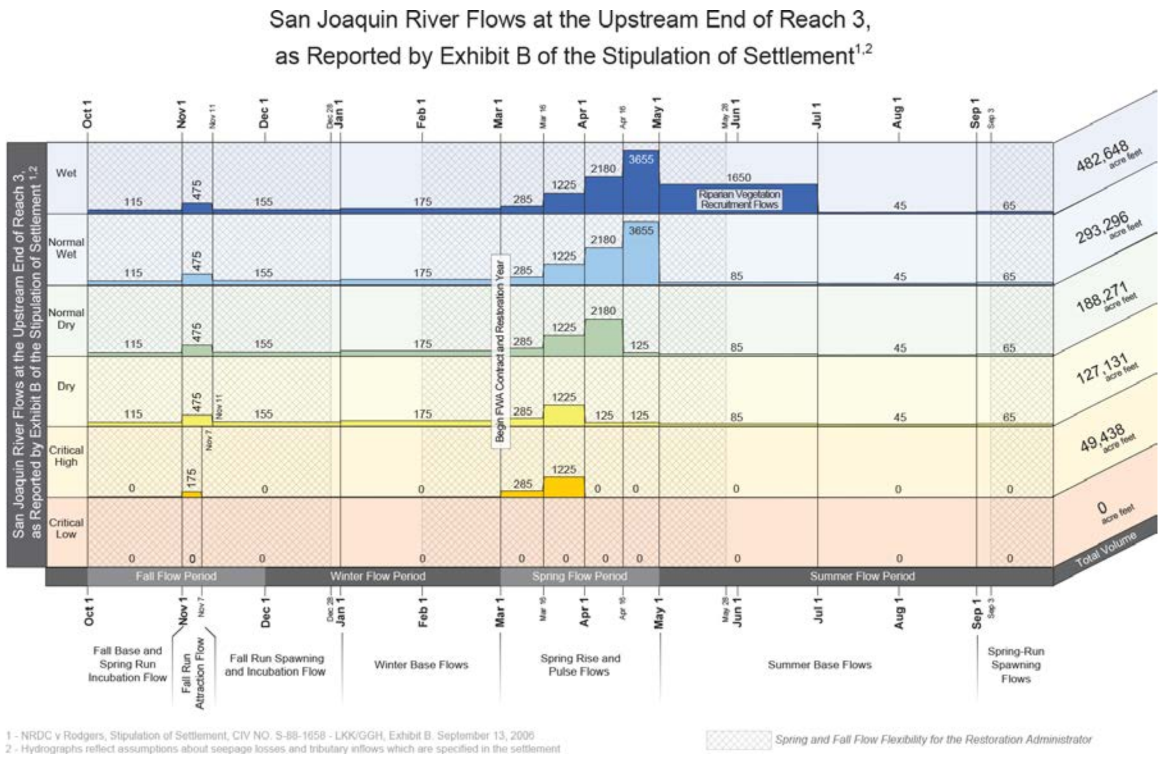
San Joaquin River Flows at the Upstream End of Reach 2,
as Reported by Exhibit B of the Stipulation of Settlement[1,2,3]



1 - NRDC v Rodgers, Stipulation of Settlement, CIV NO: S-88-1658 - LKK/GGH, Exhibit B, September 13, 2006
2 - Hydrographs reflect assumptions about seepage losses and tributary inflows which are specified in the settlement
3 - Restoration Flow volumes @ Gravelly Ford can be calculated by subtracting 3,620 acre-feet (5 cfs per day) from each Restoration Year Type

Spring and Fall Flow Flexibility for the Restoration Administrator

Figure C-2 & C-3.
Default Flows at Friant Dam (above) and at Gravelly Ford (below)



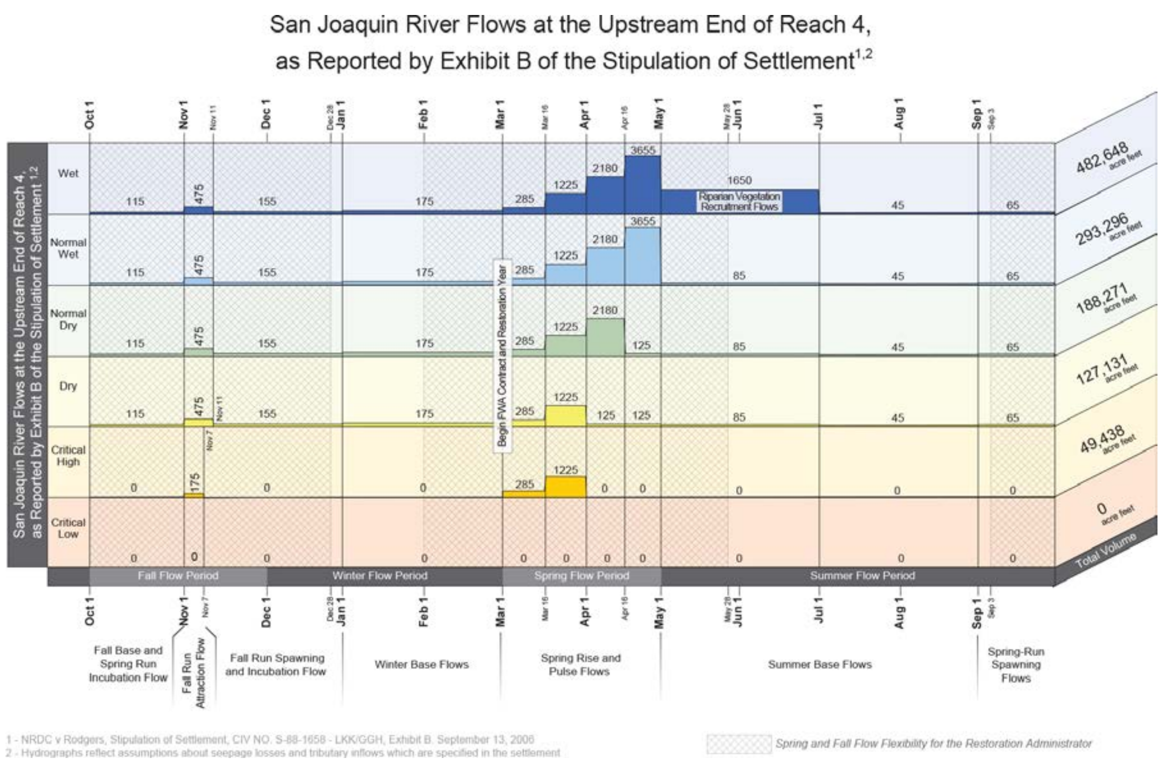
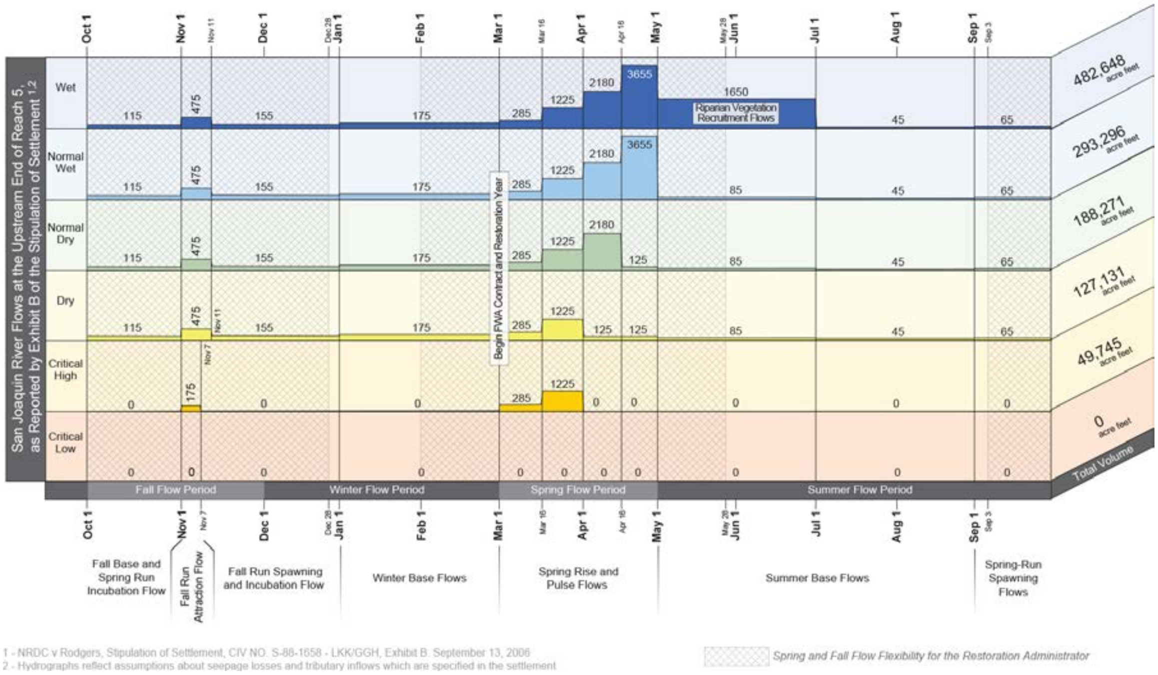


Figure C-4 & C-5.
Default Flows at Head of Reach 3 (above) and at Head of Reach 4 (below)

San Joaquin River Flows at the Upstream End of Reach 5, as Reported by Exhibit B of the Stipulation of Settlement[1,2]



San Joaquin River Flows at the Upstream End of the Confluence with the Merced River, as Reported by Exhibit B of the Stipulation of Settlement[1,2]

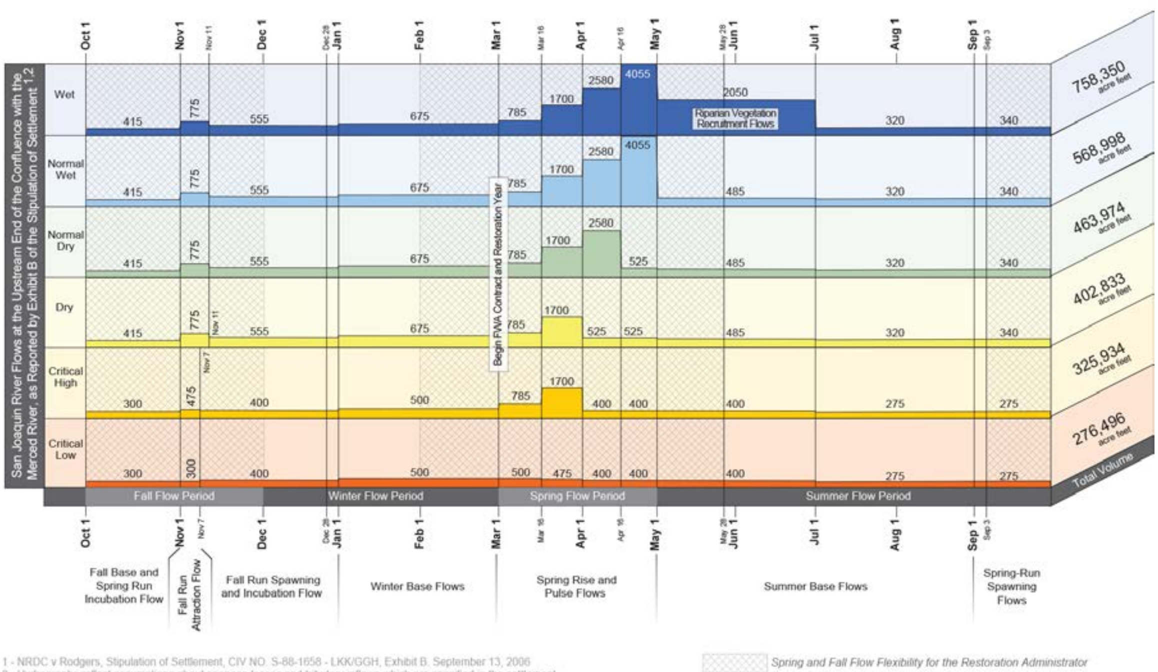


Figure C-6 & C-7.
Default Flows at Head of Reach 5 (above) and below confluence with Merced River (below)

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Restoration Flows Guidelines

Appendix D – Exhibit B of the Settlement

SAN JOAQUIN RIVER
RESTORATION PROGRAM

February 2017

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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]

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.)	116,662	116,662	60,568	276,012	3,614	0	0	0	275,468
	Assumed Riparian Release	116,662								
	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 lose 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	80	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	150	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 1995-2000 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.
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	275,220	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 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 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	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	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 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 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: 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	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 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.

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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Appendix E – Reach Definitions and CDEC Gages

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Appendix E – Reach Definitions and CDEC Gages

Figure E-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

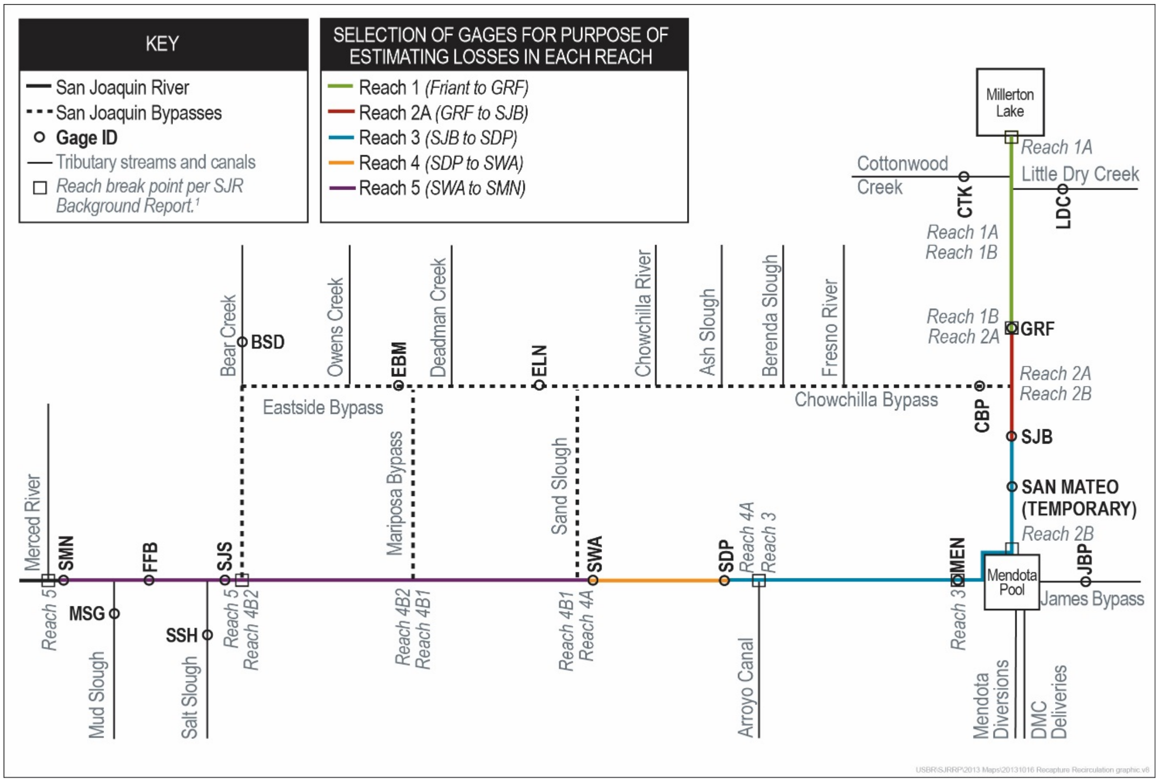

Figure E-6.
Gages and Reaches of the San Joaquin River in the SJRRP Restoration Area

Table E-1.
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

Note: Gages in **bold** constitute the minimum set required by the Settlement.

Restoration Flows Guidelines

Appendix F – Gravelly Ford Compliance

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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 of 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 that includes 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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Appendix G – Replacement or Offset Programs and Projects

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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	Authority	Status	Projected Date of Completion
Tulare Irrigation District Cordinated Basin Ground Water Storage	Public Law 111-11, Title X, Part III, SEC. 10202	Under construction	August 2018
Porterville Irrigation District In-Lieu Service Area	Public Law 111-11, Title X, Part III, SEC. 10202	Public review of Environmental Assessment complete.	August 2018
Pixley Irrigation District Ground Water Storage Bank	Public Law 111-11, Title X, Part III, SEC. 10202	During public review, issues were identified and are being addressed	2019
Shafter-Wasco Irrigation District Kimberlina Road Ground Water Storage Bank	Public Law 111-11, Title X, Part III, SEC. 10202	Public Draft EA will be ready in August 2016	August 2018
Friant-Kern Canal Reverse Pump Facilities	Omnibus Public Lands Bill of 2009 (Public Law 111-11), Title IX, Subtitle F (Secure Water), Section 9504(a)(1)(C) and (D)	Award of a Financial Assistance Agreement for the planning, design and construction of facilities expected in August 2016.	December 2018
Long-term Recapture and Recirculation Plan			

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Restoration Flows Guidelines

Appendix H – RWA Calculation Process

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Appendix H - RWA Calculations and Water Use Curve Model Documentation

Purpose

This appendix to the Restoration Flow Guidelines provides the background and documents of 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 (Guidelines) 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 these Guidelines.

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 and does not consider baseline conditions; it does, however, include 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. Section 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 available water supplies that could be captured by Friant Districts both with and without a 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 2,200,000 AF, 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 WUC's, calculates average impacts of approximately 185,000 AF/ year.
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 AF, 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 AF 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 Section 13(j)(iii) of these Guidelines. 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. for Section 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 Section 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 185,000 AF/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, to reflect the delivery reductions to the Contractors at the canal turnouts and to calibrate the model that will derive the average reduction of 185,000 AF/YR, canal losses were assumed to be 1.5% of available water at canal headworks.[4]

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, 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:

[4] 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.

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

Month	% Contract (revised)	Diversion Rate (cfs)	% Contract (original)	Diversion Rate (cfs)
March	7	1,593.8	20	4,553.8
April	12	2,823.3	20	4,705.6
May	16	3,643.0	20	4,553.8
June	20	4,705.6	20	4,705.6
July	20	4,553.8	20	4,553.8

- 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	1,593.8
April	12	2,823.3
May	16	3,643.0
June	20	4,705.6
July	20	4,553.8

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, both with and without Restoration scenarios. Water released for Restoration that 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 2,200,000 AF.
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 of 116,662 AF in Exhibit B rather than 116,741 AF. However, 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, the initial spill date occurs after filling the March 1 available storage (Item 1), and when the cumulative net inflow (Item 3), 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 between 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; 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 Section 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 not 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 2,200,000 AF 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 2,000,000 AF 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 2,100,000 AF available to them with Restoration. Regardless whether Contractors actually used 2,100,000 AF, that value is used to calculate the contract deficit for the year. In this case, 2,100,000 AF is only 100,000 AF short of full contract totals of 2,200,000 AF so the result 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 2,200,000 AF Test (Step 4) indicated a potential contract deficit of only 100,000 AF, the impacts would be the lesser of the two or 100 TAF.

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 (transfers out, 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 water; for example, 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. The 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 AF
- Maximum Storage in Millerton (Capacity), S_{max} = 520,528 AF

- Maximum Canal Delivery, Q_{max} = 5,925 cfs
  - Friant-Kern Canal Capacity: 4,650 cfs (Rated performance in 2006)
  - Madera Canal Capacity: 1,275 cfs (Rated performance in 2006)
- Friant Division Total Contract Maximum, TCM = 2,201,475 AF
- Class 1 Contract Maximum = 800,000 AF
- Class 2 Contract Maximum = 1,401,475 AF

Restoration Flows Guidelines

Appendix I – Best Practices for Runoff Forecasts

SAN JOAQUIN RIVER RESTORATION PROGRAM

February 2017

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Appendix I – Best Practices for Runoff Forecasts

Purpose

This section is currently under development, and will be added in a future version of these Guidelines.