Restoration Flows Guidelines

Version 2.1 January 2020

SAN JOAQUIN RIVER
RESTORATION PROGRAM

Table of Contents

Tables

Figures

Appendices

Abbreviations and Acronyms

AF	acre-foot/feet
ATR	Annual Technical Report
CCAG	Channel Capacity Advisory Group
CDEC	California Data Exchange Center
CVP	Central Valley Project
cfs	cubic feet per second
DWR	California Department of Water Resources
ESP	Ensemble Streamflow Prediction
Guidelines	Restoration Flows Guidelines
MAF	Million Acre-feet
NMFS	U.S. Department of Commerce, National Marine Fisheries Service
NRDC	Natural Resources Defense Council
NWIS	National Water Information System
NWS	U.S. Department of Commerce, National Weather Service
PEIS/R	Program Environmental Impact Statement / Environmental Impact Report
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
RWA	Recovered Water Account
SCCAO	Reclamation South-Central California Area Office
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
SLDMWA	San Luis & Delta–Mendota Water Authority
TAC	Technical Advisory Committee
TAF	Thousand Acre-feet
USFWS	U.S. Department of the Interior, Fish and Wildlife Service
USAN	Upper San Joaquin Basin Model
WAM Tool	Water Authority Modeling Tool
WST	Water Supply Test
WUC	Water Use Curve

Preface

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, 16, and 18.

The timely and accurate release of Restoration Flows is a fundamental part of the Settlement, integral to the success of the San Joaquin River Restoration Program (SJRRP) in meeting the Restoration Goal, the Water Management Goal, and other significant public benefits such as water quality benefits or increased recreational opportunities. The following Guidelines describe the process to quantify, release, and monitor Restoration Flows to the benefit of the Restoration Goal and Water Management Goal. This document is structured in the order of operations necessary to successfully release Restoration flows throughout the Restoration Year. Sections 1 through 6 are roughly sequential in the operations required to develop and implement the release of Restoration Flows. Sections 7 through 12 address specific additional considerations that could influence Restoration Flows which may arise throughout the course of a Restoration Year. The remaining sections- Sections 13 (Coordination on Downstream Losses), Section 14 (Recovered Water Account), and Section 15 (Revision Process) are logically included in the Restoration Flows Guidelines (Guidelines) to implement the provisions of the Settlement's Paragraph 13 (the Restoration Flows) Sections 13 through 15and relevant sections of Paragraph 16 (the Water Management Goal).

These Guidelines are developed by the SJRRP and Non-Federal Settling Parties through the experience of operating Restoration Flows and through close coordination and consultation. While these are not binding guidelines to the same extent as the Settlement and Settlement Act, they specify the manner in which the requirements of Paragraphs 13, 16, and 18 in the Settlement are implemented. They represent criteria and procedures acceptable to the Settling Parties, and it is expected that they will be followed whenever possible, and/or until amended. These Guidelines are a living document and will continue to be updated and clarified through the revision process (Section 15). Should new situations arise that are not clearly addressed in these Guidelines, or in the event of inconsistences between these Guidelines and the Settlement or its implementing legislation, variance may be subject to consultation among the Settling Parties and the Settlement and implementing legislation shall govern.

Terms of art throughout the Guidelines are explained in the Glossary. The first usage of a term is underlined to delineate it as a glossary term.

This page left blank intentionally.

Version History

1.0 December 2013

Initial Guidelines 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 (Section 1 in version 2.1): Updated list of forecast models and data sources, described collaborative forecasting between the South-Central California Area Office and the San Joaquin River Restoration Program, 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 (Section 2 and 3 in version 2.1): 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 (Section 4 in version 2.1): 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 is taken.

Section 6.4 created (Section 4 in version 2.1): 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 is taken.

Modified graphics in Appendix C

2.1 January 2020

Reorganized chapter order as per the following table.

RFG 2.1 Chapter Number	Title	RFG 2.0 Chapter Number	Settlement Reference
1	Restoration Allocation, Restoration Water Year Type, and Flow Schedules	6.1	¶13(j)(i), Ex.B(2)
2	Development of Default Flow Schedules	New Section	¶13(j)(i), Ex.B(3-6)
3	Coordination with the Restoration Administrator on the Release of Restoration Flows	6.2	¶18
4	Flow Scheduling Flexibility and Water Supply Tests	6.3, 6.4	¶13, ¶18, Ex.B(4)
5	Measuring, Monitoring, and Reporting of Restoration Flows	7	¶13(j)(ii), ¶13(g)
6	Methodology for Monitoring Seepage Losses	9	¶13(j)(iv)
7	Release Changes for Maintenance on Friant Division Facilities	3	¶13(e)
8	Restoration Flows during Flood Releases	11	¶13(d), ¶13(j)(vi)
9	Buffer Flows	1	¶13(a), Ex.B(1)
10	Releases for Unexpected Seepage Losses	2	¶13(c)
11	Unreleased Restoration Flows	5	¶13(i)
12	Urgent Flow Changes	10	¶13(j)(v)
13	Coordination on Downstream Losses	4	¶13(f), ¶13(h)
14	Recovered Water Account	8	¶13(j)(iii), ¶16(b)(1)
15	Revision Process	12	¶13(j)

Section 1: Changes to Table 1 (Forecast Exceedance Pattern), added concept of four individual flow accounts, and structured the timing of allocation issuances. Revised some language surrounding urgent “real-time” flow changes. Numerous clarifications throughout.

Section 2: New section pulled from Section 1. describing the development of Default Flow Schedules. This includes new concept of three types of Default Flow Schedules. Water volume that is added to the allocation in the upper range of Normal–Wet was rescheduled from May through June to March through April. Revision of flexibilities and scheduling of Riparian Recruitment Flows. Numerous clarifications throughout.

Section 3: New section pulled from Section 1. Set maximum of 10-day response window for Restoration Administrator to return a schedule after an allocation issuance. Added new subhead for expected actions in the absence of a flow recommendation. Numerous clarifications throughout.

Section 4: Major revision to Water Supply Test, now handled as its own Section, formerly part of Section 1. Developed concept of two-tiered Water Supply Test. Clarified the scope of the Water Supply Test, what constitutes a water delivery reduction to any Friant Contractor, established the timing of when a test is necessary, and the mechanisms which may result in a water delivery reduction.

Section 6: Clarifications made to reach definitions and boundaries for tracking Unexpected Seepage Losses.

Section 12: Revised to be consistent with Section 1.

Section 14: Rewrite for clarity.

Appendix B: Revised to include Restoration Flow Accounts

Appendix E: Updated

Appendix H: Deleted Steps 7 and 8 (individual contractor test) and better explanations throughout.

Appendix J: New appendix to describe the Water Supply Test in detail.

Minor grammar and formatting corrections throughout.

Creation of a Glossary, with first usage of terms underlined in body of document.

Technical examples added to document to clarify meaning throughout.

Sections are cross-referenced when appropriate for the reader's benefit.

This page left blank intentionally.

1 Issuance of Restoration Allocation, Restoration Water Year Type, and Default Flow Schedules

This section describes the process to determine the Water Year Unimpaired Runoff for Millerton Lake, identify the Restoration Water Year Type, set the Restoration Allocation volume, and manage the accounting of that water. The U.S. Department of the Interior, Bureau of Reclamation (Reclamation) sets the Restoration Allocation and Default Flow Schedule and transmits it to the Restoration Administrator, who subsequently returns a recommended Restoration Flow Schedule to Reclamation for review, approval, and implementation if found consistent with the Settlement. Sections of the Settlement pertaining to this section of the Guidelines include Exhibit B and Paragraph 13(j)(i).

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

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

The Unimpaired Runoff on the San Joaquin River at Friant Dam (also known as "Natural River", "unimpaired inflow," or "full natural flow", and sometimes expressed "at Millerton Lake") over the course of the Water Year (October through September) sets the allocation of water volume available to the Restoration Administrator and the default Restoration Flow releases for each Restoration Year (March through February), which is also the contract year for Friant Division Long-term Contractors. The overlap of Water, Calendar, and Restoration Years is illustrated in Figure 1.

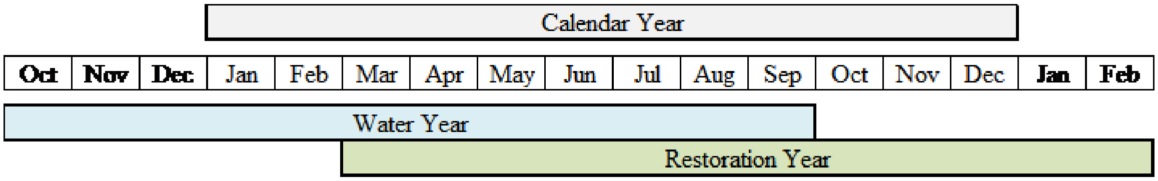


Figure 1.
Overlap of Water Year, Calendar Year, and Restoration Year

1.1.1 Step 1: Weighting Forecast Models and Data Sources

Determinations of Unimpaired Runoff at Millerton Lake for the Water Year will be conducted by Reclamation using one or more of the following sources of hydrologic information (further guidance on analyzing and developing forecasts is provided in Appendix I):

- Computed Unimpaired Runoff at Friant Dam, typically reported as “Full Natural Flow of San Joaquin River at Friant Dam” by Reclamation[1];
- 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];
- Daily Ensemble Streamflow Prediction (ESP) Water Supply Forecast for Millerton Lake, as reported by the U.S. Department of Commerce, National Weather Service (NWS) California-Nevada River Forecast Center[3];
- Southern California Edison forecast model;
- Ground-based observations, satellite observations, or aerial observations of snowpack;
- Runoff regression algorithm developed by Reclamation for Unimpaired Runoff and other analyses of historic runoff patterns;
- Recent accumulated precipitation observations and short-term forecasts for the Millerton watershed;
- Other runoff or precipitation forecasts, snowpack models, and runoff 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 will 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 runoff forecast (i.e. a hybrid forecast), described as a set of Unimpaired Runoff volumes at various

[1] Full Natural Flow is reported daily at FullNaturalFlowMonthly_MILFN. Further detail of this calculation is included in Appendix I.

[2] Available online at: Bulletin 120 - WSI

[3] Available online at: CNRFC - California Nevada River Forecast Center

exceedance probabilities that will be used by Reclamation to determine both the Restoration Allocation and the Friant Division Long-term Contractor water supply allocation (although the chosen exceedance probability 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 will seek to evaluate 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 will provide a more thorough briefing explaining the selection and weighting of forecast information; this request may include consultation with the Restoration Administrator and/or Signatories to the Settlement (Settling Parties) in the development of the forecast. Parties are encouraged to participate in a standing Millerton Forecast Advisory Committee to engage with Reclamation forecasting efforts.

1.1.2 Step 2: Determining Forecast Exceedance

The hybrid forecast will include expected Unimpaired Runoff at the 90%, 75%, 50%, and 10% exceedance probability values. SJRRP will use the percent probability of exceedance forecasts described in Table 1; the exceedance probability forecast used by SCCAO may differ from those used by SJRRP (e.g. 90% vs. 75%), but both offices will use unimpaired runoff assumptions from the same jointly determined hybrid forecast. The percent probability of exceedance forecast used to issue the Restoration Allocation is derived by comparing the 50% exceedance forecast in thousands of acre-feet (TAF) to the date of the forecast used for the Restoration Allocation (Table 1). This determination of whether to use the 90%, 75%, or 50% exceedance probability of the hybrid forecast is made each time there is a new Restoration Allocation issued and is based on the date of forecast information, not the date of allocation issuance.

Table 1.
Percent Probability of Exceedance Forecast Patterns

		Date of Forecast Used for the Allocation [2]					
	Value (TAF)	**January**	**February**	**March**	**April**	**May**	**June**
If the 50% forecast is[1]	Above 2200	50	50	50	50	50	50
	1600 to 2200	75	75	50	50	50	50
	900 to 1599	75	75	75	50	50	50
	500 to 899	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 Water Year Types, which are set in Step 3.
2. The date of forecast issuance sets the progression in Table 1 as opposed to the date of Restoration Allocation issuance. For example, an allocation issued on May 1 but using the forecast data released on April 30 in a “Below 500” hydrologic condition would utilize the 90% exceedance forecast.

The progression of exceedance forecasts in Table 1 has been selected to balance the objective to release Restoration Flows in a timely manner to meet biological needs against the risk of over-allocating volume and potentially increasing Friant Division Long-term Contractors' water supply reductions or reducing available Restoration Flows later in the year. It was developed through careful analysis of the forecast performance and assumes the set of rules on allocation timing and flow release flexibility outlined in Sections 1 through 3 of these Guidelines.

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

The appropriate percent exceedance identified in Table 1 is then used to determine the associated value of the hybrid forecast of Unimpaired Runoff, which is then used to determine the Restoration Water Year Type and Restoration Allocation. The Year Type is determined from Table 2, which depicts the Unimpaired Runoff bounds for each.

Table 2.
Restoration Allocation and Water Year Type

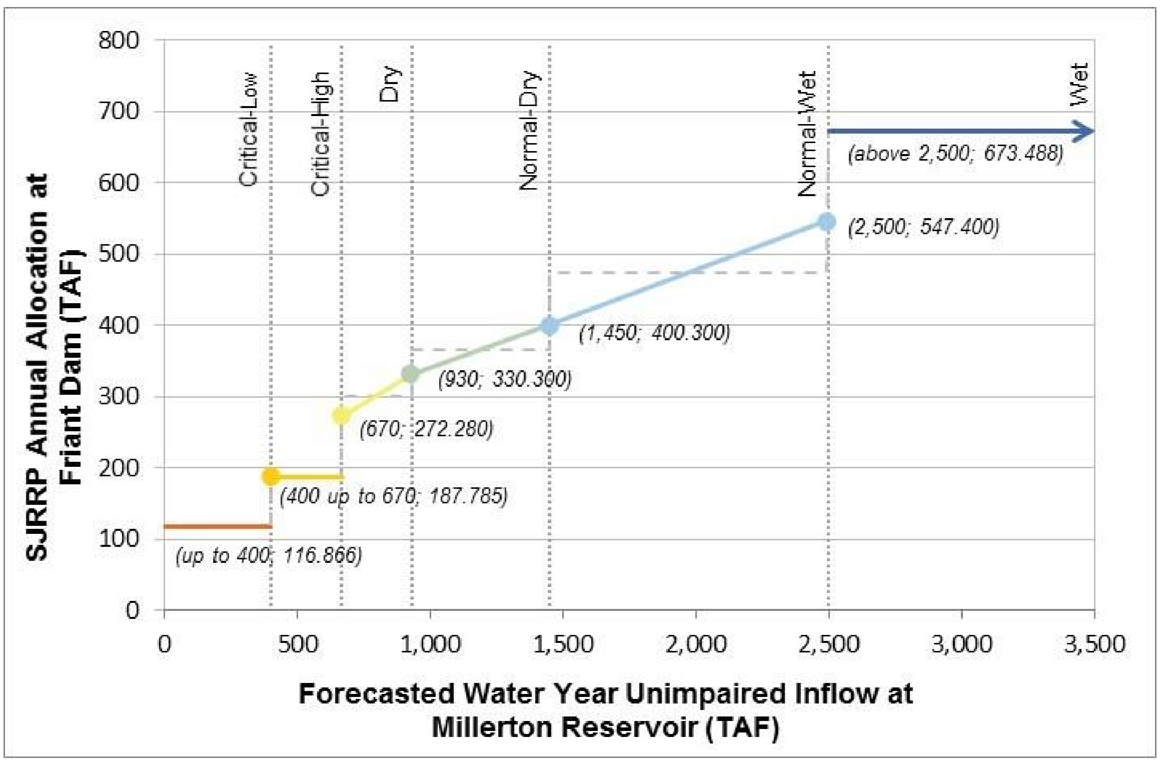
Unimpaired Water Year Runoff Forecast (TAF)	Total Friant Dam Release (TAF) [1,2,3]	Restoration Allocation (TAF) [4, 5]		Water Year Type [6] (Unimpaired Runoff in TAF)
above 2,500.000	673.488	556.542	Fixed Allocation	**Wet** (above 2,500.000)
at 2,500.000	547.400	430.455	Interpolated Allocation	**Normal–Wet** (1,450.000 – 2,500.000)
at 1,450.000	400.300	283.355		**Normal–Dry** (930.000 – 1,449.999)
at 930.000	330.300	213.355		**Dry** (670.000 – 929.999)
at 670.000	272.280	155.335		
from 400.000 to 669.999	187.785	70.919	Fixed Allocation	**Critical–High** (400.000 – 669.999)
below 400.000	116.866	0		**Critical–Low** (below 400.000)

Notes:

1. TAF = Thousand Acre-Feet.
2. Leap years will result in 0.198 TAF added to the Friant Dam releases in Critical–Low years, 0.218 TAF added to the Friant Dam releases in Critical–High years, and 0.694 TAF added to Friant Dam releases in other year types due to the extra day of releases in February. See Appendix B.
3. Friant Dam releases used to meet Exhibit B Base Flows at Gravelly Ford using Exhibit B assumptions for Riparian Releases. Actual Friant Dam Releases may be higher (or lower) than this value.
4. As Measured at Gravelly Ford.
5. To maintain the flow rates established in Exhibit B during leap years, the Restoration Allocation is increased by 0.020 TAF in Critical–High years and 0.496 TAF in Dry through Wet Year Types. See Appendix B.
6. The Restoration Water Year Type should not be confused with the San Joaquin Valley Water Year Type (or "San Joaquin Index"). The categorization presented here is unique to the Restoration Program.

A series of steps have been taken per Exhibit B (3) to alter the stair-step hydrographs (also termed the "base flow hydrographs" in Exhibit B). Restoration Allocations for Dry, Normal–Dry, and Normal–Wet Year Types are interpolated (i.e. smoothed) between the values shown in Table 2. The allocation will be calculated to the nearest acre-foot through interpolation. Other year types have a fixed allocation that does not change within the year type boundaries. Figure 2 and Figure 3 depict these steps and interpolations 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 vary from year to year, or day to day, from what is depicted in Exhibit B of the Settlement. These are further described in Section 2.1 and apply to the generation of the Restoration Allocation and Default Flow Schedule.

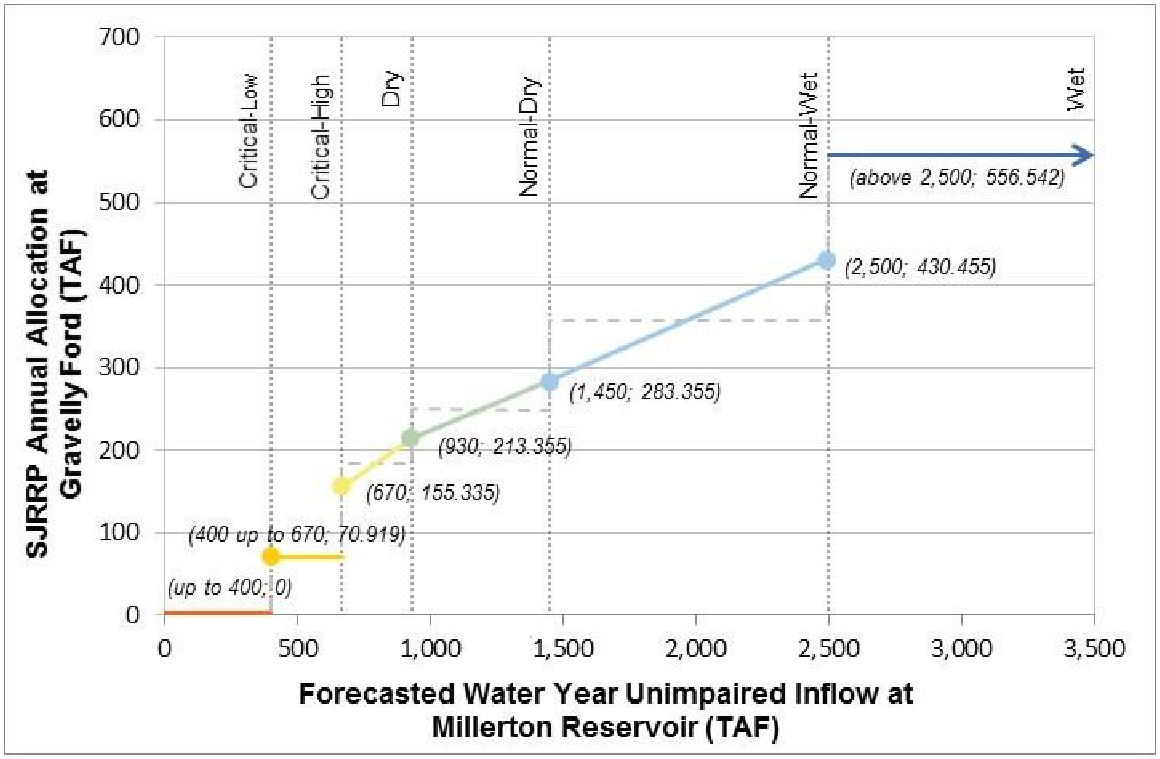
When preparing the Restoration Allocation, Reclamation will provide hypothetical Restoration Allocations that would result from the percent probability of exceedance forecasts (using the hybrid forecast) of 90%, 75%, 50%, and 10%. This information is useful for contingency planning or for informing the Friant Division water supply allocations.



Notes:

- Gray dashed lines represent the volumes depicted in Exhibit B prior to "smoothing" of the stair-step hydrographs.
- Water Year types are set by the 1922 to 2004 unimpaired runoff record. Wet; > 80th percentile, Normal–Wet: 50th – 80th percentile, Normal–Dry: 30th – 50th percentile, Dry: 5th – 20th percentile, Critical–High 1st to 5th percentile.

Figure 2.
SJRRP Restoration Allocation at Friant Dam as a Function of Forecasted Unimpaired Runoff at Millerton Lake



Notes:

- Gray dashed lines represent the volumes depicted in Exhibit B prior to "smoothing" of the stair-step hydrographs.
- Water Year types are set by the 1922 to 2004 unimpaired runoff record. Wet; > 80th percentile, Normal–Wet: 50th – 80th percentile, Normal–Dry: 30th – 50th percentile, Dry: 5th – 20th percentile, Critical–High 1st to 5th percentile.

Figure 3.
SJRRP Restoration Allocation at Gravelly Ford as a Function of Forecasted Unimpaired Runoff at Millerton Lake

1.1.4 Step 4: Leap Year Adjustments

The volumes shown in the Exhibit B hydrograph are based upon a year with 365 days. When an extra day is added for a leap year, flow rates at Friant Dam, Gravelly Ford, and other flow monitoring locations are maintained across the month of February; thus, the corresponding volumes are increased. The incremental volume increases during leap years are shown in the footnotes of Table 2.

1.1.5 Static Water Year Types

In accordance with Exhibit B (2), the six Year Types and the Unimpaired Runoff breakpoints are based on the 1922 to 2004 hydrologic record. The intent of the Settlement is to avoid a moving distribution, even if current trends in climate are shifting the Unimpaired Runoff associated with the percentiles (e.g. top 20% in the case of a Wet Year Type). As a result, the breakpoints between water years will not be adjusted to address a longer hydrological record (except through the provision of Settlement Paragraph 37).

1.2 Setting the Default Flow Schedule

When Reclamation sets the Initial Restoration Allocation, the issuance should be accompanied by a Default Flow Schedule. The Default Flow Schedule is derived from the Exhibit B Base Flow Hydrographs adjusted for the precise Unimpaired Runoff, as described in Section 2 of these Guidelines. 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 specific flow schedule. Default Flow Schedules will be issued irrespective of the Restoration Flows released to date or the remaining Restoration Allocation volume. An approved Restoration Administrator's Restoration Flow Schedule Recommendation supersedes any Default Flow Schedule for the purposes of scheduling and releasing Restoration Flows. Section 2 of these Guidelines describes the development of Default Flow Schedules in detail.

1.3 Flow Accounts

The volume of water provided in the Restoration Allocation is distributed among four flow accounts, consisting of the Continuity Flow Account, the Spring Flexible Flow Account, the Fall Flexible Flow Account, and the Riparian Recruitment Flow Account. Because there are different flexible flow provisions and limitations placed on the scheduling of Restoration Flow releases depending on the time of year, year type, and purpose, dividing the allocation in this manner streamlines accounting and administration. The stated purpose of these accounts is not intended to limit the Restoration Administrator from other uses.

Continuity Flow Account — Restoration Flow volumes corresponding to a Friant Dam release of 350 cfs throughout the entire calendar year constitute the Continuity Flow Account. In critical year types, this volume is reduced from 350 cfs to the values in Exhibit B. This volume has limited flexibility and shifting of flows within this account invoke Exhibit B 4(d) and would require a successful Water Supply Test to deviate from the Default Flow Schedule. This account is intended to prioritize maintaining river connectivity and other fundamental flow requirements. This volume is used for the following Hydrograph Components: Fall Base and Spring–Run Incubation, Fall-Run Spawning and Incubation, Fall–Run Spawning and Incubation Flows, Summer Base, Winter Base, and Spring-run Spawning (see Section 2.1).

Spring Flexible Flow Account — Restoration Flow volumes provided in Exhibit B between March 1 and April 30 in excess of 350 cfs constitute the Spring Flexible Flow Account. This volume is used for Spring Rise and Pulse Hydrograph Component and Flushing Flows and may be used to augment other Hydrograph Components. It has the flexibilities outlined in Exhibit B (4)(b) which allow these flows to be released from February 1 through May 28 (see Section 2.1).

Fall Flexible Flow Account — Restoration Flow volumes provided in Exhibit B between November 1 and November 10 in excess of 350 cfs constitute the Fall Flexible Flow Account. This volume is used for the Fall Run Attraction Hydrograph Component and may be used to augment other Hydrograph Components. It has flexibilities outlined in Exhibit B (4)(b) which allow these flows to be released from September 3 through December 28 (see Section 2.1).

Riparian Recruitment Flow Account — Restoration Flow volumes provided in Exhibit B during Wet Year Types and between May 1 and July 29 in excess of the flow rates in Normal–Wet Year Types during this same period constitute the Riparian Recruitment Flow Account. These flows are intended to establish and maintain riparian vegetation as outlined in Exhibit B (6), though they may also meet other purposes.

Appendix B includes look-up tables for the flow accounts at various year types and Unimpaired Runoff values.

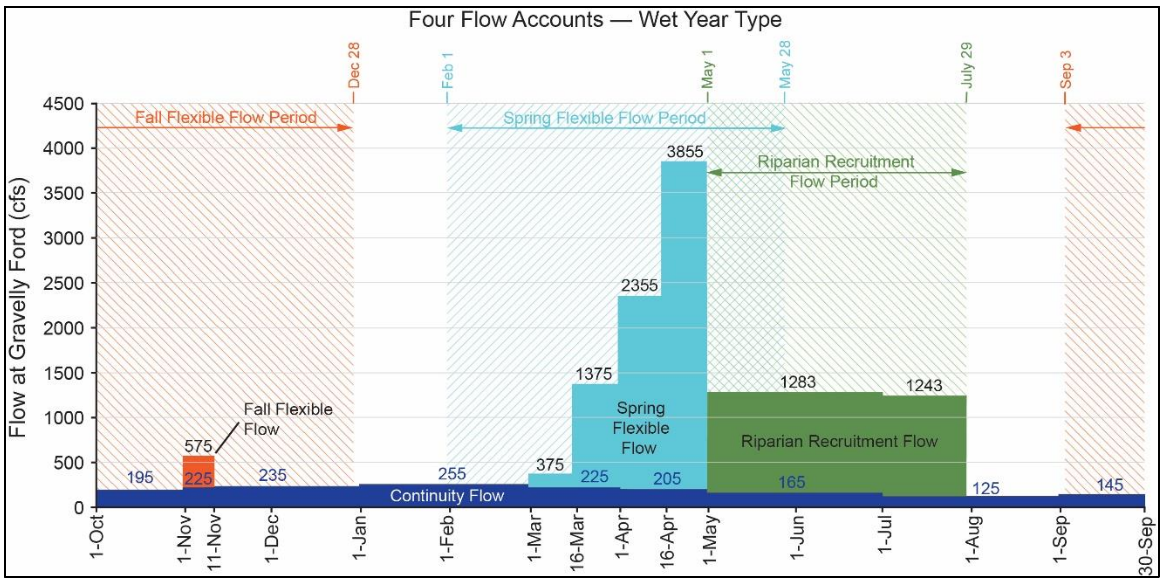


Figure 4.
Depiction of Four Flow Accounts in a Wet Year Type

Table 3.
Timing and Volumes of Flow Accounts

	Continuity	Spring	Fall	Riparian Recruitment Flow
Time Period	March 1 – February 28/29	March 1 – April 30	October 1 – November 30	May 1 – July 29
Flexible Flow Period	None (flexibility only provided pursuant to Exhibit B 4(d), see Section 4)	February 1/2 – May 28	September 3 – December 28	May 1 – July 29 (limited by Water Supply Test, see Section 4.1.4)
Volume at Gravelly Ford	0 – 136.443 TAF [1] (starting at 400 TAF Unimpaired Runoff, reaching maximum at 800 TAF Unimpaired Runoff)	0 – 287.069 TAF (starting at 400 TAF Unimpaired Runoff, reaching maximum at 2500 TAF Unimpaired Runoff, then reduced to 213.519 above 2500 TAF)	0 – 6.942 TAF (starting at 400 TAF Unimpaired Runoff, reaching maximum at 702 TAF Unimpaired Runoff)	199.638TAF (above 2500 TAF only)

1. During leap years, the Continuity Flow Account is increased by 0.020 TAF in Critical–High years and 0.496 TAF in Dry through Wet Year Types. See Appendix B.

These accounts are not exclusive to a time period. For example, the month of May can have Spring Flexible Flow Account releases, Continuity Flow Account releases, and Riparian Recruitment Flow account releases occurring in the same month or even simultaneously (because of the flexibility of the Spring Flexible Flow Account). Each account volume must be tracked by Reclamation separately to ensure adherence with Exhibit B and other provisions of the Settlement. In this manner, the Restoration Allocation is managed not as a single block volume, but instead as a collection of four flow accounts, each with its own set of flexibilities and limitations. These accounts are progressively finalized and closed through the course of a year (Section 1.5). Buffer Flows are volumes of water in addition to these flow accounts and are described in Section 9.

1.4 Calculating the Remaining Restoration Allocation

[This subsection has been identified as needing review and potential revision in a subsequent update to these Guidelines. Release error, seepage losses, increased Holding Contract demands, and residual flood flows call into question the accounting methods.]

Each issuance of an updated Restoration Allocation will include the current accounting of Restoration Flows, both in total volume and among the four flow accounts. The remaining allocation is the annual allocation (and each of the flow accounts) reduced by the volume of Restoration Flows released to the San Joaquin River to date, any delivered Unreleased Restoration Flows, and any volume prohibited from use by the Water Supply Test.

The volume of Restoration Flows released to date is the sum of mean daily flows at Gravelly Ford less 5 cfs during Restoration Flow releases, plus any scheduled Restoration Flows met by Flood Control Releases (Section 8), less any tributary flows not originating from Friant Dam. Purchased water and other releases in excess of the Restoration Flow Schedule, including releases for other contractual obligations, will not be debited against the Restoration Allocation.

1.5 Finalization and Closure of Flow Accounts

The volume allocated to each flow account sets the maximum volume that the Restoration Administrator can schedule. The Restoration Administrator is responsible for adjusting the flow schedule when an updated allocation changes the volume of one or more flow accounts (see Section 3.4.1).

As the Restoration Allocation is increased through higher forecasted Unimpaired Runoff, water volume is progressively added among the four flow accounts. Below 800 thousand acre-feet (TAF) Unimpaired Runoff, increments of volume are added to the Continuity Flow Account, the Spring Flexible Flow Account, and Fall Flexible Flow Account in accordance with the Gamma 3.1 Transformation Pathway (Appendix C, Figure C-1). Above 800 TAF Unimpaired Runoff, incremental volume is added only to the Spring Flexible Flow Account and Riparian Recruitment Flow Account (the latter only during Wet Year Types). The Continuity Flow Account and Fall Flexible Flow Accounts reach their maximum volume at 800 TAF and 702 TAF Unimpaired Runoff respectively. Under a declining hydrology scenario, water volume is removed from each flow account in accordance with the Gamma 3.1 Transformation Pathway in reverse order.

For operational certainty, to balance risk among the Friant Water Supply and Restoration supply without compromising the Restoration Goal, and to avoid complicating the Water Supply Test process, flow accounts are finalized at various points in the Restoration Year (Table 4). Increases or decreases in Unimpaired Runoff will not alter an account that has previously been finalized. This may sometimes reduce the water available to the Restoration Administrator as compared to if the increased allocation was made earlier in the year.

Table 4.
Timing of Finalization and Closure of Flow Accounts

<table>
<tr><th></th><th>Spring</th><th>Riparian Recruitment Flow</th><th>Fall</th><th>Continuity</th></tr>
<tr><td>Finalized upon issuance of Restoration Allocation within these dates</td><td colspan="2">May 10–18</td><td colspan="2">May 10–18
(June 10–20 when less than 900 TAF Unimpaired Runoff)</td></tr>
<tr><td>Closure on this date [1]</td><td>May 28</td><td>July 29</td><td>December 28</td><td>February 28/29</td></tr>
</table>

1. To be precise, the account closes at 11:59 pm on these dates.

If, through no fault of the Restoration Administrator, a flow account has been overspent (i.e. released volume exceeds authorized volume), the deficit is not carried over into another account upon closure (see example below). This situation can occur when a subsequent issuance of the Restoration Allocation lowers the volume of a flow account after a greater volume of water (from a higher allocation set by a previous issuance) has already been approved and released. The volume in a flow account remains accessible to the Restoration Administrator until it is closed, as defined in Table 4. Upon closure, any remaining volume must be transferred, if permitted through a Water Supply Test, or relinquished. The sole exception to this is when a May 18 or earlier issuance transitions from Normal–Wet to Wet Year Type, over-releases in the spring account should be debited against the Riparian Recruitment Flow Account; or if the water year transitions from a Wet to Normal–Wet Year Type, any over-releases in the riparian Recruitment Flow Account are debited to the Spring Account. This exception results from the reduction in the Spring Flexible Flow Account volume as a water year transitions from Normal-Wet to Wet. Relevant examples are presented in Section 1.6 (see Examples A–C).

1.6 Timing of Restoration Allocations

The first Restoration Allocation and Default Flow Schedule will be issued on or before January 21 of each year. This allows enough time for the Restoration Administrator to make an initial Restoration Flow Recommendation by January 31, prior to the beginning of the next Restoration Year's spring flexible flow period. Thereafter, issuances should be made at approximately monthly intervals, in accordance with the schedule provided in Table 5. This schedule of issuances is timed to coincide with the monthly release of DWR's Bulletin 120 Water Supply Forecast and other scheduled information releases (on about the 10th of the month) and is also designed to provide the Restoration Administrator at least 10 days to respond to the allocation prior to critical dates in Exhibit B.

Additionally, Reclamation should issue an updated allocation as conditions warrant. Examples of when issuances should be made in addition to the schedule in Table 4 include:

- When requested by the Restoration Administrator.
- When there is a significant *increase* observed in the Unimpaired Runoff forecast, especially one that transitions the "steps" in the hydrographs between Critical–Low and Critical–High, Critical–High and Dry, and Normal–Wet and Wet Year Types.

- When there is a significant *decrease* in the Unimpaired Runoff Forecast, especially one that transitions the “steps” in the hydrographs between Critical–Low and Critical–High, Critical–High and Dry, and Normal–Wet and Wet Year Types. Issuing an updated allocation is critically important if the hydrologic trend may result in inadequate volume to maintain 350 cfs at Friant Dam.
- At the conclusion of flood management actions which occur between February 20 and May 18.

The issuance made between May 10–18 finalizes the volume of water available for all flow accounts and provides a timely opportunity for the Restoration Administrator to manage the volume remaining in the Spring Flexible Flow Account. However, when the Unimpaired Runoff forecast at the 50% exceedance is less than 900 TAF, the Continuity Flow Account and Fall Flexible Flow Account will not be finalized until a subsequent allocation issued between June 10–20. This allows more time to resolve forecast uncertainty in drier conditions which may affect the Default Flow Schedule during the summer, fall, and winter seasons.

Table 5.
Timing of Allocation Issuances

If the 50% forecast is[1] (TAF)	Initial Allocation	Next Allocation	Next Allocation	Next Allocation	Next Allocation	Final Allocation
900 or above	Jan 10–21	Feb 10–18	Mar 10–21	Apr 10–20	—	May 10–18
Less than 900	Jan 10–21	Feb 10–18	Mar 10–21	Apr 10–20	May 10–18	June 10–20

Example A for 1.5 & 1.6: A Restoration Allocation and Default Flow Schedule is issued on May 18 of a Normal–Wet Year Type, in accordance with Table 5. The Unimpaired Runoff forecast at that issuance is substantially lower than the previous issuance, resulting in a reduction in the combined allocation by 30 TAF. This reduced allocation changes only the Spring Flexible Flow Account, all other accounts are unaffected by this change in Unimpaired Runoff. However, by the time of issuance the Restoration Administrator had scheduled and released 10 TAF more than the revised spring account volume, resulting in a negative balance. This over-release, as it was consistent with the allocation at the time of release, does not affect any other flow account and is shown as a 10 TAF adjustment to the Spring Flexible Flow Account justified by the previous issuance.

Example B for 1.5 & 1.6: A Restoration Allocation and Default Flow Schedule is issued on May 8 in accordance with Table 5. This issuance results in a change in the water year type from Normal–Wet to Wet and the addition of nearly 126 TAF of volume to the allocation. With this transition, the Spring Flexible Flow Account is decreased by up to 74 TAF at the same time the Riparian Recruitment account is increased from 0 to 200 TAF. At the time of issuance, the Restoration Administrator has released more volume than is now available in the now finalized Spring Flexible Flow Account. In this particular instance, any over-releases in Spring Flexible Flow Account are debited to the Riparian Recruitment account, reducing that account by an equal volume.

Similarly, if the May 8 issuance results in a change from Wet to Normal–Wet Year Type, any over-releases in the Riparian Recruitment flow account, which is now set at 0 TAF, would be debited to the Spring Flexible Flow Account (as if it was released as a normal spring-account flow). Management of the Spring Flexible Flow Account would continue as normal, with finalization based on a May 10–18 issuance and closure on May 28.

Example C for 1.5 & 1.6: In a year where the 50% forecast is less than 900 TAF, the final Restoration Allocation and Default Flow Schedule is issued on June 20 in accordance with Table 5. This issuance results in a change in the water year type from Critical–High to Dry, and the addition of nearly 53 TAF of volume to the Continuity Flow Account and 23 TAF to the Fall Flexible Flow Account. If this allocation had been made prior to May 20, it would have also added 8 TAF to the Spring Flexible Flow Account, however because the Spring Flexible Flow Account had been closed by the date of issuance (June 20), those 8 TAF are not added to the available Restoration Allocation and are instead shown as an 8 TAF adjustment based on account closure.

Volume added to the Fall Flexible Flow Account can be used normally. Volume added to the Continuity Flow Account would include a portion of the that volume that would have been released prior to June 20 under the Default Flow Schedule and would be subject to a Water Supply Test (Section 4.0).

1.7 Tracking Restoration Allocation Deviations

To monitor how these forecast and allocation procedures are performing, Reclamation will provide a record of final Restoration Allocations, the associated Unimpaired Runoff forecasts for key allocation issuances, any relinquished water or over-released water in any of the flow accounts, and a comparison to allocations based on a perfect foresight hypothetical forecast. This is especially important as the majority of the Restoration Volume is set with the May allocation issuance, well before there is certainty in the total Unimpaired Runoff for the water year. It is recommended that this data be reported annually or as a supplemental page to the Restoration Flow Allocation for the purpose of assessing performance of allocation timing, forecast exceedance progression, and accounting procedures. If significant deviations can be shown over the long-term (at least a five-year span), the parties will review discrepancies and may recommend changes through the Guidelines revision process.

2 Development of Default Flow Schedules

The Default Flow Schedule is defined as the interpolation and transformation of the Exhibit B Base Flow Hydrographs to a more precise release schedule specific to the forecasted Unimpaired Runoff. The Default Flow Schedule created by Reclamation provides a daily distribution of the annual Restoration Allocation volume. The Default Flow Schedule serves multiple purposes, including: 1) as a starting point for the Restoration Administrator to develop a flow recommendation; 2) as a release schedule to be considered and implemented by Reclamation when there is no approved flow recommendation from the Restoration Administrator; and 3) as a component of the Water Supply Test. Default Flow Schedules are prepared by Reclamation each time a Restoration Allocation is issued.

The Settlement provides context on the Default Flow Schedule development. Paragraph 13(j) of the Settlement describes the need for the guidelines to determine the timing of Restoration Flows consistent with the hydrograph releases.

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

Furthermore, the Settlement describes the necessary transformation from the Exhibit B Base Flow Hydrographs to a continuous set of hydrographs that are more suitable for implementation in Exhibit B (3).

> *“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.”*

According to Exhibit B (2) the Exhibit B Base Flow Hydrographs are classified by Water Year Type and vary in shape and volume based on the basin’s hydrology. The breakdown of the Water Year Types is described in Exhibit B (2).

> *“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."

Paragraph 20 notes that Restoration Flows shall not be changed from what is set forth under Exhibit B of the Settlement, except by written agreement.

Prior to December 31, 2025, the Restoration Flows shall not be changed from those provided under this Settlement unless augmented by water acquired by the Secretary from willing sellers through voluntary acquisitions, or a different level of Restoration Flows is agreed to in writing signed on behalf of all the Parties hereto. After December 31, 2025, the Restoration Flows provided under this Settlement shall not be changed except by a written agreement signed on behalf of all the Parties, acquisition of water from willing sellers, or a final recommendation by the SWRCB and a final Order of this Court.

Included with the Restoration Allocation and Default Flow Schedule, Reclamation will provide a list of channel capacity[4] constraints that affect Restoration Flows with the initial annual issuance and update these throughout the year as conditions change. These should be categorized by reach and include expected flow rate limitations based on channel or levee capacity constraints, seepage constraints, construction and maintenance or other interruptions.

The Restoration Allocation lookup tables in Appendix B (Restoration Allocation Lookup Tables) provide a reference for how much total volume of water is available for Restoration Flows. Intermediate runoff values and other information not articulated in Appendix B can be derived from the procedures in Section 1.1 and with the tables in Appendix C (Default Flow Schedules). Reclamation also maintains a spreadsheet to calculate the Restoration Allocation precisely.

The tables in Appendix C reflect Default Flow Schedules for each inflection point in Figure 3 and other intermediate values of Unimpaired Runoff. Data in Appendix C is presented for the multiple points within the Restoration Area.

[4] Channel Capacity constraints includes limitations set forth in the Seepage Management Plan, and limitations for levee stability set forth by the Channel Capacity Advisory Group.

The Restoration Administrator has the flexibility to recommend modifications of the release schedule of Restoration Flows, differing from the Default Flow Schedules within the Guidelines.

Default flow schedules should be issued irrespective of the Restoration Flows released to date or the remaining Restoration Allocation volume. Default Flow Schedules do not consider precise scheduling of flushing flows and shaping of Riparian Recruitment flows (Section 3), use of Buffer Flows (Section 9), use of stored or exchanged Unreleased Restoration Flows (Section 11), or releases above the requirements of the Settlement for Flood Management (Section 8). These aspects of the flow schedule should be addressed in the Restoration Administrator's flow schedule, and once approved, supersede the Default Flow Schedule.

Because the Default Flow Schedule does not depict or capture all of the flexibility articulated in Exhibit B, it is incumbent upon Reclamation to provide this latitude afforded to the Restoration Administrator in both the scheduling of Restoration Flows and the application of the Water Supply Test. Section 4 describes the extent and limitations of this flexibility and the protection of the Friant Water Supply.

Three versions of the Default Flow Schedule are produced by Reclamation:

Basic Default Flow Schedule — Assumes no shaping or shifting of flows. See Figure 4 of this section.

Flexed Default Flow Schedule — Incorporates potential shifting of flows provided under Exhibit B (4)(b). This is used for the Water Supply Test (Section 4) and to depict possible release patterns available to the Restoration Administrator. See Figure 7 of Section 7.

Capacity Constrained Default Flow Schedule — Is limited by channel capacity of the Restoration Flow routing and employs the provisions of Exhibit B (4)(b) to shift flows to accommodate channel capacity constraints. This includes levee safety constraints, seepage constraints, and other non-ephemeral limitations (temporary limitations such as minor in-river construction would not be included). This may be unique to the capacity constraints at the time of issuance. Application of the Capacity Constrained Default Flow Schedule will result in the estimation of potential Unreleased Restoration Flows.

2.1 Transformation Pathways between Water Year Types

A number of different transformations were analyzed in the development of the first Guidelines and implementation of Exhibit B (3). These transformations apply incremental increases in Restoration Allocation volume in a systematic way to a specific flow schedule to maximize the ecological objectives of each Hydrograph Component in a manner that is consistent with Exhibit B and in accordance with the Guidelines. Note that the transformation process does not replace the hydrographs in Exhibit B, it elaborates on their shape and relationship to Unimpaired Runoff. The transformation process will not include purchased water, returned exchanges, or Buffer Flows, and does not provide any specific guidance relative to the use of such water types.

As described in Appendix G of the Program Environmental Impact Statement / Environmental Impact Report (PEIS/R)[5], the transformation pathways for increasing flow according to forecasted runoff is based on biological rationale for transformation of the stair-step hydrographs to more continuous line hydrographs. The transformation includes the incremental increase or decrease that occurs between year types (i.e. the interpolation) of the Hydrograph Components that make up the annual allocation of water, as well as where that volume should be scheduled within the annual hydrograph. The pathways for transformation are based on the ecological intent of the Exhibit B Base Flow Hydrographs described in the Hydrograph Components below:

> **Fall Base and Spring-Run Incubation Flow** — To provide conditions (temperature and connectivity between reaches) suitable for spawning and incubation of spring-run Chinook salmon.
>
> **Fall-Run Attraction Flow** — To provide conditions (temperature, connectivity between reaches, and duration) suitable for fall-run Chinook salmon migration and to stimulate emigration of juvenile spring-run Chinook salmon.
>
> **Fall-Run Spawning and Incubation Flow** — To provide conditions (temperature and connectivity between reaches) suitable for fall-run Chinook salmon spawning and incubation.
>
> **Winter Base Flow** — To provide conditions (temperature and connectivity between reaches) suitable for incubation, emergence, and rearing of fall-run Chinook salmon.
>
> **Spring Rise and Pulse Flow** — To provide conditions (temperature, connectivity between reaches, duration, and quantity) suitable for juvenile salmon outmigration, for adult spring-run Chinook salmon upstream migration, spawning of resident native fishes, initiation of fluvial geomorphic processes, and floodplain inundation for salmon rearing and other species (e.g., splittail spawning).
>
> **Summer Base Flow** — To provide conditions (temperature and connectivity between reaches) suitable for holding and rearing of spring-run Chinook, summer life stages of native fishes and warm-water game fishes, and riparian vegetation recruitment.
>
> **Spring-Run Spawning Flow** — To provide conditions (temperature and connectivity between reaches) suitable for spring-run Chinook salmon spawning.

---

[5] Available online at: 1/Introduction

Riparian Recruitment Flow[6] — To provide conditions for establishment and maintenance of channel margin and floodplain vegetation. This Hydrograph Component is only available in Wet Year Types.

Note that the transformation process does not smooth the steps that occur between "blocks" of the Default Flow Schedule; for example, the 1,000 cfs change that occurs between March 15 and March 16 in most water year types remains a large change in flow rate. It is presumed that the Restoration Administrator would smooth any deleterious abrupt changes in flow that are depicted in the Default Flow Schedule in the flow schedule that is submitted to Reclamation.

The description of the initial pathways for transforming the Exhibit B Base Flow Hydrographs into a Default Flow Schedule is described below. Also, refer to Figure 2, Figure 3, and Appendix C.

2.1.1 Critical–Low to Critical–High Step

The Critical–Low flow schedule represents releases for Holding Contracts in Reach 1 only, with no additional Restoration Flows. The Default Flow Schedule as depicted at Gravelly Ford exceeds the 5 cfs Holding Contract requirement only with the advent of a Critical–High Year Type. Because the Critical–High Restoration Allocation is regarded as the minimum flow allocation to meet some ecological objectives, no attempt is made to transform between Critical–Low and Critical–High flow schedules. Critical-High includes flows for multiple Hydrograph Components across three flow accounts (Continuity, Spring, and Fall).

2.1.2 Critical–High to Mid–Point of Dry Step and Transformation

A step function exists between the Critical–High and the lower point of Dry Year Types. From the lower point of Dry Year Types to the mid–point of Dry Year Types, a transformation is applied to distribute the available volume of water across multiple Hydrograph Components and three flow accounts (Continuity, Spring, and Fall).

Among the transformations analyzed in the development of version 1 of the Guidelines, the "Gamma 3.1" transformation was selected to distribute allocated volume smoothly across these water year types and to the most appropriate Hydrograph Component. This transformation pathway is shown in Figure C-1 (Gamma Transformation Pathway from Critical–High to Mid-point of Dry) of Appendix C. In the final selection of transformations, steps 1 – 4 of Gamma 3.1 were omitted in favor of a step function between Critical–High and Dry, while steps 5 through Dry were retained to smoothly apply additional volume from the low point of Dry to the mid-point of Dry Year Type.

2.1.3 Mid–Point of Dry to Mid–Point of Normal–Wet Transformation

In transforming from the mid–point Dry to mid–point of Normal–Wet Year Types, additional flow is added incrementally to the spring rise and pulse flows (Spring Flexible Flow Account). Volume is first added to the April 1 – 15 period up to a Friant Dam

---

[6] Exhibit B does not list Riparian Recruitment Flow as a Hydrograph Component, but it can be construed as one for the purposes of these Guidelines. This component overlaps the Summer Base Flow component.

release of 2,500 cfs (the flow rate for each day during this range is increased evenly until reaching 2,500 cfs). Then volume is added in the same manner to the April 16–30 period up to a Friant Dam release of 4,000 cfs.

2.1.4 Upper Range of Normal–Wet Transformation

Above the mid-point of Normal–Wet Year Type (corresponding to an Unimpaired Runoff of 1975 TAF) to the upper limit of Normal–Wet (2,500 TAF), additional volume provided to the Restoration Allocation is scheduled in the Spring Flexible Flow Account. At the mid–point of Normal–Wet, the April 15 – 30 period is scheduled for the maximum channel capacity of 4,500 cfs. Additional volume above the mid–point is first added to the period of April 1 – 15 (the flow rate for each day during this range is increased evenly until reaching 4,500 cfs), then to March 16–31 (again adding flow rate for each day during this range evenly), at which time the additional volume is fully distributed. Thus, flow is added to each earlier block once a block exceeds the channel capacity of 4,500 cfs (or the relevant channel capacity constraint for the Constrained Default Flow Schedule). A Flushing Flow is intended to be released in Normal–Wet Year Types. The volume for the Flushing Flow is included in the Spring Flow Period volume; there is not a specific allocated volume for Flushing Flows.

2.1.5 Normal–Wet to Wet Step

In stepping from the upper limit of Normal–Wet to Wet Year Type, 126.088 TAF is added to the Restoration Allocation. This includes an addition of 199.638 TAF to the Riparian Recruitment Flow account and a subtraction of 73.550 TAF from the Spring Flexible Flow Account. With the advent of a Wet Year Type, the Spring Flexible Flow Account returns to the lower flow rates associated with the mid-point of Normal–Wet Year Type. Riparian Recruitment Flows are depicted in the Default Flow Schedule as an even distribution of the 199.638 TAF volume across the 90-day Riparian Recruitment Flow period extending from May 1 through July 29 (Figure 5 and 6). Note that the Riparian Recruitment Flow account is not shaped in the Default Flow Schedule to optimize vegetation growth on floodplains; the Restoration Administrator is expected to optimize releases to meet vegetation objectives.

A Flushing Flow is intended to be released in Wet Year Types also. The volume for the Flushing Flow is included in the spring flow period volume; there is not a specific allocated volume for Flushing Flows.

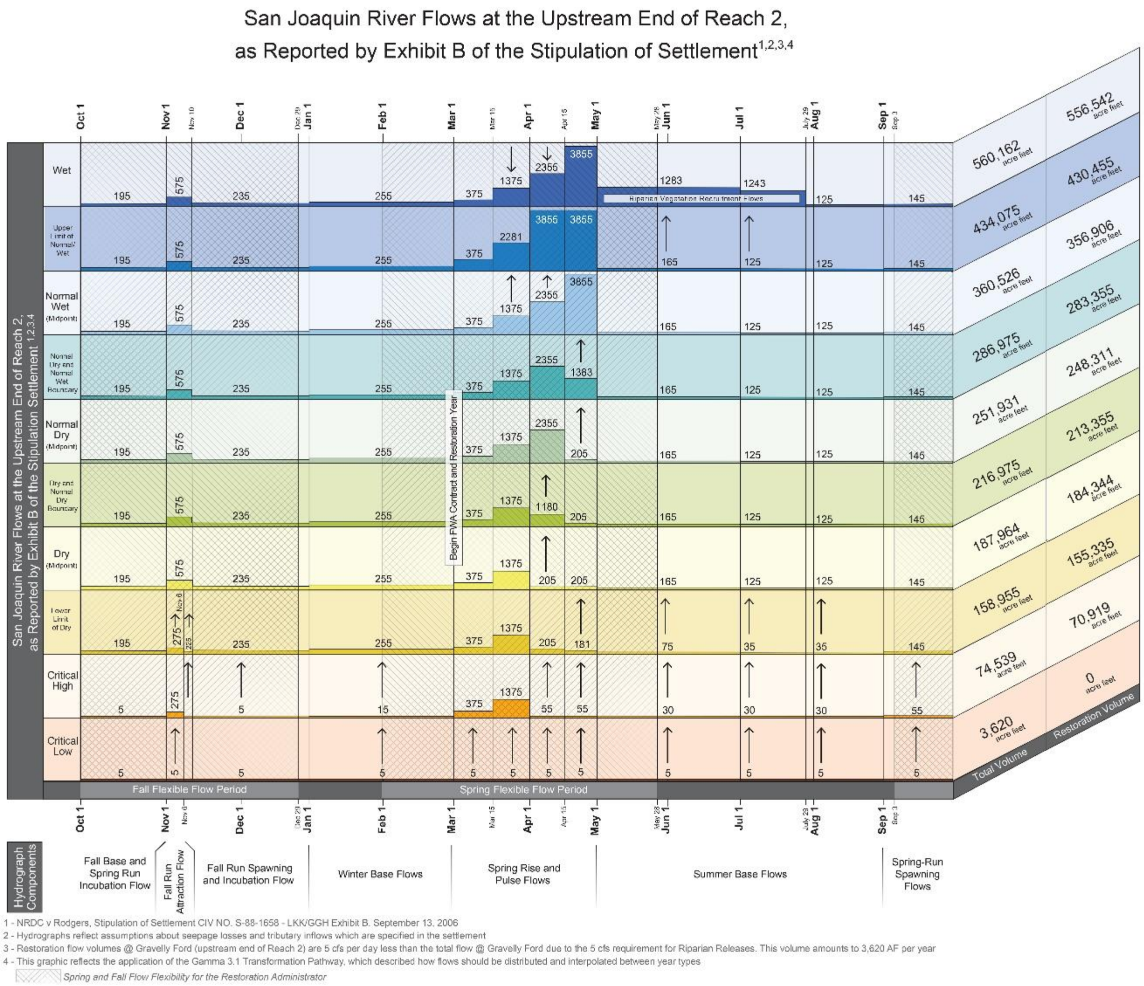


Figure 5.
Flow Transformation Pathways Between Various Steps in the Default Hydrograph

2.2 Flushing Flows

Flushing Flows provide a high magnitude, short duration pulse flow that is large enough to mobilize gravel and serve other geomorphic functions as identified in Exhibit B 5 (see below). While these Flushing Flows are not graphically depicted in a Default Flow Schedule, they are included in the Spring Rise and Pulse Flow volumes in Normal–Wet and Wet Year Types. The volume utilized for Flushing Flows is drawn from the Spring Rise and Pulse Hydrograph Component of the spring period.

"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 tine 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."

The peak flow rate of the Flushing Flow may only be a few hours in duration and will quickly attenuate as the pulse travels downstream. Thus, by the time it reaches Gravelly Ford, it will be significantly diminished in peak flowrate and broadened in duration. In this manner, a pulse rate approaching 8,000 cfs for several hours at Friant Dam can potentially attenuate to less than 4,500 cfs below Gravelly Ford. The design of the flushing flow will require additional investigation and/or experience to meet intended geomorphic objectives while staying within the channel capacity and other downstream constraints.

Although the Flushing Flow is not expressly articulated in the Default Flow Schedule due to its short duration and flexible implementation, it is nonetheless available to the Restoration Administrator. Furthermore, it is incumbent upon Reclamation to release a Flushing Flow in the appropriate water year types if no flow recommendation is received from the Restoration Administrator and subsequently approved. In such a situation, the precise timing and design of the Flushing Flow should be developed in consultation with Implementing Agencies and Settling Parties.

The Restoration Administrator is not precluded from scheduling Flushing Flows in other water year types, provided it is permitted pursuant to Exhibit B (4)(d) (Section 4.1.5).

2.3 Riparian Vegetation Recruitment Flows

[This section is intended to be revisited and potentially revised upon completion of the compact bypass approximately in 2024, when additional channel capacity and recontoured floodplains may change the riparian recruitment strategy.]

The purpose of the Riparian Recruitment Flows is to encourage and facilitate riparian vegetation establishment and maintenance, either during normal reservoir operations or in conjunction with flood management releases to the San Joaquin River. The latter may include releasing Riparian Recruitment Flows immediately following flood flows, bridging of multiple flood flow periods, or otherwise using this flow volume to produce a suitable hydrograph for achieving the purpose. The volume of water designated as Riparian Recruitment Flows is only available during Wet Year Types. Exhibit B 6 provides a description of 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."

In the Default Flow Schedule for Wet Year Types, the Riparian Recruitment Flow spans across the top of summer base flows at a flow rate of 1,118 cfs (Friant Dam releases would then total 1,468 cfs in combination with the 350 cfs summer base flow release), extending from May 1 – July 29, ending no more than 90 days after the end of the spring flexible flow period (Figure 6). When released following flood control releases from Friant Dam, the intent is to use this volume to shape a recession curve at the end of flood control releases to the San Joaquin River, bridge gaps if flood control releases decline at the onset of riparian seed dispersal, and to gradually ramp down flows through key flow ranges for riparian vegetation recruitment. The volume depicted in this block may be shaped and shifted as needed, within the flexibilities and limitations set forth in Section 4.1.4.

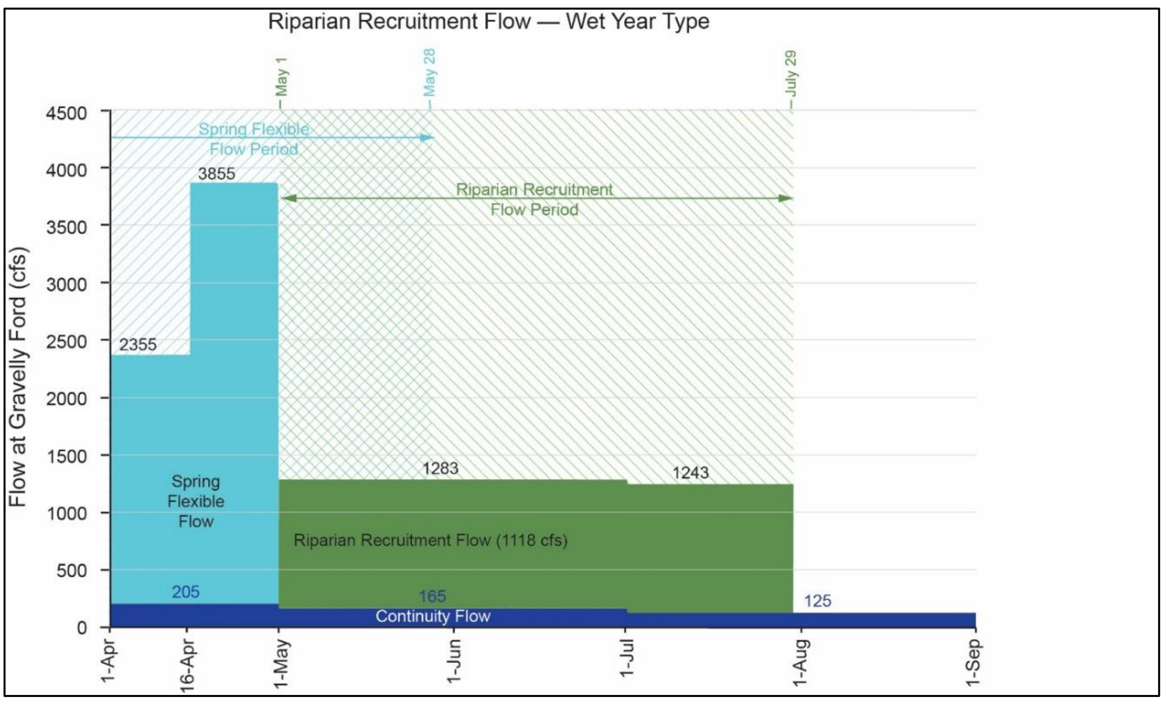


Figure 6.
Default Flow Schedule of Riparian Recruitment Flow at Gravelly Ford in a Wet Water Year Type

It is critical that SJRRP coordinate closely with Friant Dam Operations and the Restoration Administrator regarding flood management releases to optimize the transition to or from flood flows and Riparian Recruitment Flows. Riparian Recruitment Flows can help achieve Flood Management Objectives, and conversely, Flood Management may have the flexibility to meet ecological objectives that would otherwise be achieved with Restoration Flows. Collaboration in this regard may benefit both the Water Management Goal and Restoration Goal.

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

Paragraph 18 of the Settlement outlines the responsibilities of Reclamation and the Restoration Administrator related to flow recommendations.

> *"The selection and duties of the Restoration Administrator and the Technical Advisory Committee are set forth in this Settlement and Exhibit D. 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."*

Reclamation will discuss forecasts and operations with the Restoration Administrator and, if requested, with the Settling parties and Implementing Agencies, before issuance of a Restoration Allocation and Default Flow Schedule. Reclamation will 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 management, discuss channel conveyance capacity constraints, and provide updates to flow operations and flow accounting.

3.1 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 Water 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 and schedule of Unreleased Restoration Flows distributed to date for the year, and any available Unreleased Restoration Flow exchanges.

5. Default Flow targets at Gravelly Ford, and associated releases at Friant Dam for the entire 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 will simultaneously provide the Restoration Allocation and Default Flow Schedule to the Settling Parties and Implementing Agencies, and subsequently make the document available online.

3.2 Consultation with Federal Fisheries Agencies

As described in Paragraph 18 and Exhibit D of the Settlement, the Restoration Administrator will consult with the Technical Advisory Committee. Furthermore, Reclamation's Water Right for instream flow dedication requires that the Restoration Administrator coordinate with the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and other agencies as appropriate in developing flow recommendations.

3.3 Restoration Administrator Flow Schedule Recommendations

The Restoration Administrator will provide 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 will provide an updated recommendation within 10 calendar days (consistent with Sections 1.5 and 1.6). 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 as necessary to assist in the determination of water supply allocations or to help manage operational issues or urgent or rapidly changing hydrologic conditions.

Reclamation will 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 received and approved.

Restoration Administrator Flow 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. In some year types, may also include recommendations for Riparian Recruitment Flows and Flushing Flows.

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 Paragraph 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 or expected to become available, the Restoration Administrator may make recommendations regarding the management of such water pursuant to Paragraph 13(i) of the Settlement.

Modifications to Flood Flows — Suggestions on how ramping up to or down from a Flood Releases to the San Joaquin River could improve success in meeting the Restoration Goal. Such recommendations would be secondary to life and property concerns.

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

3.4 Consistency of Restoration Administrator Recommendations with Settlement and Settlement Act

As per Paragraph 18, Reclamation will determine the consistency of the Restoration Administrator Flow Recommendations with the Settlement and Settlement Act prior to implementation of the recommendations. In addition, Reclamation will assess whether the Restoration Administrator's Restoration Flow Schedule is consistent with permit conditions, operating criteria, and these Guidelines.

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

> The recommended flow schedule is consistent with 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 provisions pursuant to Exhibit B, allowable Buffer Flow releases pursuant to Exhibit B, and addresses recommended releases 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 revised flow schedule. Each Restoration Administrator Flow Recommendation will be reviewed for acceptability by Reclamation within 5 calendar days of receipt. Extensions of the review period are permitted when a full Water Supply Test is necessary in accordance with Section 4 or under extraordinary circumstances.

Reclamation will calculate the volume of Unreleased Restoration Flows that are generated from the approved schedule (Section 11). Once approved, Reclamation will transmit approval of the Restoration Administrator Flow Recommendation to Settling Parties, Implementing Agencies, and make it available to the public.

3.4.1 Restoration Allocation Balancing

The Restoration Administrator has the responsibility to provide Reclamation with a recommended Restoration Flow Schedule that does not exceed the volume allocated to the current and each future flow accounts. This requirement for balancing does not extend to flow accounts that have already been closed (see Section 1). Reclamation has the responsibility to issue an updated Restoration Allocation and Default Flow Schedule when hydrology changes such that the resulting Restoration Allocation is significantly different. Cumulative Release Error (Section 3.5.3) may also dictate that an updated Restoration Flow Schedule be provided by the Restoration Administrator. The Restoration Administrator and Reclamation should strive for a Restoration Allocation balance of zero at the end of the Restoration Year. The final volume of Restoration Flows released from each flow account and the entirety of the Restoration Year will be reported annually.

3.4.2 Management of Friant Dam Releases for Flow Targets

[This section has been identified as needing review and potential revision in a subsequent update to these Guidelines. Release error, seepage losses, Holding Contract demands, and residual flood flows call into question the management of flow targets at Gravelly Ford.]

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, Friant Dam, or other specified locations. Recommendations may include a flow schedule at Gravelly Ford without a flow schedule at Friant Dam, or may include a flow schedule at Friant Dam without a corresponding Gravelly Ford target (but must include at least one of the two). Releases from Friant Dam also include flows to meet Holding Contract requirements in Reach 1 and to compensate for channel losses between Friant Dam and Gravelly Ford that exceed assumed losses in Exhibit B. By maintaining 5 cfs at Gravelly Ford (often referred to as the "5 cfs flow requirement"), Holding Contracts and channel losses are met. When Restoration Flows are to be made available at Gravelly Ford, they are calculated as the total flows at Gravelly Ford in excess of 5 cfs except as adjustments may be required to account for inflow below Friant Dam. (see Section 1.4 Calculating the Remaining Restoration Allocation),

It is recognized that fluctuations in Holding Contract demand in Reach 1, and any channel losses for Restoration Flows, may necessitate that Reclamation adjust releases at Friant Dam in order to meet the recommended flow targets at Gravelly Ford and other specified locations. Tributary flows may or may not necessitate that Reclamation adjust scheduled releases at Friant Dam to meet the recommended flow targets; adjustments should be coordinated with the Restoration Administrator if possible. However, in no circumstance will Friant Dam releases fall below the Restoration Flow Schedule at Gravelly Ford, if a flow schedule at Gravelly Ford is provided, since Restoration Flows must by water right definition only include Friant Dam releases.

Reclamation will 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 5 of these Guidelines describes procedures for compliance with Gravelly Ford flow targets, and Section 10 describes releases for Unexpected Seepage Losses.

3.5 Real-time Flow Changes

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 issuance. 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 Release Error 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, in response to an urgent situation, or other adjustments that are short-term in duration. These operational flow adjustments can also be expected if a submitted flow schedule is awaiting approval, a submitted flow schedule has been rejected and the previous flow schedule is outdated, or there is otherwise a delay in approving a full Restoration Flow Schedule.

These adjustments will be reviewed by Reclamation as quickly as possible (5 calendar days or less, 24 hours if an urgent situation), and may be approved in writing without a full rescheduling of the annual allocation provided that: the adjustment does not result in a material change in Restoration Flow release volume over the previously approved schedule; the adjustment is consistent with the Exhibit B flexible flow provisions without necessitating a full Water Supply Test (rapid evaluation Water Supply Tests are allowable and action must pass this evaluation, see Section 4); and such changes are documented by Reclamation and made available to the Settling Parties and Implementing Agencies.

These operational flow adjustments will 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 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.

3.5.1 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., emergency response to protect 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 publicly available and notify the Restoration Administrator and Settling Parties of any adjustments to the most recently approved Restoration Flow Schedule.

3.5.2 Urgent Schedule 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 affect the Restoration Goal, Reclamation will respond within 24 hours by approving and 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. Section 12 covers urgent schedule changes in detail.

3.5.3 Managing Release Error

[This section has been identified as needing review and potential revision in a subsequent update to these Guidelines. Remaining allocation accounting, increased Holding Contract demands, losses attributable to Restoration flows, tributary flows, and residual flood flows call into question the management of flow targets at Gravelly Ford.]

Release Error is defined as an unintended deviation from the Restoration Flow Schedule exclusive of instances pertaining to Paragraph 13(e). 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 Release Error occurs:

1. Reclamation will 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 represents the difference between the Restoration Flow Schedule and the released volume of Restoration Flows to date. Release error is created through unavoidable or unintentional operational deviations.

2. Reclamation will request the Restoration Administrator provide a new Restoration Flow Schedule when release error 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 applicable flow accounts.

$$[Released\ Flows\ (AF) + \ Committed\ Restoration\ Flows\ not\ scheduled\ for\ release\ (AF)\ ]$$
$$+\ [Scheduled\ Flows\ (AF)$$
$$+\ Restoration\ Flows\ not\ for\ scheduled\ for\ release\ (AF)][Scheduled\ Flows\ (AF)$$
$$+\ Restoration\ Flows\ not\ for\ scheduled\ release\ (AF)][Scheduled\ Flows\ (AF)$$
$$+\ Restoration\ Flows\ not\ for\ scheduled\ for\ release\ (AF)]\ \leq\ Restoration\ Allocation\ (AF)$$

By necessity, rescheduling release error 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 (Section 4) is not required to reschedule release error, provided that only the volume identified as release error is rescheduled.

3.6 Absence of an Approved Flow Recommendation

If an initial flow schedule has not been provided by the Restoration Administrator, or if the Restoration Administrator position is vacant, Reclamation will implement the Capacity Constrained Default Flow Schedule. In this situation, Reclamation will consult with the Settling Parties and Implementing Agencies on specifics of shaping Flushing Flows and Riparian Recruitment Flows when applicable, the management of Unreleased Restoration Flows if applicable, and other flow responsibilities normally addressed by the Restoration Administrator.

4 Flow Scheduling Flexibility and Water Supply Test

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);

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 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 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 (exclusive of Buffer Flows and other water beyond the base flows). This is addressed in Section 3.4 — 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 flow volumes do not exceed the applicable flow accounts.

2. Changes to the Restoration Flow Schedule beyond those specifically called for in the Settlement must not increase the water delivery reductions to any Friant Division Long–term Contractor. This is termed the "Water Supply Test." For the purposes of the Water Supply Test, the term "materially" in Exhibit B 4(d) as it describes limitations on increased water delivery reductions to any Friant Division Long–term Contractor is captured in the description of the Water Supply Test in this section.

Other actions by the Secretary or Restoration Administrator may also be subject to a Water Supply Test. These applicable provisions include:

1. Paragraph 13(a), the storage of Unexpected Seepage Loss water

   "Additional water acquired by the Secretary may be carried over or stored provided that doing so shall not increase the water delivery reductions of any Friant Division long–term contractors beyond that caused by releases made in accordance with the hydrographs (Exhibit B) and Buffer Flows"

2. Paragraph 13(c), the release of Unexpected Seepage Loss water

   "…any further releases or transfers for Unexpected Seepage Loss water within the hydrograph required by this paragraph 13(c) shall not increase the water delivery reduction to any Friant Division long–term contractors beyond that caused by releases made in accordance with the hydrograph (Exhibit B) and Buffer flows."

3. Paragraph 13(e), the adjustment of flows due to maintenance at Friant facilities

   "…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 reduction 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."

4. Paragraph 13(i), the management of Unreleased Restoration Flows by the Secretary

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

5. Paragraph 18, a general statement regarding the Restoration Administrator's schedule

   "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 reduction to any Friant Division long–term contractors."

4.1 Applicable Flows and Actions

Releases from Friant Dam and actions by either the Restoration Administrator or the Secretary are potentially subject to the Water Supply Test to ensure that there are no increased water delivery reductions to any Friant Division Long–term Contractor.

4.1.1 Flexibility Provided to the Restoration Administrator in Scheduling Flows

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

> Exhibit B 4(b) — the ability to flexibly schedule Restoration Flows within the Spring Flexible Flow Period and Fall Flexible Flow Period, so long as the total volume of flows during that period of the year is not changed. The volume of flows depicted in the Exhibit B Base Flow Hydrograph during the Spring Period

(March 1– April 30[7]) and Fall Period (October 1–November 30) may be shifted up to four weeks earlier or later. This includes shifting Spring Flows into the winter of the proceeding Restoration Year. Flushing Flows also fall within this flexibility (Section 4.1.3). These Flexible Flow Periods are depicted in Figure 7 below.

Exhibit B 4(c) — the ability to schedule Buffer Flows needed to meet the Restoration Goal based on daily flow rates or within the flexible provisions provided in Section 9.

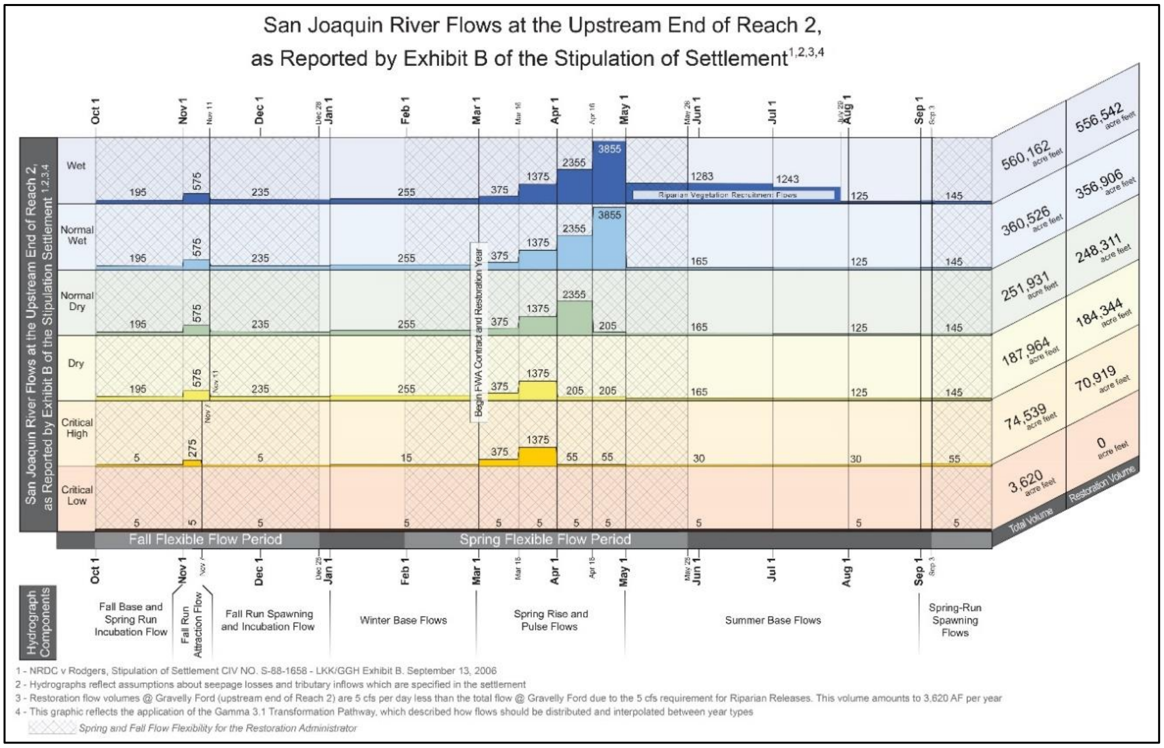
Exhibit B 6 — the ability to release Riparian Recruitment Flows to promote the establishment of riparian vegetation at appropriate elevations in the channel. These flows must be coordinated with the peak Flushing Flows release and ramp down over a specific period of time. See Section 2.3 and Section 4.1.4 for further detail.

The return of water from a previous Unreleased Restoration Flow exchange under Paragraph 13(i), either with or without a Friant Division Long–term Contractor as party to the agreement.

Water that is rescheduled due solely to Release Error at Gravelly Ford (Section 3.5.3).

The Restoration Administrator may recommend daily flow rates less than those in the Default Flow Schedule at any time without a Water Supply Test, presuming the displaced volume is not added to another flow account. For example, the generation of Unreleased Restoration Flows (URFs) does not require a Water Supply Test, however the management of those URFs may be subject to a Water Supply Test.

[7] The dates of the Spring Rise and Pulse Flows, i.e. Spring Flows, is written as "March 1 through May 1 in Exhibit B 4(b). However, this appears to be a date-rounding error as the convention throughout the Settlement is to presume the last day of the month as the end of a period (not the first of the subsequent month). This correction would bring this period in line with other date conventions in the Settlement, such as the end of the fall Flexible Flow Period written as "November 30," and allow four full weeks before the end of the spring Flexible Flow Period on "May 28."



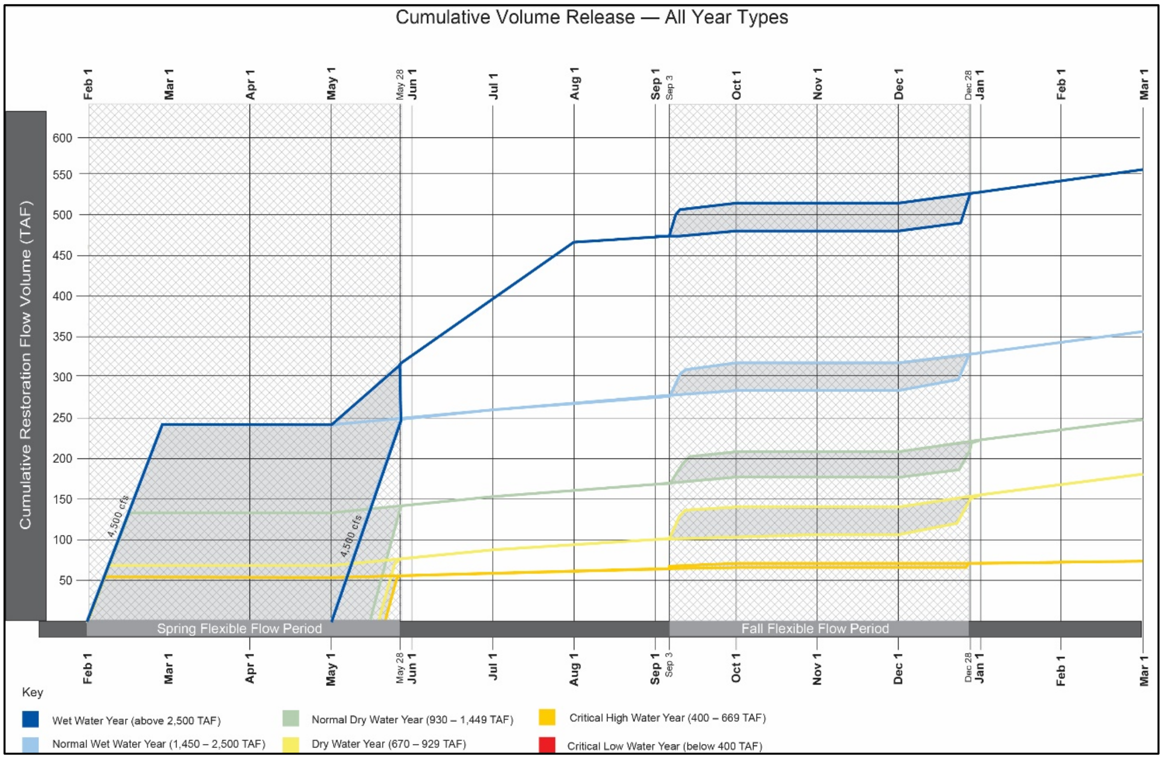
NOTE: Spring and Fall Flexible Flow Periods are shown as cross-hatched areas. These flows include 5 cfs for the Gravelly Ford compliance requirement, which are not accounted for as Restoration Flows and amount to 3,620 AF per year. A full set of Default Flows for other key locations can be found in Appendix C.

Figure 7.
SJRRP Exhibit B Default Flows at Gravelly Ford

4.1.2 Limits of Flexibility Provided by Exhibit B (4)(b)

The flexible flow provisions of Exhibit B provide latitude for the Restoration Administrator to shift and shape flows within the Spring Period from February 1 (February 2 in a leap year) through May 28, and within the corresponding fall period from September 3 through December 28. This flexibility is interpreted as being able to schedule the volume of water available in the Spring Flexible Flow Account and Fall Flexible Flow Account with few limitations. For the purpose of establishing a baseline comparison in the Water Supply Test, a broad envelope of potential volume distribution is allowable for the spring and fall flexible flow periods under Exhibit B 4(b). The most favorable assumption to the Restoration Administrator as depicted by the Flexed Default Flow Schedule will be used as a baseline condition in the Water Supply Test to acknowledge the flexibility that is granted under the Settlement.

The flexibility of the Spring Flexible Flow Account has some limitations that are further delineated here. Restoration Flow releases are constrained by the 4,500 cfs channel capacity below Gravelly Ford as per Paragraph 11(a) of the Settlement. Therefore, for the purposes of a Water Supply Test, Restoration Flows released to the river cannot be scheduled above 4,500 cfs at Gravelly Ford within a flexible flow period. For example, the entire volume of the Spring Period cannot be scheduled for the last day of the flexible flow period as doing so would exceed the 4,500 cfs channel capacity. To interpret this hypothetical limit of flexibility in the Flexed Default Flow Schedule, flows could be scheduled up to the maximum flow rate on the first several days of the spring flexible flow period, or the last several days, depending on the volume allocated within the flexible period. The possible shape of the cumulative release volume of Restoration Flows for the spring and fall periods is shown in Figure 8.



Note: The area within the shaded parallelograms is the potential range of release patterns for the spring and fall flexible flow periods. The dashed line is the default release pattern for the Riparian Recruitment Flow Account.

Figure 8.
Flexed Default Flow Schedule Depicted as a Cumulative Volume Release

4.1.3 Flexibility Provided to Restoration Administrator with Flushing Flows

As described in Exhibit B of the Settlement, Flushing Flows are intended to achieve geomorphic functions such as mobilizing spawning gravels and transporting fine sediment. Flushing Flows are distinct from Pulse Flows and are further described in Section 2.2. Flushing Flows are a subset of Spring Period flows. The Restoration Administrator has the flexibility to decide if and when to schedule Flushing Flows. The use of Flushing Flows will have the flexibilities and limitations set forth in these guidelines:

> Flushing Flows are intended to be released in Normal–Wet and Wet Year Types, yet are not obligatory during these year types, nor are they limited to these year types.
>
> Flushing flows may occur at any point within the Spring Flexible Flow Period.

The Restoration Administrator is not precluded from scheduling Flushing Flows outside of the flexibility provided in Exhibit B, provided it passes a Water Supply Test.

Flushing Flows may be shaped as needed to achieve the desired Restoration Goal benefits within the volume and timing constraints of the Spring Rise and Pulse Flow period.

4.1.4 Flexibility Provided to Restoration Administrator with Riparian Recruitment Flows

The use of Riparian Recruitment Flows (or Riparian Vegetation Recruitment Flows) will have the flexibilities and limitations set forth in these guidelines:

The Riparian Recruitment Flow period may start at the end of the scheduled Flushing Flows, or at another justifiable time within the Spring Flexible Flow Period, or at the end of flood flows, as long as the total volume available is not exceeded. Riparian Recruitment Flows may be restarted if interrupted by Flood Flows or other operational issues.

The Riparian Recruitment Flow period is shown as 90 days from May 1 to July 29 in the Flexed Default Flow Schedule. The duration of the period may be shortened or lengthened by a Restoration Administrator Flow Recommendation, as long as the total volume available is not exceeded. However, to schedule and release Riparian Recruitment Flows beyond July 29, a Water Supply Test must be successfully applied.

Riparian Recruitment Flow volumes may be used “atop” or simultaneously with flows from Spring Flexible Flow Account or Continuity Flow Account; they need not be exclusively applied.

The Riparian Recruitment Flow volume may be used to briefly increase the flow rate to wet floodplain surfaces, before ramping down, as long as the total volume of Riparian Recruitment Flows available to the Restoration Administrator is not exceeded.

Riparian Recruitment Flows may be utilized flexibly (within the 90-day flow period) prior to the end of any Flood Management Action. Additionally, Riparian Recruitment Flows may be utilized flexibly (within the 90-day period) after the end of any Flood Management Action. Riparian Recruitment Flows may be used to ramp-down after flood flow releases and may be shaped as needed to achieve the desired Restoration Goal benefits within the volume and timing constraints.

The volume available in the Riparian Recruitment Flow Account at the end of any Flood Management Action (i.e. at the end of Uncontrolled Season) is the lesser of: 1) the total Riparian Recruitment Flow Account volume minus all released Restoration Flows and evacuated Unreleased Restoration Flows ; or 2) the volume depicted on the Flexed Default Flow Schedule that remains between the end of

Flood Management Actions and the end of the 90-day flow period. Should Flood Flows recommence after a period of Riparian Recruitment Flow releases, the available volume of Riparian Recruitment Flows is calculated in the same manner, irrespective of previous releases or calculations.

The Restoration Administrator may adjust the schedule of Riparian Recruitment Flows as conditions change (even during Flood Releases to the San Joaquin River), subject to volume and timing constraints above.

Unreleased Restoration Flows may be generated from the Riparian Recruitment Flow volume. However, the dispossession (evacuation from Millerton) of these Unreleased Restoration Flows generated from Riparian Recruitment Flow volumes are subject to a Water Supply Test at the conclusion of any Flood Management Action that ends between May 1 and July 29 (i.e., at the end of Uncontrolled Season). They are also subject to a Water Supply Test when delivered after July 29.

Example D for 4.1.5: Flood Management Actions occur during the Riparian Recruitment Flow period, starting before May 1 and lasting through June 14. At the conclusion of Uncontrolled Season, a Water Supply Test is conducted to determine how much Riparian Recruitment Flow volume is remaining. On June 14, 45 days of the 90-day Riparian Recruitment Flow period has passed (50%). Therefore, 50% of the Riparian Recruitment Flow volume shown in the Flexed Default Flow Schedule may be available to the Restoration Administrator equaling 100 TAF, with the remainder having been used during the Uncontrolled Season, “spilled” due to the Water Supply Test, been evacuated from Millerton as URFs, released as Restoration Flows to the river, or a combination thereof. The previously approved schedule of Riparian Recruitment Flows has no bearing upon this calculation.

In the above example, assume that 80 TAF of Riparian Recruitment Flows were released prior through June 14 (through a combination of river releases and URFs). Once flood management actions ended on June 15, the accounting would show 80 TAF used, 20 TAF spilled during Flood Management Actions, and 100 TAF available to the Restoration Administrator (totaling the entire Riparian Recruitment Flow volume of approximately 200 TAF).

The Restoration Administrator and Friant Dam operators are strongly encouraged to coordinate on the scheduling and release of Riparian Recruitment Flows and Flood Flows (Section 2.3). There are advantages to the Water Management Goal and the Restoration Goal in close coordination.

4.1.5 Restoration Administrator Recommendations Subject to a Water Supply Test

The Settlement outlines additional flexibilities that are only available to the Restoration Administrator with the application of a Water Supply Test and determination of no increase in water delivery reduction to Friant Division Long–term Contractors.
These include:

Shifts within the summer or winter flow accounts pursuant to Exhibit B 4(d). The volume within the summer or winter flow period remains the same, but the distribution of that volume across the flow period is different on a monthly or daily basis as compared to the Default Flow Schedule. This is referred to as "shifting flows". Shifts within a flow period that were necessitated by a changing allocation are subject to a Water Supply Test.

Transfers between flow accounts pursuant to Exhibit B 4(d). The volume of water moved from one flow account to another requires a Water Supply Test. This is referred to as "transferring flows." Note that transferring Base Flows across Restoration Years (other than the advancing provision in Exhibit B 4(b), storage of Unexpected Seepage Water pursuant to Paragraph 13(c), and exchanges of Unreleased Restoration Flows pursuant to Paragraph 13(i)) has not been determined to be consistent with the Settlement. Transfers between flow accounts that were necessitated by a changing allocation are subject to a Water Supply Test (the sole exception being at the transition from a Normal–Wet to Wet Year Type as per Section 1.5).

The rescheduling of water pursuant to Paragraph 13(e). When Restoration Flows are reduced or interrupted by maintenance at Friant Division facilities, the volume of scheduled water that was not released can be rescheduled by the Restoration Administrator in the future. However, this rescheduled water is subject to a Water Supply Test if it is outside of a flexible flow period.

The management of water pursuant to Paragraph 13(i). The management of Unreleased Restoration Flows by the Restoration Administrator is subject to a Water Supply Test. This includes unscheduled Restoration Allocation that was created by a changing allocation. Paragraph 13(i) water that was exchanged at another time and returned to the Restoration Administrator for release into the San Joaquin River is not subject to a Water Supply Test.

4.1.6 Secretarial Actions Subject to a Water Supply Test

Some flow actions by Reclamation have the potential to cause a water delivery reduction and are thus subject to a Water Supply Test. These include:

Management of water pursuant to Paragraph 13(a) and 13(c). The management of Unexpected Seepage Loss water (Section 10) is subject to a Water Supply Test.

Management and disposal of water pursuant to Paragraph 13(i). The management of Unreleased Restoration Flow water (Section 11), once that water is passed from the Restoration Administrator to the Secretary for disposal, is subject to a Water Supply Test. For the purposes of the Water Supply Test, Secretarial actions cease when the water is delivered at the turnout of a canal, delivered directly from Millerton, or released from Friant Dam to the San Joaquin River.

4.2 Purpose and Scope of Water Supply Test

The purpose of the Water Supply Test is to ensure that actions by the Restoration Administrator and Secretary do not result in an increased water delivery reduction to any Friant Division Long–term Contractor as compared to the hydrographs and provisions of Exhibit B.

The Water Supply Test is distinct from Appendix H–RWA Impact Calculation and Water Use Curve Model Documentation. In contrast to the Water Supply Test, the baseline for the Recovered Water Account (RWA) Impact Calculation is an agreed to methodology designed to be generally consistent with the 2006 pre-Settlement conditions.

The Water Supply Test specifically examines whether due to certain actions described in Section 4.1.5 and 4.1.6, or the scheduling of Riparian Recruitment Flow Volume beyond July 29 (Section 4.1.4), a water delivery reduction to any Friant Division Long–term Contractor occurs. A water delivery reduction is defined as a reduction in the overall volume of deliveries or a reduction in the volume of a higher priority water supply in favor of a lower priority water supply as compared to the Flexed Default Flow Schedule.

There may be circumstances where a Water Supply Test would show no net reduction in total supply made available to Friant Division Long–term Contractors while an individual contractor would experience a reduction in a schedulable supply such as Class 1. Examining the effects to the following Friant Division Long–term Contractor water supplies within this framework of priorities will be used as a surrogate for determining whether any contractor was impacted without having to determine individual contractor deliveries. Using this "bucket" approach also negates having to examine schedulability or canal pro-rate factors. The priority from highest to lowest are as follows:

1. Class 1 (including Class 1 Carryover)
2. Schedulable (residual) Class 2
3. Pro-rated Uncontrolled Season Class 2
4. Unlimited Uncontrolled Season Class 2
5. Other supplies (e.g. Section 215)

[This prioritized list of five supplies may be simplified in future revisions of the Guidelines if it can be shown to be inconsequential to protecting Friant Long-term Contractor water supply.]

Example E for 4.2: An examination of a planned URF sale to take place during flood management actions indicates that it would result in changes to the above buckets of Friant water supply. Priority #1 would be unaffected, Priority #2 would decrease, and Priority #3–5 would increase. Although the total volume across all five buckets would be equal to or greater than what would be expected under the Flexed Default Flow Schedule, Priority #2 was reduced in favor of lower priorities. This would be construed as a water delivery reduction to one or more Friant Division Long–term Contractors, and therefore would not pass the Water Supply Test.

Water delivery reductions may occur during one of these three situations, where the timing of release (or not releasing) of Restoration Flows or URF's causes:

1. Increase in volume of flood management releases to the San Joaquin River which results in a reduction in total water supply made available to Friant Division Long–term Contractors.

2. A change in Millerton Flood Management Action volume, duration, or timing, even when those flood releases are to the Madera and Friant-Kern Canals. When Flood Management Actions result in an evacuation of water from Millerton Lake on a time constrained basis, that water is not necessarily delivered in strict accordance with the Class 1 and Class 2 pro-rata contract shares. This is likely to reduce the water supply available to at least one Friant Division Long–term Contractor. Note that flood space encroachment may not necessarily trigger Flood Management Actions, which may occur at storage levels above or below this threshold.

3. An increase in the duration of any Inflow Pro-rate period. Note that storage elevation at or below dead pool may not necessarily trigger Inflow Pro-rate, which may occur at storage levels above or below this threshold.

Parameters that will not be considered in the Water Supply Test include:

1. Restoration Flow recapture and recirculation activities;

2. Buffer Flows[8];

3. Water pricing and surcharges;

4. Releases from Millerton for meeting the San Joaquin River Exchange Contract;

[8] Buffer Flows have their own limitations and flexibilities above and beyond the WST. The outcome of a WST does not affect the ability of the Restoration Administrator to call upon Buffer Flows, and the potential to utilize or the decision to not utilize Buffer Flows is not considered in the WST process. This maintains separation between the two options and avoids what would be a very complex analysis.

5. San Luis Reservoir storage levels;
6. Unreleased Restoration Flows from Exchanges returned to the Restoration Administrator;
7. Affects to contractors other than Friant Division Long–term Contractors.

Example F for 4.2: Delay in making deliveries of URFs beyond the Spring Flexible Flow Period would result in a brief period of Uncontrolled Season to prevent reservoir encroachment into flood protected storage space. This short period of Uncontrolled Season would likely result in less than 100% Class 1 declaration. Even though total volume delivered as water supply would be unchanged, Pro-rated Uncontrolled Season Class 2 volume (priority #3) was increased at the expense of Class 1 volume (priority #1). This would be considered a water delivery reduction, and therefore would not pass the Water Supply Test.

4.3 Water Supply Test Baseline and Test Case

The Water Supply Test will use the Flexed Default Flow Schedule as a baseline. As described in Section 2, this Flexed Default Flow Hydrograph combines the Default Flow Hydrograph with the flexible flow provisions described in Exhibit B 4(d) and Exhibit B 6. The Water Supply Test will use a test case that combines the releases to date with the planned or scheduled Restoration Flow releases into the future through the remainder of the Restoration Year.

Baseline — The baseline for the Water Supply test is the Flexed Default Flow Schedule generated at the most recent allocation. This differs from the normal Default Flow Schedule in that it incorporates the flexible flow periods by the most flexible (and thus favorable to the Restoration Administrator) interpretation as depicted in Figure 8. This flexibility is intended to protect the authority provided to the Restoration Administrator and associated Secretarial actions by Exhibit B 4(b).

Test Case — The test case for the Water Supply Test is the cumulative volume of Restoration Flows from the beginning of the Restoration year (plus any Restoration Flows or Unreleased Restoration Flows advanced into February of the previous Restoration Year under the flexible flow provisions) combined with the cumulative volume of the proposed future flow schedule and proposed future Unreleased Restoration Flow deliveries. Any Unreleased Restoration Flows that have been previously delivered to Friant Division Long-term Contractors under sale or exchange agreements, plus any Unreleased Restoration Flows that have been evacuated from Millerton under third party agreements, will be included in the cumulative volume of Restoration Flows for the purposes of the Water Supply Test.

Buffer Flows are omitted from both the Baseline and the Test Case for the Water Supply Test. Any Buffer Flows used prior to the Water Supply Test or planned for release after the Water Supply test will not be considered as a base flow release. The result of the Water Supply Test does not preclude the Restoration Administrator from using Buffer Flows in accordance with the Buffer Flow rules in Section 9.

Buffer Flows are not subject to a Water Supply Test when released in accordance with Exhibit B(4)(c). Buffer Flows are not included in the computation of the Water Supply Test to preserve their use in a future part of the schedule. If Buffer Flows were hypothetically included as part of the baseline for a Water Supply Test, it would effectively encumber those Buffer Flows into the future.

4.4 Applicable Time Periods

The Water Supply Test will be executed as either: 1) a forward-looking forecast informed by the current Millerton Unimpaired Runoff forecast and reservoir operations plan conducted when Reclamation is approving a Restoration Flow Schedule involving actions described in Section 4.1.5 or when Reclamation is managing actions described in Section 4.1.6; or 2) a real-time test conducted at the end of a flood management action period involving actions described in Sections 4.1.4, 4.1.5 or 4.1.6; or 3) a real-time test conducted during Millerton Lake Inflow Pro-rate involving actions described in Sections 4.1.5 or 4.1.6; or 4) a real-time test conducted during at the end of a Restoration Flows interruption as described in Paragraph 13(e) (Section 7).

Restoration Flow Schedules or actions that were previously approved by Reclamation, with or without a Water Supply Test, and subsequently released as Restoration Flows, evacuated from Millerton Lake, or otherwise completed will not later be determined to be an increased water delivery reduction. The Water Supply Test is not retroactive; it only examines flow schedules and actions that take place at or after the initiation of the Water Supply Test. If a Water Supply Test is conducted upon the termination of a Flood Management Action period, it will examine Restoration Administrator and Secretarial actions at the end of Flood Management Actions and its effect upon Millerton Storage such that residual Friant Water Supply is protected. Details of the Water Supply Test are found in Appendix J.

4.5 Accounting of Water to Ensure Integrity of Water Supply Test

For any Restoration Flow water that is released as Restoration Flows or delivered as Unreleased Restoration Flows, it must be clear which flow account it is drawn from (e.g. spring, summer, fall, winter, or Riparian Recruitment Flow). This is essential in knowing what flexibilities are permitted and which actions are subject to a Water Supply Test.

Any Unreleased Restoration Flows returned to the Restoration Administrator from an exchange and scheduled for release to the San Joaquin River from Friant Dam must be allocated to a specific period of time and at a specific flow rate such that the remaining volume drawn from the Restoration Allocation and associated flow accounts can be precisely known. This will be essential in properly applying any subsequent Water Supply Tests[9].

For clear accounting of water among the four flow accounts (Continuity, Spring, Fall, and Riparian Recruitment Flows), it is assumed that flows from the Continuity Flow Account are "underneath" any flows from the other accounts. When both Riparian Recruitment Flows and Spring Flexible Flows are present, which is possible during May of a Wet Year Type, then Riparian Recruitment Flows would be "atop" any Spring Flexible Flows, which would be "atop" Continuity Flows. Any Release Errors would then be borne by the "on top of" account.

4.6 Water Supply Test Process Overview

When a Water Supply Test is warranted, Reclamation will analyze the proposed flow schedule or action in a timely manner. In order to streamline the analysis process, a two-step process is outlined below.

- First, a Rapid Evaluation Water Supply Test will be conducted to determine if one of a number of pre-determined situations apply to the proposed flow schedule or action. This evaluation identifies specific situations where there is a high likelihood that there will not be a water delivery reduction to any Friant Division Long-term Contractor, or that any impacts are de minimis. The rapid analysis is conducted by SJRPP staff in consultation with SCCAO. This analysis should be completed in 5 calendar days from receipt as part of the normal recommendation approval process. The rapid analysis evaluation is included in Appendix J.

- If conditions in the rapid analysis do not apply to all the proposed flow schedule or actions, then a Full Water Supply Test is conducted. This analysis should be completed within 15 calendar days (inclusive of the 5 calendar days normally allowed to review a recommendation). The Full Water Supply Test consists of the following three steps:

  - **Quantitative analysis of Millerton Lake storage.** A forecast of Millerton storage levels, at a time step of sufficient resolution, to determine the likelihood of creating or exacerbating a Flood Management Action and the likelihood of increasing the amount or duration of any Inflow Pro-rate. The time period of the analysis should include the current conditions through the Restoration Year. The analysis will compare storage levels of the baseline and

[9] The Restoration Administrator has all the flexibility to release returned URF exchanges that is authorized in the exchange agreement (i.e. tied to the exchanging party's water contract). However, the Restoration Administrator may not continually shift this water around the schedule to avoid a Water Supply Test. It must be released according to a schedule provided, and once released, it may not be rescheduled.

test case. The quantitative analysis will be conducted by staff of SJRRP and SCCAO and include a brief written summary.

- **Consultation with Settling Parties.** A standing expert panel will be established to review the quantitative aspect of the Water Supply Test, identify any assumptions that need further review, and make any recommendations. Other tools are available through the consultation process, such as requesting delivery schedules under different scenarios. Requesting schedules in this manner is subject to gaming bias and distortion but may be necessary in complex situations. The Restoration Administrator will be available during the consultation process to respond to questions related to flow recommendations.

- **Professional Judgment.** Staff from SJRRP and SCCAO will review comments received through consultation and discuss the proposed action/flow schedule with the Restoration Administrator and SJRRP Office. SCCAO has the final determination on whether the proposed action or flow schedule does or does not result in a water delivery reduction, as defined herein, to Friant Division Long–term Contractors. Judgement will consider and potentially dismiss any de minimis impacts that may exist but do not result in a water delivery reduction as described in Section 4.2 and elsewhere in these Guidelines.

- If a proposed action is rejected through the Water Supply Test process, Reclamation should identify the water supply reductions that would likely ensue and indicate which proposed flow actions would be acceptable (found to not be a water delivery reduction). The latter allows the Restoration Administrator to immediately proceed with the portion of the proposed actions that were not rejected by the process. At this time, the Restoration Administrator may propose alternative actions which would fully mitigate the proposed actions; such a proposal may require another round of quantification, consultation, and professional judgment, or they may fall within the scope of the current analysis and could be resolved more quickly.

This page left blank intentionally.

5 Measuring, Monitoring, and Reporting of Restoration Flows

Measurement, Monitoring, and Reporting of the Restoration Flow releases are necessary for the implementation of the Restoration Program and required per Paragraph 13(j)(ii) of the Settlement:

> *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 Flow Recommendations.

5.1 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 the California Data Exchange Center (CDEC), and publish final Quality Assurance/Quality Control mean daily flow data on-line as it becomes available. Discharge measurements will adhere to USGS protocols.[10] 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).

[10] Buchanan, T.J., and Somers, W.P., (1969) "Discharge Measurements at Gaging Stations" *U.S. Geological Survey Techniques of Water-Resources Investigations* Vol.3, p. 65

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

San Joaquin River Restoration Study
Background Report

CHAPTER 2
SURFACE WATER HYDROLOGY

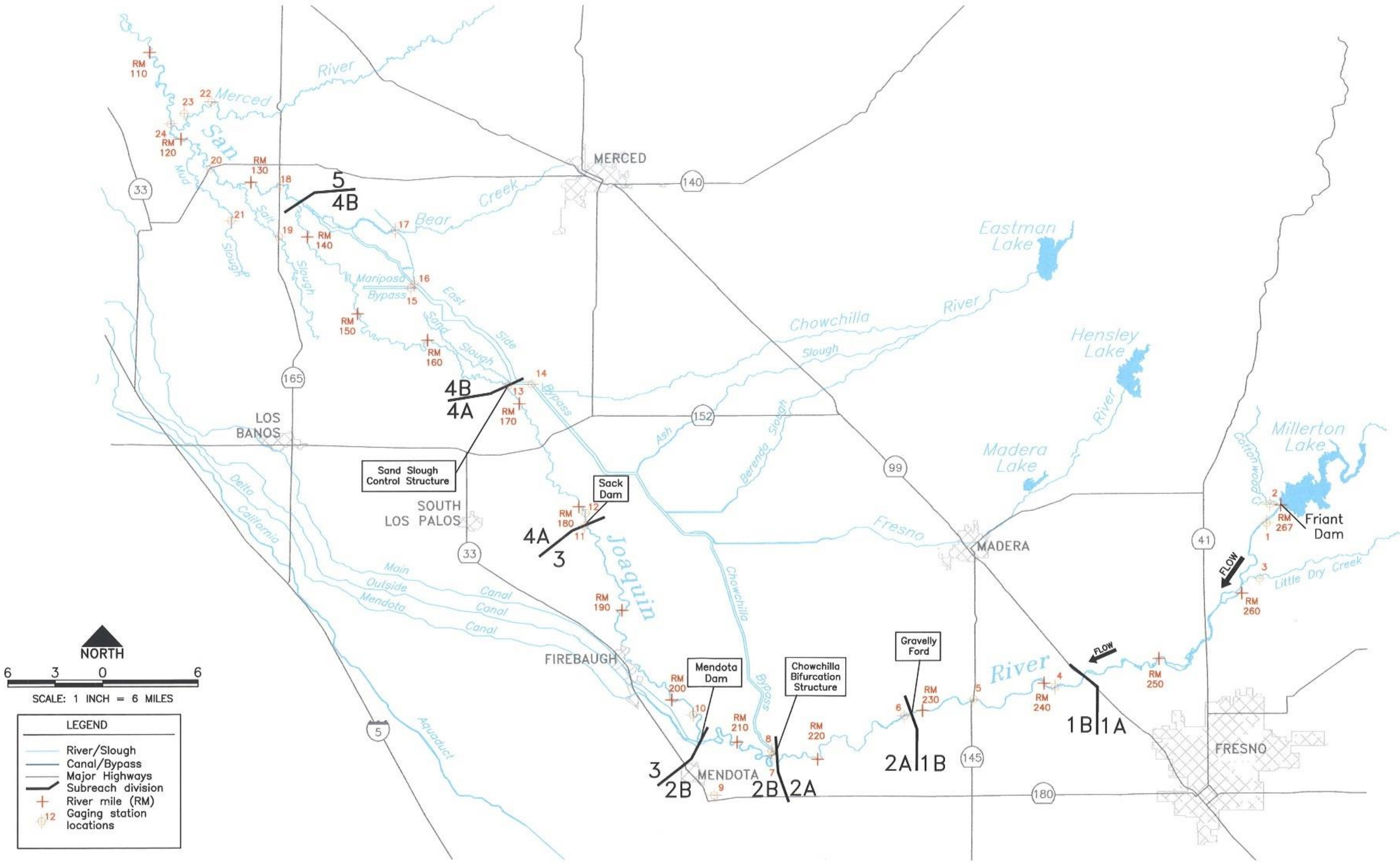


Figure 2-2. Project area of the San Joaquin River Restoration Plan showing Reach and Subreach Boundaries, and gaging stations.

Friant Water Users Authority
Natural Resources Defense Council

2-7

December 2002
FINAL REPORT

Figure 9.
River Reaches Within the Restoration Area

This page left blank intentionally

5.2 Development and Publication of the Monitoring and Analysis Plan

[This subsection has been identified as needing review and potential revision in a subsequent update to these Guidelines.]

The Monitoring and Analysis Plan will include the following information:

1. A discussion of the Restoration Administrator Flow 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 Flow 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

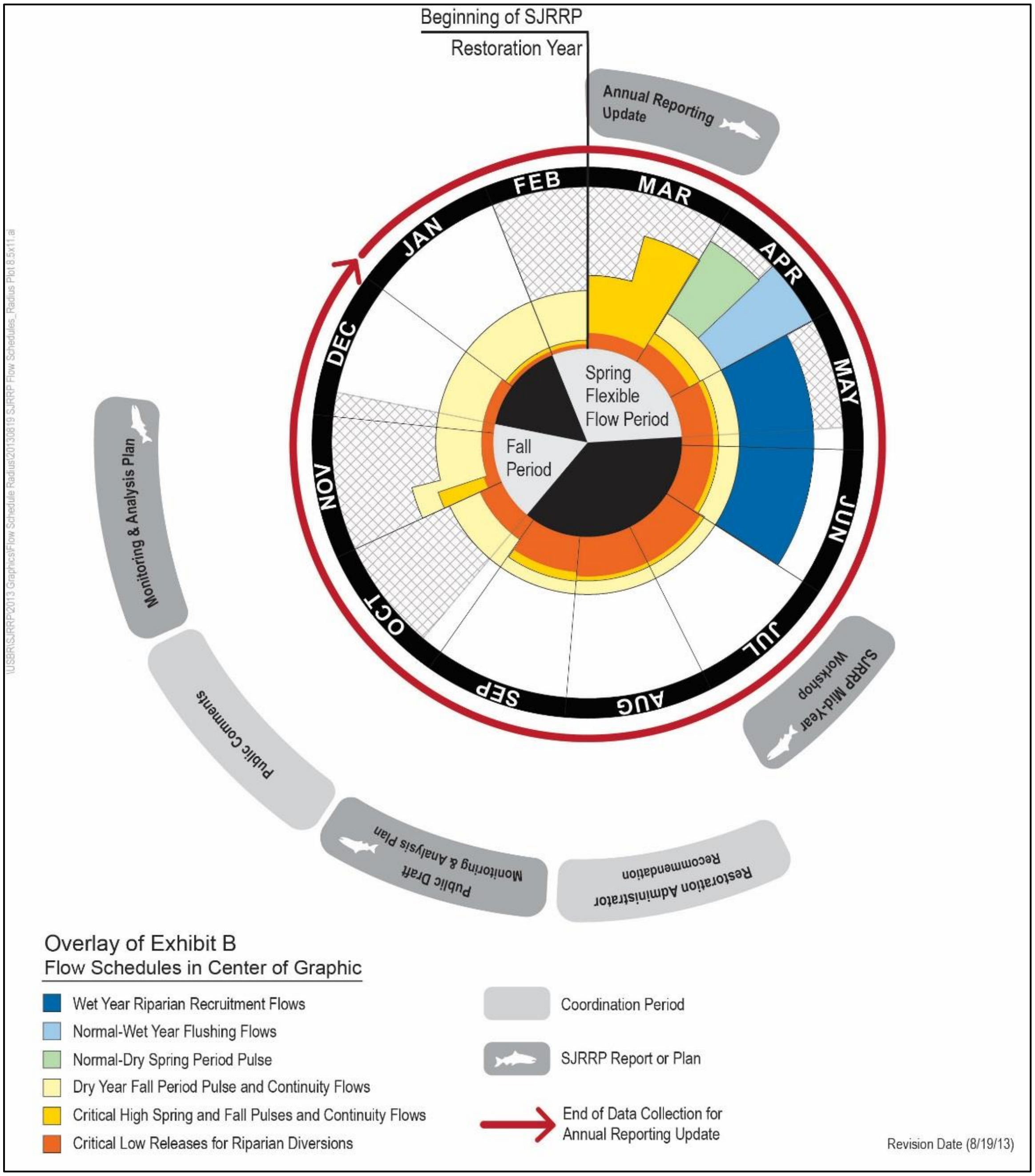
   – An inventory of physical and biological monitoring activities conducted or proposed for implementation

   – 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 10, below.



NOTE: Figure 10 has been identified as needing review and potential revision in a subsequent update to these guidelines

Figure 10.
Publication Schedule for SJRRP Monitoring and Analysis Plan

5.3 Flow Compliance Evaluation

[This subsection has been identified as needing review and potential revision in a subsequent update to these Guidelines.]

The following compliance protocols will meet the terms and conditions of the Settlement with respect to flows at Friant Dam and Gravelly Ford. The difference between Friant Dam releases and Gravelly Ford flows, which is the result of a combination of Holding Contract diversions, riparian rights diversions, unpermitted diversions, infiltration losses, and evapotranspiration, will be referred to as "losses" for the purposes of the following protocols[11, 12].

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 will adjust releases based on the difference between reported Gravelly Ford flows and the target at Gravelly Ford. Flow adjustments at Friant Dam will 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 will be adjusted (increased/decreased) as follows:

   a. Weekly flow adjustments will 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.

---

[11] Note that Exhibit B refers to all Reach 1 diversions as "Riparian Release". This is a generic term, and does not imply a specific type of water right.

[12] SCCAO accounting "Riparian Releases" currently includes deliveries for Gravelly Ford Water District.

3. For compliance during times outside the Spring Pulse, Riparian Recruitment, and Fall Pulse periods, Reclamation will 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 (MIL_T) and Gravelly Ford (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 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 will evaluate and adjust releases from Friant Dam.

   f. Reclamation will 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 the previous four days.

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

   g. Reclamation will 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 will 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 will be determined by subtracting the assumed riparian release for that time period, as shown in Exhibit B.

    b. The flows from Friant Dam will 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 will 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 will be adjusted to post pulse base flow starting on day 7 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, Gravelly Ford Compliance.

This page left blank intentionally.

6 Methodology for Monitoring Losses

[This section has been identified as needing review and potential revision in a subsequent update to these Guidelines.]

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 to Settling Parties. This data will inform the management of Unexpected Seepage Losses and obligations under Paragraph 13(f) and 13(h). In assessing seepage losses and/or downstream surface or underground diversions, Reclamation will use final flow records or best available information.

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

The San Joaquin River Restoration Study Background Report[13] defined the five river reaches which are commonly used throughout the Guidelines (Figure 9). Because of the limited availability and reliability of gaging stations, Exhibit B utilizes a somewhat different alignment of Reaches 2, 3, 4, and 5. As the Settlement directs that losses (including surface or underground diversions) should be monitored and compared to the levels assumed in Exhibit B, a rational grouping of river reaches to utilize reliable gauges is necessary.

For the purposes of this section, the determination of seepage losses and/or downstream surface or underground diversions for Reaches 1 through 5 will be measured at gauge locations identified below (Table 6). Note that losses in Reach 1 are managed differently (described under Section 5.3) than losses in Reach 2 through 5 (Section 10). Electronic links to the online data are provided in Appendix E (Reach Definitions and Gauges) for each station found in the CDEC or NWIS data portal.

[13] McBain and Thrush (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. Available online at: Chapter0-Final.indd

Table 6.
Grouping of Reaches for the Purposes of Losses Monitoring

Formal Reach Definition (from Background Report)	Exhibit B Reach (for the Purposes of Losses Monitoring)	Upper Gauge (CDEC code)	Lower gauge (CDEC code)
Reach 1	Friant Release	Friant Dam release (reported daily by USBR)	San Joaquin River at Gravelly Ford (GRF)
Reach 2A	Reach 2	San Joaquin River at Gravelly Ford (GRF)	San Joaquin River below Bifurcations (SJB)
Reach 2B, Reach 3	Reach 3	San Joaquin River below Bifurcations (SJB)	San Joaquin River near Dos Palos (SDP)
Reach 4A	Reach 4	San Joaquin River near Dos Palos (SDP)	San Joaquin River near Washington Road (SWA)
Reach 4B, Eastside Bypass, Reach 5	Reach 5	San Joaquin River near Washington Road (SWA)	San Joaquin River above Merced River near Newman (SMN)
San Joaquin River at Confluence	Confluence	San Joaquin River above Merced River near Newman (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 Components:

Fall Base and Spring-Run Incubation Flow — October 1 through October 31

Fall-Run Attraction Flow — November 1 through November 10 (in Critical years the time period is to be shortened by several days, running from Nov 1 to Nov 6.)

Fall-Run Spawning and Incubation Flow — November 11 through December 31 (from November 7 through December 31 in Critical years)

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.

6.1 Notes on Reach by Reach Losses

As Interim Flows and Restoration Flows have been released through the Restoration Area, understanding losses and the best measurement methods is evolving. The current understanding is listed below.

6.1.1 Reach 1

During normal operations, flows in Reach 1 include riparian releases to satisfy Holding Contracts and releases to meet the Restoration Flow schedule. At certain times Reach 1 may also contain tributary flows not originating from Friant Dam, flood releases from Friant Dam, purchased water and other releases in excess of the Restoration Flow Schedule, and other contractual obligations such as flow to meet obligations under the Exchange Contract or flows to meet deliveries of Gravelly Ford Water District. To understand the true demands for Holding Contracts, or to determine if there are incremental stage losses associated with Reach 1 Restoration Flows, it is important to quantify all water sources and diversions and isolate just those losses associated with Holding Contracts and riparian diverters.

6.1.2 Reach 2

Exhibit B (Footnote 2 under Tables 1A through 1F) describes losses in Reach 2 as a function of flows at the Gravelly Ford (GRF) gauge station. From Gravelly Ford to the Chowchilla Bifurcation, the near-surface groundwater table has historically dipped sharply away from the river, indicating that substantial seepage losses are likely. The presence of Restoration Flows may influence the groundwater behavior in this reach, leading to variability in seepage losses. Table 7 summarizes the relationship between flow and loss shown in Exhibit B.

Table 7.
Reach 2 Losses in Exhibit B

Flow at the Gravelly Ford Gauge Station (cfs)	Anticipated Reach 2 Losses (cfs)
<300	80
300–399	90
400–800	100
>800	41.1 * Log (GRF) – 142 (see Figure 11)

For flows greater than 800 cfs, Exhibit B footnotes reference Figure 2-4 of the *San Joaquin River Restoration Study Background Report,* [14] provided below as Figure 11.

[14] McBain and Thrush (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. Available online at: Chapter0-Final.indd

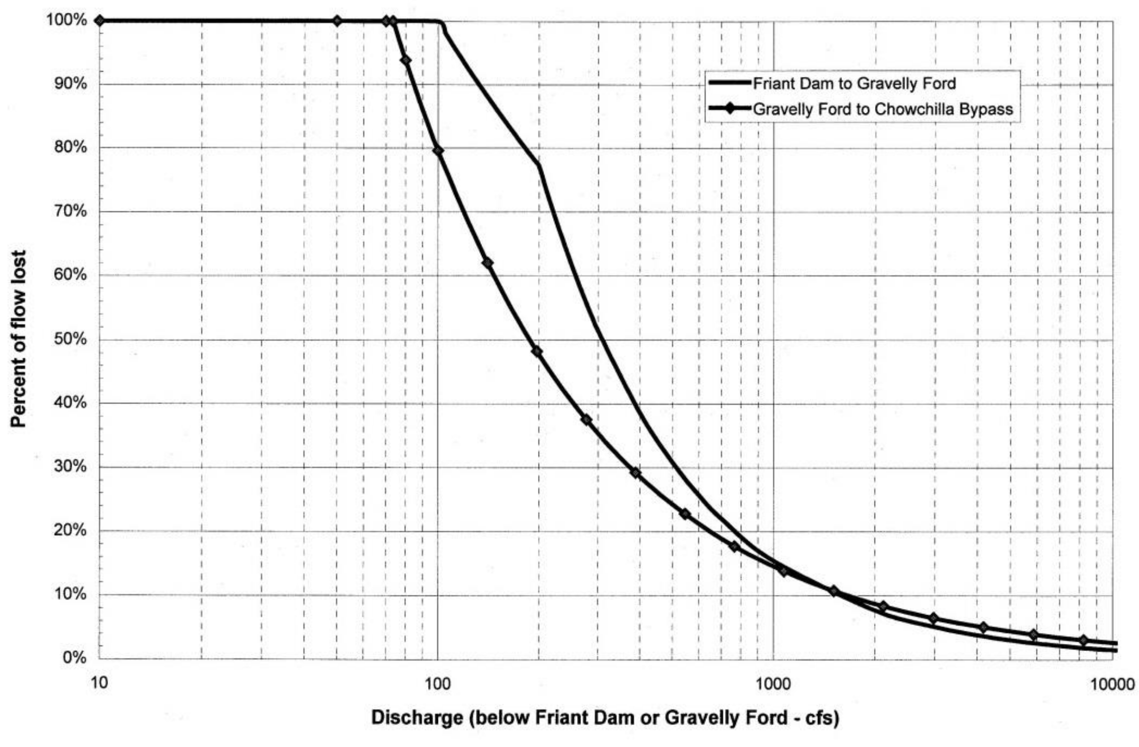


Figure 2-4. Estimated flow loss curves for the San Joaquin River between Friant Dam and Gravelly Ford, and between Gravelly Ford and the Chowchilla Bifurcation Structure.

Figure 11.
Relationship Between Flows at Gravelly Ford Gauge Station and Losses in Reach 2

6.1.3 Reach 3

Exhibit B assumes no losses in Reach 3 (which for the purposes of tracking losses includes Reach 2B). A footnote in Exhibit B indicates that Reach 3 may be a slightly losing reach, but also 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 (CDEC: SJB) gauge station to San Mateo Road, with an additional 5% loss for Mendota Pool and Reach 3, pursuant to the agreement between Reclamation and the San Luis &Delta-Mendota Water Authority. Changes to loss assumptions in this reach may result from future monitoring evaluations, or implementation of the Reach 2B and Mendota Pool Bypass project. A flow gauge was temporarily installed at San Mateo Road near the eastern arm of Mendota Pool, but removed after experience showed low precision at that site due to shifting substrate and fluctuations in the backwater effect from Mendota Pool.

6.1.4 Reach 4

The Exhibit B footnotes discuss seasonal losses in Reach 4A and gains in Reach 4B, with a net gain in overall Reach 4 flow, although no gains are assumed in the Exhibit B hydrographs. The Background Report indicates that Reach 4B1 may be a losing reach, with Reach 4B2 a gaining reach. Measured losses, including losses that may occur by the routing of Restoration Flows through the Eastside Bypass, will be considered an Unexpected Seepage Loss. Losses below Washington Avenue (CDEC: SWA) should be quantified in Reach 5 as per Exhibit B.

Limited experience with Restoration Flows indicates that when the Sand Slough Bypass and Eastside Bypass are utilized for flow routing, there are losses immediately downstream of San Joaquin River at Washington Ave which ameliorate gradually downstream. The Eastside Bypass becomes a gaining reach after Dan McNamera Road and before the confluence with Bear Creek, depending on seasonal conditions.

6.1.5 Reach 5

Exhibit B assumes net gains from Mud and Salt sloughs in Reach 5, with no net losses. These accretions vary by season and are listed as an assumption in the Exhibit B hydrographs. Reach 5 accretions would also incorporate gains from the Eastside Bypass and its tributaries (e.g. Bear Creek, Owens Creek, Deadman Creek). A reduction in measured gains from Mud and Salt sloughs below those assumed in Exhibit B will not be considered an Unexpected Seepage Loss.

As of 2019, it has been difficult to get accurate flow gauging from the confluence of the San Joaquin River with the Merced River. The low gradient of the river surface elevation combined with asynchronous flows on the respective rivers results in substantial backwater effect. In some cases, it is better to measure flows from San Joaquin River at Fremont Ford Bridge (CDEC: FFB) or San Joaquin River near Stevinson (CDEC: SJS) and add known tributary gains from Salt and Mud Sloughs (CDEC: SSH and MSG); this approach avoids most of the backwater effect but does omit a portion of ungauged accretions.

6.2 Obligations by Parties

Settling Parties have an obligation to assist with the monitoring and analysis of losses and to find appropriate resolutions. Obligations for taking measures to address losses also exist in the Purchase Contract and may exist elsewhere. Coordination on downstream losses is covered in Section 13 of these Guidelines.

This page left blank intentionally

7 Release Changes for Maintenance on Friant Division Facilities

---

This section describes the procedures for implementing a Restoration Flow release change as a result of maintenance or related activities on facilities of the Friant Division of the Central Valley Project (CVP). From paragraph 13(e) of the Settlement; 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.

Actions that affect the facilities of the Friant Division of the CVP may include 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 are 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. These releases may be subject to a Water Supply Test (Section 4); in some cases, flows that were delayed through these maintenance actions cannot be later released due to the likelihood of increasing water delivery reductions to one or more Friant Division Long–term Contractor.

8 Restoration Flows during Flood Releases

[This section has been identified as needing review and potential revision in a subsequent update to these Guidelines.]

Releases to the San Joaquin River for the purpose of flood control occur as the result of a large volume of Millerton Lake inflow not otherwise storable for Central Valley Project purposes, or infrequent and otherwise unmanaged flood flows of short duration. This section describes how these releases interact with Restoration Flows, as required by Paragraph 13(j)(vi) of the Settlement;

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

The Settlement further describes the relationship between Restoration Flows and flood flows in Paragraph 13(d);

> *Notwithstanding Paragraphs 13(a), (b), and (c), the Parties acknowledge that flood control is a primary authorized purpose of Friant Dam, that flood flows may accomplish some or all of the Restoration Flow purposes to the extent consistent with the hydrographs in Exhibit B and the guidelines developed pursuant to Paragraph 13(j), and further acknowledge that there may be times when the flows called for in the hydrographs in Exhibit B may be exceeded as a result of operation of Friant Dam for flood control purposes. Nothing in this Settlement shall be construed to limit, affect, or interfere with the Secretary's ability to carry out such flood control operations.*

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 deemed to meet the Restoration Flow hydrograph will equal the daily volumes of flow provided in the most recent and adopted Restoration Flow Schedule.

Releases of Riparian Recruitment flows will 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 (Section 4.1.4).

During years when Riparian Recruitment flows may be available, Reclamation will 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 will 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, will 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 Section 4.1.4 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, to be achieved within the 90-day time period.

9 Buffer Flows

[This section has been identified as needing review and potential revision in a subsequent update to these Guidelines.]

> *… 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.

9.1 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.*

9.2 Recommendation for Release

The release of Buffer Flows is initiated by a written recommendation from the Restoration Administrator to Reclamation. The recommendation will include at a minimum: the purpose and need for such additional flows to address the Restoration Goal, 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 will account for the volumes of Buffer Flows released daily 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.

9.3 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 6. 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 Year Type, as shown in Table 8.

Table 8.
Volumes of Buffer Flows Available based on Exhibit B

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

Notes: TAF = Thousand Acre-Feet

9.4 Flexible Management of Buffer Flows

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

9.4.1 Provision for Moving Volumes from October through December

The full volume of Buffer Flows available between October 1 and December 31, defined in Exhibit B(4)(c) as "10% of the total volume of Base Flows during that period", 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 through December 28).

9.4.2 Provision for Moving Volumes from May through September

Up to 50% of the volume of Buffer Flows available between May 1 and September 30, not to exceed 5 (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% of the Restoration Flow Schedule for any day.

9.4.3 Example Availability and Flexibility of Buffer Flows

Table 6 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 12.

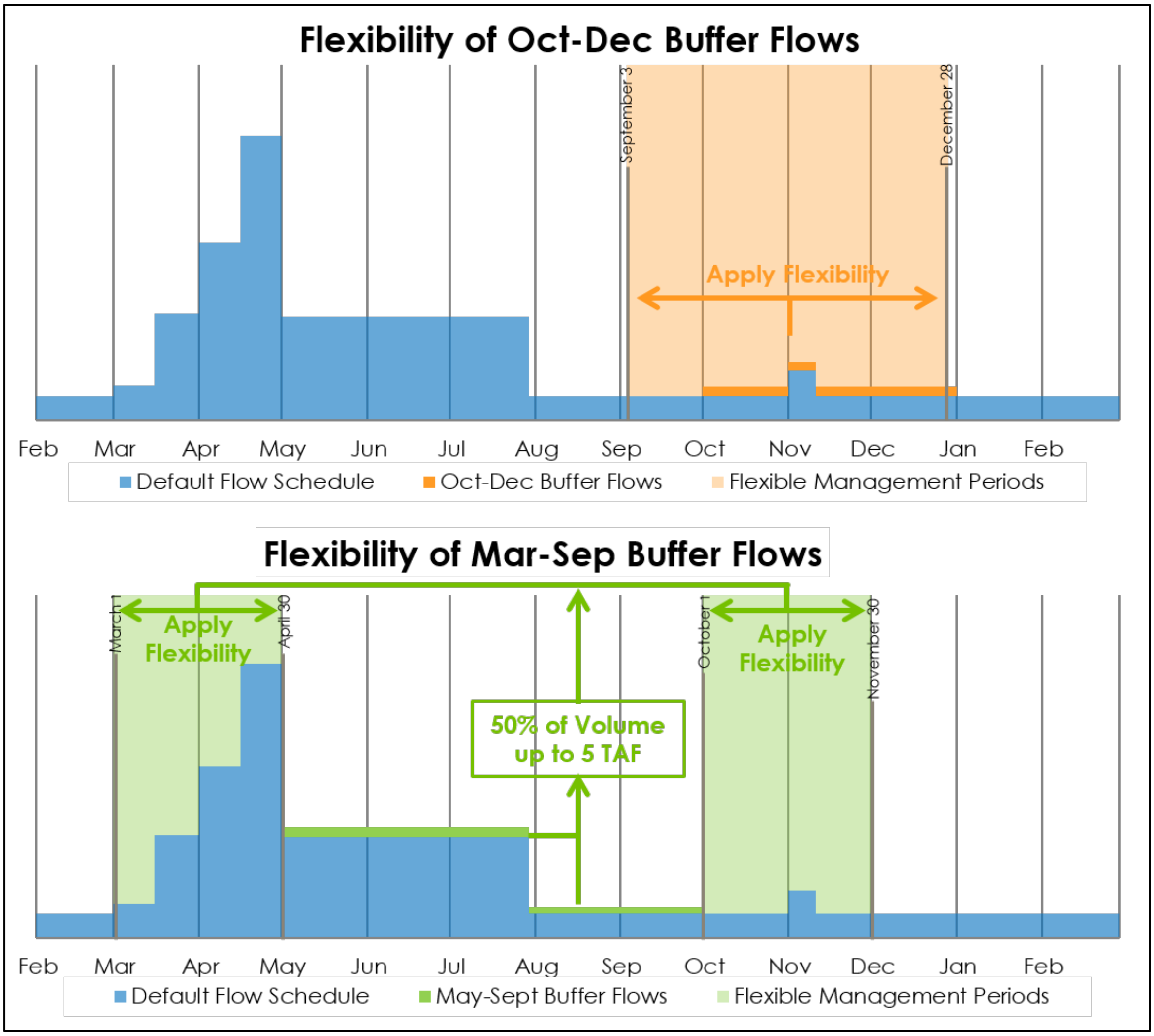


Figure 12.
Volumes and Periods Available for Flexible Management of Buffer Flows

This page left blank intentionally

10 Releases for Unexpected Seepage Losses

[This section has been identified as needing review and potential revision in a subsequent update to these Guidelines.]

This section covers the purchase and release of water for Unexpected Seepage Losses. The water acquired and used for Unexpected Seepage Losses will be designated as Unexpected Seepage Water, accounted for by Reclamation, and released by Reclamation. The methodology for monitoring losses, including quantification of unexpected seepage losses, is discussed in Section 6 of these guidelines. 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.*

10.1 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.

10.2 Procedures for Acquisition

Reclamation will 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).

10.3 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 will 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 Division Long–term Contractors that have executed 215 Water Contracts, Reclamation will make releases of the remaining available unstorable water, as necessary, for Unexpected Seepage Losses. Such releases will 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 will modify the hydrograph to transfer water from the applicable hydrograph for that year according to Method 3.1 Gamma, as described in Appendix G of the SJRRP PEIS/R (Reclamation, 2012[15]). The modified hydrograph will 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.
4. If the water cannot be transferred, Reclamation will use any available Buffer Flows for that year, in consultation with Restoration Administrator.

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

10.4 Accounting of Unexpected Seepage Water

As soon as practical after the end of each month, Reclamation will 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.

10.5 Disposal of Unexpected Seepage Water

As soon as practical, the Restoration Administrator will 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 will 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 will 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, will be those rights and priorities of the willing seller.

This page left blank intentionally

11 Unreleased Restoration Flows

[This section has been identified as needing review and potential revision in a subsequent update to these Guidelines.]

Unreleased Restoration Flows are water allocated to the Restoration Program that cannot be released into the San Joaquin River under the Restoration Administrator's recommended schedule for any reason. The Settlement calls for this water to be managed by Reclamation in consultation with the Restoration Administrator in a way that best achieves the Restoration Goal. This section describes how the volume of Unreleased Restoration Flows is determined, and how these flows are managed.

> *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).

11.1 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."

11.2 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 into the San Joaquin River, consistent with the requirements of these Guidelines, that the Secretary is unable to release 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 will 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 Flow Schedule derived from Exhibit B will be applied to the two Recommendations with appropriate adjustments for existing channel capacity.

11.3 Steps to Best Achieve the Restoration Goal

In order to best achieve the Restoration Goal, agreements for Unreleased Restoration Flows will 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.

11.4 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 Division Long–term 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 Division Long–term 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 Division Long–term 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 Division Long–term 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.

11.5 Management of Unreleased Restoration Flows

Unreleased Restoration Flows will be available as soon as the Restoration Flow Schedule is approved by Reclamation. Delivery of Unreleased Restoration Flows from Friant Dam will be subject to the availability of water in Friant Dam; the delivery priorities of contracted supplies to Friant Division Long–term Contractors and Cross Valley Canal Contractors; and flood control, safety of dams, and operations and maintenance requirements.

Reclamation will 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 will update the available volume of Unreleased Restoration Flows to account for any Restoration Flows released or spilled during that flood management release.

Prior to March 15, Reclamation will 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 will 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 11 of these Guidelines.

Exhibit B of the Settlement defines the volume of water to be released as Restoration Flows. Reclamation will not undertake any action pursuant to Paragraph 13(i) that increases the water delivery reductions to any Friant Division Long–term 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 will 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).

This page left blank intentionally.

12 Urgent Flow Changes

Urgent changes to the actual releases from Friant Dam necessitated by unforeseen or extraordinary circumstances consist of deviations from the approved Restoration Flow Schedule. They are different from other real-time flow changes described in Section 3 in that they must be reviewed within 24 hours, are unforeseen, and are short-term in duration. This section was formerly titled "Unforeseen or Extraordinary Circumstances."

> *Paragraph 13(j)*
> *Prior to the commencement of the Restoration Flows as provided in this Paragraph 13, the Secretary, in consultation with the Plaintiffs and Friant Parties, shall develop guidelines, which shall include, but not be limited to:… (v) procedures for making real-time changes to the actual releases from Friant Dam necessitated by unforeseen or extraordinary circumstances;…*

While emergency circumstances may necessitate urgent 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 these Guidelines. 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.

12.1 Qualification Factors for Urgent Flow Changes

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

12.1.1 Factor 1 — Identification of Extraordinary or Unforeseen Circumstance

The Restoration Administrator may recommend urgent changes to the actual releases at Friant Dam at any time, consistent with provisions for flexibility provided in the Settlement. The recommendation will 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 urgent 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 Friant Division CVP will be considered an unforeseen or extraordinary circumstance and managed using the procedures in this section. Release changes for maintenance on the Friant Division facilities of the CVP are covered in Section 7. Drastic changes in hydrology, including significant tributary inflows to the San Joaquin River, will also be managed using the procedures in this section.

12.1.2 Factor 2 — Duration has a Foreseeable End

The circumstances requiring real-time management will have a foreseeable end or be remedied quickly. Long–term problems, persisting issues, or ongoing maintenance activities do not necessarily qualify for remedy through this provision. Circumstances must appear to jeopardize achievement of the Restoration Goal or the Water Management Goal.

12.1.3 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 implement the requested real-time management, and to evaluate the likely consequences of changes to flow accounting, channel capacity limitations in the Restoration Area, and impacts to Friant Long-term Contractor water supplies resulting from the request.

12.1.4 Factor 4 — A Full Water Supply Test is not Required

The proposed change to the flow schedule can be implemented without triggering a full Water Supply Test (such a test cannot be conducted within 24 hours). Flow changes that pass a Rapid Water Supply Test are permitted. See Appendix J.

12.1.5 Approval

Urgent flow changes must be documented in writing. Following the review of the previous factors, Reclamation will approve or deny the request for an urgent flow change within 24 hours. Regardless of the decision, Reclamation will make the flow change available through the normal notification channels.

12.2 Commitment of Resources

Management of urgent flow changes may 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 an approved Restoration Flow Schedule covering the entire year as soon as possible and rebalance all flow accounts.

12.3 Transition between Real-time Management and Regular Schedules

Real time management is limited to short-term circumstances and will be transitioned requiring circumstances have been addressed. The transition will comply with all procedures at Friant Dam for release adjustment.

This page left blank intentionally.

13 Coordination on Downstream Losses

[This section has been identified as needing review and potential revision in a subsequent update to these Guidelines.]

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 § 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.

14 Recovered Water Account

Paragraph 16(b) of the Settlement directs the Secretary to develop and implement procedures for determining and accounting for reductions in water deliveries to Friant Division long–term contractors caused by Interim Flows and Restoration Flows

> *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.

14.1 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 accounting for late season flood control releases (August through February period).
3. Summation of Friant-wide Impacts (March through February contract year).
4. Compare total Friant-wide water made available to Friant Division Long–term Contractors with Restoration to Friant-wide total contract quantity ("2.2 Test").
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 Friant Division Long–term Contractors.

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 daily Riparian Releases from the Exhibit B schedule. River releases with Restoration will use the Restoration Flow Schedule (i.e. Restoration Administrator recommendation accepted by Reclamation) at Friant Dam plus gross URFs delivered from Millerton Lake, if any.

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 9, 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 9.
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 acre-feet (MAF). 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 to the San Joaquin River are in excess of requirements to meet Restoration Flows as determined by Reclamation, i.e., flood control releases.

The reduction in water deliveries Friant-wide and for each contractor is calculated after a series of "tests" or comparisons are done, as described in Appendix H. This is the total RWA impact for the year.

Reclamation will assess 1 AF of RWA impact for each AF of Reduction in Water Deliveries, except for Buffer Flows. Reclamation will assess 1.25 AF of RWA impact for each 1.0 AF of Buffer Flows that cause impacts as identified in Appendix H. Reclamation will not assess RWA impacts for scheduled releases of Buffer Flows when releasing water to the San Joaquin River for flood control releases in excess of the Restoration Flow Schedule.

14.2 Accounting for Recovered Water Account Balances

Reclamation will maintain an account balance for each Friant Division Long–term Contractor that will include: reductions in water deliveries as described in Section 14.1; water delivered due to recapture/recirculation, replacement or other offset programs and projects; RWA Water; and RWA balance transfers. Reclamation will determine the reductions in water deliveries annually. By March 31 of each year, Reclamation will provide the Settling Parties with a provisional accounting of the prior Restoration Year that will include reductions in water deliveries, and RWA balances as of the last day of the prior Restoration Year. The final RWA balance accounting for the previous Restoration Year will be completed by August 31. 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.

14.2.1 Recirculation, Replacement, or Offset Programs and Projects

After calculating the reduction in water deliveries for the prior Restoration Year and including it in the running RWA balance, water replaced by recirculation, recapture, reuse, exchange or transfer of Restoration Flows will decrease the Friant Division Long–term Contractor's RWA balance.

RWA balances will also 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

14.2.2 RWA Water

RWA Water is 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. RWA Water 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.

RWA Water shall be made available to all 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 RWA Water will be determined based upon the annual update of RWA balances. RWA Water will have priority over Section 215 Water, but a lower priority than Class 1 and Class 2 contract supplies. Friant Division Long–term Contractors may exchange, bank, or transfer RWA Water with other Friant Division Long–term Contractors and non-Friant water users.

RWA Water shall decrease the RWA balances of Friant Division Long–term Contractors. Although Friant Divisions Long–term Contractors may transfer RWA Water to non-Friant water users, the Friant Division Long–term Contractor's RWA balance will be decreased commensurate with those deliveries. RWA Water made available and not diverted by Friant Division Long–term Contractors does not decrease the RWA balances.

14.2.3 Transfers of RWA Balances

Only Friant Division Long–term Contractors may hold Recovered Water Accounts. Accordingly, RWA balances may only be transferred between Friant Division Long–term Contractors. Any Friant Division Long–term Contractor transferring its RWA balance will notify Reclamation in writing, as soon as practical. Reclamation will deduct the transferred amount from the transferring Friant Division Long–term Contractor's RWA balance and increase the recipient's RWA balance by the equivalent amount, resulting in a net zero change. Unlike transfers of RWA Water, RWA balance transfers may occur at any time during the year and are not subject to RWA Water availability at the time of the balance transfer.

This page left blank intentionally.

15 Revision Process

These Guidelines are intended to be perfected over time with the experience of implementing the Settlement and the wisdom and cooperation of Settling Parties and Implementing Agencies.

> *Paragraph 13(j)*
> *Prior to the commencement of the Restoration Flows as provided in this Paragraph 13, the Secretary, in consultation with the Plaintiffs and Friant Parties, shall develop guidelines, which shall include, but not be limited to:… such guidelines shall also establish the procedures to be followed to make amendments or changes to the guidelines.*

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

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

"Not Accepted" revisions will 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 will 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 will take effect immediately upon publication on the SJRRP website.

This page left blank intentionally.

Restoration Flows Guidelines Appendices

SAN JOAQUIN RIVER
RESTORATION PROGRAM

January 2020

This page left blank intentionally.

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:

1. Friant Dam
2. Friant-Kern Canal
3. Madera Canal
4. Appurtenant facilities owned by Reclamation

This page left blank intentionally.

Appendix B – Restoration Allocation and Flow Account Lookup Tables

Table B-1 provides look-up values for Restoration Total Allocation and Flow Accounts in TAF per each 10 TAF increment of forecasted Unimpaired Water Year Runoff on the San Joaquin River. 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 AF. SJRRP allocations should then be calculated based on these more precise values.

Table B-1.
Restoration Flow Account and Total Allocation

Unimpaired Water Year Runoff (TAF)	Flow Account (TAF)				SJRRP Total Allocation at Gravelly Ford (TAF)	Friant Dam Release Volume (TAF)
	Continuity	Spring	Fall	Riparian Recruitment Flow		
Restoration Water Year Type: Critical–Low						
Up to 400	0	0	0	0	0	116.866
Restoration Water Year Type: Critical–High						
400 up to 670	29.365	40.959	0.595	0	70.919	187.785
Restoration Water Year Type: Dry						
670	113.781	40.959	0.595	0	155.335	272.280
680	114.486	40.959	2.121	0	157.566	274.512
690	114.486	40.959	4.353	0	159.798	276.743
700	114.486	40.959	6.584	0	162.029	278.975
710	116.360	40.959	6.942	0	164.261	281.206
720	118.592	40.959	6.942	0	166.493	283.438
730	120.823	40.959	6.942	0	168.724	285.669
740	123.055	40.959	6.942	0	170.955	287.901
750	125.286	40.959	6.942	0	173.187	290.132
760	127.518	40.959	6.942	0	175.418	292.364
770	129.749	40.959	6.942	0	177.650	294.595
780	131.981	40.959	6.942	0	179.881	296.827
790	134.212	40.959	6.942	0	182.113	299.058
800	136.443	40.959	6.942	0	184.345	301.290
810	136.443	43.191	6.942	0	186.576	303.522
820	136.443	45.423	6.942	0	188.808	305.753

Unimpaired Water Year Runoff (TAF)	Flow Account (TAF)				SJRRP Total Allocation at Gravelly Ford (TAF)	Friant Dam Release Volume (TAF)
	Continuity	Spring	Fall	Riparian Recruitment Flow		
830	136.443	47.654	6.942	0	191.039	307.985
840	136.443	49.886	6.942	0	193.271	310.216
850	136.443	52.118	6.942	0	195.502	312.448
860	136.443	54.349	6.942	0	197.734	314.679
870	136.443	56.581	6.942	0	199.965	316.911
880	136.443	58.812	6.942	0	202.197	319.142
890	136.443	61.044	6.942	0	204.428	321.374
900	136.443	63.275	6.942	0	206.660	323.605
910	136.443	65.507	6.942	0	208.891	325.837
920	136.443	67.738	6.942	0	211.123	328.068
Restoration Water Year Type: Normal–Dry						
930	136.443	69.970	6.942	0	213.355	330.300
940	136.443	71.316	6.942	0	214.701	331.646
950	136.443	72.662	6.942	0	216.047	332.992
960	136.443	74.008	6.942	0	217.393	334.338
970	136.443	75.354	6.942	0	218.739	335.685
980	136.443	76.701	6.942	0	220.085	337.031
990	136.443	78.047	6.942	0	221.431	338.377
1000	136.443	79.393	6.942	0	222.778	339.723
1010	136.443	80.739	6.942	0	224.124	341.069
1020	136.443	82.085	6.942	0	225.470	342.415
1030	136.443	83.431	6.942	0	226.816	343.762
1040	136.443	84.778	6.942	0	228.162	345.108
1050	136.443	86.124	6.942	0	229.508	346.454
1060	136.443	87.470	6.942	0	230.855	347.800
1070	136.443	88.816	6.942	0	232.201	349.146
1080	136.443	90.162	6.942	0	233.547	350.492
1090	136.443	91.508	6.942	0	234.893	351.838
1100	136.443	92.854	6.942	0	236.239	353.185
1110	136.443	94.201	6.942	0	237.585	354.531
1120	136.443	95.547	6.942	0	238.931	355.877
1130	136.443	96.893	6.942	0	240.278	357.223
1140	136.443	98.239	6.942	0	241.624	358.569
1150	136.443	99.585	6.942	0	242.970	359.915

Unimpaired Water Year Runoff (TAF)	Flow Account (TAF)				SJRRP Total Allocation at Gravelly Ford (TAF)	Friant Dam Release Volume (TAF)
	Continuity	Spring	Fall	Riparian Recruitment Flow		
1160	136.443	100.931	6.942	0	244.316	361.262
1170	136.443	102.278	6.942	0	245.662	362.608
1180	136.443	103.624	6.942	0	247.008	363.954
1190	136.443	104.970	6.942	0	248.355	365.300
1200	136.443	106.316	6.942	0	249.701	366.646
1210	136.443	107.662	6.942	0	251.047	367.992
1220	136.443	109.008	6.942	0	252.393	369.338
1230	136.443	110.354	6.942	0	253.739	370.685
1240	136.443	111.701	6.942	0	255.085	372.031
1250	136.443	113.047	6.942	0	256.431	373.377
1260	136.443	114.393	6.942	0	257.778	374.723
1270	136.443	115.739	6.942	0	259.124	376.069
1280	136.443	117.085	6.942	0	260.470	377.415
1290	136.443	118.431	6.942	0	261.816	378.762
1300	136.443	119.778	6.942	0	263.162	380.108
1310	136.443	121.124	6.942	0	264.508	381.454
1320	136.443	122.470	6.942	0	265.855	382.800
1330	136.443	123.816	6.942	0	267.201	384.146
1340	136.443	125.162	6.942	0	268.547	385.492
1350	136.443	126.508	6.942	0	269.893	386.838
1360	136.443	127.854	6.942	0	271.239	388.185
1370	136.443	129.201	6.942	0	272.585	389.531
1380	136.443	130.547	6.942	0	273.931	390.877
1390	136.443	131.893	6.942	0	275.278	392.223
1400	136.443	133.239	6.942	0	276.624	393.569
1410	136.443	134.585	6.942	0	277.970	394.915
1420	136.443	135.931	6.942	0	279.316	396.262
1430	136.443	137.278	6.942	0	280.662	397.608
1440	136.443	138.624	6.942	0	282.008	398.954

Unimpaired Water Year Runoff (TAF)	Flow Account (TAF)				SJRRP Total Allocation at Gravelly Ford (TAF)	Friant Dam Release Volume (TAF)
	Continuity	Spring	Fall	Riparian Recruitment Flow		
Restoration Water Year Type: Normal–Wet						
1450	136.443	139.970	6.942	0	283.355	400.300
1460	136.443	141.371	6.942	0	284.755	401.701
1470	136.443	142.772	6.942	0	286.156	403.102
1480	136.443	144.173	6.942	0	287.557	404.503
1490	136.443	145.574	6.942	0	288.958	405.904
1500	136.443	146.975	6.942	0	290.359	407.305
1510	136.443	148.376	6.942	0	291.760	408.706
1520	136.443	149.777	6.942	0	293.161	410.107
1530	136.443	151.177	6.942	0	294.562	411.508
1540	136.443	152.578	6.942	0	295.963	412.909
1550	136.443	153.979	6.942	0	297.364	414.310
1560	136.443	155.380	6.942	0	298.765	415.710
1570	136.443	156.781	6.942	0	300.166	417.111
1580	136.443	158.182	6.942	0	301.567	418.512
1590	136.443	159.583	6.942	0	302.968	419.913
1600	136.443	160.984	6.942	0	304.369	421.314
1610	136.443	162.385	6.942	0	305.770	422.715
1620	136.443	163.786	6.942	0	307.171	424.116
1630	136.443	165.187	6.942	0	308.572	425.517
1640	136.443	166.588	6.942	0	309.973	426.918
1650	136.443	167.989	6.942	0	311.374	428.319
1660	136.443	169.390	6.942	0	312.775	429.720
1670	136.443	170.791	6.942	0	314.175	431.121
1680	136.443	172.192	6.942	0	315.576	432.522
1690	136.443	173.593	6.942	0	316.977	433.923
1700	136.443	174.994	6.942	0	318.378	435.324
1710	136.443	176.395	6.942	0	319.779	436.725
1720	136.443	177.796	6.942	0	321.181	438.126
1730	136.443	179.197	6.942	0	322.582	439.527
1740	136.443	180.597	6.942	0	323.982	440.928
1750	136.443	181.998	6.942	0	325.383	442.329
1760	136.443	183.399	6.942	0	326.784	443.730
1770	136.443	184.800	6.942	0	328.185	445.130

Unimpaired Water Year Runoff (TAF)	Flow Account (TAF)				SJRRP Total Allocation at Gravelly Ford (TAF)	Friant Dam Release Volume (TAF)
	Continuity	Spring	Fall	Riparian Recruitment Flow		
1780	136.443	186.201	6.942	0	329.586	446.531
1790	136.443	187.602	6.942	0	330.987	447.932
1800	136.443	189.003	6.942	0	332.388	449.333
1810	136.443	190.404	6.942	0	333.789	450.734
1820	136.443	191.805	6.942	0	335.190	452.135
1830	136.443	193.206	6.942	0	336.591	453.536
1840	136.443	194.607	6.942	0	337.992	454.937
1850	136.443	196.008	6.942	0	339.393	456.338
1860	136.443	197.409	6.942	0	340.794	457.739
1870	136.443	198.810	6.942	0	342.195	459.140
1880	136.443	200.211	6.942	0	343.596	460.541
1890	136.443	201.612	6.942	0	344.997	461.942
1900	136.443	203.013	6.942	0	346.398	463.343
1910	136.443	204.414	6.942	0	347.799	464.744
1920	136.443	205.815	6.942	0	349.200	466.145
1930	136.443	207.216	6.942	0	350.601	467.546
1940	136.443	208.617	6.942	0	352.002	468.947
1950	136.443	210.017	6.942	0	353.402	470.348
1960	136.443	211.418	6.942	0	354.803	471.749
1970	136.443	212.819	6.942	0	356.204	473.150
1980	136.443	214.220	6.942	0	357.605	474.550
1990	136.443	215.621	6.942	0	359.006	475.951
2000	136.443	217.022	6.942	0	360.407	477.352
2010	136.443	218.423	6.942	0	361.808	478.753
2020	136.443	219.824	6.942	0	363.209	480.154
2030	136.443	221.225	6.942	0	364.610	481.555
2040	136.443	222.626	6.942	0	366.011	482.956
2050	136.443	224.027	6.942	0	367.412	484.357
2060	136.443	225.428	6.942	0	368.813	485.758
2070	136.443	226.829	6.942	0	370.214	487.159
2080	136.443	228.230	6.942	0	371.615	488.560
2090	136.443	229.631	6.942	0	373.015	489.961
2100	136.443	231.032	6.942	0	374.416	491.362
2110	136.443	232.433	6.942	0	375.817	492.763

Unimpaired Water Year Runoff (TAF)	Flow Account (TAF)				SJRRP Total Allocation at Gravelly Ford (TAF)	Friant Dam Release Volume (TAF)
	Continuity	Spring	Fall	Riparian Recruitment Flow		
2120	136.443	233.834	6.942	0	377.218	494.164
2130	136.443	235.235	6.942	0	378.619	495.565
2140	136.443	236.636	6.942	0	380.020	496.966
2150	136.443	238.037	6.942	0	381.412	498.367
2160	136.443	239.437	6.942	0	382.822	499.768
2170	136.443	240.838	6.942	0	384.223	501.169
2180	136.443	242.239	6.942	0	385.624	502.570
2190	136.443	243.640	6.942	0	387.025	503.970
2200	136.443	245.041	6.942	0	388.426	505.371
2210	136.443	246.442	6.942	0	389.827	506.772
2220	136.443	247.843	6.942	0	391.228	508.173
2230	136.443	249.244	6.942	0	392.629	509.574
2240	136.443	250.645	6.942	0	394.030	510.975
2250	136.443	252.046	6.942	0	395.431	512.376
2260	136.443	253.447	6.942	0	396.832	513.777
2270	136.443	254.848	6.942	0	398.233	515.178
2280	136.443	256.249	6.942	0	399.634	516.579
2290	136.443	257.650	6.942	0	401.035	517.980
2300	136.443	259.051	6.942	0	402.435	519.381
2310	136.443	260.452	6.942	0	403.836	520.782
2320	136.443	261.853	6.942	0	405.237	522.183
2330	136.443	263.254	6.942	0	406.638	523.584
2340	136.443	264.655	6.942	0	408.039	524.985
2350	136.443	266.056	6.942	0	409.440	526.386
2360	136.443	267.457	6.942	0	410.841	527.787
2370	136.443	268.857	6.942	0	412.242	529.188
2380	136.443	270.258	6.942	0	413.643	530.589
2390	136.443	271.659	6.942	0	415.044	531.990
2400	136.443	273.060	6.942	0	416.445	533.390
2410	136.443	274.461	6.942	0	417.846	534.791
2420	136.443	275.862	6.942	0	419.247	536.192
2430	136.443	277.263	6.942	0	420.648	537.593
2440	136.443	278.664	6.942	0	422.049	538.994
2450	136.443	280.065	6.942	0	423.450	540.395

Unimpaired Water Year Runoff (TAF)	Flow Account (TAF)				SJRRP Total Allocation at Gravelly Ford (TAF)	Friant Dam Release Volume (TAF)
	Continuity	Spring	Fall	Riparian Recruitment Flow		
2460	136.443	281.466	6.942	0	424.851	541.796
2470	136.443	282.867	6.942	0	426.252	543.197
2480	136.443	284.268	6.942	0	427.653	544.598
2490	136.443	285.669	6.942	0	429.054	545.999
2500	136.443	287.070	6.942	0	430.455	547.400
Restoration Water Year Type: Wet						
Above 2500	136.443	213.520	6.942	199.636	556.542	673.488

Table B-2.
Adjustments to Allocations for Leap Years

Restoration Water Year Type	Unimpaired Water Year Runoff (TAF)	Adjustment to Friant Dam Release Volume (TAF)	Adjustment to SJRRP Allocation Total at Gravelly Ford (TAF)	Adjustment to Continuity Flow Account (TAF)
Critical–Low	Up to 400	+0.198	0	0
Critical–High	400 up to 670	+0.218	+0.020	+0.020
All other year types	670 and above	+0.694	+0.496	+0.496

This page left blank intentionally.

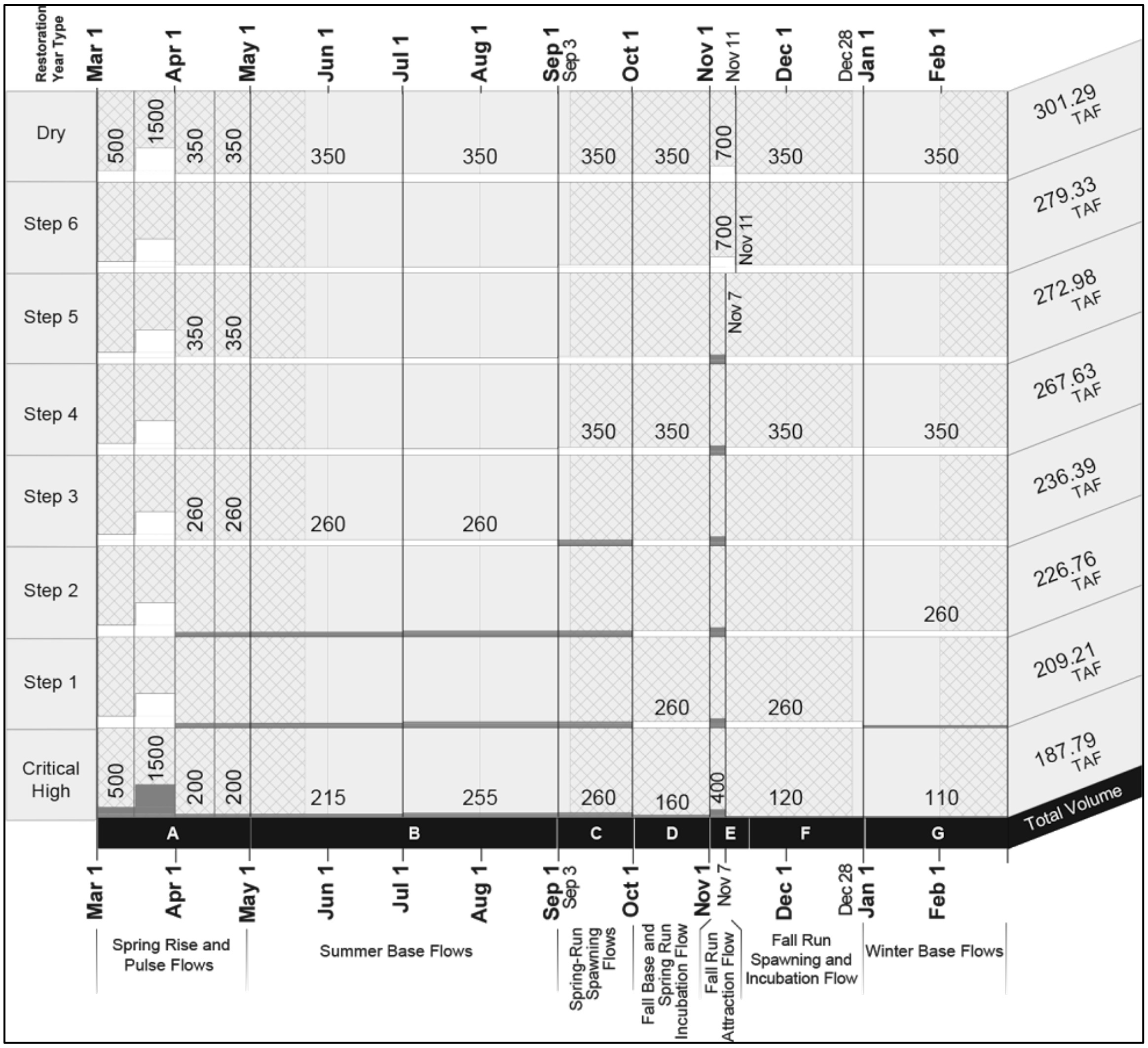
Appendix C – Default Flow Schedules

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.



Note: The current implementation skips Steps 1-3 and part of Step 4, with Step 5 being near the lower limit of the Dry Year Type.

Figure C-1.
Gamma Transformation Pathway

Table C-1.
Default Flow Schedule at <400 TAF Unimpaired Runoff (Critical-Low)

Period	Friant Dam		Gravelly Ford		Head of Reach 2B		Head of Reach 4A		Head of Reach 4B		Before Confluence	
	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)
Mar 1 - Mar 15	**130**	***3,868***	**5**	***149***	**0**	-	**0**	-	**0**	-	**500**	***14,876***
Mar 16 - Mar 31	130	*4,126*	5	*159*	0	-	0	-	0	-	475	*15,074*
Apr 1 - Apr 15	**150**	***4,463***	**5**	***149***	**0**	-	**0**	-	**0**	-	**400**	***11,901***
Apr 16 - Apr 30	150	*4,463*	5	*149*	0	-	0	-	0	-	400	*11,901*
May 1 - May 28	**190**	***10,552***	**5**	***278***	**0**	-	**0**	-	**0**	-	**400**	***22,215***
May 29 - Jun 30	190	*12,436*	5	*327*	0	-	0	-	0	-	400	*26,182*
Jul 1 - Jul 29	**230**	***13,230***	**5**	***288***	**0**	-	**0**	-	**0**	-	**275**	***15,818***
Jul 30 - Aug 31	230	*15,055*	5	*327*	0	-	0	-	0	-	275	*18,000*
Sept 1 - Sept 30	**210**	***12,496***	**5**	***298***	**0**	-	**0**	-	**0**	-	**275**	***16,364***
Oct 1 - Oct 31	160	*9,838*	5	*307*	0	-	0	-	0	-	300	*18,446*
Nov 1 - Nov 6	**130**	***1,547***	**5**	***60***	**0**	-	**0**	-	**0**	-	**300**	***3,570***
Nov 7 - Nov 10	120	*952*	5	*40*	0	-	0	-	0	-	400	*3,174*
Nov 11 - Nov 30	**120**	***4,760***	**5**	***198***	**0**	-	**0**	-	**0**	-	**400**	***15,868***
Dec 1 - Dec 31	120	*7,379*	5	*307*	0	-	0	-	0	-	400	*24,595*
Jan 1 - Jan 31	**100**	***6,149***	**5**	***307***	**0**	-	**0**	-	**0**	-	**500**	***30,744***
Feb 1 - Feb 28	100	*5,554*	5	*278*	0	-	0	-	0	-	500	*27,769*
		116,866		***3,620***		**-**		**-**		**-**		***276,496***

Table C-2.
Default Flow Schedule at 400-669 TAF Unimpaired Runoff (Critical-High)

Period	Friant Dam		Gravelly Ford		Head of Reach 2B		Head of Reach 4A		Head of Reach 4B		Before Confluence	
	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)
Mar 1 - Mar 15	**500**	***14,876***	**375**	***11,157***	**285**	***8,479***	**285**	***8,479***	**285**	***8,479***	**785**	***23,355***
Mar 16 - Mar 31	1500	*47,603*	1375	*43,636*	1220	*38,717*	1220	*38,717*	1220	*38,717*	1695	*53,792*
Apr 1 - Apr 15	**200**	***5,950***	**55**	***1,636***	**0**	-	**0**	-	**0**	-	**400**	***11,901***
Apr 16 - Apr 30	200	*5,950*	55	*1,636*	0	-	0	-	0	-	400	*11,901*
May 1 - May 28	**215**	***11,940***	**30**	***1,666***	**0**	-	**0**	-	**0**	-	**400**	***22,215***
May 29 - Jun 30	215	*14,073*	30	*1,964*	0	-	0	-	0	-	400	*26,182*
Jul 1 - Jul 29	**255**	***14,668***	**30**	***1,726***	**0**	-	**0**	-	**0**	-	**275**	***15,818***
Jul 30 - Aug 31	255	*16,691*	30	*1,964*	0	-	0	-	0	-	275	*18,000*
Sept 1 - Sept 30	**260**	***15,471***	**55**	***3,273***	**0**	-	**0**	-	**0**	-	**275**	***16,364***
Oct 1 - Oct 31	160	*9,838*	5	*307*	0	-	0	-	0	-	300	*18,446*
Nov 1 - Nov 6	**400**	***4,760***	**275**	***3,273***	**195**	***2,321***	**195**	***2,321***	**195**	***2,321***	**495**	***5,891***
Nov 7 - Nov 10	120	*952*	5	*40*	0	-	0	-	0	-	400	*3,174*
Nov 11 - Nov 30	**120**	***4,760***	**5**	***198***	**0**	-	**0**	-	**0**	-	**400**	***15,868***
Dec 1 - Dec 31	120	*7,379*	5	*307*	0	-	0	-	0	-	400	*24,595*
Jan 1 - Jan 31	**110**	***6,764***	**15**	***922***	**0**	-	**0**	-	**0**	-	**500**	***30,744***
Feb 1 - Feb 28	110	*6,109*	15	*833*	0	-	0	-	0	-	500	*27,769*
		187,785		***74,539***		***49,517***		***49,517***		***49,517***		***326,013***

Note: Schedule at Gravelly Ford includes 5 cfs for Holding Contracts (3,620 AF, 3,630 AF in leap years)

Note: Flow rates are rounded to nearest 1 cfs. Volumes are rounded to nearest 1 AF.

Note: Exhibit B riparian demands, losses, and accretions assumed

Table C-3.
Default Flow Schedule at 670 TAF Unimpaired Runoff (Lower end of Dry)

Period	Friant Dam		Gravelly Ford		Head of Reach 2B		Head of Reach 4A		Head of Reach 4B		Before Confluence	
	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)
Mar 1 - Mar 15	**500**	***14,876***	**375**	***11,157***	**285**	***8,479***	**285**	***8,479***	**285**	***8,479***	**785**	***23,355***
Mar 16 - Mar 31	1500	*47,603*	1375	*43,636*	1220	*38,717*	1220	*38,717*	1220	*38,717*	1695	*53,792*
Apr 1 - Apr 15	**350**	***10,413***	**205**	***6,099***	**125**	***3,719***	**125**	***3,719***	**125**	***3,719***	**525**	***15,620***
Apr 16 - Apr 30	326	*9,709*	181	*5,395*	101	*3,014*	101	*3,014*	101	*3,014*	501	*14,915*
May 1 - May 28	**260**	***14,440***	**75**	***4,165***	**0**	-	**0**	-	**0**	-	**400**	***22,215***
May 29 - Jun 30	260	*17,018*	75	*4,909*	0	-	0	-	0	-	400	*26,182*
Jul 1 - Jul 29	**260**	***14,955***	**35**	***2,013***	**0**	-	**0**	-	**0**	-	**275**	***15,818***
Jul 30 - Aug 31	260	*17,018*	35	*2,291*	0	-	0	-	0	-	275	*18,000*
Sept 1 - Sept 30	**350**	***20,826***	**145**	***8,628***	**65**	***3,868***	**65**	***3,868***	**65**	***3,868***	**340**	***20,231***
Oct 1 - Oct 31	350	*21,521*	195	*11,990*	115	*7,071*	115	*7,071*	115	*7,071*	415	*25,517*
Nov 1 - Nov 6	**400**	***4,760***	**275**	***3,273***	**195**	***2,321***	**195**	***2,321***	**195**	***2,321***	**495**	***5,891***
Nov 7 - Nov 10	350	*2,777*	225	*1,785*	145	*1,150*	145	*1,150*	145	*1,150*	445	*3,531*
Nov 11 - Nov 30	**350**	***13,884***	**235**	***9,322***	**155**	***6,149***	**155**	***6,149***	**155**	***6,149***	**555**	***22,017***
Dec 1 - Dec 31	350	*21,521*	235	*14,450*	155	*9,531*	155	*9,531*	155	*9,531*	555	*34,126*
Jan 1 - Jan 31	**350**	***21,521***	**255**	***15,679***	**175**	***10,760***	**175**	***10,760***	**175**	***10,760***	**675**	***41,504***
Feb 1 - Feb 28	350	*19,438*	255	*14,162*	175	*9,719*	175	*9,719*	175	*9,719*	675	*37,488*
		272,280		***158,955***		***104,499***		***104,499***		***104,499***		***380,201***

Table C-4.
Default Flow Schedule at 690 TAF Unimpaired Runoff (Dry)

Period	Friant Dam		Gravelly Ford		Head of Reach 2B		Head of Reach 4A		Head of Reach 4B		Before Confluence	
	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)
Mar 1 - Mar 15	**500**	***14,876***	**375**	***11,157***	**285**	***8,479***	**285**	***8,479***	**285**	***8,479***	**785**	***23,355***
Mar 16 - Mar 31	1500	*47,603*	1375	*43,636*	1220	*38,717*	1220	*38,717*	1220	*38,717*	1695	*53,792*
Apr 1 - Apr 15	**350**	***10,413***	**205**	***6,099***	**125**	***3,719***	**125**	***3,719***	**125**	***3,719***	**525**	***15,620***
Apr 16 - Apr 30	350	*10,413*	205	*6,099*	125	*3,719*	125	*3,719*	125	*3,719*	525	*15,620*
May 1 - May 28	**260**	***14,440***	**75**	***4,165***	**0**	-	**0**	-	**0**	-	**400**	***22,215***
May 29 - Jun 30	260	*17,018*	75	*4,909*	0	-	0	-	0	-	400	*26,182*
Jul 1 - Jul 29	**260**	***14,955***	**35**	***2,013***	**0**	-	**0**	-	**0**	-	**275**	***15,818***
Jul 30 - Aug 31	260	*17,018*	35	*2,291*	0	-	0	-	0	-	275	*18,000*
Sept 1 - Sept 30	**350**	***20,826***	**145**	***8,628***	**65**	***3,868***	**65**	***3,868***	**65**	***3,868***	**340**	***20,231***
Oct 1 - Oct 31	350	*21,521*	195	*11,990*	115	*7,071*	115	*7,071*	115	*7,071*	415	*25,517*
Nov 1 - Nov 6	**700**	***8,331***	**575**	***6,843***	**475**	***5,653***	**475**	***5,653***	**475**	***5,653***	**775**	***9,223***
Nov 7 - Nov 10	360	*2,853*	235	*1,861*	155	*1,226*	155	*1,226*	155	*1,226*	455	*3,607*
Nov 11 - Nov 30	**350**	***13,884***	**235**	***9,322***	**155**	***6,149***	**155**	***6,149***	**155**	***6,149***	**555**	***22,017***
Dec 1 - Dec 31	350	*21,521*	235	*14,450*	155	*9,531*	155	*9,531*	155	*9,531*	555	*34,126*
Jan 1 - Jan 31	**350**	***21,521***	**255**	***15,679***	**175**	***10,760***	**175**	***10,760***	**175**	***10,760***	**675**	***41,504***
Feb 1 - Feb 28	350	*19,438*	255	*14,162*	175	*9,719*	175	*9,719*	175	*9,719*	675	*37,488*
		276,631		***163,306***		***108,612***		***108,612***		***108,612***		***384,314***

Note: Schedule at Gravelly Ford includes 5 cfs for Holding Contracts (3,620 AF, 3,630 AF in leap years)
Note: Flow rates are rounded to nearest 1 cfs. Volumes are rounded to nearest 1 AF.
Note: Exhibit B riparian demands, losses, and accretions assumed

Table C-5.
Default Flow Schedule at 702 TAF Unimpaired Runoff (Dry)

Period	Friant Dam		Gravelly Ford		Head of Reach 2B		Head of Reach 4A		Head of Reach 4B		Before Confluence	
	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)
Mar 1 - Mar 15	**500**	***14,876***	**375**	***11,157***	**285**	***8,479***	**285**	***8,479***	**285**	***8,479***	**785**	***23,355***
Mar 16 - Mar 31	1500	*47,603*	1375	*43,636*	1220	*38,717*	1220	*38,717*	1220	*38,717*	1695	*53,792*
Apr 1 - Apr 15	**350**	***10,413***	**205**	***6,099***	**125**	***3,719***	**125**	***3,719***	**125**	***3,719***	**525**	***15,620***
Apr 16 - Apr 30	350	*10,413*	205	*6,099*	125	*3,719*	125	*3,719*	125	*3,719*	525	*15,620*
May 1 - May 28	**260**	***14,440***	**75**	***4,165***	**0**	-	**0**	-	**0**	-	**400**	***22,215***
May 29 - Jun 30	260	*17,018*	75	*4,909*	0	-	0	-	0	-	400	*26,182*
Jul 1 - Jul 29	**260**	***14,955***	**35**	***2,013***	**0**	-	**0**	-	**0**	-	**275**	***15,818***
Jul 30 - Aug 31	260	*17,018*	35	*2,291*	0	-	0	-	0	-	275	*18,000*
Sept 1 - Sept 30	**350**	***20,826***	**145**	***8,628***	**65**	***3,868***	**65**	***3,868***	**65**	***3,868***	**340**	***20,231***
Oct 1 - Oct 31	350	*21,521*	195	*11,990*	115	*7,071*	115	*7,071*	115	*7,071*	415	*25,517*
Nov 1 - Nov 6	**700**	***8,331***	**575**	***6,843***	**475**	***5,653***	**475**	***5,653***	**475**	***5,653***	**775**	***9,223***
Nov 7 - Nov 10	700	*5,554*	575	*4,562*	475	*3,769*	475	*3,769*	475	*3,769*	775	*6,149*
Nov 11 - Nov 30	**350**	***13,884***	**235**	***9,322***	**155**	***6,149***	**155**	***6,149***	**155**	***6,149***	**555**	***22,017***
Dec 1 - Dec 31	350	*21,521*	235	*14,450*	155	*9,531*	155	*9,531*	155	*9,531*	555	*34,126*
Jan 1 - Jan 31	**350**	***21,521***	**255**	***15,679***	**175**	***10,760***	**175**	***10,760***	**175**	***10,760***	**675**	***41,504***
Feb 1 - Feb 28	350	*19,438*	255	*14,162*	175	*9,719*	175	*9,719*	175	*9,719*	675	*37,488*
		279,332		***166,007***		***111,154***		***111,154***		***111,154***		***386,856***

Table C-6.
Default Flow Schedule at 724 TAF Unimpaired Runoff (Dry)

Period	Friant Dam		Gravelly Ford		Head of Reach 2B		Head of Reach 4A		Head of Reach 4B		Before Confluence	
	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)
Mar 1 - Mar 15	**500**	***14,876***	**375**	***11,157***	**285**	***8,479***	**285**	***8,479***	**285**	***8,479***	**785**	***23,355***
Mar 16 - Mar 31	1500	*47,603*	1375	*43,636*	1220	*38,717*	1220	*38,717*	1220	*38,717*	1695	*53,792*
Apr 1 - Apr 15	**350**	***10,413***	**205**	***6,099***	**125**	***3,719***	**125**	***3,719***	**125**	***3,719***	**525**	***15,620***
Apr 16 - Apr 30	350	*10,413*	205	*6,099*	125	*3,719*	125	*3,719*	125	*3,719*	525	*15,620*
May 1 - May 28	**350**	***19,438***	**165**	***9,163***	**85**	***4,721***	**85**	***4,721***	**85**	***4,721***	**485**	***26,935***
May 29 - Jun 30	260	*17,018*	75	*4,909*	0	-	0	-	0	-	400	*26,182*
Jul 1 - Jul 29	**260**	***14,955***	**35**	***2,013***	**0**	-	**0**	-	**0**	-	**275**	***15,818***
Jul 30 - Aug 31	260	*17,018*	35	*2,291*	0	-	0	-	0	-	275	*18,000*
Sept 1 - Sept 30	**350**	***20,826***	**145**	***8,628***	**65**	***3,868***	**65**	***3,868***	**65**	***3,868***	**340**	***20,231***
Oct 1 - Oct 31	350	*21,521*	195	*11,990*	115	*7,071*	115	*7,071*	115	*7,071*	415	*25,517*
Nov 1 - Nov 6	**700**	***8,331***	**575**	***6,843***	**475**	***5,653***	**475**	***5,653***	**475**	***5,653***	**775**	***9,223***
Nov 7 - Nov 10	700	*5,554*	575	*4,562*	475	*3,769*	475	*3,769*	475	*3,769*	775	*6,149*
Nov 11 - Nov 30	**350**	***13,884***	**235**	***9,322***	**155**	***6,149***	**155**	***6,149***	**155**	***6,149***	**555**	***22,017***
Dec 1 - Dec 31	350	*21,521*	235	*14,450*	155	*9,531*	155	*9,531*	155	*9,531*	555	*34,126*
Jan 1 - Jan 31	**350**	***21,521***	**255**	***15,679***	**175**	***10,760***	**175**	***10,760***	**175**	***10,760***	**675**	***41,504***
Feb 1 - Feb 28	350	*19,438*	255	*14,162*	175	*9,719*	175	*9,719*	175	*9,719*	675	*37,488*
		284,330		***171,005***		***115,874***		***115,874***		***115,874***		***391,577***

Note: Schedule at Gravelly Ford includes 5 cfs for Holding Contracts (3,620 AF, 3,630 AF in leap years)
Note: Flow rates are rounded to nearest 1 cfs. Volumes are rounded to nearest 1 AF.
Note: Exhibit B riparian demands, losses, and accretions assumed

Table C-7. Default Flow Schedule at 750 TAF Unimpaired Runoff (Dry)

Period	Friant Dam		Gravelly Ford		Head of Reach 2B		Head of Reach 4A		Head of Reach 4B		Before Confluence	
	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)
Mar 1 - Mar 15	500	14,876	375	11,157	285	8,479	285	8,479	285	8,479	785	23,355
Mar 16 - Mar 31	1500	47,603	1375	43,636	1220	38,717	1220	38,717	1220	38,717	1695	53,792
Apr 1 - Apr 15	350	10,413	205	6,099	125	3,719	125	3,719	125	3,719	525	15,620
Apr 16 - Apr 30	350	10,413	205	6,099	125	3,719	125	3,719	125	3,719	525	15,620
May 1 - May 28	350	19,438	165	9,164	85	4,721	85	4,721	85	4,721	485	26,936
May 29 - Jun 30	350	22,909	165	10,800	85	5,564	85	5,564	85	5,564	485	31,745
Jul 1 - Jul 29	260	14,978	35	2,036	0	-	0	-	0	-	275	15,818
Jul 30 - Aug 31	260	17,018	35	2,291	0	-	0	-	0	-	275	18,000
Sept 1 - Sept 30	350	20,826	145	8,628	65	3,868	65	3,868	65	3,868	340	20,231
Oct 1 - Oct 31	350	21,521	195	11,990	115	7,071	115	7,071	115	7,071	415	25,517
Nov 1 - Nov 6	700	8,331	575	6,843	475	5,653	475	5,653	475	5,653	775	9,223
Nov 7 - Nov 10	700	5,554	575	4,562	475	3,769	475	3,769	475	3,769	775	6,149
Nov 11 - Nov 30	350	13,884	235	9,322	155	6,149	155	6,149	155	6,149	555	22,017
Dec 1 - Dec 31	350	21,521	235	14,450	155	9,531	155	9,531	155	9,531	555	34,126
Jan 1 - Jan 31	350	21,521	255	15,679	175	10,760	175	10,760	175	10,760	675	41,504
Feb 1 - Feb 28	350	19,438	255	14,162	175	9,719	175	9,719	175	9,719	675	37,488
		290,244		176,919		121,438		121,438		121,438		397,141

Table C-8. Default Flow Schedule at 800 TAF Unimpaired Runoff (Midpoint of Dry)

Period	Friant Dam		Gravelly Ford		Head of Reach 2B		Head of Reach 4A		Head of Reach 4B		Before Confluence	
	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)
Mar 1 - Mar 15	500	14,876	375	11,157	285	8,479	285	8,479	285	8,479	785	23,355
Mar 16 - Mar 31	1500	47,603	1375	43,636	1220	38,717	1220	38,717	1220	38,717	1695	53,792
Apr 1 - Apr 15	350	10,414	205	6,100	125	3,720	125	3,720	125	3,720	525	15,621
Apr 16 - Apr 30	350	10,413	205	6,099	125	3,719	125	3,719	125	3,719	525	15,620
May 1 - May 28	350	19,438	165	9,164	85	4,721	85	4,721	85	4,721	485	26,936
May 29 - Jun 30	350	22,909	165	10,800	85	5,564	85	5,564	85	5,564	485	31,745
Jul 1 - Jul 29	350	20,132	125	7,190	45	2,588	45	2,588	45	2,588	320	18,407
Jul 30 - Aug 31	350	22,909	125	8,182	45	2,945	45	2,945	45	2,945	320	20,945
Sept 1 - Sept 30	350	20,826	145	8,628	65	3,868	65	3,868	65	3,868	340	20,231
Oct 1 - Oct 31	350	21,521	195	11,990	115	7,071	115	7,071	115	7,071	415	25,517
Nov 1 - Nov 6	700	8,331	575	6,843	475	5,653	475	5,653	475	5,653	775	9,223
Nov 7 - Nov 10	700	5,554	575	4,562	475	3,769	475	3,769	475	3,769	775	6,149
Nov 11 - Nov 30	350	13,884	235	9,322	155	6,149	155	6,149	155	6,149	555	22,017
Dec 1 - Dec 31	350	21,521	235	14,450	155	9,531	155	9,531	155	9,531	555	34,126
Jan 1 - Jan 31	350	21,521	255	15,679	175	10,760	175	10,760	175	10,760	675	41,504
Feb 1 - Feb 28	350	19,438	255	14,162	175	9,719	175	9,719	175	9,719	675	37,488
		301,290		187,965		126,973		126,973		126,973		402,676

Note: Schedule at Gravelly Ford includes 5 cfs for Holding Contracts (3,620 AF, 3,630 AF in leap years)

Note: Flow rates are rounded to nearest 1 cfs. Volumes are rounded to nearest 1 AF.

Note: Exhibit B riparian demands, losses, and accretions assumed

Table C-9.
Default Flow Schedule at 930 TAF Unimpaired Runoff (Lower end of Normal-Dry)

	Friant Dam		Gravelly Ford		Head of Reach 2B		Head of Reach 4A		Head of Reach 4B		Before Confluence	
Period	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)
Mar 1 - Mar 15	**500**	***14,876***	**375**	***11,157***	**285**	***8,479***	**285**	***8,479***	**285**	***8,479***	**785**	***23,355***
Mar 16 - Mar 31	1500	*47,603*	1375	*43,636*	1220	*38,717*	1220	*38,717*	1220	*38,717*	1695	*53,792*
Apr 1 - Apr 15	**1325**	***39,424***	**1180**	***35,110***	**1031**	***30,686***	**1031**	***30,686***	**1031**	***30,686***	**1431**	***42,587***
Apr 16 - Apr 30	350	*10,413*	205	*6,099*	125	*3,719*	125	*3,719*	125	*3,719*	525	*15,620*
May 1 - May 28	**350**	***19,438***	**165**	***9,164***	**85**	***4,721***	**85**	***4,721***	**85**	***4,721***	**485**	***26,936***
May 29 - Jun 30	350	*22,909*	165	*10,800*	85	*5,564*	85	*5,564*	85	*5,564*	485	*31,745*
Jul 1 - Jul 29	**350**	***20,132***	**125**	***7,190***	**45**	***2,588***	**45**	***2,588***	**45**	***2,588***	**320**	***18,407***
Jul 30 - Aug 31	350	*22,909*	125	*8,182*	45	*2,945*	45	*2,945*	45	*2,945*	320	*20,945*
Sept 1 - Sept 30	**350**	***20,826***	**145**	***8,628***	**65**	***3,868***	**65**	***3,868***	**65**	***3,868***	**340**	***20,231***
Oct 1 - Oct 31	350	*21,521*	195	*11,990*	115	*7,071*	115	*7,071*	115	*7,071*	415	*25,517*
Nov 1 - Nov 6	**700**	***8,331***	**575**	***6,843***	**475**	***5,653***	**475**	***5,653***	**475**	***5,653***	**775**	***9,223***
Nov 7 - Nov 10	700	*5,554*	575	*4,562*	475	*3,769*	475	*3,769*	475	*3,769*	775	*6,149*
Nov 11 - Nov 30	**350**	***13,884***	**235**	***9,322***	**155**	***6,149***	**155**	***6,149***	**155**	***6,149***	**555**	***22,017***
Dec 1 - Dec 31	350	*21,521*	235	*14,450*	155	*9,531*	155	*9,531*	155	*9,531*	555	*34,126*
Jan 1 - Jan 31	**350**	***21,521***	**255**	***15,679***	**175**	***10,760***	**175**	***10,760***	**175**	***10,760***	**675**	***41,504***
Feb 1 - Feb 28	350	*19,438*	255	*14,162*	175	*9,719*	175	*9,719*	175	*9,719*	675	*37,488*
		330,300		***216,975***		***153,939***		***153,939***		***153,939***		***429,641***

Table C-10.
Default Flow Schedule at 1190 TAF Unimpaired Runoff (Midpoint of Normal-Dry)

	Friant Dam		Gravelly Ford		Head of Reach 2B		Head of Reach 4A		Head of Reach 4B		Before Confluence	
Period	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)
Mar 1 - Mar 15	**500**	***14,876***	**375**	***11,157***	**285**	***8,479***	**285**	***8,479***	**285**	***8,479***	**785**	***23,355***
Mar 16 - Mar 31	1500	*47,603*	1375	*43,636*	1220	*38,717*	1220	*38,717*	1220	*38,717*	1695	*53,792*
Apr 1 - Apr 15	**2500**	***74,380***	**2355**	***70,066***	**2178**	***64,797***	**2178**	***64,797***	**2178**	***64,797***	**2578**	***76,697***
Apr 16 - Apr 30	351	*10,458*	206	*6,143*	126	*3,763*	126	*3,763*	126	*3,763*	526	*15,664*
May 1 - May 28	**350**	***19,438***	**165**	***9,164***	**85**	***4,721***	**85**	***4,721***	**85**	***4,721***	**485**	***26,936***
May 29 - Jun 30	350	*22,909*	165	*10,800*	85	*5,564*	85	*5,564*	85	*5,564*	485	*31,745*
Jul 1 - Jul 29	**350**	***20,132***	**125**	***7,190***	**45**	***2,588***	**45**	***2,588***	**45**	***2,588***	**320**	***18,407***
Jul 30 - Aug 31	350	*22,909*	125	*8,182*	45	*2,945*	45	*2,945*	45	*2,945*	320	*20,945*
Sept 1 - Sept 30	**350**	***20,826***	**145**	***8,628***	**65**	***3,868***	**65**	***3,868***	**65**	***3,868***	**340**	***20,231***
Oct 1 - Oct 31	350	*21,521*	195	*11,990*	115	*7,071*	115	*7,071*	115	*7,071*	415	*25,517*
Nov 1 - Nov 6	**700**	***8,331***	**575**	***6,843***	**475**	***5,653***	**475**	***5,653***	**475**	***5,653***	**775**	***9,223***
Nov 7 - Nov 10	700	*5,554*	575	*4,562*	475	*3,769*	475	*3,769*	475	*3,769*	775	*6,149*
Nov 11 - Nov 30	**350**	***13,884***	**235**	***9,322***	**155**	***6,149***	**155**	***6,149***	**155**	***6,149***	**555**	***22,017***
Dec 1 - Dec 31	350	*21,521*	235	*14,450*	155	*9,531*	155	*9,531*	155	*9,531*	555	*34,126*
Jan 1 - Jan 31	**350**	***21,521***	**255**	***15,679***	**175**	***10,760***	**175**	***10,760***	**175**	***10,760***	**675**	***41,504***
Feb 1 - Feb 28	350	*19,438*	255	*14,162*	175	*9,719*	175	*9,719*	175	*9,719*	675	*37,488*
		365,300		***251,975***		***188,094***		***188,094***		***188,094***		***463,796***

Note: Schedule at Gravelly Ford includes 5 cfs for Holding Contracts (3,620 AF, 3,630 AF in leap years)

Note: Flow rates are rounded to nearest 1 cfs. Volumes are rounded to nearest 1 AF.

Note: Exhibit B riparian demands, losses, and accretions assumed

Table C-11.
Default Flow Schedule at 1450 TAF Unimpaired Runoff (Lower end of Normal-Wet)

	Friant Dam		Gravelly Ford		Head of Reach 2B		Head of Reach 4A		Head of Reach 4B		Before Confluence	
Period	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)
Mar 1 - Mar 15	500	14,876	375	11,157	285	8,479	285	8,479	285	8,479	785	23,355
Mar 16 - Mar 31	1500	47,603	1375	43,636	1220	38,717	1220	38,717	1220	38,717	1695	53,792
Apr 1 - Apr 15	2500	74,380	2355	70,066	2178	64,797	2178	64,797	2178	64,797	2578	76,697
Apr 16 - Apr 30	1528	45,458	1383	41,143	1228	36,525	1228	36,525	1228	36,525	1628	48,426
May 1 - May 28	350	19,438	165	9,164	85	4,721	85	4,721	85	4,721	485	26,936
May 29 - Jun 30	350	22,909	165	10,800	85	5,564	85	5,564	85	5,564	485	31,745
Jul 1 - Jul 29	350	20,132	125	7,190	45	2,588	45	2,588	45	2,588	320	18,407
Jul 30 - Aug 31	350	22,909	125	8,182	45	2,945	45	2,945	45	2,945	320	20,945
Sept 1 - Sept 30	350	20,826	145	8,628	65	3,868	65	3,868	65	3,868	340	20,231
Oct 1 - Oct 31	350	21,521	195	11,990	115	7,071	115	7,071	115	7,071	415	25,517
Nov 1 - Nov 6	700	8,331	575	6,843	475	5,653	475	5,653	475	5,653	775	9,223
Nov 7 - Nov 10	700	5,554	575	4,562	475	3,769	475	3,769	475	3,769	775	6,149
Nov 11 - Nov 30	350	13,884	235	9,322	155	6,149	155	6,149	155	6,149	555	22,017
Dec 1 - Dec 31	350	21,521	235	14,450	155	9,531	155	9,531	155	9,531	555	34,126
Jan 1 - Jan 31	350	21,521	255	15,679	175	10,760	175	10,760	175	10,760	675	41,504
Feb 1 - Feb 28	350	19,438	255	14,162	175	9,719	175	9,719	175	9,719	675	37,488
		400,300		286,975		220,856		220,856		220,856		496,558

Table C-12.
Default Flow Schedule at 1975 TAF Unimpaired Runoff (Midpoint of Normal-Wet)

	Friant Dam		Gravelly Ford		Head of Reach 2B		Head of Reach 4A		Head of Reach 4B		Before Confluence	
Period	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)
Mar 1 - Mar 15	500	14,876	375	11,157	285	8,479	285	8,479	285	8,479	785	23,355
Mar 16 - Mar 31	1500	47,603	1375	43,636	1220	38,717	1220	38,717	1220	38,717	1695	53,792
Apr 1 - Apr 15	2500	74,380	2355	70,066	2178	64,797	2178	64,797	2178	64,797	2578	76,697
Apr 16 - Apr 30	4000	119,008	3855	114,693	3658	108,821	3658	108,821	3658	108,821	4058	120,722
May 1 - May 28	350	19,438	165	9,164	85	4,721	85	4,721	85	4,721	485	26,936
May 29 - Jun 30	350	22,909	165	10,800	85	5,564	85	5,564	85	5,564	485	31,745
Jul 1 - Jul 29	350	20,132	125	7,190	45	2,588	45	2,588	45	2,588	320	18,407
Jul 30 - Aug 31	350	22,909	125	8,182	45	2,945	45	2,945	45	2,945	320	20,945
Sept 1 - Sept 30	350	20,826	145	8,628	65	3,868	65	3,868	65	3,868	340	20,231
Oct 1 - Oct 31	350	21,521	195	11,990	115	7,071	115	7,071	115	7,071	415	25,517
Nov 1 - Nov 6	700	8,331	575	6,843	475	5,653	475	5,653	475	5,653	775	9,223
Nov 7 - Nov 10	700	5,554	575	4,562	475	3,769	475	3,769	475	3,769	775	6,149
Nov 11 - Nov 30	350	13,884	235	9,322	155	6,149	155	6,149	155	6,149	555	22,017
Dec 1 - Dec 31	350	21,521	235	14,450	155	9,531	155	9,531	155	9,531	555	34,126
Jan 1 - Jan 31	350	21,521	255	15,679	175	10,760	175	10,760	175	10,760	675	41,504
Feb 1 - Feb 28	350	19,438	255	14,162	175	9,719	175	9,719	175	9,719	675	37,488
		473,850		360,525		293,152		293,152		293,152		568,854

Note: Schedule at Gravelly Ford includes 5 cfs for Holding Contracts (3,620 AF, 3,630 AF in leap years)

Note: Flow rates are rounded to nearest 1 cfs. Volumes are rounded to nearest 1 AF.

Note: Exhibit B riparian demands, losses, and accretions assumed

Table C-13.
Default Flow Schedule at 2500 TAF Unimpaired Runoff (Upper end of Normal-Wet)

	Friant Dam		Gravelly Ford		Head of Reach 2B		Head of Reach 4A		Head of Reach 4B		Before Confluence	
Period	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)
Mar 1 - Mar 15	**500**	***14,876***	**375**	***11,157***	**285**	***8,479***	**285**	***8,479***	**285**	***8,479***	**785**	***23,355***
Mar 16 - Mar 31	2411	*76,524*	2286	*72,557*	2110	*66,975*	2110	*66,975*	2110	*66,975*	2585	*82,050*
Apr 1 - Apr 15	**4000**	***119,008***	**3855**	***114,694***	**3658**	***108,822***	**3658**	***108,822***	**3658**	***108,822***	**4058**	***120,723***
Apr 16 - Apr 30	4000	*119,008*	3855	*114,694*	3658	*108,822*	3658	*108,822*	3658	*108,822*	4058	*120,723*
May 1 - May 28	**350**	***19,438***	**165**	***9,164***	**85**	***4,721***	**85**	***4,721***	**85**	***4,721***	**485**	***26,936***
May 29 - Jun 30	350	*22,909*	165	*10,800*	85	*5,564*	85	*5,564*	85	*5,564*	485	*31,745*
Jul 1 - Jul 29	**350**	***20,132***	**125**	***7,190***	**45**	***2,588***	**45**	***2,588***	**45**	***2,588***	**320**	***18,407***
Jul 30 - Aug 31	350	*22,909*	125	*8,182*	45	*2,945*	45	*2,945*	45	*2,945*	320	*20,945*
Sept 1 - Sept 30	**350**	***20,826***	**145**	***8,628***	**65**	***3,868***	**65**	***3,868***	**65**	***3,868***	**340**	***20,231***
Oct 1 - Oct 31	350	*21,521*	195	*11,990*	115	*7,071*	115	*7,071*	115	*7,071*	415	*25,517*
Nov 1 - Nov 6	**700**	***8,331***	**575**	***6,843***	**475**	***5,653***	**475**	***5,653***	**475**	***5,653***	**775**	***9,223***
Nov 7 - Nov 10	700	*5,554*	575	*4,562*	475	*3,769*	475	*3,769*	475	*3,769*	775	*6,149*
Nov 11 - Nov 30	**350**	***13,884***	**235**	***9,322***	**155**	***6,149***	**155**	***6,149***	**155**	***6,149***	**555**	***22,017***
Dec 1 - Dec 31	350	*21,521*	235	*14,450*	155	*9,531*	155	*9,531*	155	*9,531*	555	*34,126*
Jan 1 - Jan 31	**350**	***21,521***	**255**	***15,679***	**175**	***10,760***	**175**	***10,760***	**175**	***10,760***	**675**	***41,504***
Feb 1 - Feb 28	350	*19,438*	255	*14,162*	175	*9,719*	175	*9,719*	175	*9,719*	675	*37,488*
		547,400		***434,075***		***365,436***		***365,436***		***365,436***		***641,139***

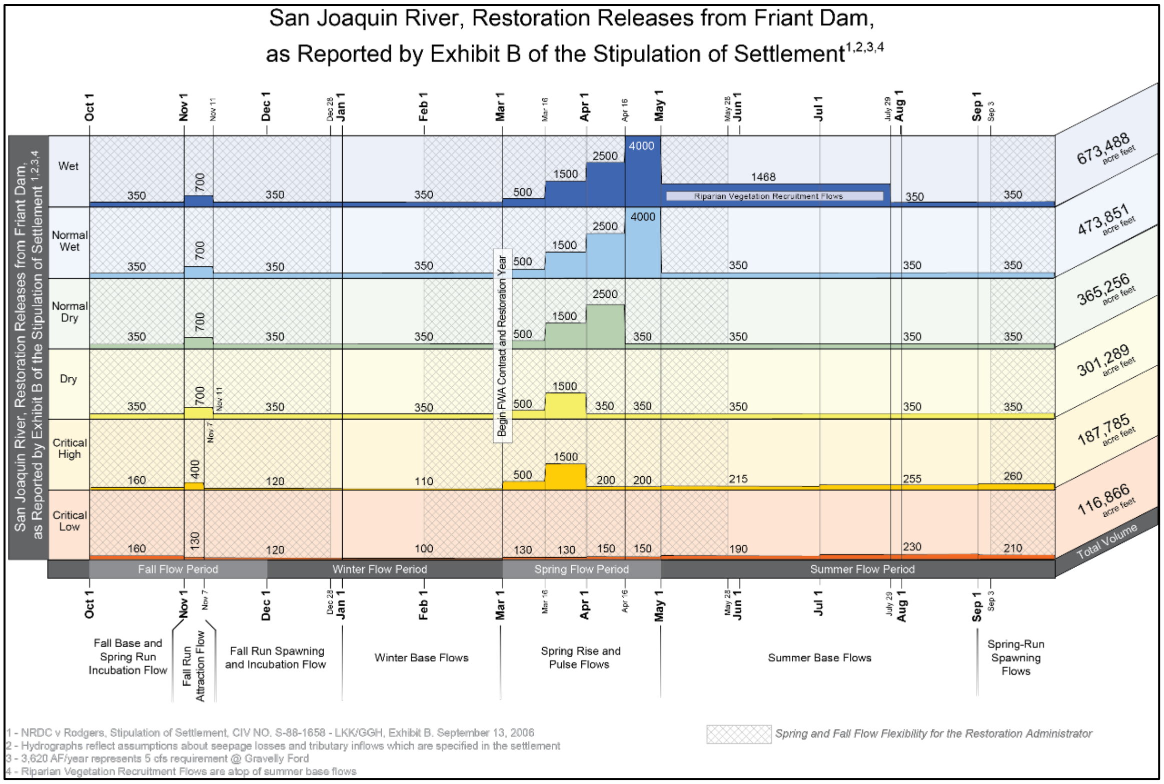
Table C-14.
Default Flow Schedule at 2500+ TAF Unimpaired Runoff (Wet)

	Friant Dam		Gravelly Ford		Head of Reach 2B		Head of Reach 4A		Head of Reach 4B		Before Confluence	
Period	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)	Release (cfs)	Volume (AF)
Mar 1 - Mar 15	**500**	***14,876***	**375**	***11,157***	**285**	***8,479***	**285**	***8,479***	**285**	***8,479***	**785**	***23,355***
Mar 16 - Mar 31	1500	*47,603*	1375	*43,636*	1220	*38,717*	1220	*38,717*	1220	*38,717*	1695	*53,792*
Apr 1 - Apr 15	**2500**	***74,380***	**2355**	***70,066***	**2178**	***64,797***	**2178**	***64,797***	**2178**	***64,797***	**2578**	***76,697***
Apr 16 - Apr 30	4000	*119,008*	3855	*114,694*	3658	*108,822*	3658	*108,822*	3658	*108,822*	4058	*120,723*
May 1 - May 28	**1468**	***81,547***	**1283**	***71,273***	**1131**	***62,822***	**1131**	***62,822***	**1131**	***62,822***	**1531**	***85,037***
May 29 - Jun 30	1468	*96,109*	1283	*84,000*	1131	*74,040*	1131	*74,040*	1131	*74,040*	1531	*100,222*
Jul 1 - Jul 29	**1468**	***84,459***	**1243**	***71,517***	**1092**	***62,840***	**1092**	***62,840***	**1092**	***62,840***	**1367**	***78,658***
Jul 30 - Aug 31	350	*22,909*	125	*8,182*	45	*2,945*	45	*2,945*	45	*2,945*	320	*20,945*
Sept 1 - Sept 30	**350**	***20,826***	**145**	***8,628***	**65**	***3,868***	**65**	***3,868***	**65**	***3,868***	**340**	***20,231***
Oct 1 - Oct 31	350	*21,521*	195	*11,990*	115	*7,071*	115	*7,071*	115	*7,071*	415	*25,517*
Nov 1 - Nov 6	**700**	***8,331***	**575**	***6,843***	**475**	***5,653***	**475**	***5,653***	**475**	***5,653***	**775**	***9,223***
Nov 7 - Nov 10	700	*5,554*	575	*4,562*	475	*3,769*	475	*3,769*	475	*3,769*	775	*6,149*
Nov 11 - Nov 30	**350**	***13,884***	**235**	***9,322***	**155**	***6,149***	**155**	***6,149***	**155**	***6,149***	**555**	***22,017***
Dec 1 - Dec 31	350	*21,521*	235	*14,450*	155	*9,531*	155	*9,531*	155	*9,531*	555	*34,126*
Jan 1 - Jan 31	**350**	***21,521***	**255**	***15,679***	**175**	***10,760***	**175**	***10,760***	**175**	***10,760***	**675**	***41,504***
Feb 1 - Feb 28	350	*19,438*	255	*14,162*	175	*9,719*	175	*9,719*	175	*9,719*	675	*37,488*
		673,487		***560,162***		***479,982***		***479,982***		***479,982***		***755,684***

Note: Schedule at Gravelly Ford includes 5 cfs for Holding Contracts (3,620 AF, 3,630 AF in leap years)

Note: Flow rates are rounded to nearest 1 cfs. Volumes are rounded to nearest 1 AF.

Note: Exhibit B riparian demands, losses, and accretions assumed



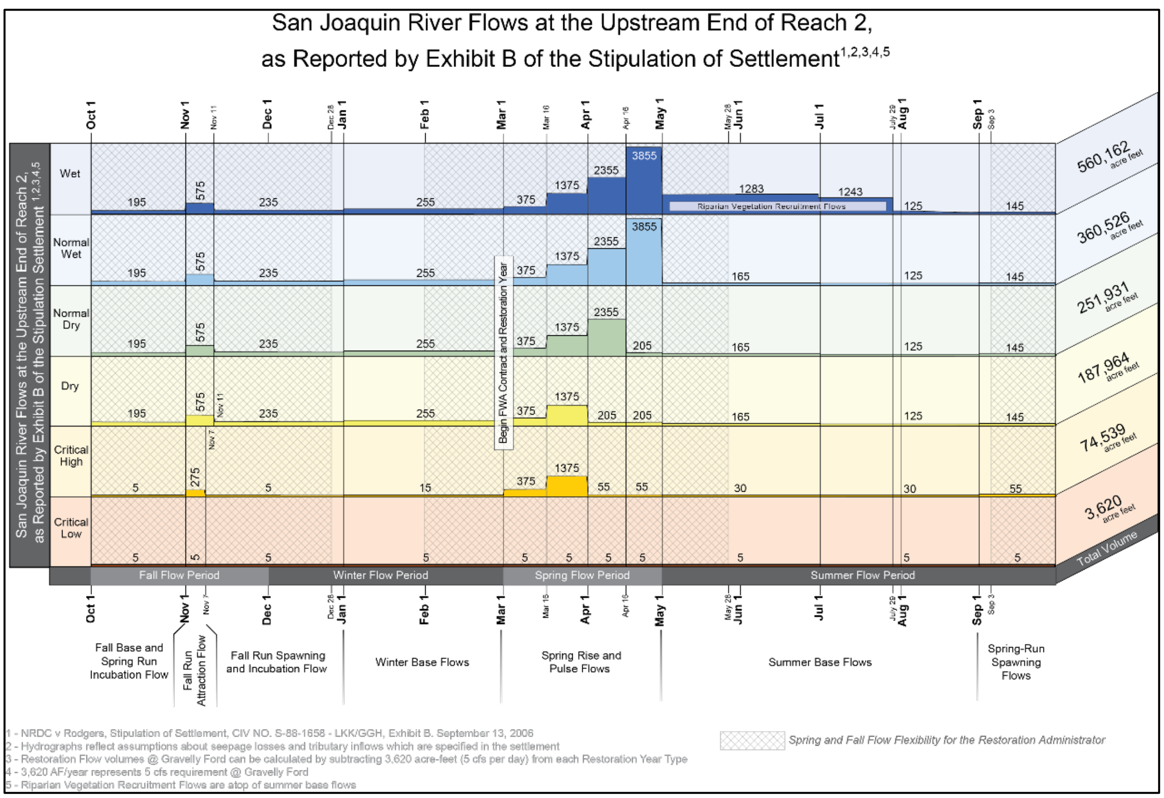
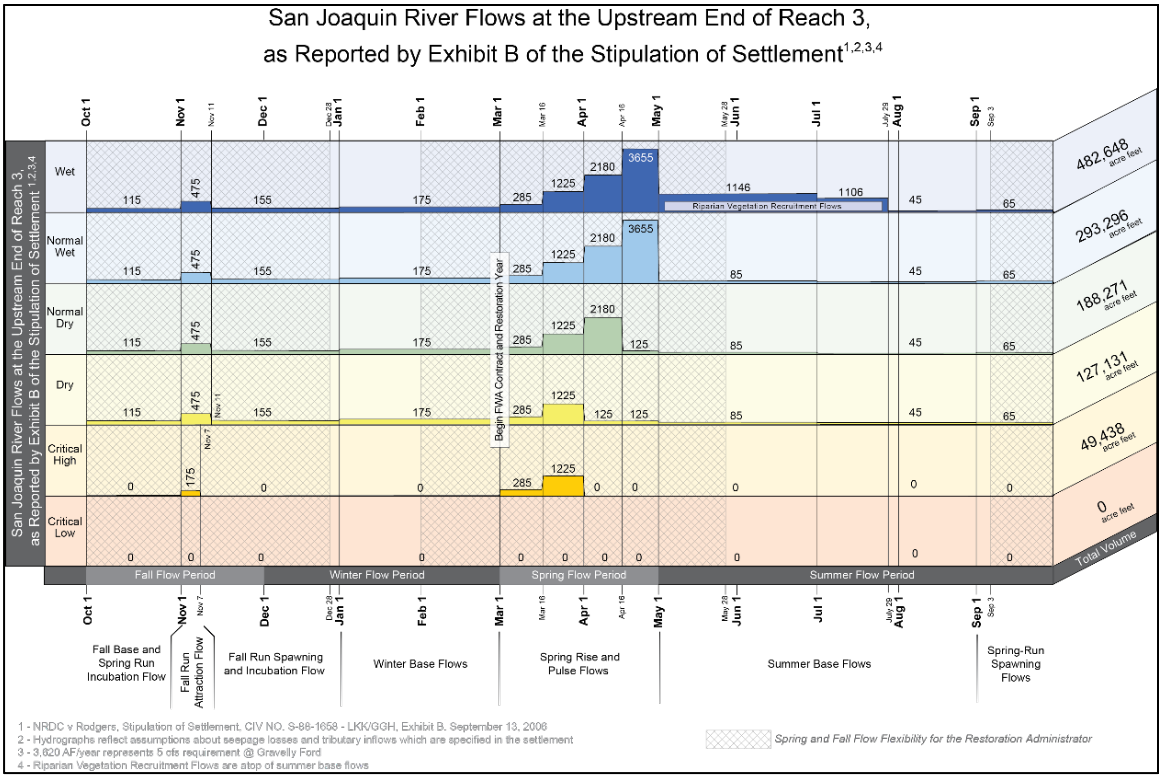


Figure C-2 and C-3.
Default Flows at Friant Dam (above) and at Gravelly Ford (below)



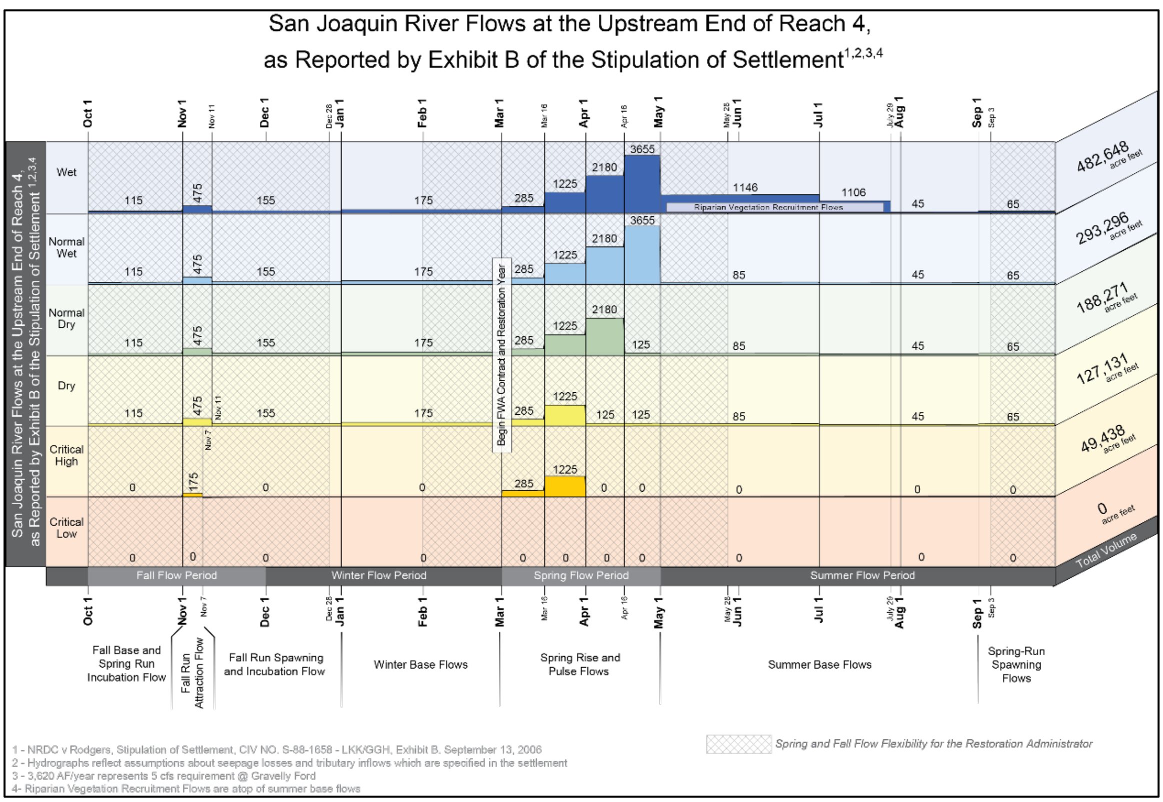
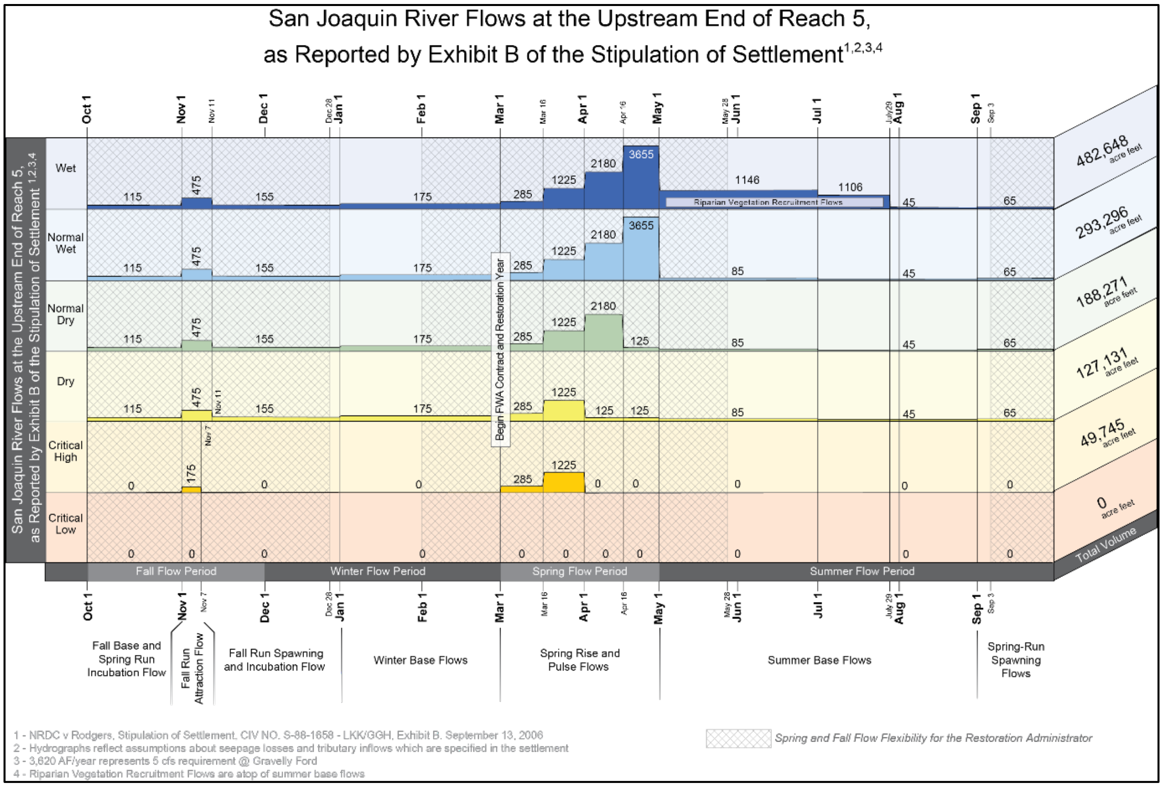


Figure C-4 and C-5.
Default Flows at Head of Reach 3 (above) and at Head of Reach 4 (below)



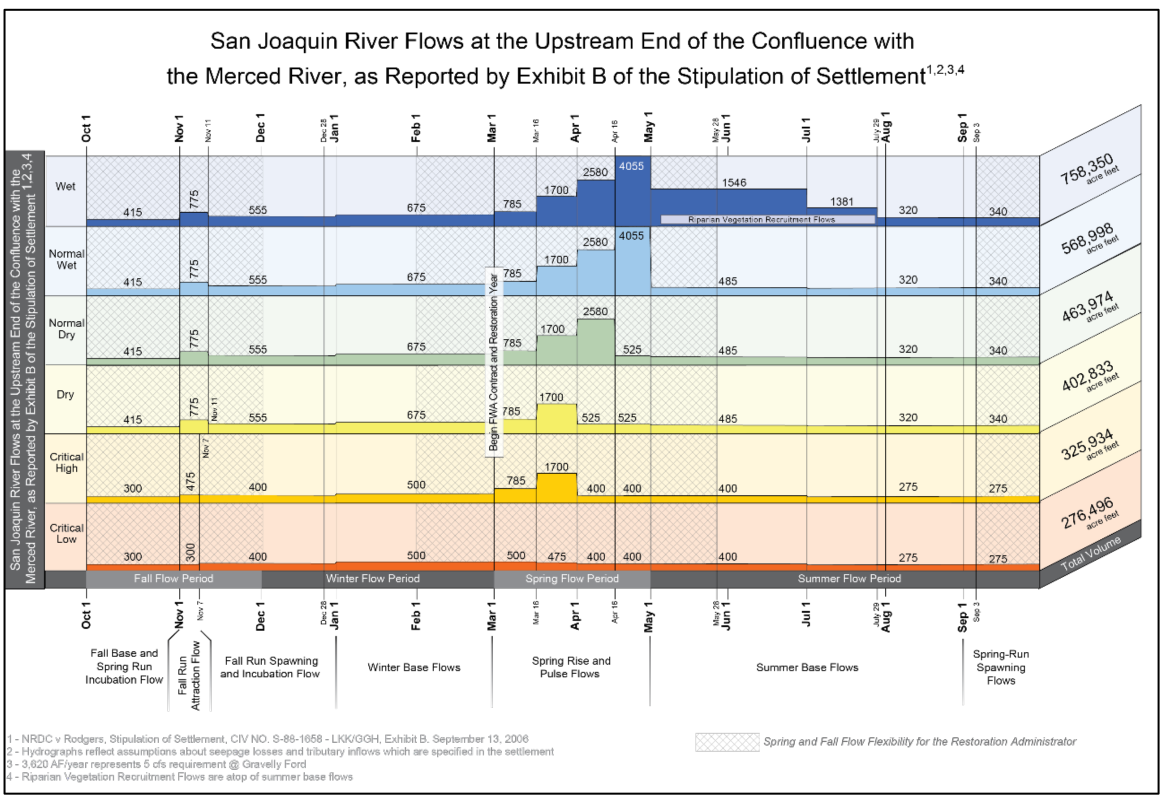


Figure C-6 and C-7.
Default Flows at Head of Reach 5 (above)
and below confluence with Merced River (below)

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.

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

			Gain and Loss Assumptions			Flow at Upstream End of Reach				
Hydrograph Component		Friant Release	Riparian Releases	Reach 2 losses	Salt and Mud Slough Accretions	Reach 2	Reach 3	Reach 4	Reach 5	Confluence
Fall Base and Spring Run Incubation Flow	Oct. 1 - 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

			Gain and Loss Assumptions			Flow at Upstream End of Reach				
Hydrograph Component		Friant Release	Riparian Releases	Reach 2 losses	Salt and Mud Slough Accretions	Reach 2	Reach 3	Reach 4	Reach 5	Confluence
Fall Base and Spring Run Incubation Flow	Oct. 1 - 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

			Gain and Loss Assumptions			Flow at Upstream End of Reach				
Hydrograph Component		Friant Release	Riparian Releases	Reach 2 losses	Salt and Mud Slough Accretions	Reach 2	Reach 3	Reach 4	Reach 5	Confluence
Fall Base and Spring Run Incubation Flow	Oct. 1 - 31	350	160	80	300	195	115	115	115	415
Fall Run Attraction Flow	Nov. 1 - 10	700	130	100	300	575	475	475	475	775
Fall-Run Spawning and Incubation Flow	Nov. 11 - Dec 31	350	120	80	400	235	155	155	155	555
Winter Base Flows	Jan. 1 - Feb. 28	350	100	80	500	255	175	175	175	675
Spring Rise and Pulse Flows	March 1 - 15	500	130	90	500	375	285	285	285	785
	March 16 - 31	1,500	130	150	475	1,375	1,225	1,225	1,225	1,700
	April 1-15	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

			Gain and Loss Assumptions			Flow at Upstream End of Reach				
Hydrograph Component		Friant Release	Riparian Releases	Reach 2 losses	Salt and Mud Slough Accretions	Reach 2	Reach 3	Reach 4	Reach 5	Confluence
Fall Base and Spring Run Incubation Flow	Oct. 1 - 31	350	160	80	300	195	115	115	115	415
Fall Run Attraction Flow	Nov. 1 - 10	700	130	100	300	575	475	475	475	775
Fall-Run Spawning and Incubation Flow	Nov. 11 - Dec 31	350	120	80	400	235	155	155	155	555
Winter Base Flows	Jan. 1 - Feb. 28	350	100	80	500	255	175	175	175	675
Spring Rise and Pulse Flows	March 1 - 15	500	130	90	500	375	285	285	285	785
	March 16 - 31	1,500	130	150	475	1,375	1,225	1,225	1,225	1,700
	April 1-15	2,500	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

			Gain and Loss Assumptions			Flow at Upstream End of Reach				
Hydrograph Component		Friant Release	Riparian Releases	Reach 2 losses	Salt and Mud Slough Accretions	Reach 2	Reach 3	Reach 4	Reach 5	Confluence
Fall Base and Spring Run Incubation Flow	Oct. 1 - 31	350	160	80	300	195	115	115	115	415
Fall Run Attraction Flow	Nov. 1 - 10	700	130	100	300	575	475	475	475	775
Fall-Run Spawning and Incubation Flow	Nov. 11 - Dec 31	350	120	80	400	235	155	155	155	555
Winter Base Flows	Jan. 1 - Feb. 28	350	100	80	500	255	175	175	175	675
Spring Rise and Pulse Flows	March 1 - 15	500	130	90	500	375	285	285	285	785
	March 16 - 31	1,500	130	150	475	1,375	1,225	1,225	1,225	1,700
	April 1-15	2,500	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.

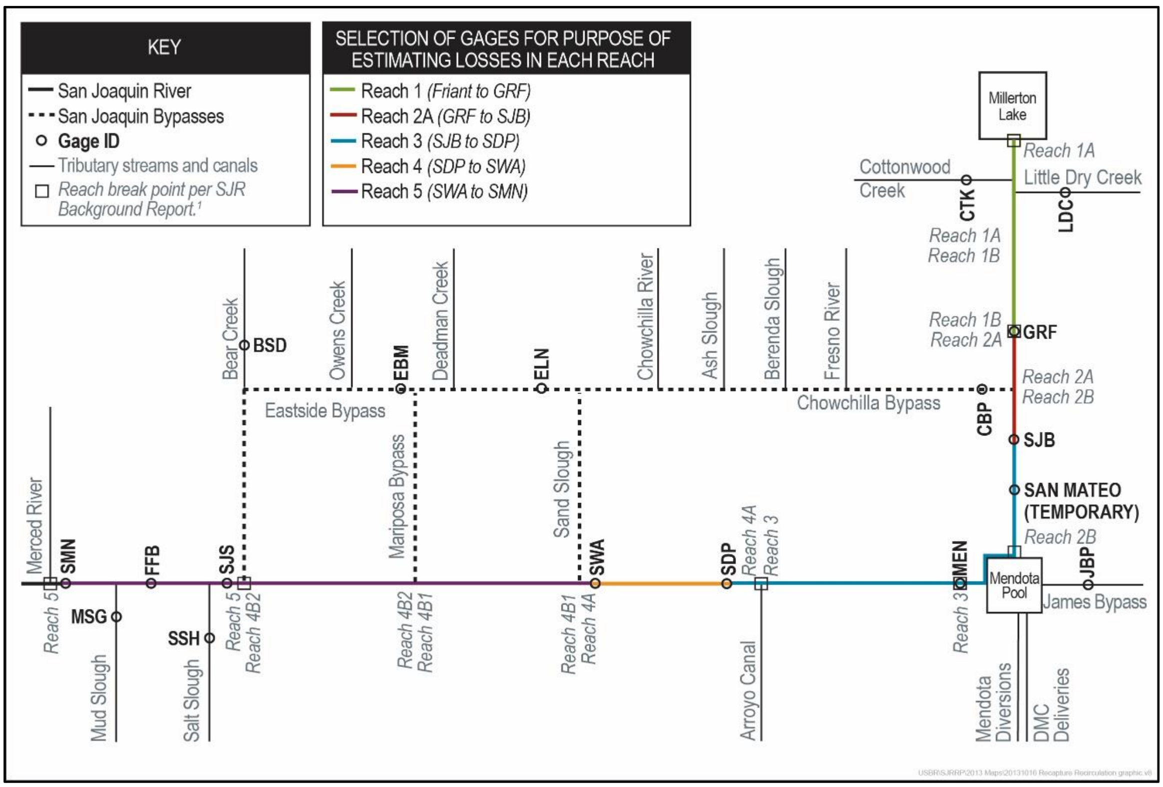
8. Confluence - Reach 5 flow plus Mud and Salt Slough. Does not include up to another 50 cfs of accretion upstream of Mud and Salt Slough that the WOST hydrograph included.

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

This page left blank intentionally.

Appendix E – Reach Definitions and Gauges

Figure E-1 shows the location of gauges 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 California Data Exchange Center (CDEC) and National Water Information System (NWIS) identification codes for electronic access, along with periods of operation.



Note: as of 2020 San Mateo gauge no longer operating

Figure E-1.
Gauges and Reaches of the San Joaquin River in the SJRRP Restoration Area

Table E-1.
Flow Monitoring Gauges on the San Joaquin River

Assoc. SJRRP Reach	Physical Location [1]	Agency [2]	CDEC ID [3]	NWIS ID [4]	Period of Record [5]
Above Reach 1	Friant Dam (Millerton Lake- Elevation and Storage)	USBR	MIL		1974 – present
	Friant Dam River Release	USBR			1947-present
Reach 1A	San Joaquin River Below Friant Dam	USGS	SJF	11251000	1950 – present
	Cottonwood Creek near Friant Dam	USBR	CTK		1974 – present
	Little Dry Creek	USBR	LDC		1974 – present
	San Joaquin River at Highway 41	USBR	H41		
Reach 1B	San Joaquin River at Donny Bridge	USBR	DNB		1988 – present
	San Joaquin River Below Hwy 145 (Skaggs Bridge)	USBR	SKB		1974 – present
Reach 2A	San Joaquin River at Gravelly Ford	USBR	GRF		1974 – present
Reach 2B	**San Joaquin River below Bifurcation** (Chowchilla Bifurcation, aka Whitehouse)	USBR	SJB		1974 – 1986, 1988 – 1997, 2005 – present
	San Joaquin River at San Mateo Road Near Mendota	USGS	SJN	11253130	2009 – 2018
Chowchilla Bypass	Chowchilla Bypass (Head)	SLDMWA	CBP		1974 – 1986, 1988 – 1997 – present
Mendota Pool	James Bypass (Fresno Slough near San Joaquin)	Reclamation Dist 1606	JBP		1974 – 1987, 1995 – 1997
Reach 3	San Joaquin River near Mendota	USGS	MEN	11254000	1950 – 1954, 1974 – present
Reach 4A	San Joaquin River near Dos Palos (below Sack Dam)	DWR	SDP		
Reach 4B / Sand Slough Bypass	San Joaquin River near Washington Road (at the head of Reach 4B)	DWR	SWA		

Assoc. SJRRP Reach	Physical Location [1]	Agency [2]	CDEC ID [3]	NWIS ID [4]	Period of Record [5]
Eastside Bypass	Eastside Bypass near El Nido	DWR	ELN		1980 – present
	Eastside Bypass below Mariposa Bypass	DWR	EBM		
	Bear Creek below Eastside Canal	DWR	BSD		1980 – present
Reach 5	San Joaquin River near Stevinson	DWR	SJS		1981 – 2007
	Salt Slough at Highway 165 Near Stevinson	USGS	SSH	11261100	1985 – 2007
	San Joaquin River at Fremont Ford Bridge	USGS	FFB	11261500	1950 – 1971, 1985 – 1989, 2001 – 2007[2]
	Mud Slough near Gustine	USGS	MSG	11262900	1985 – 2007
	San Joaquin River above Merced River Near Newman	USGS	SMN	11273400	
Merced River	Merced River Near Stevinson	DWR	MST		
Below Reach 5	San Joaquin River near Newman (Below Merced)	USGS	NEW	11244000	

Notes:
1. Gauges in **bold** constitute the minimum set required by the Settlement.
2. Many gauges have changed operating agency over time. Only the current agency operator is shown.
3. It is preferred to access USGS-administrated gauges through the USGS NWIS site, which provides retrospective rating table adjustments (https://waterdata.usgs.gov/ca/nwis/dv/?referred_module=sw)
4. It is preferred to access USBR and DWR-administrated gauges through the CDEC site (http://cdec.water.ca.gov/).
5. Friant Dam diversions began in 1950. All years are articulated in calendar year

This page left blank intentionally.

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 — (at Gravelly Ford following flow change at Friant Dam), 2 Days (Interim Flow monitoring data as reported in the 2010 Annual Technical Report (ATR).

2. Stabilization — 4–5 days (Interim Flow monitoring data as reported in the 2010 ATR)

3. Measurement Accuracy — +/- 8%–15% (USGS stream gauge monitoring protocols).

4. Minimum Release Increment for a Gravelly Ford (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 — Plaintiff Parties believe 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

Modeling of weekly and daily flow adjustment methods produced similar results, meeting the flow target 26 percent and 28 percent of the time, respectively. The SJRRP will take an experimental approach to implementing flow compliance at Gravelly Ford. The methodology is proposed notwithstanding the acknowledged inability to precisely measure flows within 10 cfs at Gravelly Ford, and the historical experience of the Friant Dam staff regarding predictability of flow rates at Gravelly Ford following flow changes at Friant Dam. 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.

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.

Table G-1.
List of Offset Programs

Project Name	Authority	Status	Projected Date of Completion
Tulare Irrigation District Coordinated Basin Ground Water Storage	Public Law 111-11, Title X, Part III, SEC. 10202	Under construction	August 2020
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
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
Recapture & Recirculation Implementation (includes Friant-Kern Canal Reverse Pump facilities, Long–term Recapture and Recirculation Plan, etc.)	Public Law 111-11, Title X, Part III, SEC 10004(a)(4)		On-Going

This page left blank intentionally.

Appendix H – RWA Impact Calculations and Water Use Curve Model Documentation

Purpose

This appendix to the Restoration Flow Guidelines (Guidelines) provides the background and development of the Recovered Water Account (RWA) impact calculation procedures. The RWA procedures determine the reductions in water deliveries (hereafter "water supply impacts" or "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 describe the explicit procedures for the RWA impact calculation. Another purpose is to provide background regarding the discussion and rationale leading up to the selection of a RWA impact calculation method by the Settling Parties. This appendix supplements the main body of the Guidelines and provides the detail to apply the procedures for determining the reduction in water deliveries. The amount accrued to a Contractor's RWA balance in a year equals the net delivery reductions (calculated with the procedures detailed in this appendix) minus any water returned by recirculation and, replacement and offset programs as described in Chapter 14 of these Guidelines.

Impact Calculation

An inflow-based water use curve (WUC) model is utilized for the March through July period to calculate the difference of water made available to Contractors between the without Restoration Program baseline and with Restoration Flows scenarios. The model baseline is as of October 2006 and is not intended to reflect subsequent operational changes nor real time operations. The model calculates the projected Millerton Lake flood control releases, both with and without Restoration scenarios. Water released for Restoration that would have been a flood control release prior to Restoration reduces the impacts to Contractors from Restoration Flows. The model uses actual daily values (subject to final Quality Assurance/Quality Control review) for the inflow to Millerton Lake, and the Restoration Flow Schedule (Restoration Administrator recommended flow schedule approved by Reclamation) plus gross URFs delivered from Millerton Lake, if any, for the with Restoration scenario. The background describing the rationale and development of the model is provided on page H-8.

The process to ultimately determine the net impacts (as impacts in some years will be potentially less than total Restoration Flows released) 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 accounting for late season flood control releases (August through February period).
3. Sum Friant-wide impacts from Steps 1 and 2 (March through February water contract year).
4. Compare total Friant-wide water made available to Contractors with Restoration to Friant-wide total contract quantity of 2,201,475 AF.
5. Compare Step 3 to Step 4 and use the lesser of the two as net Friant-wide Impacts.
6. Distribute net Friant-wide Impacts from Step 5 to each individual Contractor.

Note that after calculating the reduction in water deliveries for the prior Restoration Year, as summarized above, that year's impact will be included in each Contractor's running RWA balance. The RWA balance will subsequently be reduced by the amount of recirculation, recapture, reuse, exchange or transfer of Restoration Flows allocated to each Contractor and the amount of RWA Water taken by each Contractor during the prior Restoration Year. RWA balances will also be decreased for programs and projects undertaken or funded by Reclamation or other agencies to mitigate the water delivery impacts caused by Restoration Flows, such as those funded under Part III of the Settlement Act. Friant Division Long-term Contractors may transfer RWA balances between each other, which will result in a deduction from the transferring Friant Division Long–term Contractor's RWA balance, and an equivalent increase in the recipient's RWA balance.

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 through 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, Restoration Flow Schedule, and URF deliveries. 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 the Restoration Flow Schedule and gross URFs with the baseline river releases. 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 the daily Riparian Releases noted in the Exhibit B tables of the Stipulation of Settlement totaling approximately 117,000 AF annually.

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 the calculated Millerton Lake level approaches dead pool (134,054 AF), water available for delivery to Contractors could be less than 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 catches up and equals that which would otherwise have occurred absent dead pool reductions.

Item 5: Spill Calculation (C). Using the March 1 storage (Item 1) as the starting point, the model calculates the daily reservoir storage based on the cumulative net inflow (Item 3) and the cumulative water use (Item 4). In the event calculated storage levels reach 520,528 AF, spill occurs, and the model takes into account going in and out of spill mode. Once the reservoir is full, all daily net inflow (Item 3) in excess of the daily water use curve (Item 4), becomes spill, and is therefore not water supply available to Contractors.

Item 6: Net Water Available to Contractors (C). Subsequently, the Net Water Available to Contractors becomes the Net Inflow (Item 3) minus the Spill Calculation (Item 5) and subsequently multiplied by 98.5% to account for the negotiated 1.5% factor for reservoir and canal losses (as a calibration parameter and to reflect the water delivered to the Contractors at the turnouts).

WITH RESTORATION

Item 7: Restoration releases (D). Restoration releases 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 plus gross URFs delivered from Millerton, if any. In the event of flood control releases from the Friant Dam outlets, the Restoration Flows are those previously recommended by the RA and approved by Reclamation for the period of flood control releases. 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/restoration-flows/RA-Recommendations/.

Item 8: Net Inflow with Restoration (C). Under the with-Restoration scenario the Restoration releases, as defined in Item 7, 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 3 minus Item 7).

Item 9: Net Water Available to Contractors with Restoration (C). Once Item 8 is calculated the model steps through the same steps as outlined in Items 4, 5, and 6 in Step 1 thus, determining the net water made available to Contractors with Restoration.

Item 10: Net impacts to Contractors (C). Subsequently, the difference between Item 6 and Item 9 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 11: Buffer Flow impacts. Buffer Flows that cause reductions to Contractors (impacts) receive an extra 0.25 AF of RWA impact credit. To determine the reductions due to Buffer Flows, the steps outlined in Items 8 through 10 are duplicated with Buffer Flows subtracted from the Restoration Flows in Item 7. If the recalculated impacts without Buffer Flows are less than the impacts with Buffer Flows (Item 10), the difference in impacts are due to Buffer Flows, and the additional 0.25 factor is applied.

As an example, if the data indicates 30,000 AF of Buffer Flows were released and the impacts to Contractors (Item 10) totaled 120,000 AF, but the calculation 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. The additional impacts would be 15,000 x 0.25 = 3,750 AF and added to the 120,000 AF calculated above for a final net impact to contractors of 123,750 AF.

Step 2: Determine Friant-wide Impacts accounting for Late–Season Flood Control Releases (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 generally be a reduction in water supplies or considered an impact to Contractors. Flood control releases may occur, however, under anomalous conditions of rainfall and/or early snowmelt. During such a flood control release, the concurrent Restoration releases would not count as an impact. It is noted that flood control releases include when water is released into the San Joaquin River via the Friant Dam valves and/or spillway in excess of the Restoration Flow Schedule. In the event of flood control releases from the Friant Dam outlets, the Restoration Flows for the purposes of the model are those previously recommended by the RA and approved by Reclamation for the period of flood control releases.

This RWA methodology manually deducts scheduled Restoration Flows from impacts during flood control releases during the August through February time period. When river releases are being made from Friant Dam in excess of the approved Restoration Flow Schedule to meet Millerton Lake flood management criteria, Restoration Flows scheduled on those days would not count as a water supply reduction. During a late season flood control release the associated impacts will be reduced by the scheduled Restoration Flow release, as approved by Reclamation *prior* to the flood control release, for that day.

As an example, if 108,000 AF were scheduled and released for Restoration during August through February, but flood control releases occurred 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 August through February period would be reduced to 103,500 AF.

Buffer Flow impacts. Buffer Flows that cause reductions to Contractors (impacts) receive generate an extra 0.25 AF of impact caused by the Buffer Flows calculation. Accordingly, the August through February period will include separate accounting of Restoration and Buffer Flow releases. If a flood control release is not occurring, the Restoration amount will be multiplied by 1.00 and the Buffer Flows amount will be multiplied by 1.25. If there is a flood control release, neither Restoration Flows nor Buffer Flows would count as impacts on those days.

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

The results from using the WUC model for March through July (Step 1), and accounting for the late season flood control releases for August through February (Step 2), will be added together including contributions from Buffer Flows to get the potential impacts for the entire Restoration year period of March through 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 ("2.2 Test")

The net water captured and/or made available to Contractors with Restoration will be calculated for the entire Restoration year (Step 1, Item 9 plus August through February inflow less Riparian Releases less Restoration releases less flood control releases). The quantity of water released for flood control will not count as water made available to Contractors. For example, if there was 100,000 AF of simulated spill in March through July, and 20,000 AF of flood control releases in August through February, that 120,000 AF would not be counted as made available to Contractors. Upon calculation of the total amount of water made available to Contractors, Reclamation will compare the calculated amount of water made available to the full Friant wide contractual amount of 2,201,475 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 2,101,475 AF water made available to them with Restoration. Regardless whether Contractors actually used 2,101,475 AF, that value is used to calculate the contract deficit for the year. In this case, 2,101,475 AF is only 100,000 AF short of full contract totals of 2,201,475 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 2.2 Test (Step 4) indicated a potential contract deficit of only 100,000 AF, the impacts would be the lesser of the two or 100,000 AF.

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

Upon completion of Step 5, Reclamation would allocate the reduction in supplies to individual districts as a proportion of the Class 1 and Class 2 contract totals. Class 1 contracts would record impacts first until, when adding to the calculated water made available, 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.

As an example: if the water made available calculation indicates a Friant supply allocation of 80% Class 1 (640,000 AF) and the Friant-wide impacts were 227,475 AF (Step 5), the first 160,000 AF of calculated impacts will be contributed to Class 1 contracts (640,000 + 160,000 = 800,000). Subsequently, Contractor A, with a 50,000 AF Class 1 contract, would be allocated 10,000 AF of impact. Impacts greater than 160,000 AF, in this case 67,475 AF, would be distributed to Class 2 Contractors (equal ratio based on contract amounts). Continuing with the example above, Contractor B, with a 15,000 AF Class 2 contract, would be allocated 722 AF of the remaining 67,475 AF Friant-wide impact. If the water made available indicates a Friant supply allocation is 100% Class 1, all recorded impacts will be distributed to Class 2 Contractors.

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 March through July
123,750 AF	Step 1: include Buffer Flows
103,500 AF	Step 2: Late season Flood Control Releases, August through February
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

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) = 134,054 AF
- Maximum Storage in Millerton (Capacity) = 520,528 AF
- Maximum Canal Delivery = 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 = 2,201,475 AF
- Class 1 Contract Maximum = 800,000 AF
- Class 2 Contract Maximum = 1,401,475 AF

RWA Methodology Background

By 2009, Reclamation, in consultation with the Settling Parties, had developed a range of potential approaches for the RWA 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 Paragraph 16(b)(1) stating that the Secretary will "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 Shared Principles

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 2,201,475 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 WUCs. One for Wet and one for Normal–Wet Year Types.
3. All other year types will be run against the Normal–Wet 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 Reclamation 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 185,000AF/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 Normal–Wet 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 of the March through July 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 14 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 14) 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 are 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 calibrate the model to derive the average reduction of 185,000 AF/YR, and to reflect the delivery reductions to the Contractors at the canal turnouts, canal losses were calculated to be 1.5% of available water at canal headworks.[16]

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:

Table H-1.
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

Table H-2.
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

16 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 canal loss factor was derived as a calibration parameter to obtain the target average reduction in water deliveries of 185,000 AF/YR. The resulting factor of 1.5% was within the range of historically measured values and was used for the sole purpose to calibrate the model to obtain 185,000 AF/YR reduction in water deliveries.

Table H-3.
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. Wet and Normal–Wet 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 a long–term average. The long–term average reduction in deliveries results (with 1922-2003 base period, Gamma 3.1 transformation, canal losses, etc.) are shown below.

Table H-4.
Results using the revised Obligation Period water use curve

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%) neither the 185,020 AF/year average reduction in deliveries nor the 1.5% canal loss factor used to calibrate the model will have further significance and does not in any way reflect model performance going forward.

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.

This page left blank intentionally.

Appendix J – Water Supply Test

Purpose

Section 4 of the Guidelines describes several actions by the Secretary or Restoration Administrator that are subject to a Water Supply Test (WST). This test is intended to ascertain whether a proposed or ongoing action results in a water delivery reduction to any Friant Division Long–term Contractor as compared to the hydrographs and provisions in Exhibit B. When situations occur that are outside of the flexibility provided in Exhibit B as described in Section 4.1 (those actions which are specifically excluded from the application of a WST), Reclamation must undertake a WST in order to approve or reject the proposed action.

The WST is a good-faith effort by Reclamation, through a transparent process in consultation with Settling Parties, to determine whether an action is likely to result in a water delivery reduction to any Friant Division Long-term Contractor. It does not guarantee that if passed, a potential conflict will not arise later; nor does it guarantee that if rejected, a potential conflict would have resulted. The application of a WST provides all parties some confidence that ongoing and proposed actions are not likely to result in a water delivery reduction, streamlines reservoir management, and provides certainty for the Restoration Administrator and Secretary to plan actions.

Changes in hydrology and actual reservoir conditions may necessitate a subsequent application of the WST. Actions that were rejected may later be shown to pass a WST, and vice versa. Flood Management Actions and Inflow Pro-rate, if they occur, are likely to require that Secretarial and Restoration Administrator actions are modified to avoid water delivery reductions.

The WST examines current and future (forecasted) conditions. A retrospective WST will not be conducted on any action that when released or executed was shown at the time to be not a water delivery reduction.

Baseline Case

Critical to the determination of a potential water delivery reduction is the establishment of a baseline — What is the proposed action compared to. The baseline case is the Flexed Default Flow Schedule (Section 2). This differs substantially from the regular Default Flow Schedule during the Spring and Fall flexible flow periods pursuant to Exhibit B (4)(b) and B (6). Thus, the Flexed Default Flow Schedule captures both the Exhibit B Hydrographs and the flexibility in release of Restoration Flows that is exempt from the WST. This is shown in Figure J-1 where the release pattern is depicted as a cumulative volume released from the beginning of the Restoration Year instead of a discrete flow rate across a particular range of dates.

> **Definition of Baseline (from Section 4.4)** — The baseline for the Water Supply test is the Flexed Default Flow Schedule generated at the most recent allocation. This differs from the normal Default Flow Schedule in that it incorporates the flexible flow periods by the most flexible (and thus favorable to the Restoration Administrator) interpretation as depicted in Figure J-1. This flexibility is intended to protect the authority provided to the Restoration Administrator and associated Secretarial actions by Exhibit B 4(b).

The baseline pattern depicts the spring and fall flexible flow period as approximate parallelograms. Within this shaded area, there are a range of permitted release schedules, all of which are exempt from the WST. These parallelograms are bounded on the right and left sides by curves representing a maximum 4,500 cfs release. This is intended to ensure that flexibilities are limited to the constraints of the system, specifically a channel capacity of 4,500 cfs below Gravelly Ford. The Spring and Fall Flexible Flow Accounts overlap the non-flexible Summer and Winter flow accounts. The summer and winter flow accounts are depicted as singular lines that rise from left to right corresponding to the flow rate in the Default Flow Schedule. There is no difference between the Flexed Default Flow Schedule and the Default Flow Schedule for the Summer and Winter flow accounts.

The Baseline case may change with each Restoration Allocation issuance but is unchanged by actual Restoration Releases to date. In all situations, the WST is comparing a proposed or current action (the test case) against the baseline case from the most recent Restoration Allocation issuance. Buffer Flows are exempt from the WST and likewise should not be incorporated into the baseline case.

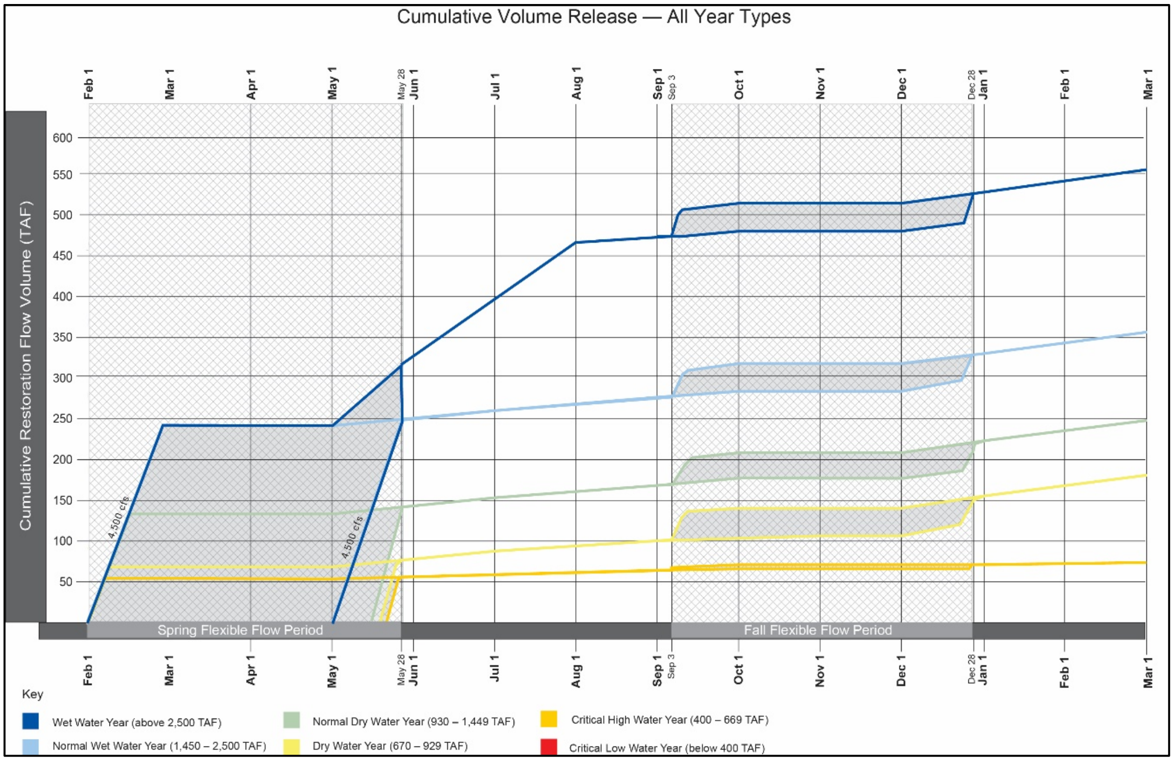


Figure J-1.
Figure 8 from Section 4.1.2 — The Flexed Default Flow Schedule depicted for multiple year types at Gravelly Ford. Spring and fall flow flexibility depicted as a cumulative volume release – the area within the parallelograms is the potential range of release patterns pursuant to Exhibit B 4(b) and Exhibit B 6.

Test Case

The test case combines the past Restoration Flow releases with the proposed future release schedule. Volumes should incorporate both Secretarial and Restoration Administrator Actions. Because Restoration Allocations frequently fluctuate over the course of the spring season, it is unlikely that that baseline and test cases will be congruent for periods preceding the test date. As described in Section 4, the WST is not retroactive, though the cumulative release pattern from the beginning of the Restoration Year will play an important role in determining whether future actions will or will not be determined to cause a water delivery reduction. This approach assures that cumulative impacts from multiple actions will be fairly assessed.

> **Definition of Test Case (from Section 4.4)** — The test case for the WST is the cumulative volume of Restoration Flows from the beginning of the Restoration year (plus any Restoration Flows or Unreleased Restoration Flows advanced into February of the previous Restoration Year under the flexible flow provisions) combined with the cumulative volume of the proposed future flow schedule and proposed future Unreleased Restoration Flow deliveries. Any Unreleased Restoration Flows that have been previously delivered to Friant Division Long–

term Contractors under sale or exchange agreements, plus any Unreleased Restoration Flows that have been evacuated from Millerton under third party agreements, will be included in the cumulative volume of Restoration Flows for the purposes of the WST.

Buffer Flows are exempt from the WST and likewise should not be incorporated into the test case. Restoration Flows previously released as Buffer Flows cannot be reassigned as Base Flows for the purposes of creating a more favorable test case.

Procedure

The purpose and scope of the WST is explained in Section 4. This appendix provides procedural clarity to Section 4. The WST is a two-tiered analysis consisting of a "rapid evaluation" and a "full analysis." This approach allows Reclamation to efficiently review proposed actions that are unlikely to result in a water delivery reduction within the normal 5-day review period. A flowchart depicting this procedure, and under what conditions those are applied, is shown below in Figure J-2.

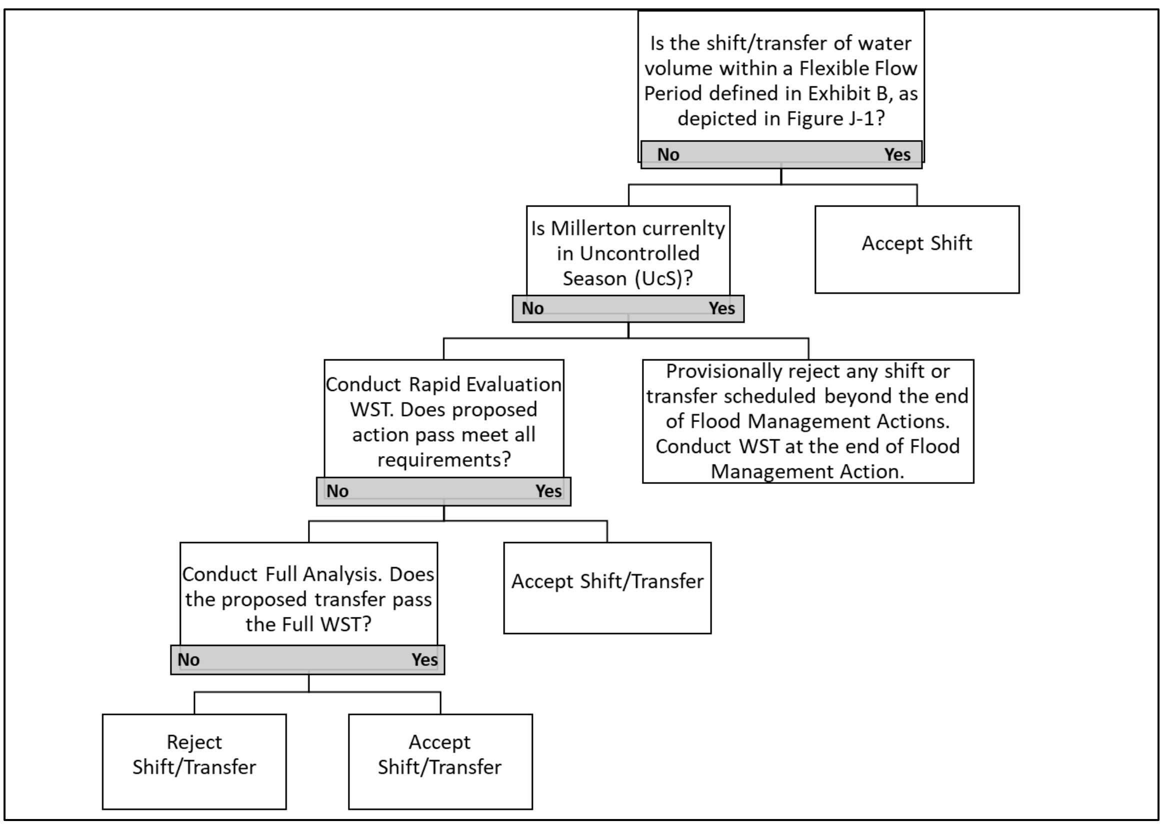


Figure J-2.
Flow Chart Depicting Water Supply Test Process, Applicable to Both Restoration Administrator Recommendations and Secretarial Actions

The following framework guides Reclamation through the WST procedure. This procedure (at least Step 1) should be executed every time there is a proposed change in flow schedule, proposed changes in the management of Unexpected Seepage Loss water or Unreleased Restoration Flows. This procedure should also be executed at the end of a flood management action period (i.e. at the end of Uncontrolled Season), during Millerton Lake Inflow Pro-rate, and at the end of an interruption of Restoration Flows pursuant to Paragraph 13(e).

Step 1 — Review of Exemptions

In consideration of the Restoration Administrator and Secretarial actions that are exempt from the WST (Section 4.2), complete the following dichotomous question. If it is determined that a WST is not applicable, then this should be documented in the flow schedule approval process and no further reviews are necessary.

REVIEW OF ACTIONS EXEMPT FROM WATER SUPPLY TEST (SELECT ONE)		RESULT
All actions proposed by the Restoration Administrator's schedule or by the Secretary fall within the Allowable Flexible Actions listed above and therefore do not require a WST	☐	**WST not applicable**
At least one action proposed by the Restoration Administrator's schedule or by the Secretary falls outside of the Allowable Flexible Actions listed above	☐	**Continue WST Procedure**

Step 2 — Rapid Evaluation Water Supply Test

Some Restoration Administrator Recommendations and Secretarial actions invoking Exhibit B 4(d) and other provisions requiring a WST may be easily determined to not materially increase the water delivery reductions to any Friant Division Long–term Contractors. This checklist serves to provide an efficient method for evaluating simple cases and low risk situations.

Once an action is determined to warrant a WST in Step 1, a Rapid Evaluation WST is conducted. This process first clearly identifies what actions are being tested, and then links each action to one or more test components. If a proposed Restoration Administrator schedule (including Paragraph 13(e) rescheduling) or Secretarial Action should fall outside of the thresholds in the Rapid Evaluation, a Full WST must be conducted. Water delivered under Paragraph 13(i) (i.e. URFs) should be evaluated in this checklist alongside Restoration Flows; the combined Restoration Administrator and Secretarial actions will be evaluated in unison.

The terminology for changes in a flow schedule within the Continuity Flow Account is a "shift;" changes in a flow schedule within the Spring and Fall Flexible Flow Accounts, and Riparian Recruitment Account is a "flex;" changes in a flow schedule involving water moved between flow accounts is a "transfer." Only the Continuity Flow Account can accept transfers. The term "releases" includes all Restoration Flows that are evacuated from Millerton Lake, which combines Secretarial actions such as URF sales with releases to the San Joaquin River as part of the Restoration Administrator's flow schedule.

PROPOSED ACTIONS THAT REQURIE A WATER SUPPLY TEST (Fill In)
List all actions that require a WST, including those actions from previous recommendations that are still pending, applicable URF deliveries, and rescheduling water required by 13(e):
1.
2.
3.
4.
5.

The following tables should be completed, with linkages to the proposed actions indicated above (#1–5). If a proposed action is not applicable to a test component, that test component should be marked as "not applicable." If all applicable actions are approved in the checklist below, then a Rapid Evaluation satisfies the WST. The results should then be documented as part of the approval process, and no further review is required; otherwise, proceed to the Full WST.

ACTION	**TEST COMPONENT**	
ACTIONS **DURING** INFLOW PRO-RATE		
	Restoration Releases during Inflow Pro-rate:	
	Involve only Spring Flexible, Fall Flexible, or Riparian Recruitment Flow Accounts within their respective flexibilities, **OR**	☐
	The daily release rate is equal to or less than what is depicted in the Default Flow Schedule.	☐
If box 1 **OR** box 2 is checked, the action passes		

ACTION	TEST COMPONENT	
RESCHEDULING OF RELEASE CHANGES FOR MAINTENANCE		
	The rescheduling of water due to conditions resulting solely because of Paragraph 13(e):	
	Rescheduled flow releases are derived from the Spring Flexible, Fall Flexible, or Riparian Recruitment Flow Accounts and can be completed entirely within the relevant flexible flow period, **OR**	☐
	Rescheduled flow releases derived from Continuity Flow Account can be completed before the end of any forecasted Flood Management Action; **AND**	☐
	Rescheduled flow releases can be completed before the beginning of any forecasted Inflow Pro-rate period.	☐
	If box 1 **OR** (box 2 **AND** box 3) are checked, the action passes	

ACTION	TEST COMPONENT	
REVIEW **AT THE END** OF FLOOD MANAGEMENT ACTIONS		
	For actions at the end date of Uncontrolled Season:	
	Riparian Recruitment Flow Account releases meet or exceed the cumulative release volume to date as compared to the Flexed Default Flow Schedule (which is the same as the Default Flow Schedule for the Riparian Recruitment Flow account); **AND**	☐
	Spring and Fall Flexible Flow Account releases meet or exceed the cumulative release volume to date as compared to the Flexed Default Flow Schedule; **AND**	☐
	Continuity Flow Account releases meet or exceed the cumulative release volume to date as compared to the Flexed Default Flow Schedule (which is the same as the Default Flow Schedule for the Continuity Flow Account).	☐
	If **ALL** boxes are checked, the action passes	

ACTION	TEST COMPONENT	
PLANNED SHIFTS **WITHIN** CONTINUITY FLOW ACCOUNT MAR 1 – AUG 15		
	Shifts within the Continuity Flow Account, exclusive of other account flows:	
	The shift results in a schedule that is less than 15 TAF ahead or behind (i.e. disparity) of the cumulative release pattern in the Flexed Default Flow Schedule between May 29 – Aug 15; **AND**	☐
	Millerton storage is at least 15 TAF below max storage capacity and declining during all periods involved in the shift, **OR**	☐
	Millerton is not forecast to enter (and has not been in) Flood Management Actions between May 1 and Aug 15 of the current Restoration Year.	☐
	If box 1 **AND** (box 2 **OR** box 3) are checked, the action passes	

ACTION	TEST COMPONENT	
PLANNED SHIFTS **WITHIN** CONTINUITY FLOW ACCOUNT AUG 16 – FEB 28/29		
	Shifts within the Continuity Flow Account, exclusive of other account flows:	
	The shift results in a schedule that is less than 5 TAF ahead or behind (i.e. disparity) of the cumulative release pattern in the Flexed Default Flow Schedule between Aug 16 – May 28; **AND**	☐
	Millerton is not forecast to enter Flood Management Actions between Aug 16 and February 28/29 of the current Restoration Year.	☐
	If box 1 **AND** box 2are checked, the action passes	

<table>
<tr><td>ACTION</td><td colspan="4">TEST COMPONENT</td></tr>
<tr><td colspan="5">PLANNED TRANSFERS BETWEEN FLOW ACCOUNTS</td></tr>
<tr><td>Select Action</td><td colspan="4">Transfers to another Flow Account:</td></tr>
<tr><td rowspan="8"></td><td></td><td>Maximum Transfer Into Flow Account</td><td>Maximum Disparity Between Cumulative Release Volume and Flexed Default Flow Schedule (using combination of all shifts and transfers)</td><td rowspan="5"></td></tr>
<tr><td>Continuity</td><td>15 TAF</td><td>15 TAF (Mar 1 – Aug 15)
5 TAF (Aug 16 – Feb 28/29)</td></tr>
<tr><td>Spring Flexible</td><td>0 TAF</td><td>No disparity limit
(as long as comports with Figure J-1)</td></tr>
<tr><td>Fall Flexible</td><td>0 TAF</td><td>No disparity limit
(as long as comports with Figure J-1)</td></tr>
<tr><td>Riparian Recruitment</td><td>0 TAF</td><td>No disparity limit, except at end of Flood Management Action</td></tr>
<tr><td colspan="3">All transfers and shifts within the above limits; AND</td><td>☐</td></tr>
<tr><td colspan="3">Millerton is not forecast to be (and has not been) in Flood Management Action or Inflow Pro-rate during any flow period involved in the transfer, OR</td><td>☐</td></tr>
<tr><td colspan="3">Millerton Flood Management Actions are (were) limited to periods before May 1 of the Restoration Year and no future periods are forecast.</td><td>☐</td></tr>
<tr><td colspan="4">box 1 AND (box 2 OR box 3) are checked, the action passes</td><td>Choose an item</td></tr>
</table>

Based on the responses above, complete the summary table below:

SUMMARY FROM RAPID EVALUATION WST (SELECT ONE)		RESULT
All actions proposed by the Restoration Administrator's schedule or by the Secretary pass the criteria outlined above or are not applicable.	☐	**Approved**
One or more action(s) proposed by the Restoration Administrator's schedule or by the Secretary fail(s) the criteria outlined above — evaluate the full schedule with all transfer actions (including any transfer actions which passed the rapid evaluation WST, excluding any exempt actions) using the Full WST	☐	**Conduct Full WST**

Step 3 — Full Water Supply Test

The Full WST will be conducted when a Rapid Evaluation WST results in a rejection of any reviewed action. The Full WST should be completed within 15 calendar days of receiving a Restoration Administrator's recommendation or a proposed Secretarial Action.

The Full WST is the final authority on any transfers or shifts of flow volumes beyond flexibility described in Section 4.1. The Full WST entails three steps: 1) Quantitative analysis of Millerton Lake storage, 2) Consultation with Settling Parties, and 3) Professional Judgment. If an action fails the WST, the Restoration Administrator or Reclamation staff operating on behalf of the Secretary may revise the proposed action and the WST process will be conducted again.

Quantitative Analysis

The full WST utilizes the Millerton Lake Operations Spreadsheets to examine the difference between the baseline case and test case in terms of reservoir storage. The WST will examine reservoir operations at both the 90% and 50% Unimpaired Runoff exceedance (the former being more sensitive to Inflow Pro-rate, the latter more sensitive to flood management actions). The entire contract year is analyzed for full WST using the most recent contractor delivery schedules. This reservoir storage level is then used to infer any potential water delivery reductions resulting from flood management actions or Inflow Pro-rate. The analysis is completed on a monthly time-step, and if there is any ambiguity in the storage levels between end of months, a daily time step will then be conducted. The results should be accompanied by a short narrative. This information is then shared with the expert panel representing the Settling Parties for the consultation step of the process.

Consultation

Reclamation will maintain a membership list of an expert panel to quickly review the quantitative analysis and provide comments back to Reclamation. This panel will have representatives from the Settling Parties. Their panel members' purpose is to examine assumptions and inferences made in the WST, render their opinion on whether the proposed actions are or are not likely to cause a water delivery reduction, and to make recommendations to improve the WST process. Feedback from the expert panel may be through consensus or may be individual opinion to SCCAO for the final step of professional judgment.

The panel shall consist of:

- 1-3 members representing Friant Long-term Contractors
- 1-3 members representing Plaintiff Coalition
- 1-3 members representing Restoration Administrator/TAC
- Ex officio members from implementing agencies at appropriate

Professional Judgment

Staff from SJRRP and SCCAO will review feedback from the expert panel and render their professional judgment. SCCAO will make the final judgment on whether the proposed actions are likely to result in a water delivery reduction to any Friant Division Long–term Contractor. Reclamation may reject individual actions or portions of individual actions in their conclusion of a WST.

Concepts Surrounding Flood Management Actions

Managing flow flexibility beyond the provisions of Exhibit B (4)(b) during Flood Management Actions is complex and is conducted under near real-time operations. Flow shifts and transfers that were previously approved are reevaluated during subsequent Flood Management Actions.

If Millerton Flood Management Actions exist anytime during the Restoration Year, any transfers between flow periods affecting current and future cumulative release patterns or shifts within the Continuity Flow Account affecting current and future cumulative release patterns, whether Restoration Administrator recommendations or Secretarial actions, are rejected beyond the end of a Flood Management period. Because the exact end of a flood management action is not precisely known, this is a "real-time" operational paradigm; any future transfers or shifts will be reevaluated at the end of the Flood Management period.

During Millerton Flood Management Actions, transfers and shifts may continue, though they are at risk of "spill" at the end of Flood Management Actions by application of a WST. Millerton operational planning will assume no future transfers or shifts (other than flows scheduled within the flexible flow periods pursuant to Exhibit B(4)(b)) and will assume that the released volume of restoration flows is on pace with (i.e. catches up with) the Flexed Default Flow Schedule.. By doing so, the Flood Management Action period is not extended in the reservoir planning process by an action that would likely fail the WST.

Example G for Appendix J: On April 1 Reclamation conducts a WST on a proposed shift of water from spring to summer (i.e. past May 28th) and determines that there will be no impact to water supply. Based on this analysis and discussion, Reclamation approves this transfer of water from one flow period to another. However, unexpected late storms result in Flood Management Actions starting May 1. Upon this date, reservoir operations change their assumption on the transfer of spring Restoration Flows to summer, instead assuming that this volume of water will be expended by May 28 or the end of Flood Management Actions, whichever is later. The Restoration Administrator may continue to release this water for Restoration Flows during Flood Management Actions, but not beyond the end of May 28 or the end of the Flood Management period (whichever is later), unless approved by a subsequent WST. If Flood Management Actions end prior to the end of the Spring Flexible Flow Period (i.e. prior to May 28), any remaining balance of spring flows must be evacuated from Millerton by May 28, or later if approved through a WST. If Flood Management Actions end after the end of the Spring Flexible Flow Period, any remaining balance of the Spring Flexible Flow Account at that time would be removed from the Restoration Allocation, forfeited.

Riparian Recruitment Flows are addressed in a different manner. The Restoration Administrator is provided flexibility within the Riparian Recruitment Flow Account to shift volumes; this is necessary to meet the stated purpose of this flow account. However, this flexibility is limited in that the schedule cannot shift flows beyond the end of Flood Management Action. When the end of the Flood Management Action occurs during the period of May 1 through July 29, this is treated like a hard boundary beyond which flows cannot be shifted later in time (they may be shifted earlier in time). Riparian Recruitment Flows may be transferred beyond July 29 into the summer flow account (i.e. to July 30 – September 30) only through a successful WST. As with other flow shifts and transfers, the point of reckoning is the exact time of the end of Flood Management Actions, which is typically the end of Uncontrolled Season. This often occurs a few days after the end of Flood Management Releases to the San Joaquin River.

Generally, abrupt changes in hydrology are responsible for Flood Management Actions. It is mathematically possible for shifts and transfers of Restoration Flows to be solely responsible for precipitating Uncontrolled Season or some other Flood Management Action which would result in a water delivery reduction. It is important that flexibilities outside of Exhibit B (4)(b) and (6) not by themselves initiate a Flood Management Action.

Concepts Surrounding Inflow Pro-rate

Inflow Pro-rate describes a condition where the reservoir storage is so low that only water that is added to the reservoir as inflow may be evacuated. That inflow is then pro-rated in accordance with the current water supply declarations and respective contractor shares. If Millerton is under Inflow Pro-rate outside of the flexible flow periods, Restoration Flow releases and Secretarial actions may not in combination exceed the daily flow rate shown in the Flexed Default Flow Schedule. To exceed the Flexed Default Flow Schedule would reduce the volume of water supply that may be available to individual Friant Division Long-term Contractors. Thus, Inflow Pro-rate may throttle flow rates to, but not below, what is depicted on that particular day for the Default Flow Schedule, applicable only to the Summer and winter flow accounts. Once Inflow Pro-Rate has concluded, release rates may return to what is scheduled or planned.

Table J-1.
Summary Table of WST Scope and Actions

Parameter	Spring & Fall Flexible Flow Accounts	Continuity Flow Account	Riparian Recruitment Flow Account
Flow Period	Mar 1 – Apr 30 and Oct 1 – Nov 30	Mar 1 – Feb 28/29	May 1 – July 29
Flexible Periods	Feb 1/2 – May 28 & Sep 3 – Dec 28	N/A	May 1 – July 29 [1]
Shifts within the flow period	Allowed [2]	Allowed with WST	Allowed [1]
Transfers out of account	Allowed with WST	Not allowed	Allowed with WST
Transfers into account	Not allowed	Allowed with WST	Not allowed
WST Actions undertaken during Flood Management Actions	No action during flexible periods [2]	Shifts within period and transfers into account are rejected beyond the end of Flood Management Actions. [3]	No action during flow period
WST Actions undertaken at end of Flood Management Actions	No action during flexible flow periods [2]	Releases, including shifts within period and transfers into account, must be on pace with Flexed Default Flow Schedule	Releases must be on pace with Flexed Default Flow Schedule
WST Actions outside of Flood Management Actions	No action necessary for shifting within flexible flow periods; WST required for transferring volume to Continuity Flow Account	WST required for shifting within flow period	No Action necessary for shifting flows within flow period; WST required for transferring volume to Continuity Flow Account
WST during Inflow Pro-rate	No action necessary during flexible flow periods	Release rate, including shifts within period and transfers into account, must not exceed Flexed Default Flow Schedule	No action necessary during flow period

1. Shifts limited by to the cumulative release pattern at the end of Flood Management Actions — volume released at that time must equal the Flexed Default Flow Schedule.
2. Shifts within the flexible flow period limited to the assumption of a maximum release rate of 4,500 cfs.
3. Shifts and transfers may not, by themselves, cause a Flood Management Action; they would be disallowed if that was a direct consequence.

Restoration Flows Guidelines Glossary

SAN JOAQUIN RIVER
RESTORATION PROGRAM

January 2020

This page left blank intentionally.

This Glossary is intended to provide an overview of terminology used in the Restoration Flow Guidelines, its appendices, and other related documents such as the Restoration Allocation and Default Flow Schedule. The terms included appear throughout the Guidelines and are underlined for their first usage. While some of the terms are defined in the Settlement, this Glossary provides additional context for understanding their use in the Guidelines.

Actual Restoration Flows — Measured or Calculated Restoration Flows, distinct from scheduled Restoration Flows. When measured at Gravelly Ford they are San Joaquin River flows apart from Holding Contract requirements, tributary inflows, and other transfers in the river.

Annual Technical Report (ATR) — The ATR is a method for the Implementing Agencies to present to stakeholders the process used to address specific SJRRP needs and accomplishments.

Base Flows — A subset of Restoration Flows, distinct from Buffer Flows and other water purchased or exchanged by the Restoration Program for release at Friant Dam. The Base Flows are described in Settlement Paragraph 13a and presented in Exhibit B of the Settlement (see Default Hydrograph). Base Flows as used in the Settlement and Guidelines is not the same as the commonly used hydrologic term defined as the portion of streamflow that is sustained between precipitation and high runoff events. In the Guidelines, the generic usage of base flows is not capitalized.

Base Flow Hydrographs — The annual schedule of flow rates depicted in Exhibit B Table 1A through 1F. Synonymous with the Stair-Step Hydrographs, Exhibit B Hydrographs, and Default Hydrographs.

Buffer Flows — *Exhibit B(1):"Paragraph 13 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."*

California Data Exchange Center (CDEC) — The hydrometeorological data collection and data sharing network (http:cdec.water.ca.gov) maintained by the California Department of Water Resources. CDEC provides a centralized database to store, process, and exchange real-time hydrological information gathered by various cooperators throughout the State and includes automatic snow sensors, weather stations, and surface water and groundwater sensors.

Capacity Limited Recommendation — Proposed release of Restoration Flows in consideration of known channel capacity constraints.

Carryover — Water made available during one Contract Year that is requested by the Contractor to be rescheduled (carried over) for use during the subsequent Contract Year. Carryover Water requires compliance with the rescheduling guidelines and Contracting Officer's written approval.

Channel Capacity — Limitation of flow rates in the Restoration Reaches to a then-existing channel capacity imposed upon Restoration Flows by either the Channel Capacity Advisory Group, Seepage Management Plan, Channel Capacity Report, or other guidance document to avoid increased risk of damage to the levees, inundation risk to adjacent properties, or seepage impacts.

Channel Capacity Advisory Group (CCAG) — The Channel Capacity Advisory Group provides focused input to Reclamation's determination of then-existing channel capacity within the Restoration Area.

Class 1 Water — That supply of water stored in or flowing through Millerton Lake which, subject to contingencies described in the Contracts, will be available for delivery from Millerton Lake and the Friant-Kern and Madera Canals as a dependable water supply during each Contract year.

Class 2 Water — That supply of water stored in or flowing through Millerton Lake that can be made available subject to contingencies described in the Contracts for delivery addition to the supply of Class 1 Water. Because of its uncertainty as to availability and time of occurrence, such water will be undependable in character and will be furnished only if, as, and when it can be made available as determined by the Contracting Officer.

Contract Total — The maximum amount of Class 1 Water plus the maximum amount of Class 2 Water specified in Article 3(a) of each Friant Contractor's water service or repayment contract (Contract).

Contract Year — The period from and including March 1 of each calendar year through the last day of February of the following calendar year that applies to repayment and water service contracts held by Friant Division Long-Term Contractors.

Daily Diversion Accumulation — The cumulated daily flow in cfs or AF released to the Friant-Kern and Madera canals determined by the Water User Curves for RWA accounting.

Deadpool — The artificial dead storage volume below which no water can be released to the Friant-Kern Canal or Madera Canal due to low water elevation. Deadpool levels are defined in the Friant Operational Guidelines.

Default Flow Schedule — Derived from the Method 3.1 Gamma transformations of the Exhibit B base flow hydrographs and interpolated for the precise Restoration Allocation volume. The Default Flow Schedule prepared by Reclamation provides an initial daily distribution of the annual Restoration Allocation and a starting point for the Restoration Administrator to develop a more specific flow schedule. It also serves as a release schedule should no recommendation be received from the Restoration Administrator and subsequently approved. There are three versions of the Default Flow Schedule: 1) "basic", 2) "flexed", and 3) "capacity constrained", which are described in Section 2.

Default Hydrographs — See Base Flow Hydrographs

Exchange Contractors — The Firebaugh Canal Water District, Columbia Canal Company, San Luis Canal Company, and Central California Irrigation District, collectively recognized as the San Joaquin River Exchange Contractors (Exchange Contractors). The purchase of various riparian and appropriative rights (under what is called the Purchase Contract), along with an agreement for the United States to provide substitute water to the Exchange Contractors in exchange for those entities agreeing not to exercise other San Joaquin River water rights which they still own (Exchange Contract), form the basis for their water supply. Reclamation typically fulfills the Exchange Contract obligations through Shasta Dam operations, Jones Pumping Plant, and the Delta Mendota Canal.

Exchange Contractor Release — During years when Reclamation cannot deliver contractually obligated rates and/or volumes via the Delta Mendota Canal, operational releases from Friant Dam to the San Joaquin River are made pursuant to the Exchange Contract provisions.

Fall Base and Spring-Run Incubation Flow — Restoration Flows released from October 1 through October 31 in the Default Flow Schedule. This Hydrograph Component provides conditions (temperature and connectivity between reaches) suitable for spawning and incubation of spring-run Chinook salmon.

Fall Flexible Flow Period — September 3rd to December 28th. Restoration Flows derived from the Fall Flow Period can be scheduled flexibly within this range of dates pursuant to Exhibit B 4(b) and without a Water Supply Test.

Fall Flow Period — October 1st through November 30th.

Fall-Run Attraction Flow — Restoration Flows released from November 1st through November 10th (through November 6th in Critical-High years) in the Default Flow Schedule. This Hydrograph Component provides conditions (temperature, connectivity between reaches, and duration) suitable for fall-run Chinook salmon migration and to stimulate emigration of juvenile spring-run Chinook salmon.

Fall-Run Spawning and Incubation Flow — Restoration Flows released from November 11th (from November 7th in Critical-High years) through December 31 in the Default Flow Schedule. This Hydrograph Component provides conditions (temperature and connectivity between reaches) suitable for fall-run Chinook salmon spawning and incubation.

Flood Control Releases — See Flood Flows

Flood Flows — Flood Management Actions that result in Friant Dam releases through the river valves and/or over the Friant Dam spillway to the San Joaquin River in excess of Restoration Flows and Holding Contract obligations.

Flood Management Actions — A suite of actions that Reclamation may take at any time of the year in order to prevent or minimize spill or to meet Friant Dam flood control criteria. The sequence and priority of actions are outlined in the Friant Operational Guidelines. Flood Management Actions are typically undertaken in consultation with the US Army Corps of Engineers.

Flow Account — An account holding a volume of Restoration Base Flows that is a constituent of the Restoration Allocation. The flow accounts are used for tracking releases and applying the Water Supply Test. The four flow accounts include continuity, spring flexible, fall flexible, and Riparian Recruitment Flow accounts.

Flow Bench Evaluation –The monitoring, analysis and reporting of the relationship between San Joaquin River Restoration Flows and groundwater levels adjacent to the river, which sets operating thresholds, describes additional monitoring, and is a requirement for the Seepage Management Plan. Flow Bench Evaluations are initiated by a seepage hotline concern, flow increases that could exceed the operating thresholds, or rapidly changing groundwater conditions.

Flushing Flows —Exhibit B(5): *"block of water averaging around 4000 cfs and peaking as close as practical to 8,000 cfs used to perform several functions, including but not limited to geomorphic functions such as flushing spawning gravels."* Normally applied in Normal-Wet and Wet years — the associated volume of water that can be used for Flushing Flows is included the Default Hydrograph, however the Restoration Administrator can decide to not release Flushing Flows or otherwise reschedule this block of water within the constraints of Exhibit B 4(b).

Friant Dam Operations — The day to day management of reservoir storage, water deliveries, river releases, and flood control at Friant Dam (and Millerton Lake which it impounds).

Friant Dam River Releases — Measured flow releases from Friant Dam to San Joaquin River. These include releases through the river outlet valves, spillway, powerplants, fish hatchery, and other appurtenances of Friant Dam into the San Joaquin River.

Friant Division Long–term Contractors — Arvin-Edison Water Storage District, Chowchilla Water District, City of Fresno, City of Lindsay, City of Orange Cove, County of Madera, Delano-Earlimart Irrigation District, Exeter Irrigation District, Fresno County Waterworks #18, Fresno Irrigation District, Garfield Water District, Gravelly Ford Water District, Hills Valley Irrigation District, International Water District, Ivanhoe Irrigation District, Kaweah Delta Water Conservation District, Kern-Tulare Water District, Lewis Creek Water District, Lindmore Irrigation District, Lindsay-Strathmore Irrigation District, Lower Tule River Irrigation District, Madera Irrigation District, Orange Cove Irrigation District, Porterville Irrigation District, Saucelito Irrigation District, Shafter-Wasco Irrigation District, Southern San Joaquin Municipal Utility District, Stone Corral Irrigation District, Tea Pot Dome Water District, Terra Bella Irrigation District, Tri-Valley Water District, Tulare Irrigation District.

Friant Division of the CVP — Contains 32 long–term Friant Division water service contracts totaling up to 800,000 AF for Class 1 water and up to 1,401,475 AF for Class 2 water.

Friant Parties — The Friant Division Long–term Contractors that are held to the stipulations of The Settlement.

Friant Water Supply — The water that is or should become available for delivery to Friant Division Long-Term Contractors in any Contract Year from Millerton Reservoir or other sources in accordance with water contracts and SCCAO allocation policies and procedures.

Friant Water Authority — is a public agency formed by its members under California law to, among other things, operate and maintain the Friant-Kern Canal on behalf of Reclamation and to represent its members in federal or state policy, political, and operational decisions that could affect the Friant Division water supply.

Gross URFs — The amount of water made available by the RA, as quantified in Millerton Lake, that cannot be released downstream due to channel capacity restrictions. Gross URFs do not include canal or other losses associated with moving the water from Millerton Lake to its destination and are reduced by a 5% loss factor to result-in Net URFs.

Holding Contracts — Refers to the diverters in Reach 1 that have a settlement contract with Reclamation regarding the availability of water in the river to serve the contract holder's lands pursuant to riparian or other senior appropriative water rights from the San Joaquin River. Reclamation must be able to meet the demands up to the 107 Holding Contracts prior to allocating Restoration Flows or Friant Water Supply. The releases to meet the Holding Contracts and other riparian demand are referred to as the Riparian Releases in the Exhibit B Hydrographs.

Hydrograph Component — A depiction of flow across a specific period of time intended to support salmonid lifecycles (e.g. Fall-Run Attraction Flow) and other objectives (e.g. Riparian Recruitment). In aggregate, seven Hydrograph Components build the Base Flow Hydrographs in Exhibit B.

Implementing Agencies — The Federal and State agencies that have agreed to implement the Settlement including The United States Bureau of Reclamation (one of the Settling Parties), United States Fish and Wildlife Service, National Marine Fisheries Service, California Department of Water Resources, and California Department of Fish and Wildlife.

Inflow Pro-rate — A reduction of water deliveries which occurs whenever the scheduled demand exceeds Millerton Lake inflow and storage in Millerton Lake is insufficient to meet demand, generally recognized as occurring when the water in storage reaches dead pool as defined in the Friant Operational Guidelines.

Interim Flows — Initial releases of flows to the San Joaquin River that began in October 2009 and continued through December 2013. As defined in the Settlement, Restoration Flows were to begin no later than January 1, 2014 (although abnormally dry hydrologic conditions resulting in minimal Restoration Flows until March 2016).

Method 3.1 Gamma — The method developed by the Settling Parties and described in Appendix G of the PEIS/R to distribute hydrograph volumes depicted in Exhibit B smoothly across water year types in response to the Settlement requirement in Exhibit B Paragraph 3 to transform the stair step hydrographs to more continuous set of hydrographs. The methodology is further described in Appendix C.

Millerton Lake Inflow — Inflows into Millerton Lake as measured/calculated by Reclamation.

Natural River — See Unimpaired Runoff.

Net URFs — The amount of water made available by the RA that cannot be delivered downstream due to channel capacity restrictions, reduced by 5% for canal and other losses associated with moving the water from Millerton Lake to its destination (e.g. turnout, point of diversion, pump). See Gross URFs

Normal Operations — Operations of Millerton Lake / Friant Dam other than during Flood Management Actions or Inflow Prorate.

Obligation Period — A period of time during which the Contractor would be obligated to pay for up to a specified quantity of Class 2 Water, as established by the Contracting Officer, to evacuate Project Water from Millerton Lake to prevent or minimize spill or to meet flood control criteria. This provision of the old Friant Interim Renewal Contracts was not included in any contracts executed after 2000.

Pre–use — Friant Contractor request to use a quantity of Project Water which may be made available during the subsequent Contract Year during the current Contract Year. The Contracting Officer's written approval may permit pre-use in accordance with applicable statutes, regulations, guidelines, and policies.

Project Water — All water that is developed, diverted, stored, or delivered by the Secretary in accordance with the statutes authorizing the Central Valley Project and in accordance with the terms and conditions of water rights acquired pursuant to California law.

Pulse Flow Recommendation — A portion of a Restoration Flow Recommendation that has an increased flow above the typical 350 cfs release from Friant Dam, which includes the ramping rates, time periods, and peak flow specifications for the desired hydrograph. A Pulse Flow Recommendation may include flow releases that are to occur on an hourly time-step rather than a daily time step.

Purchased Water — The recommended acquisition and use of water purchased to meet the provisions of Paragraphs 13(c) of the Settlement.

Recirculation — Recirculation, recapture, reuse, exchange or transfer of Restoration Flows for reducing or avoiding impacts to water deliveries to Friant contractors caused by Restoration Flows, pursuant to Paragraph 16(a) of the Settlement.

Recommendation on Unreleased Restoration Flows — When Unreleased Restoration Flows are generated, the Restoration Administrator may make recommendations to the Secretary regarding the management of such water pursuant to paragraph 13(i) of the Settlement.

Recovered Water Account (RWA) — Record of the annual and cumulative Reductions in Water Deliveries caused by Restoration Flows (impacts), and replacement or offset programs or projects that reduce or avoid impacts pursuant to Paragraph 16(b) of the Settlement. Paragraph 16(b) states: *"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."* See also RWA Balance and RWA Impact.

Reduction in Water Deliveries — For the RWA Impact calculation, water delivery reductions to Friant contractors as a direct result of Restoration Flows as compared to an October 2006 baseline water delivery condition.

Release Error — An unintended deviation from the Restoration Flow Schedule exclusive of instances pertaining to Paragraph 13(e) of the Settlement.

Replacement and Offsets — 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 Reduction in Water Deliveries caused by Restoration Flows.

Residual Water Supply — The water supply declared after the end of uncontrolled season allocated to the Friant Division long–term contractors for use in the balance of the contract year (those periods of the year not in uncontrolled season allocation).

Restoration Administrator — The individual selected by the non-Federal Settling Parties to help administer and implement the Restoration Goal of the Settlement, including annual and seasonal development of Restoration Flow Recommendations. 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. The Restoration Administrator's general duties are set forth in Paragraphs 9 and Paragraphs 11 through 19 of the Settlement.

Restoration Allocation — The volume of Restoration Flows that are made available for the Restoration Administrator to schedule during the Restoration Year. The Restoration Allocation has four sub-accounts where the volume must be released or made available as URFs within a certain period unless otherwise permitted through passing a Water Supply Test. The four sub-accounts include base, spring, fall, and Riparian Recruitment Flow accounts.

Restoration Area — Riparian area from Friant Dam to the San Joaquin River's confluence with the Merced River.

Restoration Flows — The Base Flows, the Buffer Flows, and any additional water acquired by the Secretary from willing sellers, and any additional water acquired by the Secretary through an exchange or purchase to meet the Restoration Goal.

Restoration Flows at Gravelly Ford — See **Actual Restoration Flows**

Restoration Flows Guidelines (Guidelines or RFG) — The 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) and exhibit B.

Restoration Flow Schedule Recommendation — The rate and timing of Friant Dam releases and/or flow targets at Gravelly Ford and other downstream locations across the current Restoration Year to achieve the Restoration Goal. May also include recommendations for Riparian Recruitment Flows, Flushing Flows, and Buffer Flows. The Restoration Administrator shall recommend the Restoration Flow Schedule as prescribed in Settlement Paragraph 18 and will be reviewed and implemented consistent with the Guidelines.

Restoration Goal — One of the two primary goals of the Settlement, to restore and maintain fish populations in "good condition" in the main stem of the San Joaquin River below Friant Dam to the confluence of the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish.

Restoration Fund — A Settlement funding source that obtains funds from the Friant Surcharge, Recovered Water Account water sales receipts, Unreleased Restoration Flow sales, sales from other water and property, and the Friant Capital Repayment.

Restoration Reaches — Sections of the San Joaquin River within the Restoration Area that are categorized by their hydrology and geomorphology, numbered 1 through 5. The transitions from one reach to another are at Gravelly Ford (Reach 1 to 2), Mendota Dam (Reach 2 to 3), Sack Dam (Reach 3 to 4), and the confluence with the Lower Eastside Bypass (Reach 4 to 5). Note these are different than the reaches defined in Exhibit B used for quantifying Unexpected Seepage Losses.

Restoration Year — The period from March 1st through the end of the next February. The Restoration Year denotes the period covered for each annual Restoration Allocation. This is the same period as the Contract Year for Friant Long-term Contractors.

Riparian Recruitment Flows — In Wet Years in coordination with the peak Flushing Flow Releases, Restoration Flows should be gradually ramped down over 60-90-day period to promote the establishment of riparian vegetation at appropriate elevation in the channel. The Restoration Administrator will recommend the timing and magnitude of the riparian recruitment release 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. (See Exhibit B.6.)

River Release — See Friant Dam River Releases

RWA — see Recovered Water Account

RWA Balance — Total of the net impacts to a Contractor consisting of a contractor's cumulative impacts minus replacements, balance transfers, and offsets.

RWA Impact — Accrual to a contractor's account based on the Reduction in Water Deliveries.

RWA Water — Water made available to Friant contractors who experience a Reduction in Water Deliveries as reflected in their RWA balance pursuant to Paragraph 16(b) of the Settlement at a total cost of $10.00 per AF. Water shall be made available only in wet hydrologic conditions when not needed to meet Restoration Flows, Friant Contractor obligations, or other contractual obligations of Reclamation.

San Joaquin River Restoration Program (SJRRP) — The SJRRP is a direct result of a Settlement reached in September 2006 on an 18-year lawsuit to provide sufficient flow and habitat in the San Joaquin River below Friant Dam near Fresno, California to restore and maintain fish populations in good condition, by the U.S. Departments of the Interior and Commerce, the Natural Resources Defense Council (NRDC), and the Friant Water Users Authority (FWUA). The Settlement received Federal court approval in October 2006. Federal legislation was passed in March 2009 authorizing Federal agencies to implement the Settlement.

Secretary — Secretary of the U.S. Department of Interior.

Secretarial Actions — Restoration Flow related activities that result in a change in Millerton Storage. These may include, but are not limited to, Paragraph 13(c) Releases for Unexpected Seepage Losses and 13(i) Unreleased Restoration Flows situations where the Secretary, not the Restoration Administrator, manages water.

Section 215 Water — Project Water supply available as the result of an unusually large water supply not otherwise storable for Project purposes or infrequent and otherwise unmanaged flood flows of short duration made available to Contractors and others pursuant to Section 215 of the Reclamation Reform Act of October 12, 1982, if a Contractor enters into a temporary contract not to exceed one year.

Seepage Loss — The flow of water through the San Joaquin River that is lost to groundwater via infiltration, thus potentially (but not necessarily) increasing the groundwater elevations adjacent to the river. Depending on the river reach where the seepage loss occurs, they may provide beneficial groundwater recharge such as in Reach 2a or may be considered harmful if the soils and stratigraphy retains the seepage water in the vicinity of the root zones of crops such as in Reaches 3 and 4.

Seepage Management Plan — A plan developed as part of the implementation of the SJRRP that includes two goals.

1. To limit or reduce Restoration Flows to the extent necessary to avoid material adverse groundwater seepage impacts, which are waterlogging or root zone salinity impacts to agricultural crops. This is done through over 200 groundwater monitoring wells, setting groundwater level thresholds in these wells and limiting Restoration Flows to avoid increasing groundwater levels over these thresholds.
2. Implement seepage projects, which may include physical or non-physical projects, that allow higher flows in the San Joaquin River and bypasses without causing unacceptable groundwater seepage impacts. Seepage projects may include seepage easements, land acquisition from willing sellers, interceptor lines, drainage ditches, slurry walls, etc.

Settlement — See Stipulation of Settlement

Settlement Act — Title X, Subtitle A, Public Law 111-11, San Joaquin Restoration Settlement Act.

Settling Parties (Parties) — Signatories to the Settlement. Natural Resources Defense Council, Inc., *et al*., United States Bureau of Reclamation, *et al*., Orange Cove Irrigation District, *et al*.,

Arvin-Edison Water Storage District, Chowchilla Water District, City of Fresno, City of Lindsay, City of Orange Cove, County of Madera, Delano-Earlimart Irrigation District, Exeter Irrigation District, Fresno County Waterworks #18, Fresno Irrigation District, Garfield Water District, Gravelly Ford Water District, Hills Valley Irrigation District, International Water District, Ivanhoe Irrigation District, Kaweah Delta Water Conservation District, Kern-Tulare Water District, Lewis Creek Water District, Lindmore Irrigation District, Lindsay-Strathmore Irrigation District, Lower Tule River Irrigation District, Madera Irrigation District, Orange Cove Irrigation District, Porterville Irrigation District, Saucelito Irrigation District, Shafter-Wasco Irrigation District, Southern San Joaquin Municipal Utility District, Stone Corral Irrigation District, Teapot Dome Water District, Terra Bella Irrigation District, Tri-Valley Water District, Tulare Irrigation District.

San Luis & Delta-Mendota Water Authority (SLDMWA) — A joint powers authority established in 1992 consisting of 29 federal and exchange water service contractors within the western San Joaquin Valley, San Benito, and Santa Clara counties. One of the primary purposes of establishing the SLDMWA was to assume the operation and maintenance responsibilities of the Jones Pumping Plant, Delta Cross Channel, Delta-Mendota Canal, O'Neill Pumping Plant, San Luis Drain and Tracy Fish Collection Facility.

Soquel Diversion — A diversion by established water right to divert from the San Joaquin watershed. "Soquel water" is sometimes conveyed by Reclamation as non-Project water through Millerton Lake (water that would otherwise have been diverted to the Fresno River but was left instream for the purpose of an alternate delivery point and energy generation).

South-Central California Area Office (SCCAO) — The South-Central California Area Office is a Bureau of Reclamation office headquartered in Fresno, California, and is responsible for managing land and water resources in the southern half of the Mid-Pacific Region.

Spring Flexible Flow Period — February 1st (February 2nd on a leap year) to May 28th. Restoration Flows derived from the Spring Flow Period can be scheduled flexibly within this range of dates pursuant to Exhibit B 4(b) and without a Water Supply Test.

Spring Flow Period — March 1st through April 30th.

Spring Rise and Pulse Flows — Restoration Flows released from March 1 through April 30 in the Default Flow Schedule. This Hydrograph Component provides conditions (temperature, connectivity between reaches, duration, and quantity) suitable for juvenile salmon outmigration, for adult spring-run Chinook salmon upstream migration, spawning of resident native fishes, initiation of fluvial geomorphic processes, riparian vegetation recruitment, and floodplain inundation for salmon rearing and other species (e.g., splittail spawning). The Spring Rise and Pulse Flows can be flexibly released between February 1 and May 28.

Spring-Run Spawning Flows — Restoration Flows released from September 1 through September 30 in the Default Flow Schedule. This Hydrograph Component provides conditions (temperature and connectivity between reaches) suitable for spring-run Chinook salmon spawning.

Stipulation of Settlement in *NRDC, et al. v. Kirk Rodgers, et al.* — In 1988, a coalition of 14 environmental, commercial and recreational fishing, and other groups, led by the Natural Resources Defense Council (NRDC) filed a lawsuit, known as *NRDC, et al., v. Kirk Rodgers, et al.,* challenging the renewal of long–term water service contracts between the United States and the Central Valley Project (CVP) Friant Division contractors. On September 13, 2006, after more than 18 years of litigation, the Settling Parties, including NRDC, Friant Water Authority (FWA), and the U.S. Departments of the Interior and Commerce, agreed on the terms and conditions of a settlement subsequently approved by the U.S. Eastern District Court of California (Court) on October 23, 2006. The San Joaquin River Restoration Program (SJRRP) was established in late 2006 to implement the Stipulation of Settlement (Settlement) in *Natural Resources Defense Council (NRDC), et al., v. Kirk Rodgers, et al.* The San Joaquin River Restoration Settlement Act (Act), included in Public Law 111-11 and signed into law on March 30, 2009, authorizes and directs the Secretary of the Interior to implement the Settlement.

Summer Base Flows — Restoration Flows released from May 1 through September 30 in the Default Flow Schedule. This Hydrograph Component provides suitable water temperature conditions in Reach 1 for holding and rearing of spring-run Chinook, and provides suitable flows and connectivity to support summer life stages of native fishes and warm-water game fishes, and maintain riparian vegetation.

Technical Advisory Committee (TAC) — Contains six members selected by the Friant Water Authority and the Natural Resources Defense Council that advise the Restoration Administrator regarding technical topic areas outlined in the Settlement Exhibit D. There are two State of California members of the TAC (DWR and DFW) and three Federal agency liaisons (Reclamation, NMFS, USFWS) to the RA and TAC to ensure coordination and information-sharing with the Implementing Agencies.

Then-existing channel capacity — The channel capacity within the Restoration Area that corresponds to flows that would not significantly increase flood risk from Restoration Flows in the Restoration Area.

Unconstrained Recommendation — Restoration Administrator recommended release of full Restoration Flows with no channel capacity constraints.

Uncontrolled Season — A Flood Management Action that results in the availability of Class 2 water to Friant Division Long–Term contractors above and beyond the strict Class 1 and Class 2 Residual Water Supply declaration described in long–term contracts. Uncontrolled Season is determined by the Contracting Officer and is often the first in a series of Flood Management Actions declared.

Unexpected Seepage Loss — As described in Paragraph 13(c), those seepage losses in the Restoration Area downstream of Gravelly Ford that are in excess of the diversion (surface and underground) and seepage losses assumed in Exhibit B of the Settlement.

Unimpaired Runoff at Friant Dam — A calculation of the volume of daily, monthly, and annual flow, usually expressed in acre-feet or TAF, that would have occurred at Friant Dam if all runoff from the watershed remained in the river without impairment by upstream reservoir storage or diversions for water supply and power generation. The unimpaired runoff at Friant Dam is computed by Reclamation through a complex formula that adjusts the measured flow into Millerton Lake by the measured and calculated upstream reservoir storage changes. Also known as Full Natural Flow or Natural River or Unimpaired Inflow

Unreleased Restoration Flows (URFs) — Restoration Flows that could not be released to the river according to the Restoration Administrator's Flow Recommendation. URFs result from channel capacity limitations or maintenance on non-Friant Division facilities and are addressed in Paragraph 13(i) of the Settlement and the corresponding section of these Guidelines. Paragraph 13(i) states: *"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."*

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

Water Delivered — Project Water diverted for use by the Contractor at the point(s) of delivery approved by the Contracting Officer.

Water Made Available — Calculated amount of Friant Division CVP Water that can be delivered to Contractors for use in the RWA impact calculation. Calculated from Millerton Lake inflow minus the Restoration Flow Schedule minus Riparian Releases minus simulated spills minus flood control releases.

Water Management Goal — One of the two primary goals of the Settlement, to reduce or avoid adverse water supply impacts to all of the Friant Division long–term contractors that may result from the Interim Flows and Restoration Flows provided for in the Settlement.

Water Supply Allocation — The allocation of CVP water contract supplies that are being made available as determined by the Contracting Officer. CVP water supply allocations are posted at https://www.usbr.gov/mp/cvo/vungvari/water_allocations_historical.pdf

Water Supply Declaration — The allocation of various supplies that is being made available as determined by the Contracting Officer including, but not limited to, Class 1, Class 2, Uncontrolled Season, URF, RWA and 215 water.

Water Supply Test — The procedure for determining if changes to the Restoration Flow Recommendation or a Secretarial action beyond those specifically called for in the Settlement increase the water delivery reductions to any Friant Division long–term contractor.

Water Use Curve/Water Use Model — The daily diversion rates as the assumed demand of the Friant Division long–term contractors for water supplies, covering March through July of the Contract Year.

Water Year — October 1st to September 30th of the next year.

Water Year Type — Categorization of Millerton Unimpaired Runoff into six bins, ranging from extreme drought conditions (Critical–Low) to copious runoff (Wet). The categories based in exceedance probability across a span of years (1922-2004). Water Year Types serve as a convenient way to describe hydrology and is tied to the Restoration Allocation and Default Flow Schedule.

Winter Base Flows — Restoration Flows released from January 1 through February 28 (February 29 in leap years) in the Default Flow Schedule. This Hydrograph Component provides conditions (temperature and connectivity between reaches) suitable for incubation, emergence, and rearing of fall-run Chinook salmon.