Appendix H – Mendota Pool Water Quality Response Plan

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Mendota Pool Water Quality Response Plan

SAN JOAQUIN RIVER
RESTORATION PROGRAM

February 1, 2011

1.0 Background

Water quality conditions in the Mendota Pool depend on inflows from the Delta-Mendota Canal (DMC), groundwater pumped into Mendota Pool by the Mendota Pool Group and San Joaquin River inflows. Water quality measurements for water released from Friant Dam show low electrical conductivity (EC) readings in the range of 0 to 100 micro Siemens per centimeter. Measurements of water from the DMC show higher concentrations of EC (300 – 1000 micro Siemens per centimeter) than water in the San Joaquin River. Water in the DMC receives additional loading from runoff and seepage pumped into the canal. Adjacent landowners pump well water into Mendota Pool. In 2007, these adjacent landowners pumped 7,423 acre-feet (AF) into Mendota Pool (DMC Pump-In EA, February 2010).

Shallow groundwater, high in salinity, is pumped into the DMC from six sumps operated by landowners located near Firebaugh. Agricultural return water flows into the DMC through culverts along its length. Reclamation monitors changes in water quality along the DMC through periodic grab samples at sump locations. Another source of groundwater pump-in, the Mendota Pool Group, pumps groundwater directly into Mendota Pool at the Fresno Slough. The Mendota Pool Group is an unincorporated association, consisting of a group of landowners with groundwater wells that pump groundwater in exchange for Central Valley Project (CVP) water from the DMC that they use or transfer to CVP South-of-Delta water users.

Under most conditions, groundwater pumped into the pool and into the DMC is diluted by better quality water in the DMC. The concentration of selenium in CVP water flowing into Mendota Pool is typically less than 2 parts per billion, the objective for the Grasslands wetlands water supply channels. The salinity of this water is suitable for irrigation.

Under the Exchange Contract, Reclamation can meet obligations at Mendota Pool through San Joaquin River deliveries. Exports that would otherwise meet contract obligations is held in storage or becomes water supply for CVP contractors. The exchange of San Joaquin River inflow reduces inflow from the DMC.

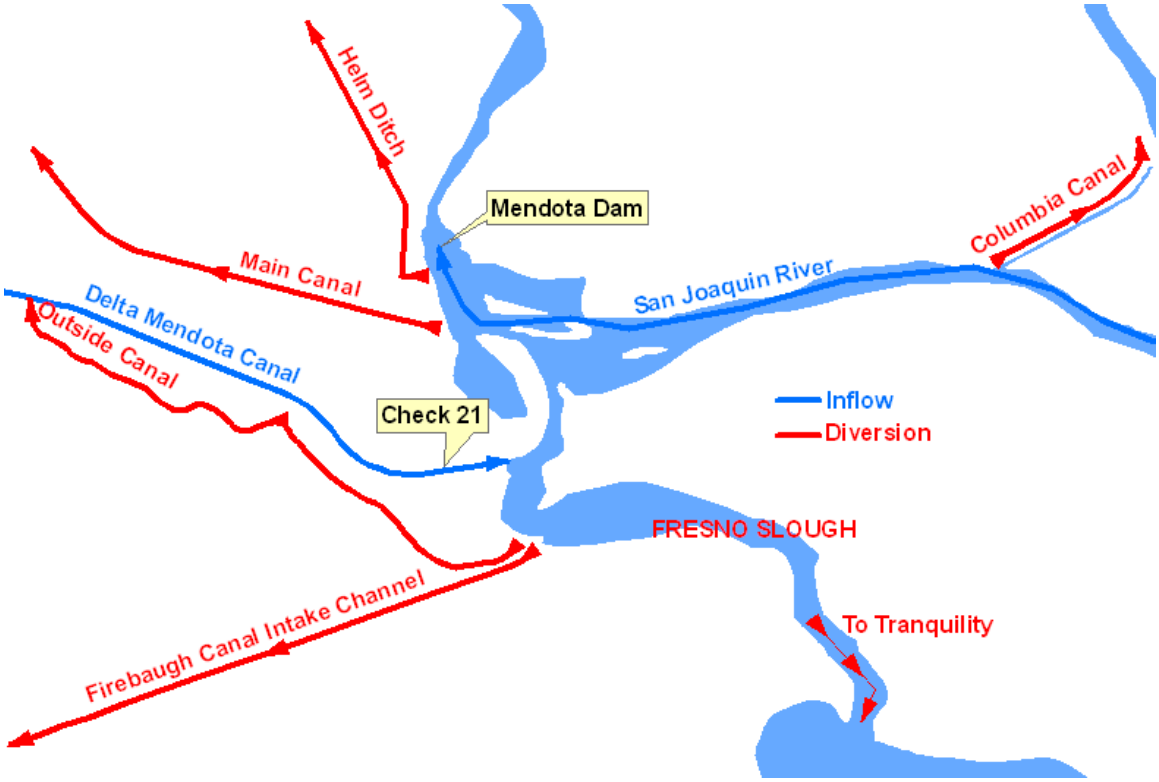

Figure 1: Mendota Pool Normal Operations

Figure 1 shows the location of major canals in the Mendota Pool.

DMC water generally flows into the Pool and backs up 10 miles into Fresno Slough through the Mendota Wildlife Management Area to four water districts near the city of Tranquility. When DMC flows are reduced to recapture Interim Flows at Mendota Pool, the dilution of Mendota Pool pump-in is reduced and salinity levels may increase in Fresno Slough. Although Interim Flows introduce high quality surface water to Mendota Pool, the exchange reduces the assimilative capacity of DMC flows on Mendota Pool pump-in. San Joaquin River water does not thoroughly mix with water in Fresno Slough, and Fresno Slough water increases in salinity, making it not suitable for irrigation purposes.

2.0 Water Quality Monitoring

Water quality monitoring near Mendota Pool includes measurements for EC at canals and in the San Joaquin River. Locations with hourly real-time telemetry of EC include:

- At Gravelly Ford, upstream of Chowchilla Bypass
- Below Chowchilla Bypass
- Check 21 of the Delta Mendota Canal
- Sack Dam

Reclamation collects periodic manual measurements of selenium and EC at the following locations:

- At Gravelly Ford, upstream of Chowchilla Bypass
- Below Chowchilla Bypass (2009)
- DMC Check 21 at Bass Ave.
- Main Canal at Bass Ave.
- Below Mendota Dam
- Firebaugh Wasteway
- At Highway 152, below Sack Dam

Reclamation measurements and real-time monitoring data are reported in the San Joaquin River Restoration Program Annual Technical Report and are available online at www.restoresjr.net/flows/Water%20Quality/WaterQuality.html.

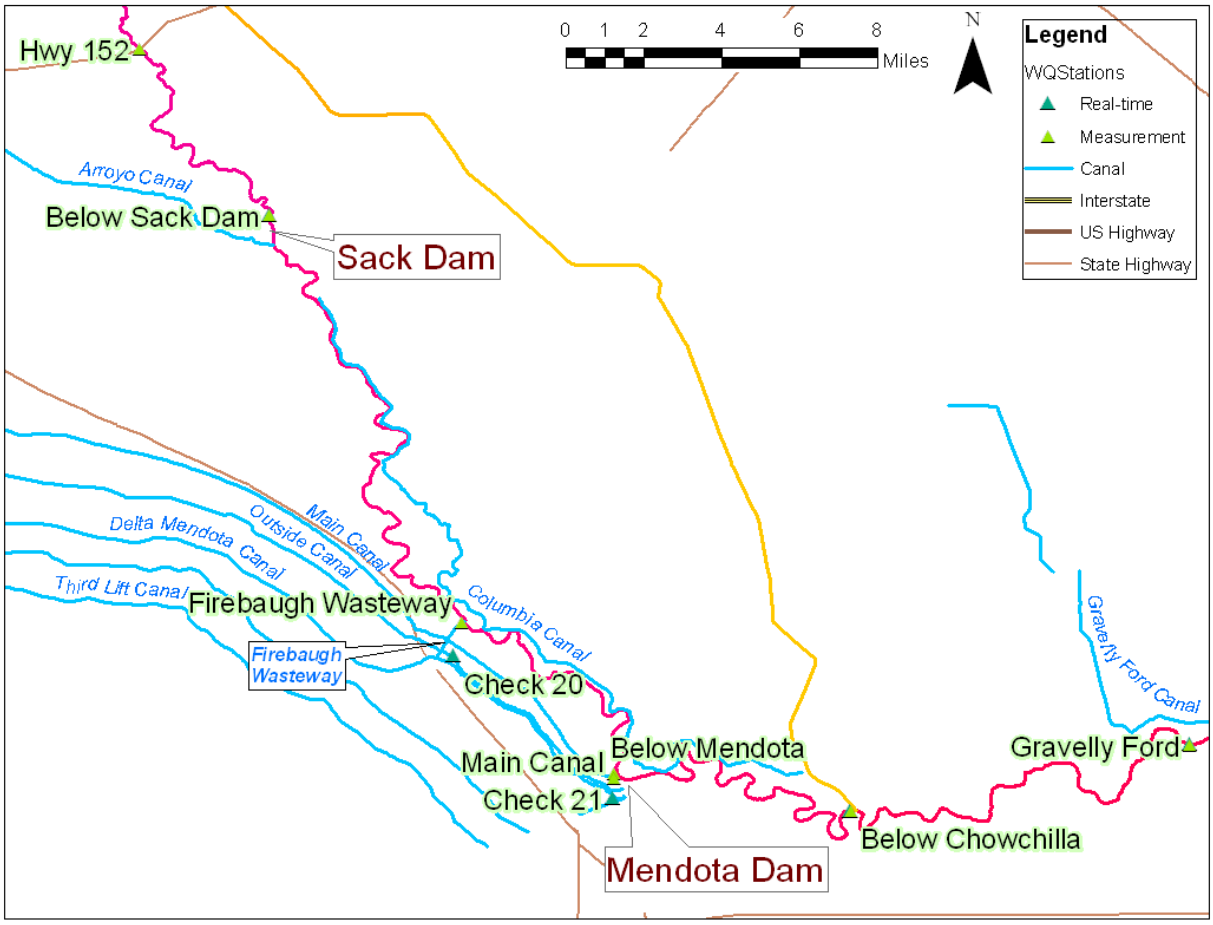

Figure 2: Water Quality Monitoring near Mendota Pool

The San Joaquin River Exchange Contractors Water Authority (Exchange Contractors) collect daily measurements at the following canal intakes:

- Columbia Canal
- Main Canal
- Outside Canal
- Firebaugh Canal Intake Channel
- Mendota Dam
- Arroyo Canal

3.0 Thresholds

The Two-Year Exchange Agreements and/or Warren Act Contracts for the Conveyance of Non-Central Valley Project (Groundwater) in the Delta-Mendota Canal Environmental Assessment (DMC Pump-in EA) specifies a salinity threshold of 450 parts per million (ppm) total dissolved solids (TDS) in a single day as measured at Check 20 on the DMC. This is approximately equal to 900 micro-Siemens per centimeter (or umhos/cm) of electrical conductivity.

The 2005 Mendota Pool 10-year Exchange Agreement Environmental Impact Statement (Mendota Pool Pump-in EIS) specifies an electrical conductivity at Exchange Contractor canal intakes. The EIS sets a threshold at EC measured 90 umhos/cm or more above the EC of the DMC at Check 20 for three consecutive days.

Coordination with the San Luis and Delta-Mendota Water Authority and the Exchange Contractors during spring 2010 identified consistent electrical conductivities in Mendota Pool above 700 umhos/cm as a level of concern.

4.0 Communication

Daily operations coordination calls will include EC updates by the Exchange Contractors as measured at canal intakes when they near thresholds. San Luis and Delta-Mendota Water Authority will notify the operators at the daily operations call when TDS levels approach 450 ppm at Check 20. Once a threshold is crossed the responsible party as described in Section 5.0 will take an appropriate response action.

5.0 Actions

Operators will discuss and Reclamation will choose an appropriate action at the daily operations call. Response actions to water quality in Mendota Pool may include the following.

1) Suspend Mendota Pool Group Pump-In

The Mendota Pool Pump-in EIS and the Agreement for the Mendota Pool Transfer Pumping Project requires shutting down Mendota Pool Group pumps when the electrical conductivity at Exchange Contractor's canal intakes is 90 umhos/cm above EC measurements in the DMC for 3 days. If the Mendota Pool Group wells are shut off for this reason, they would not be turned back on until the EC at the canal intakes returns to a level that is no more than 30 umhos/cm above the DMC inflow.

This action is the responsibility of the Exchange Contractors and the Mendota Pool Group. The Exchange Contractors track salinity levels at canal intakes. Exchange Contractors will notify operators at the daily operations call when salinity levels at canal intakes approach this threshold. When notified by the Exchange Contractors, the Mendota Pool Group will shut down pumps.

2) Suspend DMC Pump-In

The DMC Pump-in EA requires shutting off the DMC pump-in program when measured water quality at Check 20 on the DMC exceeds 450 parts per million (ppm) TDS in a single day. The wells may resume pumping after the average TDS is below 450 ppm for 3 days.

This action is the responsibility of the San Luis and Delta-Mendota Water Authority to determine when TDS at Check 20 exceeds 450 ppm, and the responsibility of Two-Year Exchange Agreement and Warren Act Contract holders to shut off pumps.

3) Water Supplies through Firebaugh Wasteway

Another response action involves supplying Exchange Contractor water deliveries through Interim Flows diverted to avoid material adverse flooding or seepage impacts, and supplying downstream Interim Flow targets and/or San Luis Canal Company (SLCC) deliveries through the Firebaugh Wasteway.

This action is the responsibility of Reclamation. Following the application of the preceding response actions, as required in their environmental documentation, the Exchange Contractors will notify Reclamation at the daily operations call if salinity levels continue to exceed thresholds. Reclamation will evaluate salinity levels and determine if a downward trend will put salinity levels below thresholds within the next day. If not, Reclamation will direct SLDMWA to shut down the DMC and push flows through Firebaugh Wasteway. Reclamation will specify the amount of Interim Flows through Firebaugh Wasteway, and flows for SLCC through Firebaugh Wasteway in addition to other accounting as specified in Section 4.0 of the San Joaquin River Restoration Program Interim Flows Operations Plan. Reclamation will also manual sample discharge to the San Joaquin River from the Firebaugh Wasteway during this action, as needed.

Appendix I – Draft San Joaquin River Underseepage Limiting Capacity Analysis

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Attachment

San Joaquin River Underseepage Limiting Capacity Analysis

Draft
Supplemental Hydrologic and Water Operations Analyses Appendix

SAN JOAQUIN RIVER
RESTORATION PROGRAM

Draft
April 2011

DRAFT
San Joaquin River Underseepage Limiting Capacity Analysis

March 30, 2011

1. INTRODUCTION

Tetra Tech, Inc., dba Mussetter Engineering, Inc. (Tt-MEI) performed an evaluation of the potential effects of restoration flows on levee underseepage in the 150-mile, mainstem portion of the San Joaquin River Restoration Reach and the Eastside Bypass between Friant Dam and the confluence with the Merced River.

Underseepage issues are most acute when a layer(s) of pervious material occurs below the levee foundation that extends both river- and land-side of the levee (USACE, 2000). These pervious layers allow seepage to occur below the levee structure where it often surfaces along the existing ground adjacent to the levee. This seepage can cause adverse impacts to adjacent landowners due to saturation of the ground surface, and can also lead to instability and failure of the levee.

To evaluate the potential impact of restoration flows on underseepage and saturation adjacent to the levees, elevations of land outside and adjacent to the levees were determined and compared to computed water-surface elevations over a range of flows. The evaluation was conducted using the HEC-RAS 1-D steady-state hydraulic models developed by Tt-MEI for the San Joaquin River Restoration Program (SJRRP), and initially consisted of a preliminary analysis of varying potential capacity thresholds and criteria (Tt-MEI, 2011). Based on the results of the preliminary analysis, a refined set of capacity criteria was established. This work was completed under the River Engineering Services for the San Joaquin River Restoration Program Contract, Task Order 48.

2. METHODOLOGY AND ASSUMPTIONS

The following sections describe the methodology and assumptions that were used in performing the analysis. The analysis specifically focused on identifying the discharge at which the water surface in the river would reach the outside ground elevation (i.e., in-channel flow capacity), and included a determination of the extent of each the reach where outside ground elevations are within 1 foot vertically of the water-surface for the identified in-channel capacity.

2.1. River Reaches

The seepage potential was evaluated for each subreach that is bounded by levees in Reaches 2A, 2B, 3, 4A, 4B2, 5, and the Eastside Bypass (**Figure 1**). As part of the project, new setback levees will be constructed in Reach 4B1 to safely convey the maximum releases under full restoration conditions. As a result, impacts associated with the full restoration releases were not evaluated in this reach. Setback levees will also be constructed in Reach 2B, but because interim-flow releases will be routed through this reach prior to construction, seepage potential along the levees upstream from the direct impacts of Mendota Pool was evaluated.

2.2. Hydraulic Models

Hydraulic models for the study reaches, which were initially developed based on 2-foot contour mapping developed by Ayres Associates (1998 and 1999) for the Sacramento and San Joaquin River Basins Comprehensive Study, have been recently updated using improved modeling techniques and the 2008 LiDAR mapping and bathymetry, where available. The models used for this analysis were further refined and the assumptions were defined as part of the evaluation of potential erosion and stability impacts to the levees associated with the proposed restoration flows (Tt-MEI, 2010). In addition, updates to the estimated pool elevation and rating curve at Mendota Dam that were made based on new information obtained after completion of the levee stability analysis (Tt-MEI, 2010) were incorporated into the Reach 2B hydraulic model.

Water-surface profiles used in the analysis were developed by running the refined models over a series of local discharges that were developed based on Friant Dam releases within the range of the Settlement Agreement Exhibit B flows, and adjusted for infiltration and diversion losses based on the curves used to develop the Exhibit B flows. The local discharges in Reach 3 include an additional 300 cfs to represent the average Arroyo Canal deliveries from Mendota Pool to the Arroyo Canal. These flows are then extracted at Sack Dam at the downstream end of Reach 3.

2.3. Outside Ground Elevations

Elevations of improved agricultural or urban land protected by the levees (outside ground) were identified as part of the levee stability analysis conducted by Tt-MEI (2010) to assess the potential for levee issues to affect land improvements along the reach. Elevations for each location were identified at each model cross section through inspection of the 2008 aerial photography, 2008 contour mapping, and cross-sectional topography. Actual elevations were determined from the topography used to develop the hydraulic model for each part of the reach (i.e., 2008 LiDAR mapping, supplemented with bathymetry from the 1998/1999 Ayres mapping, where necessary).

3. RESULTS

Computed water-surface profiles were compared to the ground elevations adjacent to both the left and right levees. The in-channel flow capacity of each reach was determined to be the highest flow rate through the reach where the water-surface elevation does not exceed the outside ground elevation. Approximate lengths of each site where the outside ground elevations are within 1 foot of the in-channel capacity discharge water-surface elevation were then estimated from the available mapping.

3.1. Reach 2A

Reach 2A is approximately 13 miles long and extends from Gravelly Ford (near the upstream end of the project levees) downstream to the Chowchilla Bypass Bifurcation Structure. Along both levees in Reach 2A, the highest local discharge for which the water surface is at or below the outside ground elevation is 1,060 cfs (**Figure 2**). A total of five locations with a combined length of approximately 1,980 feet were identified where the outside ground elevations are within 1 foot of the in-channel capacity water surface (**Figure 3 and Table 1**).

Table 1. Summary of approximate lengths of each location in each reach where the outside ground elevation is within one foot of the in-channel capacity discharge.			
Reach	Site	Capacity Flow (cfs)	Length (ft)
Reach 2A	Site 1	1,060	1,120
Reach 2A	Site 2	1,060	380
Reach 2A	Site 3	1,060	350
Reach 2A	Site 4	1,060	40
Reach 2A	Site 5	1,060	90
Reach 2B	Site 1	810	1,240
Reach 3	Site 1	2,140	1,090
Reach 4A	Site 1	630	510
Reach 4A	Site 2	630	1,620
Reach 4A	Site 3	630	100
Reach 4B2	Site 1	990	510
Reach 4B2	Site 2	990	270
Reach 4B2	Site 3	990	320
Reach 4B2	Site 4	990	590
Reach 4B2	Site 5	990	300
Reach 4B2	Site 6	990	270
Reach 4B2	Site 7	990	370
Reach 4B2	Site 8	990	130
Reach 4B2	Site 9	990	440
Reach 4B2	Site 10	990	400
Reach 4B2	Site 11	990	350
Reach 4B2	Site 12	990	740
Reach 4B2	Site 13	990	540
Reach 5	Site 1	1,690	420
Reach 5	Site 2	1,690	440
Reach 5	Site 3	1,690	830
Eastside Bypass	Site 1	600	540
Eastside Bypass	Site 2	600	2,320
Eastside Bypass	Site 3	600	560

3.2. Reach 2B

Reach 2B is approximately 11 miles long and extends from the Chowchilla Bypass Bifurcation Structure downstream to Mendota Dam. Outside ground elevations along the lower portion of this reach (downstream from approximately Sta 4765+00) are generally lower than the normal pool elevation at Mendota Dam. As a result, Interim Flows will not significantly impact the potential for saturation of the outside ground in this area, and the existing flow capacity was evaluated only for the reach upstream from Sta 4765+00. Along both levees in Reach 2B, the highest local discharge for which the water surface is at or below the outside ground elevation is 810 cfs (**Figure 4**). One location of approximately 1,240 feet in length was identified where the outside ground elevations are within 1 foot of the in-channel capacity water-surface (Table 1 and **Figure 5**).

3.3. Reach 3

Reach 3 is about 22 miles long and extends from Mendota Dam downstream to Sack Dam. Considering both levees, the highest local discharge for which the water surface is at or below the outside ground elevation is about 2,140 cfs (**Figure 6**). The limiting area where the outside ground elevations are within 1 foot of the in-channel capacity flow water surface occurs near the downstream end of the reach near Sta 3385+20, just upstream from Sack Dam, and has an approximate length of 1,090 feet (Table 1 and **Figure 7**).

3.4. Reach 4A

Reach 4A is about 23 miles long and extends from Sack Dam downstream to the Sand Slough Control Structure. The computed water-surface profiles indicate that the highest local discharge for which the water surface is at or below the outside ground elevation is 630 cfs (**Figure 8**). A total of three locations with a combined length of approximately 2,230 feet were identified where the outside ground elevations are within 1 foot of the in-channel capacity water surface (Table 1 and **Figure 9**).

3.5. Reach 4B2

Reach 4B2 extends approximately 12 miles from the Mariposa Bypass downstream to the confluence with Bear Creek. The ground adjacent to the right levee in Reach 4B2 has several significant localized depressions near Sta 1068+30 and Sta 1072+20 (**Figure 10**). These local depressions limit the in-channel capacity discharge to about 190 cfs. However, aerial photographs and contour mapping indicate that these depressions are not on or adjacent to agricultural land, are relatively small, and can contain water even at low flows (Tt-MEI, 2011). If these local depressions are excluded from the analysis, the capacity along the reach increases to about 990 cfs (Figure 10). Based on the discharge of 990 cfs, a total of 13 locations with a combined length of approximately 5,230 feet were identified where the outside ground elevations are within 1 foot of the in-channel capacity water surface (Table 1 and **Figure 11**).

3.6. Reach 5

Reach 5 extends downstream from Bear Creek to the confluence with the Merced River, and along the left side of the river, the levee only exists within the upper portion of the reach (upstream from about Sta 660+00) (**Figure 12**). Along both levees in Reach 5, the highest local discharge for which the water surface is at or below the outside ground elevation is 1,690 cfs

(Figure 12). A total of three locations with a combined length of approximately 1,690 feet were identified where the outside ground elevations are within 1 foot of the in-channel capacity water surface (Table 1 and **Figure 13**). However, since much of the outside ground adjacent to the left levee is undeveloped and contains many local depressions (Tt-MEI, 2011), these results likely represent a conservative estimate of the in-channel discharge capacity in this reach.

3.7. Eastside Bypass

The Eastside Bypass extends downstream approximately 21 miles from the Sand Slough Control Structure to where it joins Bear Creek and then the San Joaquin River. The computed water-surface profiles indicate that the highest local discharge for which the water surface is at or below the outside ground elevation is 600 cfs (**Figure 14**). A total of three locations with a combined length of approximately 3,420 feet were identified where the outside ground elevations are within 1 foot of the in-channel capacity water surface (Table 1 and **Figure 15**).

4. REFERENCES

Tetra Tech (dba Mussetter Engineering, Inc.), 2010. Evaluation of Potential Erosion and Stability Impacts on Existing Levees under Proposed restoration Program, Draft technical memorandum prepared for the California Dept. of Water Resources, Fresno, California, August.

Tetra Tech (dba Mussetter Engineering, Inc.), 2011. San Joaquin River Preliminary Underseepage Limiting Capacity Analysis, Draft technical memorandum prepared for the California Dept. of Water Resources, Fresno, California, March.

U.S. Army Corps of Engineers, 2000. Engineering and Design – Design and Construction of Levees EM 1110-2-1913 April 30.

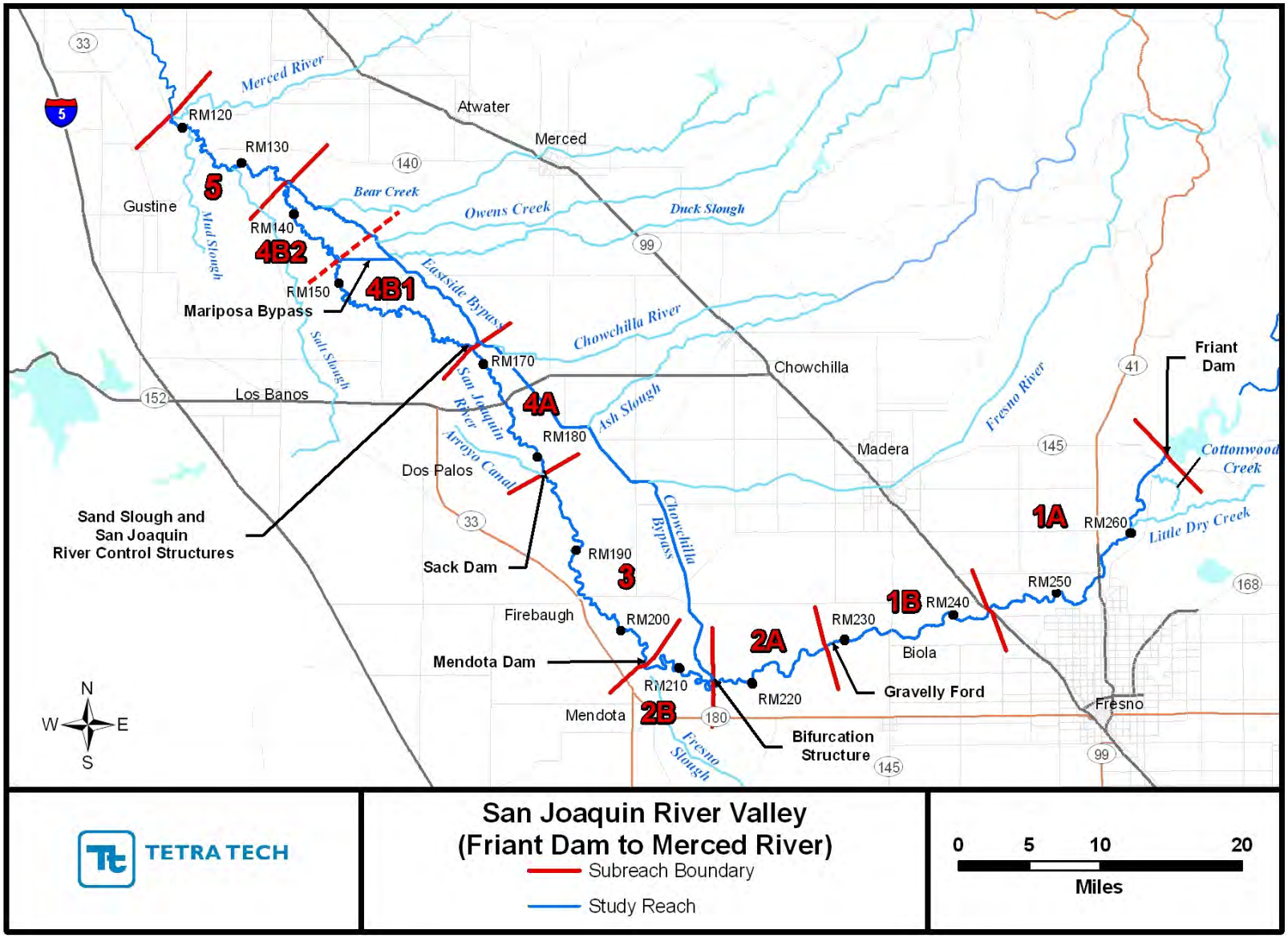

Figure 1. Map of the San Joaquin River Restoration Project Reach showing the subreach boundaries.

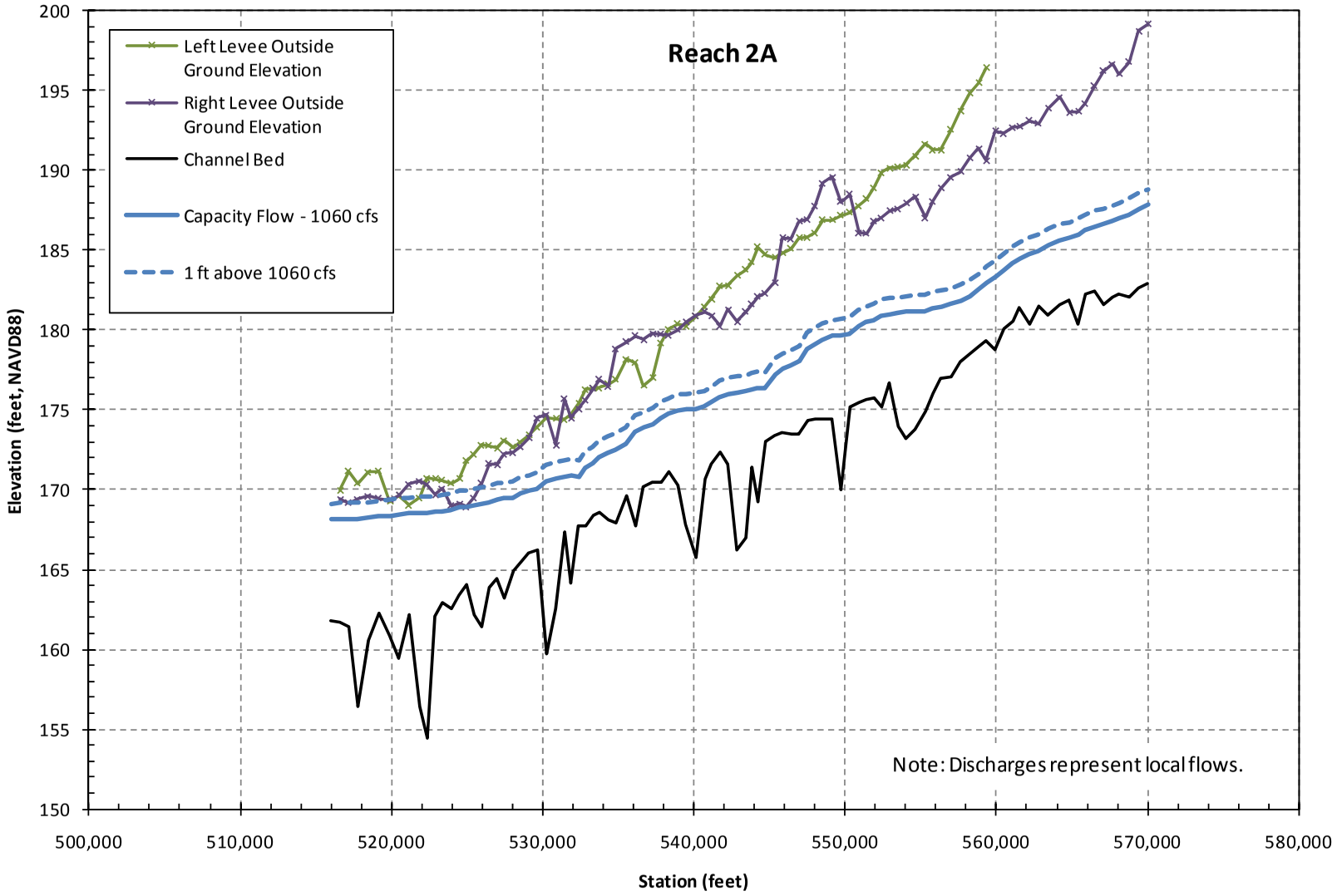

Figure 2. Outside ground elevations and computed water-surface profiles in Reach 2A at and 1 foot above the local discharge of 1,060 cfs.

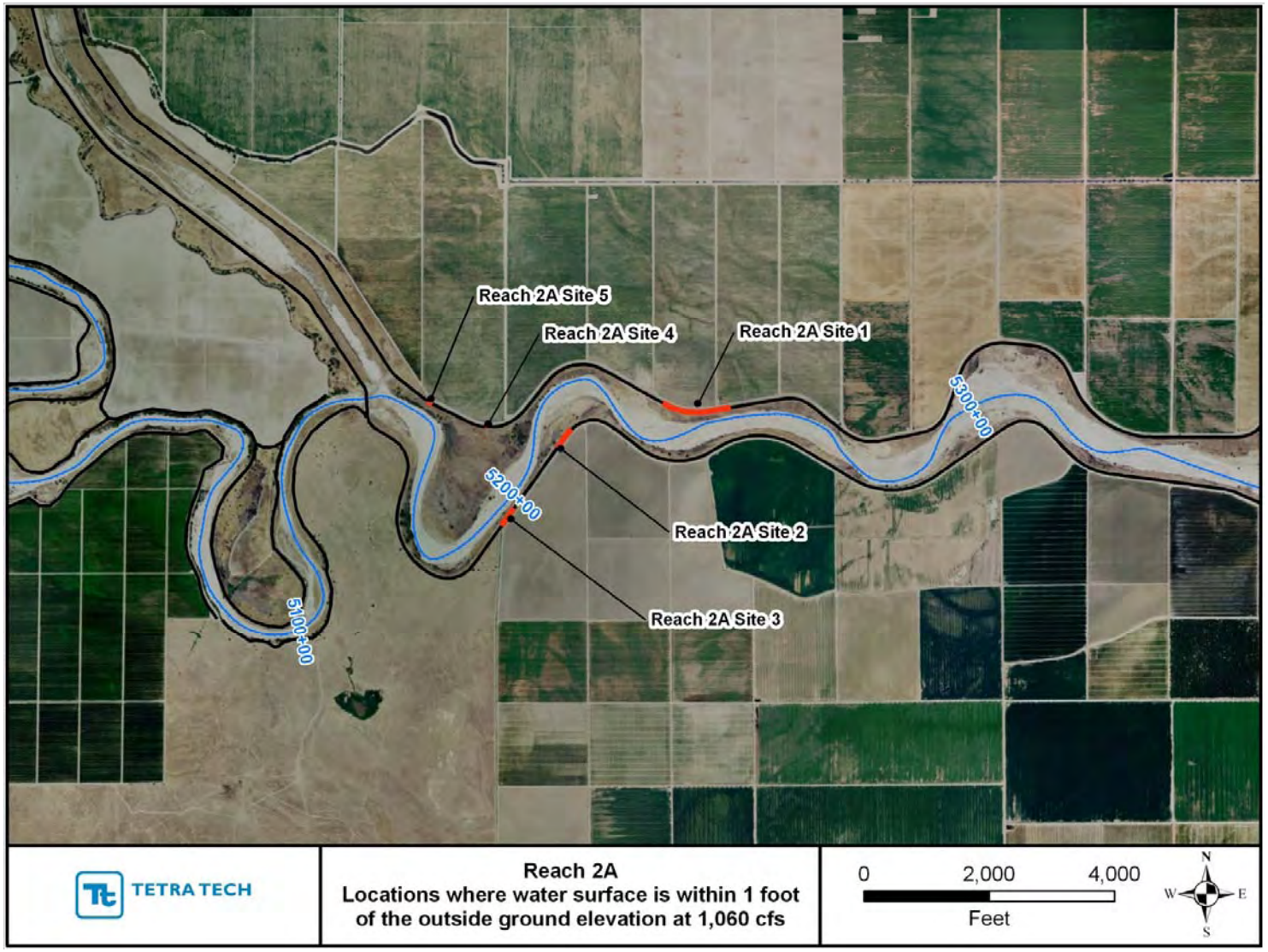

Figure 3. Map showing locations in Reach 2A where the 1,060-cfs water-surface elevation is within 1 foot of the outside ground elevation.

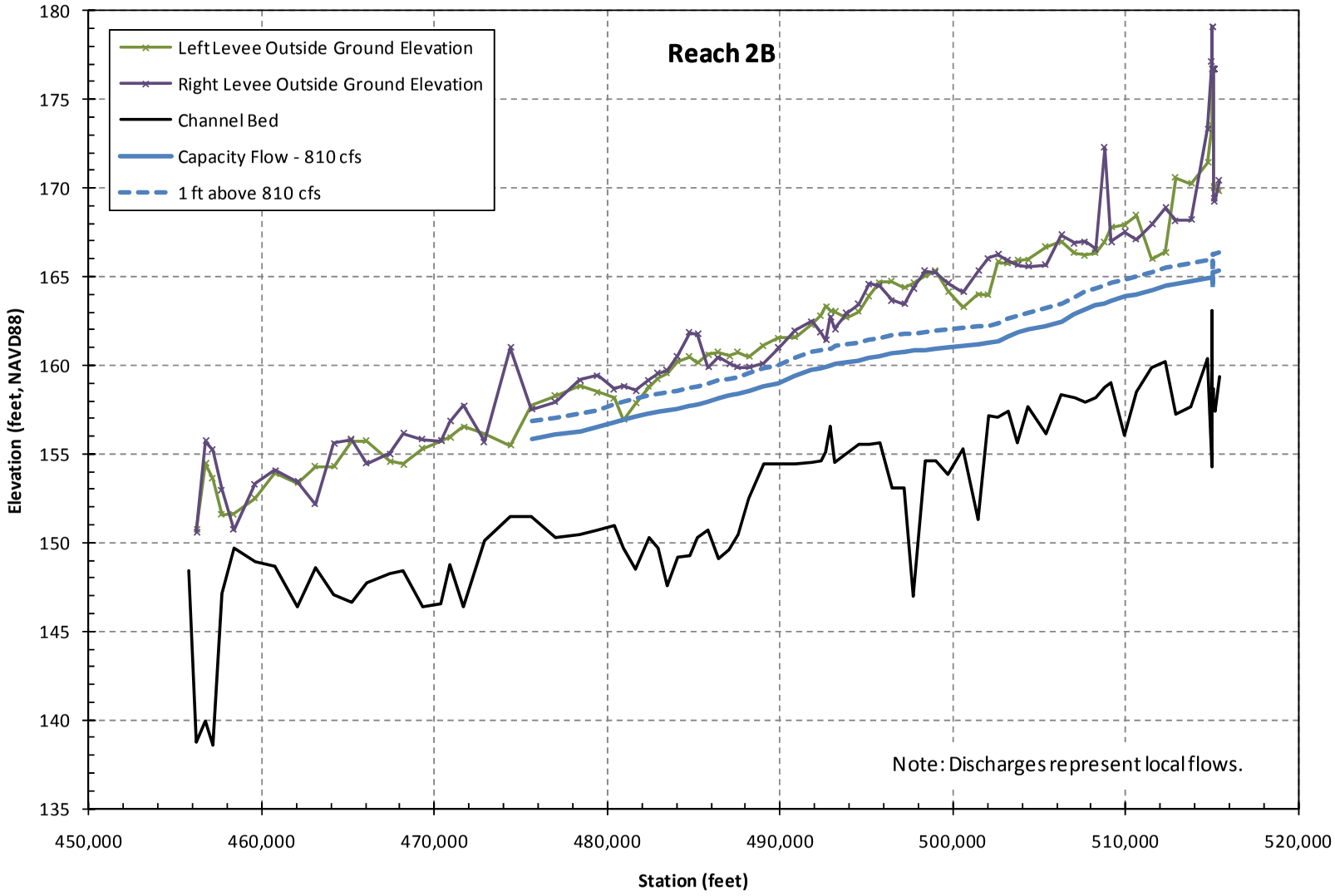

Figure 4. Outside ground elevations and computed water-surface profiles in Reach 2B at and 1 foot above the local discharge of 810 cfs.

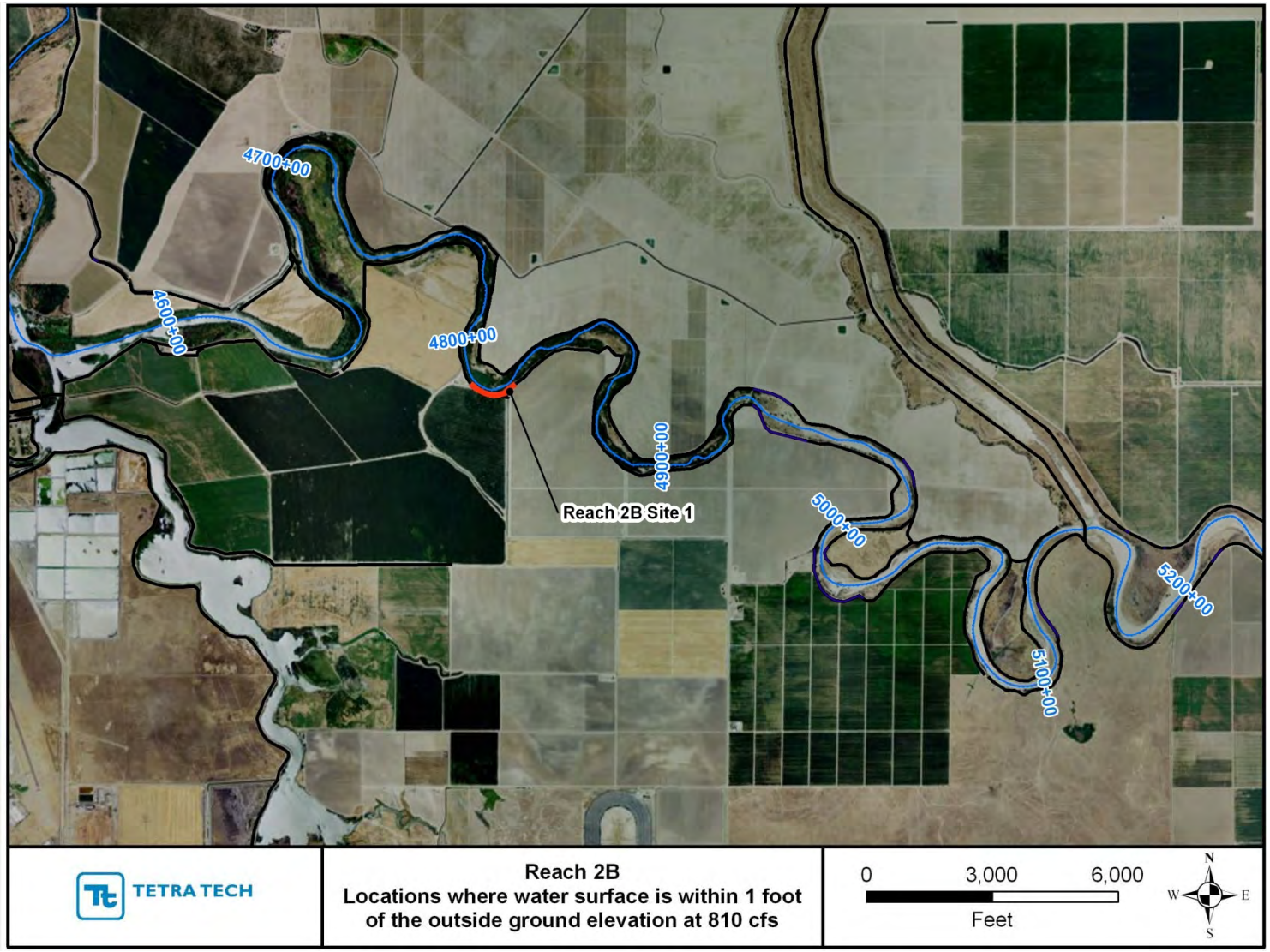

Figure 5. Map showing locations in Reach 2B where the 810-cfs water-surface elevation is within 1 foot of the outside ground elevation.

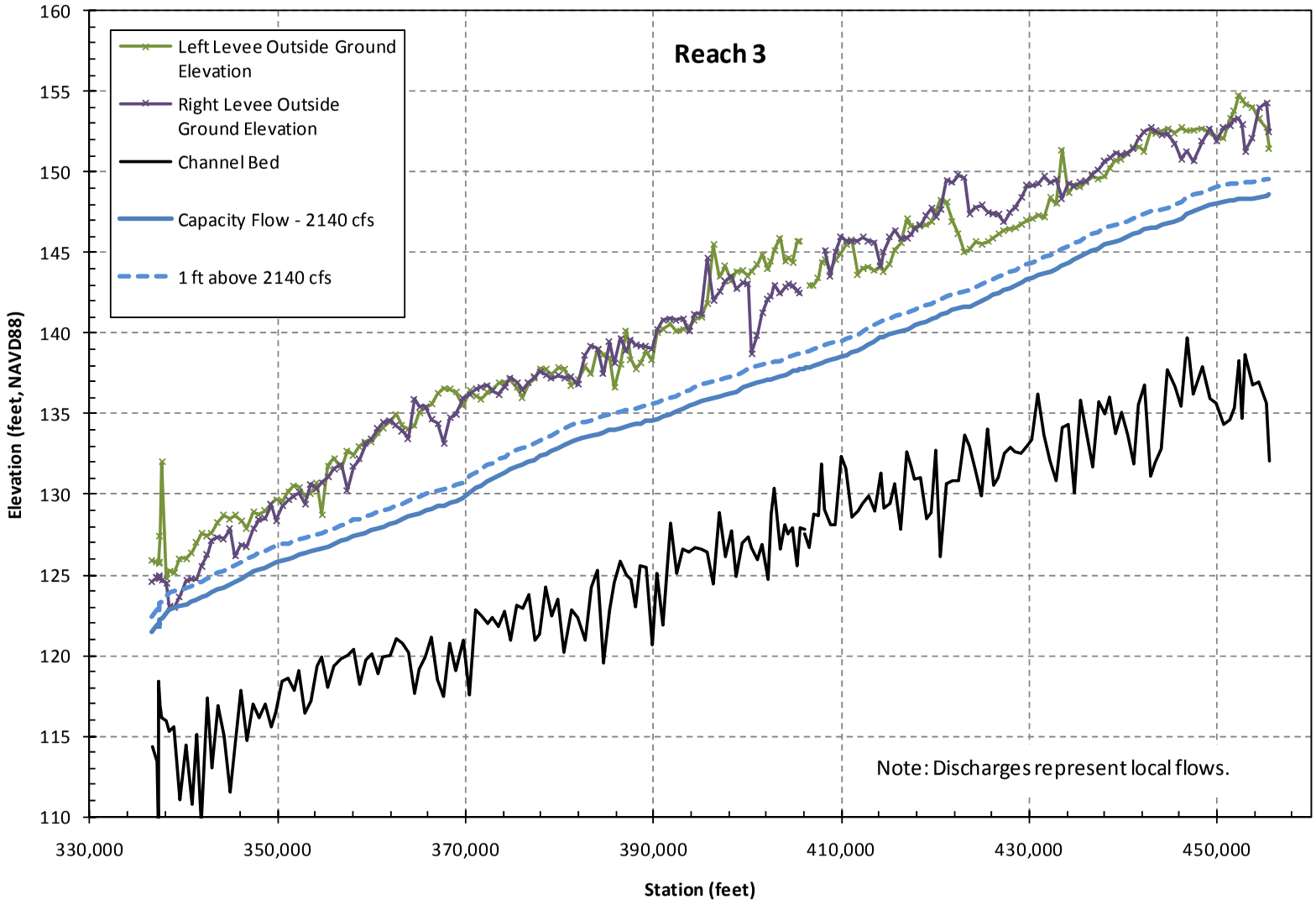

Figure 6. Outside ground elevations and computed water-surface profiles in Reach 3 at and 1 foot above the local discharge of 2,140 cfs.

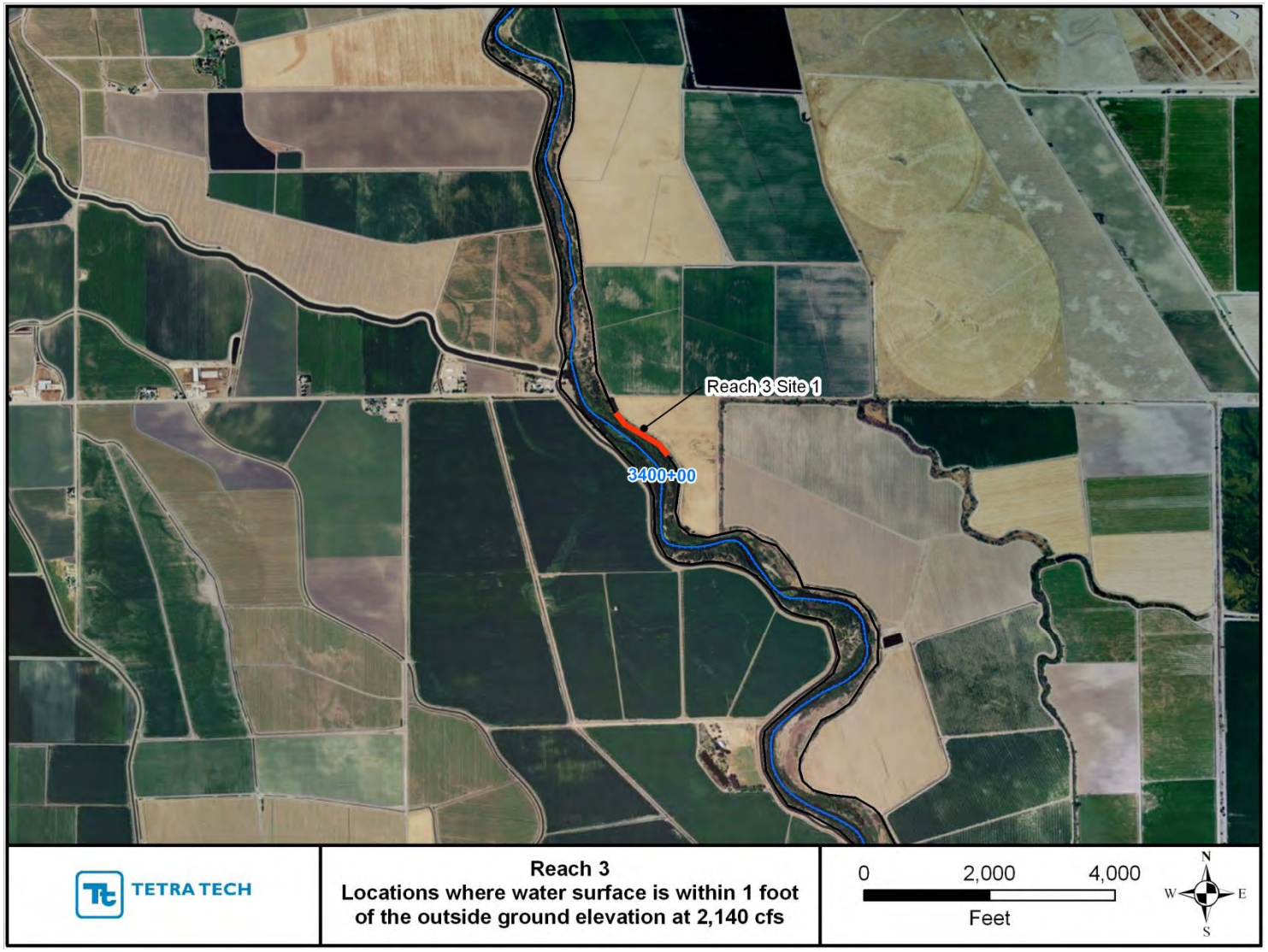

Figure 7. Map showing locations in Reach 3 where the 2,140-cfs water-surface elevation is within 1 foot of the outside ground elevation.

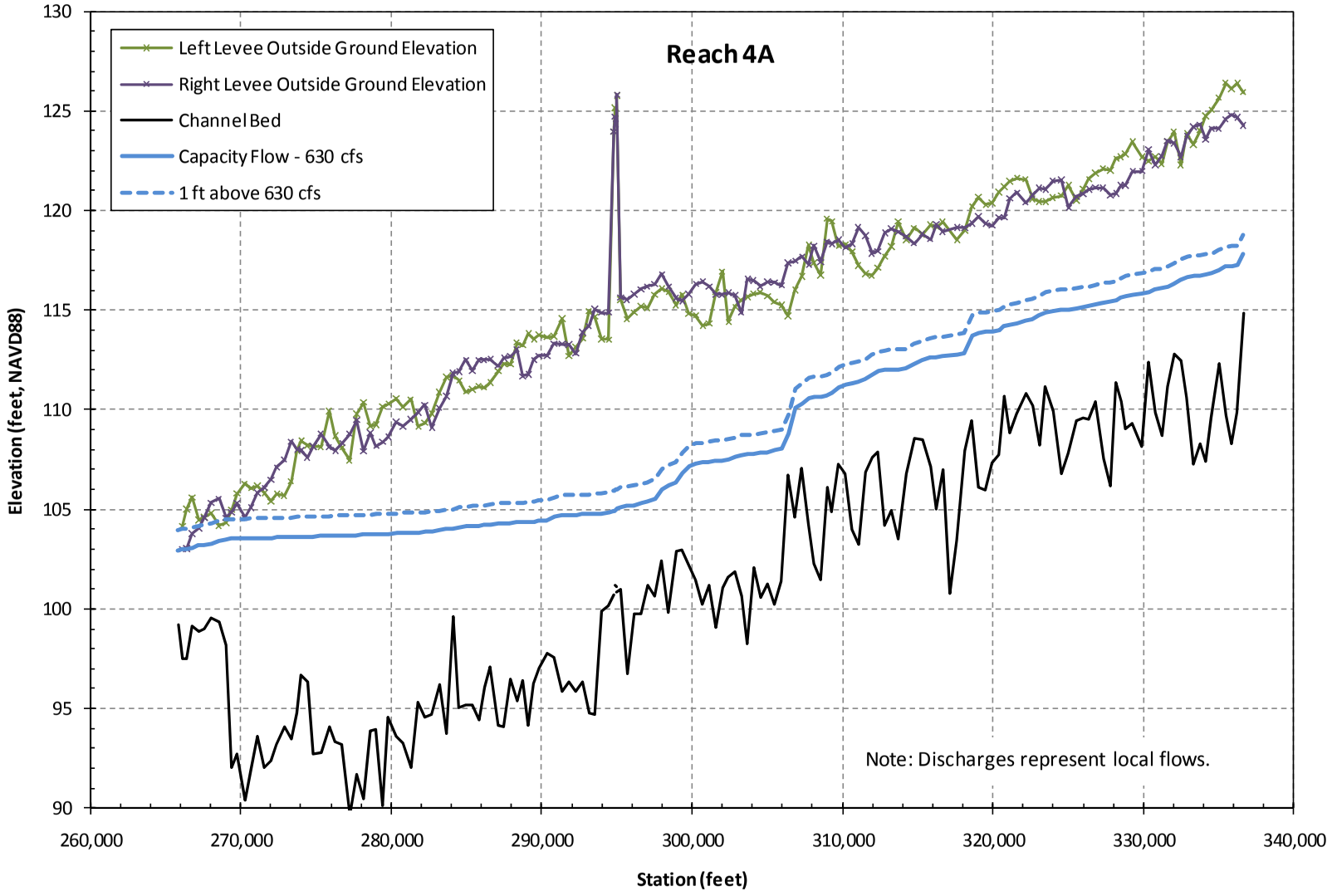

Figure 8. Outside ground elevations and computed water-surface profiles in Reach 4A at and 1 foot above the local discharge of 630 cfs.

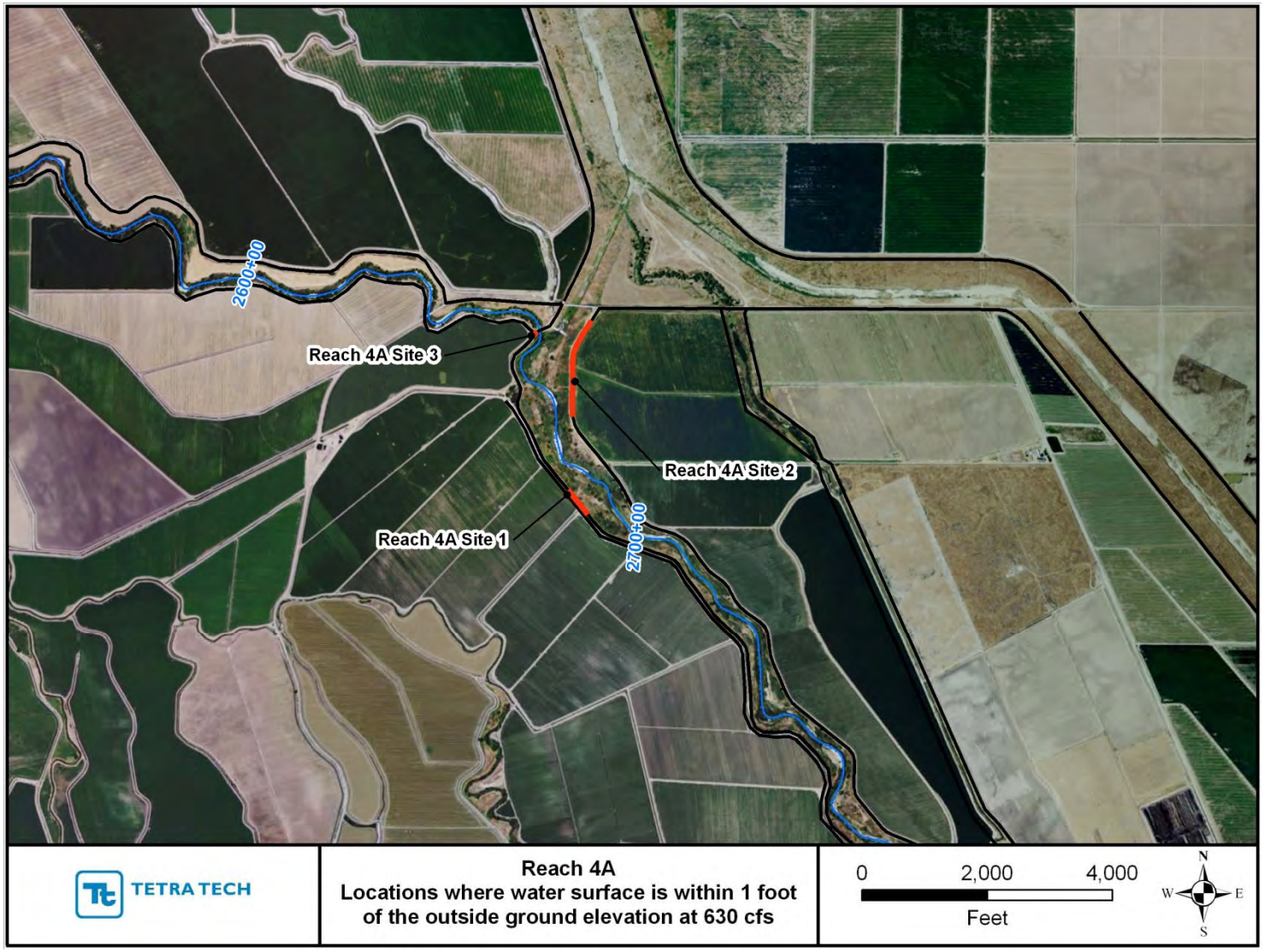

Figure 9. Map showing location in Reach 4A where the 630-cfs water-surface elevation is within 1 foot of the outside ground elevation.

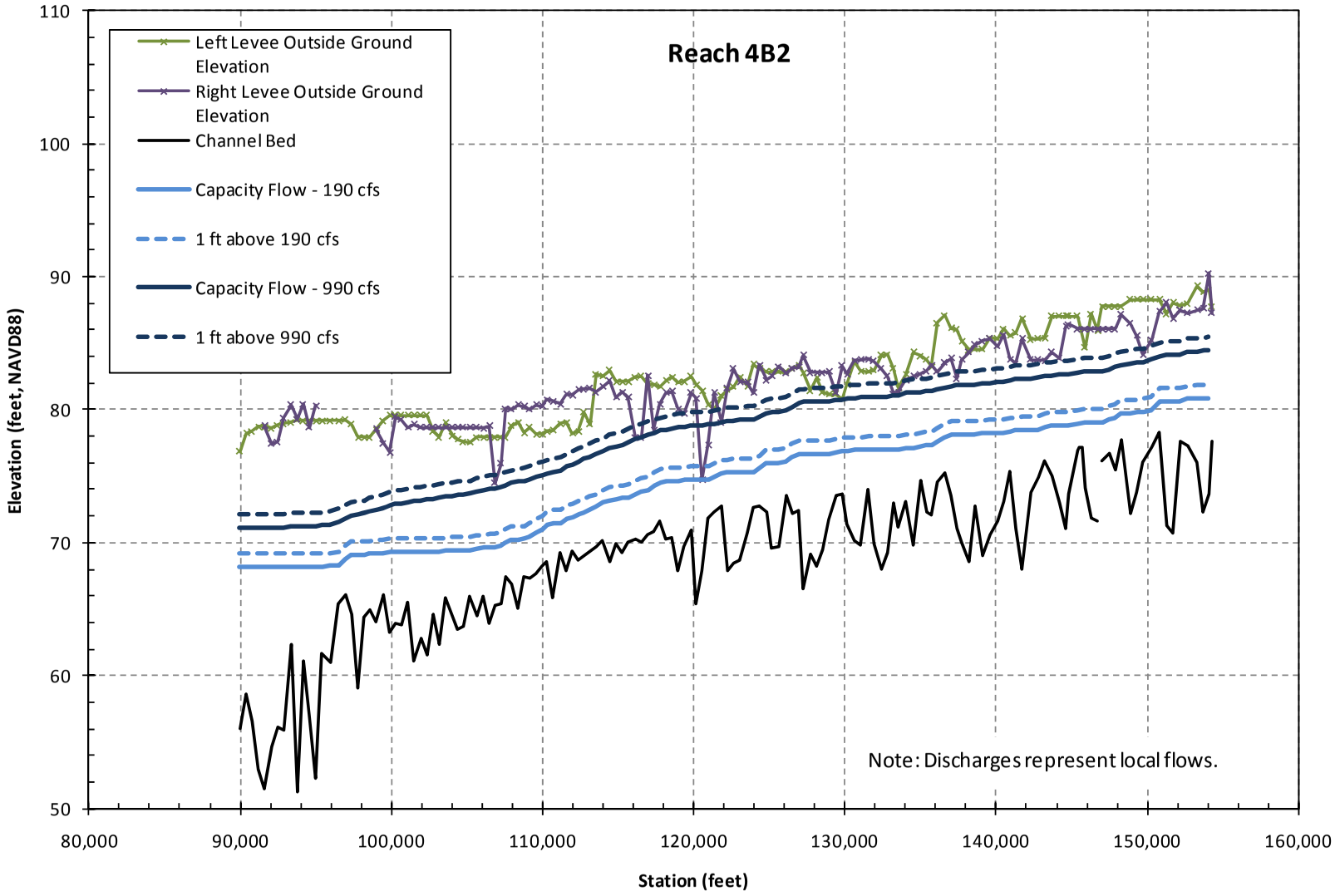

Figure 10. Outside ground elevations and computed water-surface profiles in Reach 4B2 at and 1 foot above the local discharges of 190 and 990 cfs.

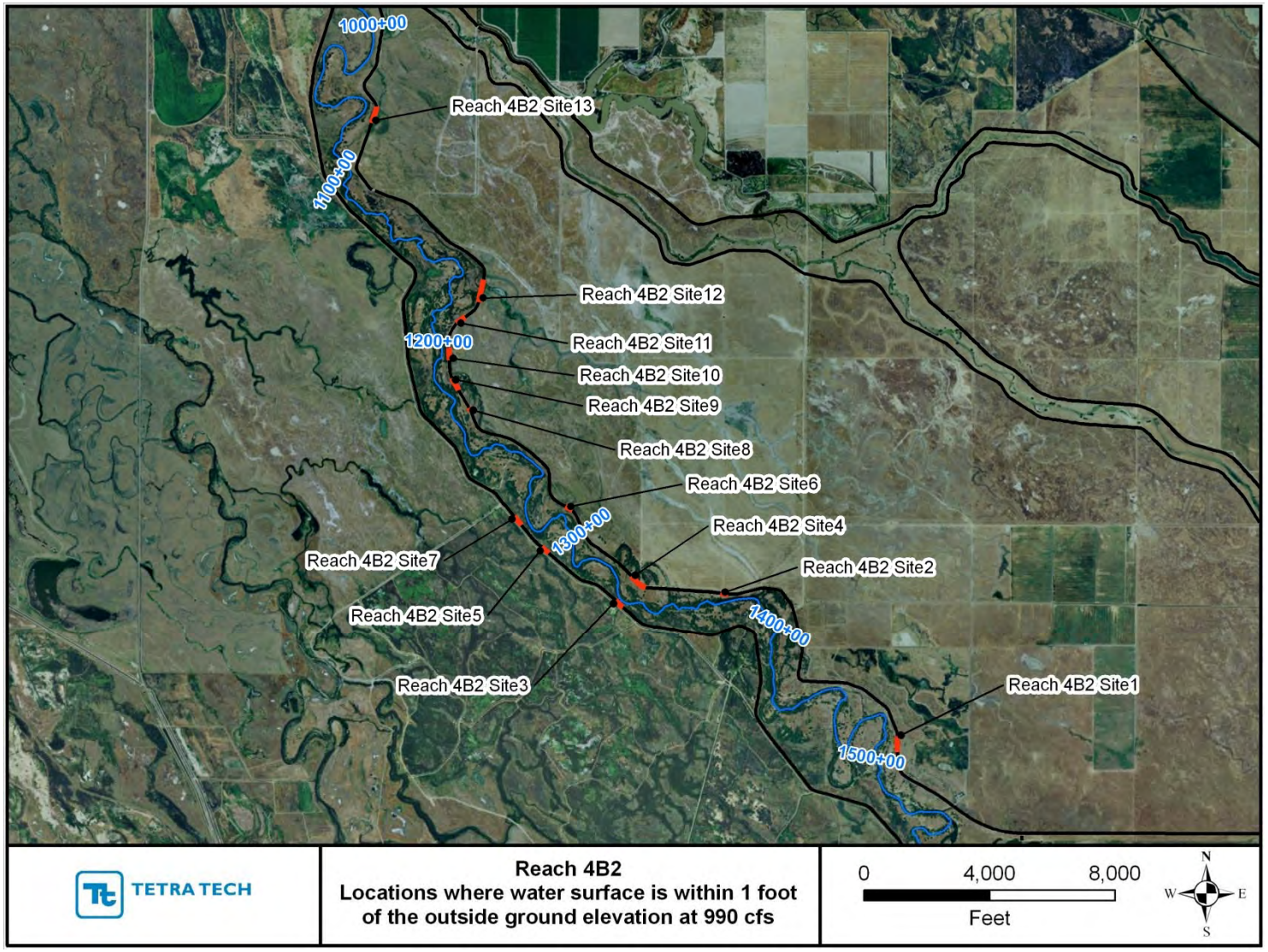

Figure 11. Map showing locations in Reach 4B2 where the 990-cfs water-surface elevation is within 1 foot of the outside ground elevation.

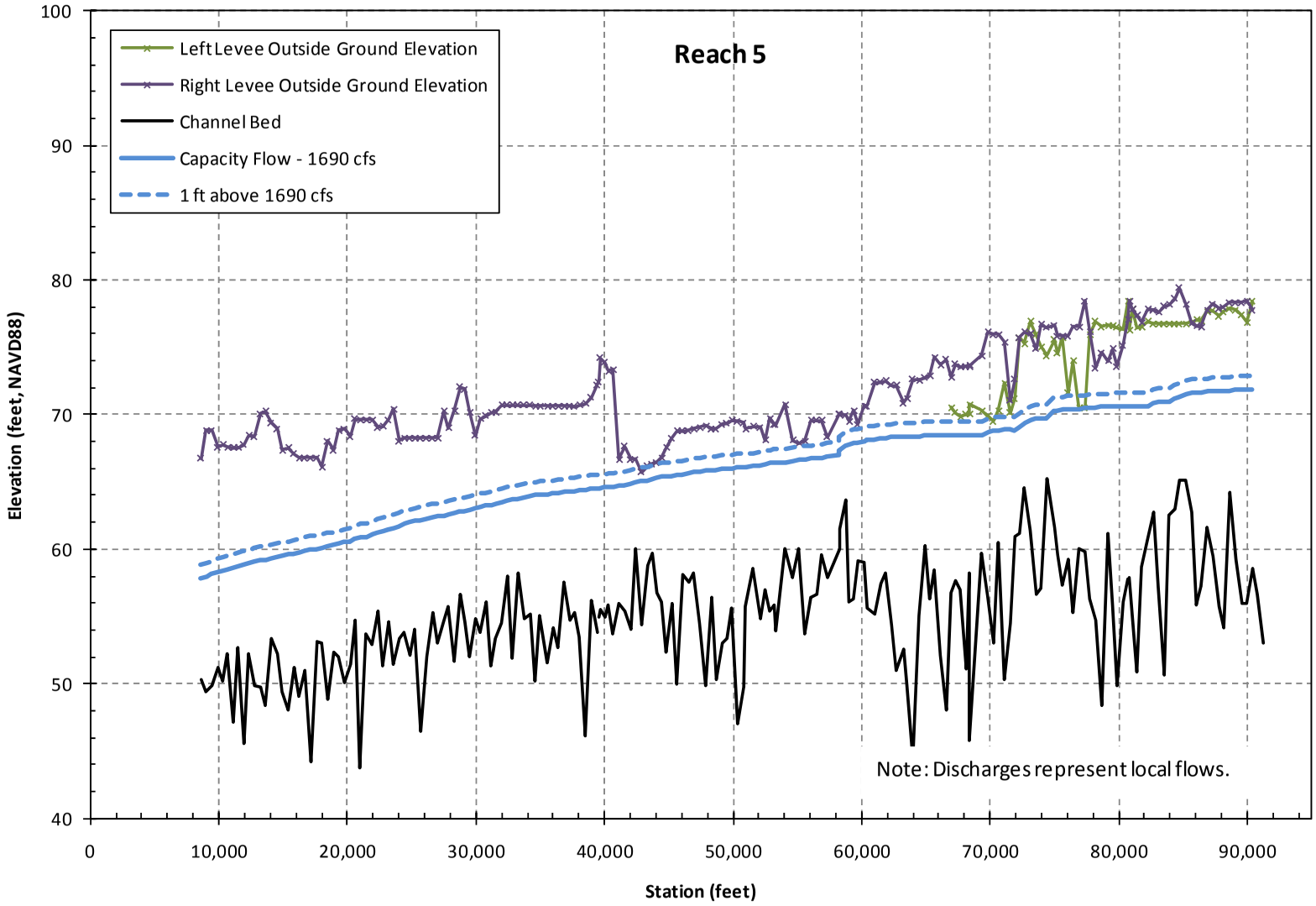

Figure 12. Outside ground elevations and computed water-surface profiles in Reach 5 at and 1 foot above the local discharges of 1,690 cfs.

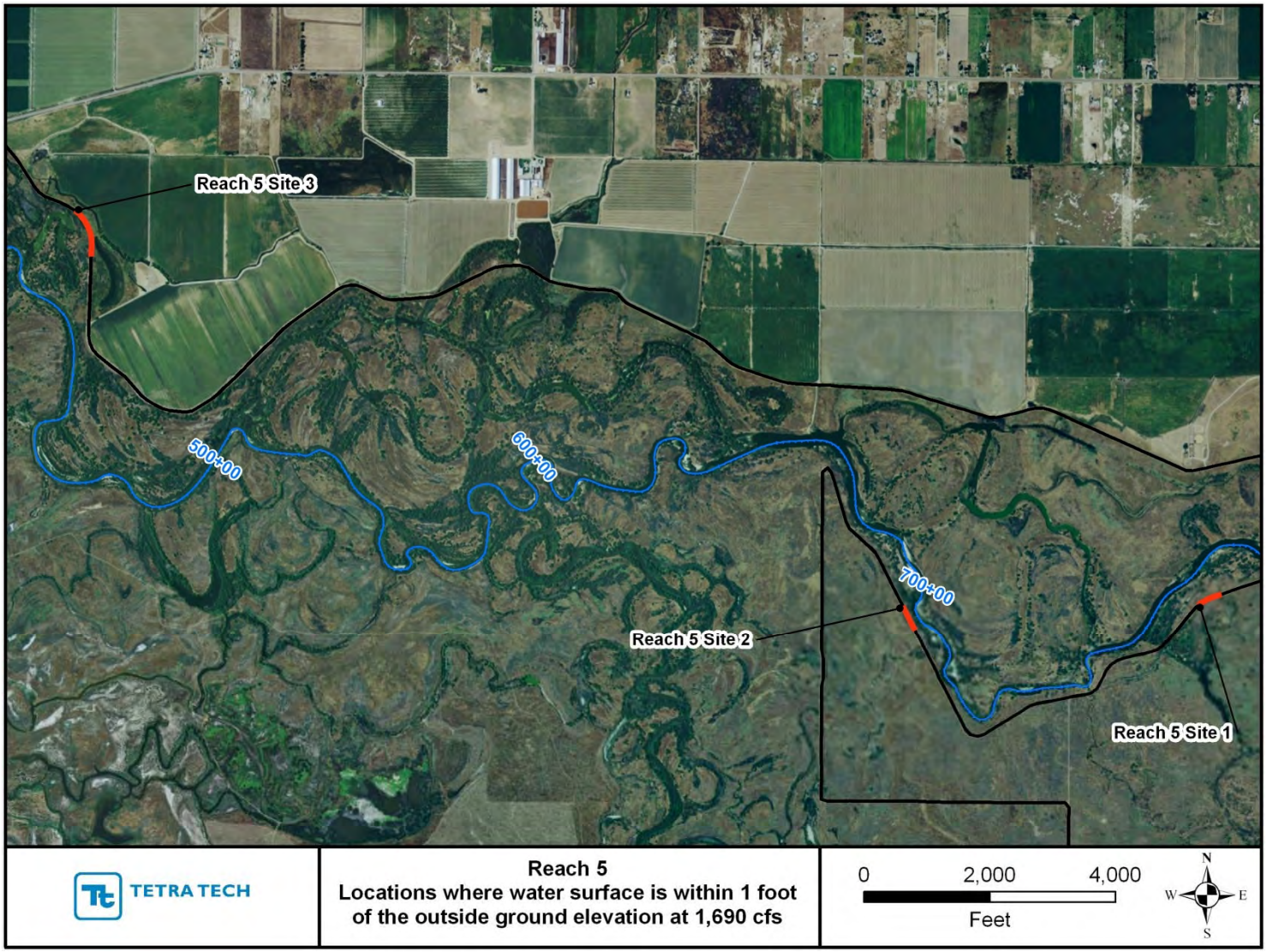

Figure 13. Map showing locations in Reach 5 where the 1,690-cfs water-surface elevation is within 1 foot of the outside ground elevation.

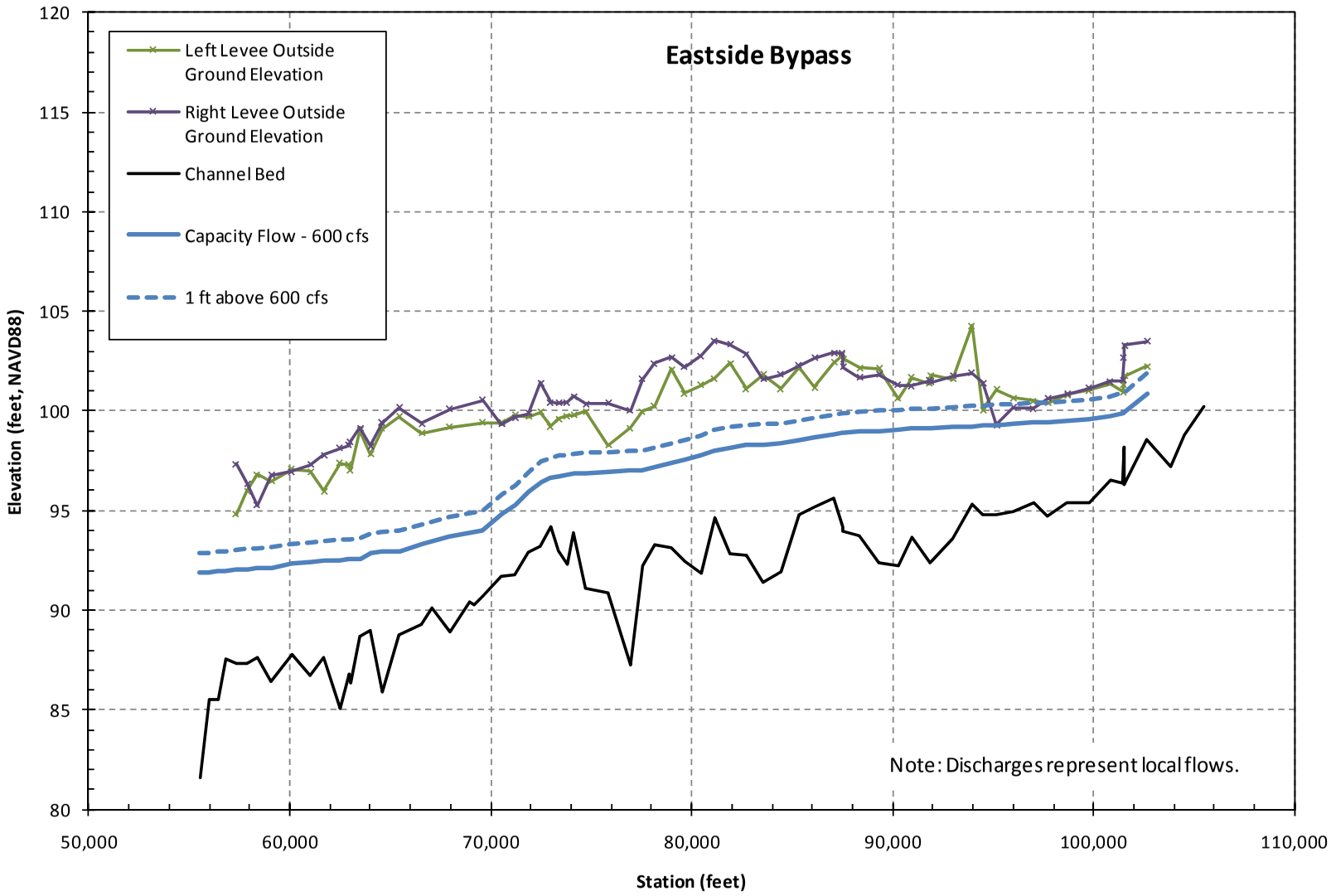

Figure 14. Outside ground elevations and computed water-surface profiles in the Eastside Bypass at and 1 foot above the local discharge of 600 cfs.

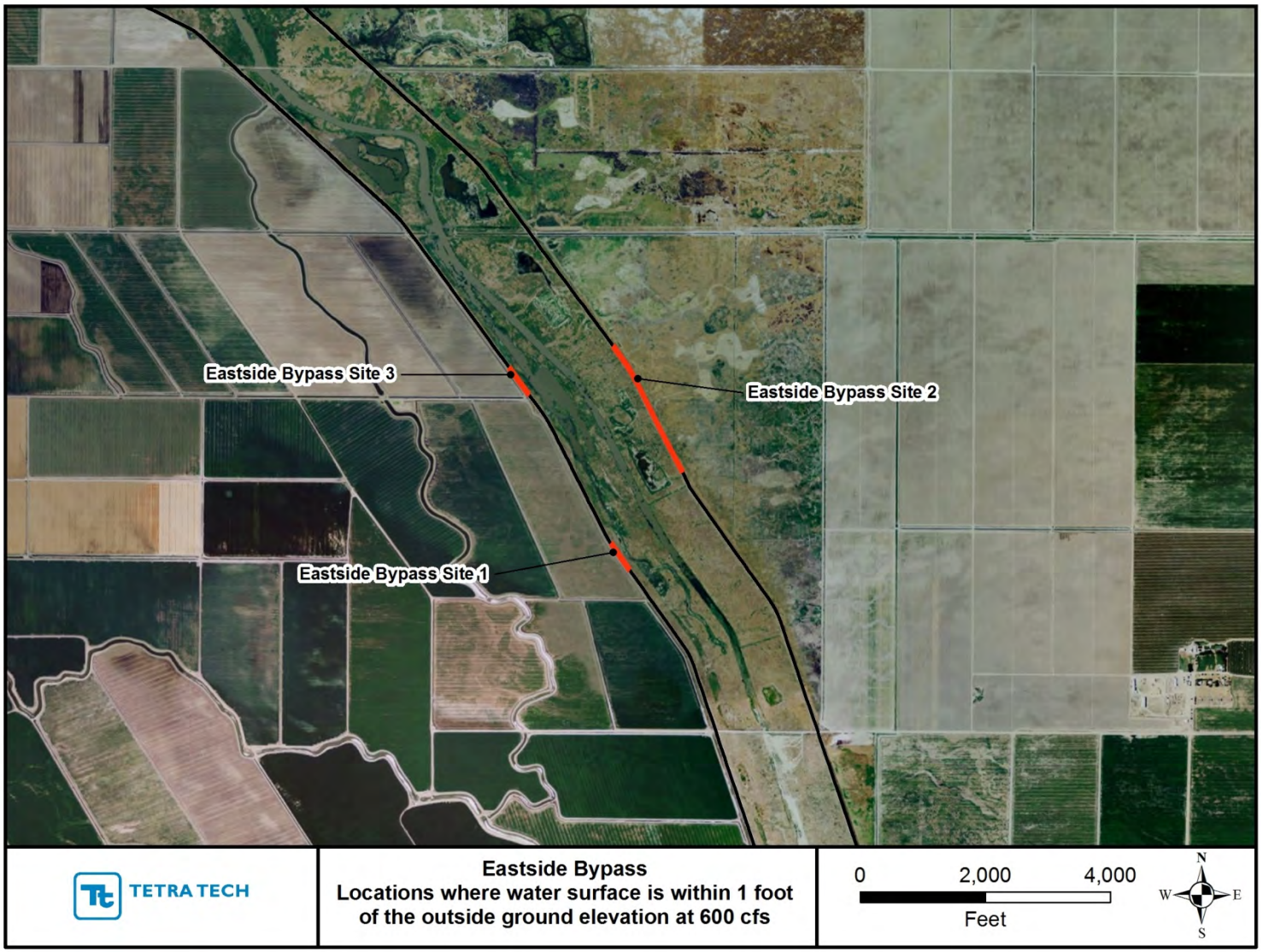

Figure 15. Map showing locations along the Eastside Bypass where the 600-cfs water-surface elevation is within 1 foot of the outside ground elevation.

Appendix J – Draft Restoration Flow Guidelines, February 2011

(Working Copy – Subject to Revision)

DRAFT

Paragraph 13j Compliance: Restoration Flow Guidelines

DRAFT 1
November 2010

Table of Contents

Tables

Figures

Appendices

Abbreviations and Acronyms

ATR	Annual Technical Report
CDEC	California Data Exchange Center
cfs	cubic feet per second
CVP	Central Valley Project
DWR	California Department of Water Resources
RA	Restoration Administrator
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
RWA	Recovered Water Account
Secretary	Secretary of the Interior
Settlement	Stipulation of Settlement in *NRDC, et al. v. Kirk Rodgers, et al.*
SJRRP	San Joaquin River Restoration Program
TAC	Technical Advisory Committee
TAF	thousand acre-feet

Purpose

This document describes procedures developed to comply with Paragraph 13(j) of the Stipulation of Settlement in NRDC, et al. v. Kirk Rodgers, et al. (Settlement). This document follows the structure of Paragraph 13(j).

The Restoration Flow Guidelines are not limited to the items enumerated under Paragraph 13(j) of the Settlement: where necessary, this document will be amended to include relevant guidelines not anticipated by the Settlement.

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Paragraph 13.(j)(i)

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

This section describes the process to develop the volume and pattern of Restoration Releases including guidelines for transmissions of year types and timing (default flow schedules) from U.S. Department of the Interior, Bureau of Reclamation (Reclamation) to the Restoration Administrator (RA) and guidelines for Reclamation to receive the RA flow schedule recommendation. The ecological basis for this approach is attached as Appendix D. The following section addresses 13(j)(i) by:

- ~~***Calculating Year Types and***~~***Technical Process for Setting the Year Type and Default Flow Schedule~~s*** – ~~Restoration flows vary in shape and volume according to the annual inflow of the San Joaquin River. The first~~ This section ~~outlines~~ provides technical procedures for: determining the volume of water year ~~inflow~~ runoff on the San Joaquin River, identifying the Restoration Year type, ~~calculating the associated annual allocation,~~ and setting the default flow schedule.
- ***Coordination with RA on the Release of Restoration Flows*** – ~~Setting the flow schedules requires a communication process between Reclamation and the RA. The following~~This section provides guidance for communications between Reclamation and the RA, including schedules and content for the following transmissions: ~~transmissions from~~ Reclamation ~~to the RA~~ determinations of ~~on~~ year type and default flow schedules, ~~content for~~ RA flow schedule recommendations, evaluation of RA recommendations for consistency with the Settlement and Legislation, and management of Friant Dam for Restoration Flows.

~~***Calculation of Year Types and***~~***Technical Process for Setting the Year Type and Default Flow Schedule~~s***

The full natural ~~inflows~~ runoff on the San Joaquin River at Friant Dam over the course of the water year (October through September) sets the allocations and default releases for each Restoration Year (March through February). The overlap of Restoration, calendar, and water years is illustrated in Figure 1~~Figure 1~~.

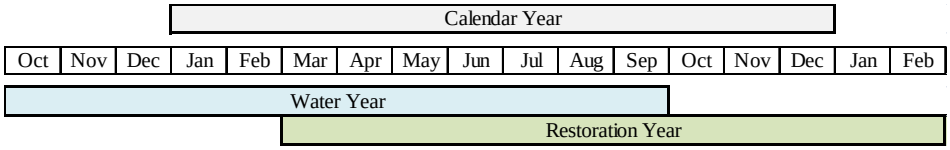


Figure 1.
Overlap Among Calendar, Water, and Restoration Years

Step 1: Determining Water Year ~~Inflow~~Runoff

All determinations of unimpaired water year runoff at Friant Dam will be conducted by Reclamation using the best available records and forecast information. Reclamation will document the sources and information used to produce runoff forecasts, which may include:

A. California Department of Water Resources (DWR) *Full Natural Flow Below Friant Dam* records, as reported by the California Data Exchange Center (CDEC)[1].

B. Forecasts of runoff for the January-through-September period, as reported by the National Weather Service (NWS) California-Nevada River Forecast Center[2].

C. Forecasts of runoff for the April-through-July period, as reported in the monthly DWR Bulletin 120 water supply forecasts.

D. Forecasts of runoff for the April-through-July period, as reported in DWR's weekly updates to the Bulletin 120 forecasts.

E. Forecasts of runoff for the months of August and September, as provided by the 50-percent exceedance forecasts reported in Bulletin 120.[3]

Inflow estimates used for setting the Restoration Annual Allocations will be the same as those used to support the Friant Division water supply allocation.

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

~~Reclamation will determine the total water year inflow from both published historical inflows and forecasts for the remainder of the year. Reclamation will use the record of *Full Natural Flow Below Friant Dam* for periods that have past, as reported by the California Data Exchange Center (CDEC). Reclamation will forecast inflow for the April through July period will be constrained between the 50- and 90-percent exceedance reported in the California Department of Water Resources (DWR) Bulletin 120 water~~

[1] http://cdec.water.ca.gov/cgi-progs/staMeta?station_id=sjf
[2] http://www.cnrfc.noaa.gov/
[3] The DWR Bulletin 120 forecasts full natural inflow to Friant Dam for the April – July period at 10-, 50-, and 90-percent exceedance probability levels. Bulletin 120 also provides forecasts for August and September, but only at the 50-percent exceedance level.

~~supply forecasts. Forecasts for periods of the year that follow the April through July period will use the 50 percent exceedance forecasts reported in Bulletin 120.~~

~~Reclamation will maintain consistency between the forecasts used to set San Joaquin River Restoration Program (SJRRP) annual allocations and those used to set Friant Division water supply allocations.~~

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

Table 1 identifies the Restoration annual allocation with respect to the unimpaired water year ~~inflow~~runoff, along with the ranges of Restoration Year types identified in the Settlement.

Table 1.
Restoration Year Type and Allocation

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

Key:
AF = acre-feet
TAF = thousand acre-feet
† - Includes assumptions about diversions and losses in Reach 1, per Exhibit B of the Settlement
‡ - Total volume of Restoration Releases passing Gravelly Ford flow gage, including 5 cfs from pre-SJRRP releases

Reclamation will interpolate between the volumes identified in Table 1 to calculate the annual allocation for each Restoration Year to the nearest thousand acre-foot (TAF). Figure 2~~Figure 2~~, below, illustrates this method.

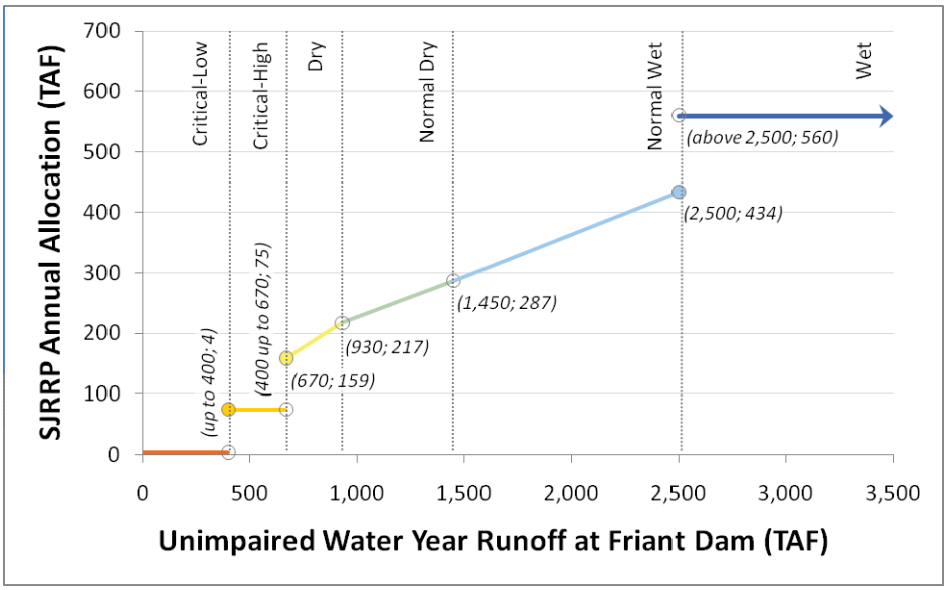


Figure 2.
SJRRP Annual Allocation above Existing Riparian Deliveries as a Function of Unimpaired ~~Inflow~~Runoff at Friant Dam

Comment [JTP1]: Figure updated for following:

MCWPA Comment: Typo in x,y axis labels.

FWA Comment: Change x-axis label from "Inflow below" to "Runoff at"

Step 3: Setting the Default Flow Schedule

Default flow schedules provide an initial daily distribution of the annual allocation and a starting point for RA flow schedule development. Default flow schedules do not consider Settlement provisions for flexible flow shifts, real-time management of flows, use of buffer flows or the potential for releases above the requirements of the Settlement for flood management, or management of unexpected seepage losses. Following acceptance of RA flow schedules, the default schedules are no longer relevant.

Appendix B (attached to this document) provides lookup tables for identifying default flow schedules. The lookup tables index flow schedules by both date and remaining allocation. The following sections describe how to calculate and use the remaining allocation to look up the default flow schedule.

The tables in Appendix B, or additional tables for time periods not considered in Appendix B, can be derived from the procedures in Appendix D, Default Flow Schedule Transformation.

Calculating the Remaining Allocation

The remaining allocation is the annual allocation reduced by the volume of Restoration Releases made to date. The volume of Restoration Releases made to date is the sum of mean daily flows at Gravelly Ford less 5 cubic feet per second (cfs). Prior and anticipated releases of Buffer Flows, purchased water, other releases in excess of the

Restoration Flow schedule~~, and~~ – including releases for other contractual obligations – will not be debited against the Restoration annual allocation.

Setting Default Flow Schedules

The tables in Appendix B reflect default flow schedules for each inflection point in Figure 2~~Figure 2~~: for each date considered in the tables, the portion of the default flow schedule that has passed has been subtracted from each row's total annual allocation to determine the remaining allocation for each date.

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

The tables provided in Appendix B reflect implementation of the 'gamma' transformation pathway, which is one of the four possible methods for distributing an annual allocation into a default flow schedule. The RA may request changes to the default flow schedule to use any of the transformations, or some hybrid thereof.

Coordination with the RA on the Release of Restoration Flows

On or before January 20th of each year, Reclamation will transmit the first determination of the Restoration Year Type and Default Flow Schedule for the following Restoration Year. Default flow schedules will be updated in a timely manner following each monthly release of DWR's Bulletin-120 water year runoff forecast for the San Joaquin River; or more frequently if determined necessary by Reclamation or requested by the RA. Reclamation will discuss forecasts with the RA before a declaration of default flow schedule. Monthly or more frequent updates to the allocation and schedule, monitoring data, and Friant Dam operations will continue until the RA and Reclamation agree that additional meetings throughout the year are no longer necessary. The final determination of Restoration annual allocation and default flow schedule will occur no later than ~~the end of~~ July 31st.

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

Comment [JTP2]: ISSUE FLAGGED:

FWA and NRDC disagree on the timing of final determinations.

Comment [JTP3]: Comments discussed by FWA and NRDC set a date for the first RA recommendation only, but neglected to discuss timeframes for RA recommendations thereafter.

Suggested 2 week turn-around is based upon language drafted for January 20th determination, and January 31st RA recommendation.

Transmissions to the Restoration Administrator from Reclamation

~~Default flow schedules will be updated monthly; or more frequently if determined necessary by Reclamation or requested by the RA. Reclamation will discuss forecasts with the RA before a declaration of default flow schedule. Monthly or more frequent updates to the allocation and schedule, monitoring data, and Friant Dam operations will continue until the RA and Reclamation agree that additional meetings throughout the year are no longer necessary. The final determination of Restoration annual allocation and default flow schedule will occur no later than the end of July.~~

Comment [JTP4]: Scheduling language moved to up-front section.

~~The~~ With each determination of Restoration Year Type and Default Flow Schedule update ~~RA will receive from~~ Reclamation will transmit the following to the RA, in writing:

- A Restoration budget including: the annual allocation, releases counted toward the annual allocation, releases of buffer flows, releases of purchased water, the remaining allocation, and volumes of water banked, stored, or exchanged for future use to supplement future Restoration Flows ~~any volume of water held in reserve for Restoration in Millerton Reservoir due to insufficient channel capacity (per Paragraph 13(i)(1))~~.

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

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

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

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

- ~~On or before February of each year, Reclamation will transmit an initial announcement of the default flow schedules for the upcoming Restoration Year.~~

Comment [JTP5]: Scheduling language moved to up-front section.

Reclamation will notify the RA when conditions necessitate a change in operating criteria for Friant Dam. Unless immediate action is required (e.g., to provide public health and safety), ~~-~~Reclamation will provide the RA with a 48-hour notice in writing and by phone of changes to the RA's most recent flow recommendation. Reclamation will make information publically available and notify RA and SPs of its availability.

Consultation with Federal Fisheries Agencies

Comment [JTP6]: Requires review by NMFS, USFWS and DFG for potential participation

The RA will consult with the U.S. Fish and Wildlife Service (USFWS) and NOAA Marine Fisheries Service (NMFS), and the USFWS and NMFS are responsible for providing input on the RA flow recommendations for meeting the Restoration Goal through participation in the SJRRP Technical Advisory Committee (TAC).

Restoration Administrator Flow Schedule Recommendations

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

~~The RA should make a recommendation to Reclamation following the receipt of each default flow schedule, and may make further recommendations at other times as determined necessary by the RA. Reclamation may request additional recommendations as necessary to assist its determination of water supply allocations, or to help manage emergency conditions. At any time, the RA may submit a new flow schedule or revise an existing flow schedule, provided that the recommendation is complete and consistent with the Settlement and these Restoration Flow Guidelines.~~

RA recommendations include the following, as appropriate:

Flow Schedule. The rate and timing of Friant Dam releases for the entire annual allocation across the current Restoration Year~~, including characterizations of all recommended flows by account (e.g., flexible flow shifts for Spring and Fall periods, Buffer Flow releases)~~. The schedule should demonstrate consistency with the annual allocation, and ~~flexible flow~~other provisions of the Settlement.

~~**Flow Targets.** The pattern of anticipated diversions and seepage losses between flow monitoring locations, and anticipated transitions between monthly flow targets.~~

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

Buffer Flows. The recommended use of Buffer Flows.

~~**Proposals for Purchased Water**. The recommended acquisitions and use.~~

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

Use of banked or stored water. Provide a recommendation regarding the use of water that has been banked or stored pursuant to Paragraph 13(i)(1) and (2)

Recommendation on unreleased flows. When there are unreleased Restoration Flows, the RA may make recommendations regarding the management of such water

Comment [JTP7]: Wordsmithing on January 19th, 2011 ended here for lunch. Remainder of day focused on compliance at Gravelly Ford, and calculation of RWA.

Changes to text below reflect language suggestions from FWA, RA and NRDC.

------ Reinitiated editing here on 2011.0201

Comment [JTP8]: FLAGGED ISSUE

Reclamation/NRDC discussion on this topic will need to continue in Gravelly Ford Compliance, potentially 13(j)(iv)

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

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

Consistency of RA Recommendations with Settlement and Legislation

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

Reclamation ~~can~~ will implement the RA flow schedule under the following conditions:

- ~~There is a clear accounting of recommended releases of Restoration Flows, Buffer Flows and purchased water~~
- The recommendation ~~accounts for a~~schedules a volume of water equal to the most current full allocation for Restoration, ~~including notation of~~ with flexible flow shifts, and additional schedules of Buffer Flow releases, ~~and the~~ recommended releases of purchased water, and releases of water pursuant to Paragraph 13(i)
- The timing of releases is consistent with provisions for flexible flow operations in Exhibit B of the Settlement
- The implementation of releases will be consistent with the Settlement regarding effects on water supply reductions to Friant Division long-term contractors
- The releases do not cause public safety concerns
- The recommendation is otherwise consistent with the terms and conditions of the Settlement, the Legislation and permit conditions

Comment [JTP9]: RA recommendation:

Check for legislation and permit conditions language throughout rest of document.

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

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

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

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

or safe operating criteria, Reclamation will inform the RA within 24 hours of any discrepancies and request a revised recommendation.

~~Reclamation must receive a recommendation which is consistent with the Settlement and Legislation before implementing a change in releases. Each RA recommendation will be reviewed for acceptability by Reclamation within 5 days of receipt unless there is an immediate request for a real-time change in flows to respond to critical conditions in the river, which affect the near-term survival of fish. In the case of critical conditions, Reclamation will respond within 24 hours. If the recommendation does not conform to either the Settlement or safe operating criteria, Reclamation will inform the RA of discrepancies and request a revised recommendation.~~

Management of Friant Dam Releases for Flow Targets

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

Other sections of this document describe compliance with Gravelly Ford flow targets (Paragraph 13.(j)(ii)) and releases for Unexpected Seepage Losses (Paragraph 13(j)(iv)).

1

2 *This page left blank intentionally.*

3

4

Paragraph 13.(j)(ii)

Procedures for the measurement, monitoring and reporting of the daily releases of the Restoration Flows and the rate of flow at the locations listed in Paragraph 13(g) to assess compliance with the hydrographs (Exhibit B) and any other applicable releases (e.g., Buffer Flows)

Reclamation will finalize and publish flow rates for Restoration releases and other applicable ~~flows~~ releases monthly. Reclamation and the implementing agencies will assist the RA and the Technical Advisory Committee (TAC) in the development of information needed to inform the RA's flow recommendations. This assistance will be guided by the development of an Annual Technical Report, and an Annual ~~Agency Plan~~Monitoring and Analysis Plan.

Measurement, Monitoring, and Reporting of Daily Flow Rates

In addition to publishing finalized monthly flow rates and volumes, Reclamation will provide provisional telemetry data on-line (via CDEC) and publish final flow data on-line monthly. 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[4]
2. At Gravelly Ford[5]
3. Below the Chowchilla Bifurcation Structure[6]
4. Below Sack Dam[7]
5. At the head of Reach 4B[8]
6. At the San Joaquin and Merced river confluence[9]

Flow data collection will comply with U.S. Geological Survey guidelines for flow measurement.[10]

[4] http://cdec.water.ca.gov/cgi-progs/stationInfo?station_id=MIL
[5] http://cdec.water.ca.gov/cgi-progs/stationInfo?station_id=GRF
[6] http://cdec.water.ca.gov/cgi-progs/staMeta?station_id=SJB
[7] http://cdec.water.ca.gov/cgi-progs/staMeta?station_id=SDP
[8] http://cdec.water.ca.gov/cgi-progs/staMeta?station_id=SWA
[9] http://cdec.water.ca.gov/cgi-progs/staMeta?station_id=SMN
[10] Buchanan, T.J., and Somers, W.P., 1969, Discharge measurements at gaging stations: U.S. Geological Survey Techniques of Water-Resources Investigations, book 3, chap A8, 65 p.

Development and Publication of the Annual Technical Report

The Annual Technical Report (ATR) will provide summaries of monitoring information; results and progress made on scientific and analytical studies for both physical and biological conditions. Annually, an ~~Agency Plan~~Monitoring and Analysis Plan will be developed to integrate monitoring efforts and scientific studies. The ATR will be published twice a year in draft form (July and November) before it is finalized and published following the conclusion of each Restoration Year (in March). This schedule is depicted relative to the six Exhibit B flow schedules in Figure 3.

The ATR will include:

- A summary of actions taken during the previous year to implement the Settlement and RA recommendations, including an account of Restoration Flows, physical and biological monitoring results, and real-time operation decisions
- 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
- Existing limitations on Restoration releases
- Write-ups and technical data for studies and monitoring activities

Following each Spring Period, Reclamation will provide drafts of the ATR to the RA, the TAC, the Settling Parties, and the public for review, and will incorporate comments into the final ATR.

Development and Publication of the Monitoring and Analysis ~~Agency~~ Plan

Comment [JTP10]: FLAG

Reclamation to find a home for suggested plans for Par 13(i) and 11 issues

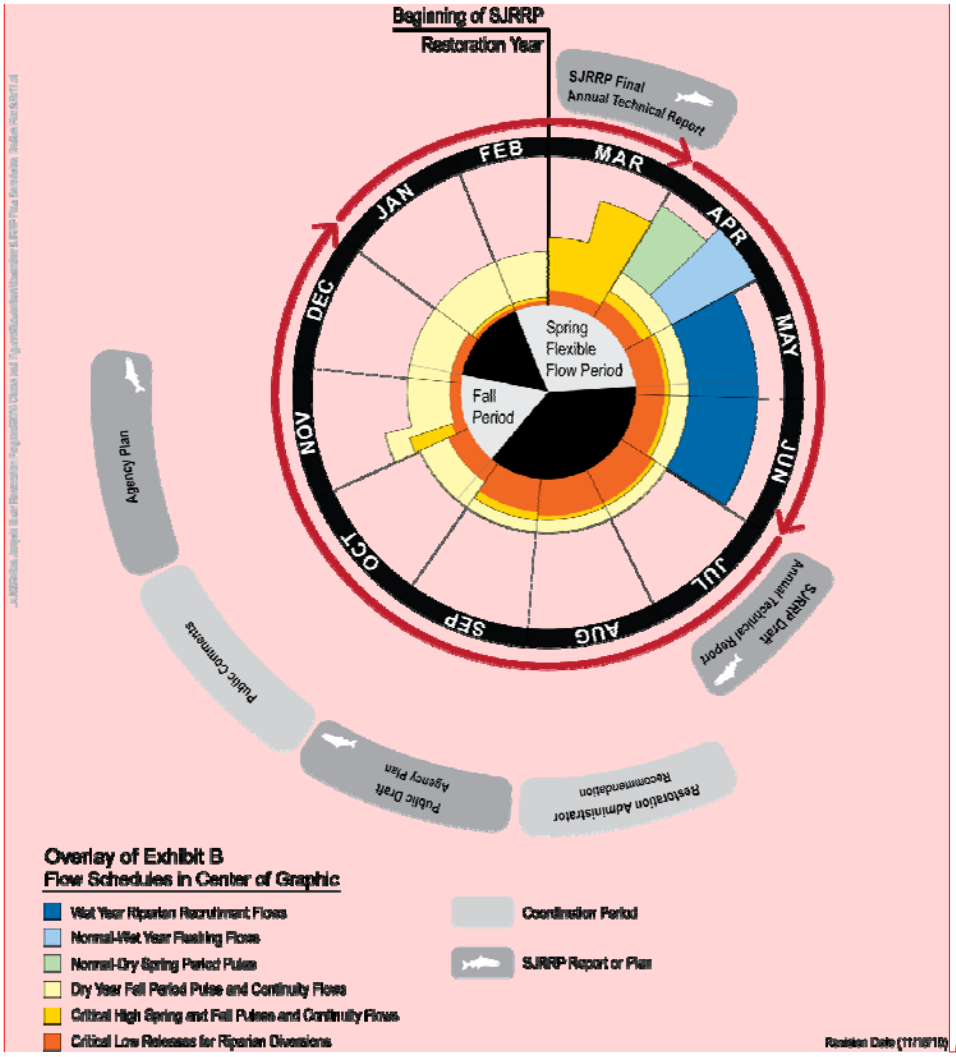
The ~~Agency~~ Monitoring and Analysis Plan will publish the following information:

- A discussion of the RA recommendations and factors influencing the release of Restoration Flows (e.g., operating agreements, construction schedules, management plans, and environmental compliance coverage)
- A description of planned monitoring activities and locations for the following Restoration Year including a plan for monitoring and determining unexpected gains and losses in reaches of the river between Gravelly Ford and the Merced River.

- A list of analyses and studies being conducted to improve implementation of the Settlement and Legislation (to be reported on in the ATR)

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

To the greatest extent possible, the ~~Agency Plan~~Monitoring and Analysis Plan will incorporate RA recommendations for monitoring and analysis. The schedule for coordination on the ~~Agency Plan~~Monitoring and Analysis Plan is displayed in Figure 3, below.



Comment [JTP11]: NRDC comment:

Jan updates would be useful on:
- flow v water quality (temp, DO, etc)
- reach losses
- fish & biological monitoring
- cold water pool summary
- updates on specific studies

Figure 3.
Publication Schedule for SJRRP Annual Technical Report and ~~Agency Plan~~Monitoring and Analysis Plan

Flow Compliance Evaluation

{Placeholder for text under development.}

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Paragraph 13.(j)(iii)

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

Determining Reductions in Water Deliveries to Friant Division Long-Term Contractors

Reductions in Water Deliveries will be recorded in each contractor's individual Recovered Water Account (RWA). RWA accounts will be 'credited' for reductions in supply, and 'debited' for water supply mitigation benefits. Procedures for crediting and debiting are described in the sections below.

RWA balances will be updated at least annually based upon information available as of the beginning of each Restoration Year (March 1). RWA balances may be updated more frequently if sufficient information is available to do so.

Comment [JTP12]: Flagged as an issue of disagreement between FWA and NRDC.

RWA Debits

The following actions will expend RWA credits:

- Water delivered under the RWA as "$10 Water"
- Water released for Restoration Flow, and subsequently recaptured and recirculated to Friant contractors
- Water supply mitigation benefits, as determined in contracts between the Friant Division contractors and Reclamation to implement and operate local projects funded pursuant to Part III of the implementing Legislation
- Water supply mitigation benefits resulting from programs or projects implemented by the State of California or federal agency specifically to mitigate the water delivery impacts caused by the Interim and Restoration flows

RWA Credits

Reclamation will calculate Reductions in Water Deliveries for the RWA using a comparison of model output in Wet and Normal-Wet year types, and measured flow rates during all other periods. RWA credits accumulated for the release of Buffer Flows will be calculated using measured flow rates.

The following sections discuss the modeling and measured flow methods separately.

Model Calculation Method

Reclamation will employ a daily simulation model for estimating the change in Friant Division deliveries for both Wet and Normal-Wet Restoration Year types. A daily mass-balance model will calculate pre-SJRRP (baseline) and post-SJRRP conditions: the difference between the two conditions quantifies the Reduction in Water Deliveries.

The daily mass-balance model calculates storages and spills at Friant Dam in response to measured Lake Millerton storage on March 1, the record of daily inflows, the actual schedule of Restoration Flows (without Buffer Flows), and an assumed schedule of diversions from Friant Dam. All inputs to the model will be taken from records, with the exception of the assumed pattern of canal deliveries, which is plotted as a cumulative volume in Figure 4~~Figure 5~~. This pattern of deliveries begins on March 1, and proceeds at a constant daily diversion rate that accumulates to 1.35 million-acre feet by July 31. Between August 1 and the last day in February, a rate of flow is selected such that the cumulative annual diversion equals the total available annual inflow (calculated as cumulative inflow minus the pre-SJRRP riparian water supply release requirement).

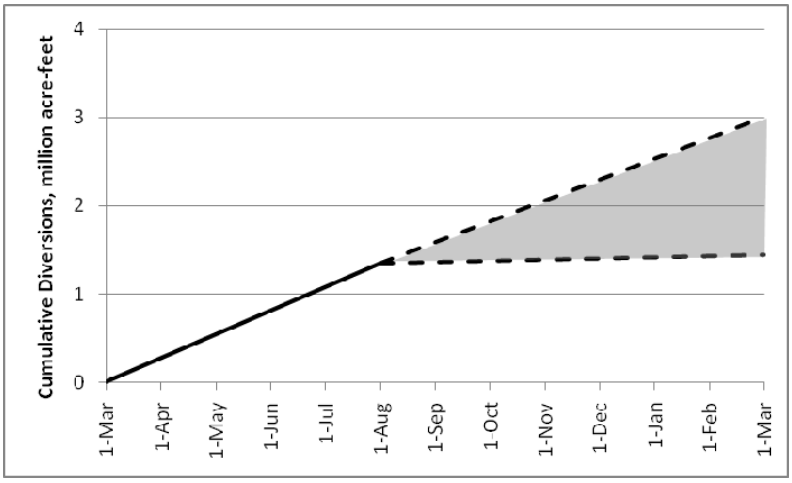

Figure ~~4~~5.
Assumed Cumulative Diversion Schedule from Friant Dam,
Diversions After July 31 Vary, Such that the Schedule for
Cumulative Diversions Equals Cumulative Inflow by the End of February

Simulated total diversions for pre- and post-SJRRP model runs will be compared to calculate RWA credits.

Measured Flow Calculation Method

Reclamation will employ a measured flow calculation method for estimating the change in Friant Division deliveries for Normal-Dry, Dry, Critical-High and Critical-Low Restoration Year types. Friant Dam releases made to meet SJRRP flow targets, above

those made to maintain the pre-SJRRP flow target at Gravelly Ford will be counted toward the RWA using a one-to-one ratio.

Adjustments to RWA Credits for Late Season Spills

Reclamation will reduce the RWA credits accumulated by the volume of Restoration Flows between August and February that are met by spills that occur after the end of snowmelt runoff, and after storages in Friant Dam have been brought under control.

Buffer Flow RWA Calculations

Reclamation will maintain a record of Buffer Flows released as part of their obligations under the Settlement, and will credit the RWA with 1.25 acre-feet of credits per acre-foot of Buffer Flows released. Whenever a spill occurs in actual operations, Reclamation will not credit the RWA for the scheduled release of Buffer Flows that have been met by spills.

Comment [JTP13]: Flagged for disagreement between FWA and NRDC

Individual RWA Accounts

Following each calculation of reductions in water supply, RWA credits will be distributed among long-term contractors based upon the relative proportion of contract volumes among water service contractors. ~~The first c~~Credits in any given water year will be distributed among Class 1 contractors for Class 1 water supply reductions attributable to Restoration Flow releases proportional to each contractor's share of the total Class 1 contract volume~~, up to the point that the total Class 1 deliveries and the total RWA credits distributed equals the total contract supply for Class 1 water~~. ~~Remaining RWA c~~Credits will be distributed among Class 2 contractors ~~holders~~for Class 2 water supply reductions attributable to Restoration Flow releases, proportional to ~~their~~ each contractor's share of the total Class 2 contract volume.

Reclamation will maintain RWA accounts for each of the Friant Division long-term contractors. Reclamation will be notified of any transfer of RWA credits among Friant Division contractors, by all parties involved in the transfer.

Allocation and use of $10 Water

Comment [JTP14]: Following language for this chapter was inserted, at suggestion of FWA. Redlines reflect edits to that language at 2011.0215 meeting

Each Contractor with an RWA balance will have access to $10 Water upon a determination by Reclamation that hydrologic and Millerton Reservoir management conditions warrant. If there is insufficient $10 Water available to meet demand and/or capacity to take delivery, then delivery will be based on relative balances in RWA accounts.

$10 Water would be made available to Friant Contractors as a priority for delivery before "215 Water" but after the priority for Class 1 and Class 2 contract supplies.

The Contractors will have the ability to exchange, bank, or transfer $10 Water supplies.

Contractors will not lose RWA credits if they do not take $10 water made available by Reclamation at any given time. A Contractor may take $10 Water in anticipation of

future impacts, but only after Contractors that have a credit balance in their RWA have had an opportunity to take water needed to meet those RWA-related impacts.

In the event of a canal conveyance prorate, and if the priority of water service being prorated is within the RWA Water tier, then conveyance capacity will be prorated on RWA balances. Contractors not intending to take $10 Water will communicate their intent in a timely manner so that available water supplies or transmission capacity can be subsequently reallocated to those taking $10 water, based on the RWA balances. The BOR shall implement an iterative allocation process to achieve these results using a procedure like that used to allocate uncontrolled season Class 2 Water.

Allocation and Use of Recaptured/Recirculated Water

All flows recovered under Section 16(a) of the Settlement Agreement ("Recaptured/Recirculated Water" or "R/R Water") shall be allocated back to the Contractors based on Recovered Water Account balances, with one exception: R/R Water released as Restoration Flows in any water year, and physically returned to the Friant system by September 1 of the same water year, will be considered part of that year's water supply and allocated and administered in accordance with normal contracting procedures, including the ability to schedule delivery any time in the water year or otherwise consistent with contract terms. Subsequently, as water that has been fully integrated into the final declaration for that water year, it will not be a part of the calculation of water accrued to any contractor's Recovered Water Account.

Recaptured/Recirculated Water will be delivered to the Friant system via exchanges in a manner that places the Recaptured/Recirculated Water in the Friant System such that it is available for distribution to all Contractors or in such other manner as one or more Contractors request to meet their needs.

R/R Water that can only be returned through arrangements requiring delayed return, thus resulting in delivery after September 1 of the same water year in which it was released, will be allocated based on RWA balances.

Note: This allocation mechanism for R/R Water will sunset after 10 years or earlier if agreed to by the Contractors. This sunset provision has been included with the stated intent of reassessing this negotiated allocation mechanism to determine whether it has fairly allocated R/R Water among the Contractors based on the actual water supply losses experienced due to Restoration Flows contributed by each Contractor. This sunset provision is to be invoked at the end of the initial ten-year period without prejudice to any allocation mechanism, including this one, but rather to consider any and all allocation mechanisms on the basis of fairly distributing R/R Water based on actual sustained long-term water losses from river restoration contributions.

Contractors will be able to exchange, bank, or transfer Recaptured/Recirculated Water supplies. Contractors will not lose RWA credits if they do not take Recaptured/Recirculated Water made available by Reclamation at any given time.

If Recaptured/Recirculated Water is not fully subscribed, Contractors will be able to take Recaptured/Recirculated Water in anticipation of future impacts, but only after Contractors that have a balance in their Recovered Water Accounts have had an opportunity to take water needed to meet those RWA impacts.

Contractors not intending to take Recaptured/Recirculated Water will communicate their intent in a timely manner so that available water supplies or transmission capacity can be subsequently reallocated to those taking Recaptured/Recirculated Water. The BOR shall implement an iterative allocation process to achieve these results using a procedure like that used to allocate uncontrolled season Class 2 Water.

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Paragraph 13.(j)(iv)

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

Determining Downstream Surface or Underground Diversions or Seepage Losses ~~and Pumping Increases~~ Beyond Levels Assumed

~~Seepage~~ Downstream surface or underground diversions or seepage losses in the San Joaquin River beyond the levels assumed in Exhibit B ~~between the Mendota Pool and the Merced River confluence~~ will be assessed at least once a year using information collected from flow monitoring along the San Joaquin River for each reach between Friant Dam and the Merced River confluence. Long-term average differences in flow rates between flow monitoring locations will be used to inform expectations for future seepage losses. Reclamation will summarize findings, and make recommendations on future seepage loss expectations for the following Restoration Year in each Annual Technical Report (see Paragraph 13(j)(ii) compliance).

Pursuant with Settlement language in Paragraph 13(f), Reclamation will work together with the Settling Parties 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.

Management of Purchased Water for Unexpected Seepage Losses

Comment [JTP15]: Flagged for further consideration.

Seepage losses will be quantified monthly as the difference between flows recorded at the Gravelly Ford gage and the gages downstream from the Chowchilla Bifurcation Structure. Unexpected Seepage Losses will have occurred when the total monthly difference exceeds the assumed monthly volumes reported in Exhibit B and flows are determined to be below targets as described by the compliance methods for Paragraph 13.(j)(ii).

Reclamation will take the following steps to manage Unexpected Seepage Losses.

1. First, Reclamation will use any available unstorable water, not contracted for by the long-term contractors.

2. Next, Reclamation will use purchased water, including any water that has been stored or carried over, until it has been exhausted.

3. If the RA recommends and Reclamation determines it to be practical, an additional amount of purchased water, up to 22 TAF, will be acquired by Reclamation from willing sellers to address Unexpected Seepage Losses.

4. Next, in consultation with the National Marine Fisheries Service and the RA, portions of the total annual allocation will be scheduled for release during the current Restoration Year.

5. Next, Reclamation will obtain recommendations from the RA on the use of Buffer Flows.

The decision about whether or how much purchased water will be released will be determined by Reclamation.

Paragraph 13.(j)(v)

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

Default Changes at Friant Dam

Reclamation will make changes to releases from Friant Dam according to flow schedules consistent with Exhibit B. Reclamation will compute potential adjustments to releases to achieve compliance by comparing the required change in average flow rate and dividing by the number of days remaining in the time period. Reclamation will increase releases from Friant Dam if:

- Average flow rates are more than 10 percent below target flow rates
- Changes in Friant Dam releases would exceed 25 cfs
- More days remain in the flow period than the transition time as described in 13.(j)(ii)

Reclamation will decrease releases from Friant Dam if:

- Mean daily releases from Friant Dam would remain greater than or equal to 350 cfs
- Average flow rates are more than 10 percent above target average flow rates
- Changes in Friant Dam releases would exceed 25 cfs
- More days remain in the flow period than the transition time

Reclamation will resume the planned release schedule from Friant Dam when average mean daily flow rates equal target average flow rates.

Real-Time Adjustment

Real-time changes to the actual releases from Friant Dam necessitated by unforeseen or extraordinary circumstances consist of deviations from hydrograph-based flow schedules and the flexible flow period provisions described in Exhibit B. Real-time changes to releases from Friant Dam will suspend compliance calculations until such changes have completed and transitioned back to scheduled flows.

The RA may request a change in release from Friant Dam through written communication to Reclamation. Real-time changes must identify the change in magnitude and duration of releases from Friant Dam and the corresponding volumetric reduction in subsequent releases or the use of Buffer Flows.

The Secretary of the Interior (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, before taking any such action, the Secretary will consult with the RA regarding the timing and implementation to avoid adverse effects on fish to the extent possible. The Secretary will 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 RA, will release, to the extent reasonably practicable, the quantity of water that would have been released in the absences 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.

Paragraph 13.(j)(vi)

Procedures for determining the extent to which flood releases meet the Restoration Flow hydrograph releases made in accordance with Exhibit B. Such guidelines shall also establish the procedures to be followed to make amendments or changes to the guidelines.

Determining the Extent to Which Flood Releases Meet Restoration Flows

For the purposes of this section, flood releases are defined by days when the recorded average Friant Dam release exceeds the releases requirement to meet targets at the Gravelly Ford gage station. During these periods, the quantity of flow subtracted from the annual allocation will equal the volume of flow provided in the most recent and adopted Restoration Flow schedule.

Guideline Revision Process

Reclamation may review and revise the Restoration Flow Guidelines at any time in consultation with the Settling Parities and will notify the RA of any revision process. The RA may submit recommendations for revising the Restoration Flow Guidelines at any time. Incorporation of comments into the next Restoration Year requires submittal by January 1.

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