

# Placer County Water Agency Middle Fork American River Project (FERC Project No. 2079)

## *DRAFT* INSTREAM FLOW AND RESERVOIR MINIMUM POOL MEASURE



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**List of Acronyms**

Agencies	United States Department of Agriculture-Forest Service, California Department of Fish and Game, and the California State Water Resources Control Board
cfs	cubic feet per second
IFRM	Instream Flow and Reservoir Minimum Pool Measure
MFP	Middle Fork American River Project
PCWA	Placer County Water Agency
SD	Supporting Document

## 1.0 INSTREAM FLOW AND RESERVOIR MINIMUM POOL MEASURE (IFRM)

This measure describes water year type determination and specifies the instream flow and reservoir minimum pool requirements for the Middle Fork American River Project (MFP). Details regarding compliance with this measure are provided in the Flow and Reservoir Monitoring Plan (PCWA 2010; SD A). The following stream reaches and reservoirs are discussed:

- Bypass Reaches
  - Rubicon River below Hell Hole Dam
  - Middle Fork American River below French Meadows Dam
  - Middle Fork American River below Middle Fork Interbay Dam
  - Middle Fork American River Immediately Below Ralston Afterbay Dam
  - Duncan Creek below Diversion Dam
  - North Fork Long Canyon Creek below Diversion Dam
  - South Fork Long Canyon Creek below Diversion Dam
- Peaking Reach
  - Middle Fork American River below Oxbow Powerhouse
- Reservoirs
  - Hell Hole Reservoir
  - French Meadows Reservoir

## 1.1 WATER YEAR TYPES

Water year types for the MFP are based on the California Department of Water Resources Bulletin 120 forecasts of unimpaired American River inflow into Folsom Reservoir.

<b>Water Year Types</b>	<b>Bulletin 120 Folsom Reservoir Inflow<sup>1</sup> (ac-ft)</b>
Wet (W)	≥3,400,000
Above Normal (AN)	2,400,000–<3,400,000
Below Normal (BN)	1,500,000–<2,400,000
Dry (D)	1,000,000–<1,500,000
Critical (C) <sup>2</sup>	600,000–<1,000,000
Extreme Critical (EC) <sup>2</sup>	<600,000

<sup>1</sup>Forecasts of unimpaired American River inflow to Folsom Reservoir for the current year, October 1 through September 30, as estimated by the California Department of Water Resources Bulletin 120.

<sup>2</sup>The EC water year type is only used in the Peaking Reach; elsewhere EC is combined with the C water year type.

## 1.2 INSTREAM FLOW REQUIREMENTS

Instream flow requirements include: (1) minimum instream flows; (2) pulse flows; (3) down ramp of spill flows; (4) operations of Oxbow Powerhouse (ramping rate, maximum flow release); and (5) recreation flows.

### 1.2.1 Minimum Instream Flows

Minimum instream flow assignment time periods and corresponding Bulletin 120 water year type forecasts are listed below for the bypass reaches and the peaking reach.

<b>Bypass Reaches<sup>1</sup></b>	
<b>Time Period</b>	<b>Bulletin 120 Forecast</b>
June 1–October 31	May
November 1–March 14	End of Water Year Basin Summary of Full Natural Flows <sup>2</sup>
March 15–May 31	March

<sup>1</sup>All river reaches except the peaking reach.

<sup>2</sup>Basin summary of full natural flows in ac-ft, California Department of Water Resources California Data Exchange Center web site <http://cdec.water.ca.gov>.

<b>Peaking Reach<sup>1</sup></b>	
<b>Time Period</b>	<b>Bulletin 120 Forecast</b>
June 1–October 31	May
November 1–February 14	End of Water Year Basin Summary of Full Natural Flows <sup>2</sup>
February 15–Mar 14	February
March 15–May 31	March

<sup>1</sup>Middle Fork American River below Oxbow Powerhouse.

<sup>2</sup>Basin summary of full natural flows in ac-ft, California Department of Water Resources California Data Exchange Center web site <http://cdec.water.ca.gov>.

Minimum instream flows are to be maintained in the bypass and peaking reaches as detailed below with the following exception:

- The minimum instream flows from March 15–May 31 specified below for the bypass and peaking reaches shall not be lower than the minimum instream flow that was in effect on March 14.

### Large River Bypass Reaches

- Rubicon River below Hell Hole Dam (Table 1);
- Middle Fork American River below French Meadows Dam (Table 2);

- Middle Fork American River below Middle Fork Interbay Dam (Table 3); and
- Middle Fork American River Immediately below Ralston Afterbay Dam.
  - 3 cubic feet per second (cfs) year-round.

### **Small Stream Bypass Reaches**

All minimum flows in the small streams are the specified minimum instream flow or the natural inflow to the diversion, whichever is less.

- Duncan Creek below Diversion Dam (Table 4);
- North Fork Long Canyon Creek below Diversion Dam (Table 5); and
- South Fork Long Canyon Creek below Diversion Dam (Table 6).

### **Peaking Reach**

- Middle Fork American River below Oxbow Powerhouse (Table 7a), with the following exceptions:
  - The minimum instream flow requirement is reduced for a period of up to 30 days (Table 7b) during the annual MFP maintenance outage. The annual maintenance outage can start between the last Sunday in September and October 31.
  - If the following conditions occur, then the minimum instream flow requirement from February 15–March 14 is equal to the critical water year type minimum flow:
    - The Bulletin 120 current year February forecast is either critical or extreme critical, and
    - The February 14 minimum flows were based on a Wet or Above Normal water year type.
  - The minimum flow requirement is reduced to the maintenance outage flows (Table 7b) for up to 48 hours if a forced or unplanned outage occurs at the Middle Fork Powerhouse and/or Ralston Powerhouse<sup>1</sup>.

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<sup>1</sup> The intent of this exception is to allow time for water to be released from upstream reservoirs and arrive in the reach to meet instream flow requirements.

## 1.2.2 Pulse Flows

Pulse flows are implemented based on the April Bulletin 120 forecast.

### Large River Bypass Reaches

- Rubicon River below Hell Hole Dam

The pulse flow specified below is an interim pulse flow. The final pulse flow magnitude will be between 200 and 600 cfs and will be determined based on the results of a valve testing program. If the magnitude of the pulse flow changes, then the volume of the pulse will remain the same, but the duration and down ramp will be modified (Attachment A).

- Wet Water Years

In wet water years provide a pulse flow beginning May 1 according to the following schedule:

- May 1. Increase flows from the minimum instream flow release to a minimum of 200 cfs.
- June 7. Reduce the flow to a minimum of 150 cfs.
- June 9. Reduce the flow to a minimum of 90 cfs.
- June 12. Release minimum instream flow requirement.

- Above Normal Water Years

In above normal water years provide a pulse flow release beginning May 1 according to the following schedule:

- May 1. Increase flows from the minimum instream flow release to a minimum of 200 cfs.
- May 16. Reduce the flow to a minimum of 150 cfs.
- May 18. Reduce the flow to a minimum of 90 cfs.
- May 21. Release minimum instream flow requirement.

- Middle Fork American River below French Meadows Dam

- Wet Water Years

In wet water years provide a pulse flow beginning May 1 according to the following schedule:

- May 1. Increase flows from the minimum instream flow release to a minimum of 200 cfs.
- May 2. Increase flows to a minimum of 400 cfs.
- May 10. Reduce the flow to a minimum of 275 cfs.
- May 12. Reduce the flow to a minimum of 190 cfs.
- May 15. Reduce the flow to a minimum of 115 cfs.
- May 18. Reduce the flow to a minimum of 65 cfs.
- May 22. Release minimum instream flow requirement.

- Above Normal Water Years

In above normal years provide a pulse flow release beginning May 7 according to the following schedule:

- May 7. Increase flows from the minimum instream flow release to a minimum of 200 cfs.
- May 8. Increase flows to a minimum of 400 cfs.
- May 10. Reduce the flow to a minimum of 275 cfs.
- May 12. Reduce the flow to a minimum of 190 cfs.
- May 15. Reduce the flow to a minimum of 115 cfs.
- May 18. Reduce the flow to a minimum of 65 cfs.
- May 22. Release minimum instream flow requirement.

- Middle Fork American River below Middle Fork Interbay Dam

- Wet Water Years

In wet water years provide a pulse flow beginning May 1 according to the following schedule. If there is a forced or unplanned outage at Middle Fork Powerhouse and inflow into Middle Fork Interbay is less than the specified pulse flow required downstream, then the inflow into Middle Fork Interbay will be passed downstream.

- May 1. Increase flows from the minimum instream flow release to a minimum of 200 cfs.
- May 2. Increase flows to a minimum of 450 cfs.
- May 10. Reduce the flow to a minimum of 360 cfs.
- May 12. Reduce the flow to a minimum of 260 cfs.
- May 15. Reduce the flow to a minimum of 155 cfs.
- May 18. Release minimum instream flow requirement.

- Above Normal Water Years

In above normal water years provide a pulse flow beginning May 7 according to the following schedule. If there is a forced or unplanned outage at Middle Fork Powerhouse and inflow into Middle Fork Interbay is less than the specified pulse flow required downstream, then the inflow into Middle Fork Interbay will be passed downstream.

- May 7. Increase flows from the minimum instream flow release to a minimum of 200 cfs.
- May 8. Increase flows to a minimum of 450 cfs.
- May 10. After 10 am, reduce flows to a minimum of 360 cfs.
- May 12. Reduce the flow to a minimum of 260 cfs.
- May 15. Reduce the flow to a minimum of 155 cfs.
- May 18. Release minimum instream flow requirement.



## Small Stream Bypass Reaches

- Duncan Creek below Diversion Dam
  - Wet Water Years

In wet water years provide a pulse flow beginning May 1 according to the following schedule:

    - May 1. Release a minimum of 150 cfs or inflow, whichever is less.
    - May 2. Close diversion completely.
    - May 11. Release a minimum of 190 cfs or inflow, whichever is less (can reopen diversion).
    - May 13. Release a minimum of 130 cfs or inflow, whichever is less.
    - May 16. Release a minimum of 90 cfs or inflow, whichever is less.
    - May 19. Release a minimum of 45 cfs or inflow, whichever is less.
    - May 23. Release minimum instream flow requirement.
  - Above Normal Water Years

In above normal water years provide a pulse flow beginning the May 7 according to the following schedule:

    - May 7. Release a minimum of 150 cfs or inflow, whichever is less.
    - May 8. Close diversion completely.
    - May 10. Release a minimum of 190 cfs or inflow, whichever is less (can reopen diversion).
    - May 12. Release a minimum of 130 cfs or inflow, whichever is less.
    - May 15. Release a minimum of 90 cfs or inflow, whichever is less.
    - May 18. Release a minimum of 45 cfs or inflow, whichever is less.
    - May 22. Release minimum instream flow requirement.
- North Fork Long Canyon Creek below Diversion Dam
  - Wet Water Years

In wet water years provide a pulse flow beginning May 1 according to the following schedule:

    - May 1. Release a minimum of 50 cfs or inflow, whichever is less.
    - May 2. Close diversion completely.
    - May 11. Release a minimum of 35 cfs or inflow, whichever is less (can reopen diversion).
    - May 13. Release a minimum of 21 cfs or inflow, whichever is less.
    - May 16. Release minimum instream flow requirement.

- Above Normal Water Years

In above normal water years provide a pulse flow beginning May 1 according to the following schedule:

- May 1. Release a minimum of 50 cfs or inflow, whichever is less.
- May 2. Close diversion completely.
- May 4. Release a minimum of 35 cfs or inflow, whichever is less (can reopen diversion).
- May 6. Release a minimum of 21 cfs or inflow, whichever is less.
- May 9. Release minimum instream flow requirement.

- South Fork Long Canyon Creek below Diversion Dam

- Wet Water Years

In wet water years provide a pulse flow beginning May 1 according to the following schedule:

- May 1. Release a minimum of 100 cfs or inflow, whichever is less.
- May 2. Close diversion completely.
- May 11. Release a minimum of 70 cfs or inflow, whichever is less (can reopen diversion).
- May 13. Release a minimum of 35 cfs or inflow, whichever is less.
- May 16. Release minimum instream flow requirement.

- Above Normal Water Years

In above normal water years provide a pulse flow beginning May 1 according to the following schedule.

- May 1. Release a minimum of 100 cfs or inflow, whichever is less.
- May 2. Close diversion completely.
- May 4. Release a minimum of 70 cfs or inflow, whichever is less (can reopen diversion).
- May 6. Release a minimum of 35 cfs or inflow, whichever is less.
- May 9. Release minimum instream flow requirement.

### **1.2.3 Down Ramp of Spill Flow**

- Rubicon River below Hell Hole Dam

In the months of May–July, if a spill or multiple spills in excess of 600 cfs (daily average flow) occur from Hell Hole Reservoir, then down ramp the declining limb of the spill(s) the day after the daily average spill flow becomes less than 600 cfs.

- First 600 cfs spill event down ramp schedule:
  - Day 1. Release a minimum of 600 cfs.
  - Day 5. Reduce the flow to a minimum of 400 cfs.
  - Day 7. Reduce the flow to a minimum of 285 cfs.
  - Day 10. Reduce the flow to a minimum of 170 cfs.
  - Day 13. Reduce the flow to a minimum of 95 cfs.
  - Day 17. Release minimum instream flow requirement.
- Subsequent 600 cfs spill event down ramp schedule (if they occur):
  - Day 1. Reduce the flow to a minimum of 400 cfs.
  - Day 3. Reduce the flow to a minimum of 285 cfs.
  - Day 6. Reduce the flow to a minimum of 170 cfs.
  - Day 10. Reduce the flow to a minimum of 95 cfs.
  - Day 14. Release minimum instream flow requirement.

If a spill event occurs in the months of May–July that does not exceed a daily average flow of 600 cfs (daily average flow), but exceeds the 400, 285, or 170 cfs flow levels in the above down ramp schedule, then down ramp the spill according to the lower flow levels in the schedule. For example, start the down ramp the day after daily average spill flow becomes less than 400, 285, or 175 cfs. Spills that do not exceed 170 cfs (daily average flow) will not be down ramped.

- Middle Fork American River below French Meadows Dam

In the months of May–July, if a spill or multiple spills in excess of 400 cfs (daily average flow) occur from French Meadows Reservoir, then down ramp the declining limb of the spill(s) ramp the day after daily average spill flow becomes less than 400 cfs.

- 400 cfs spill event down ramp schedule:
  - Day 1. Release a minimum of 400 cfs
  - Day 2. Reduce the flow to a minimum of 275 cfs.
  - Day 3. Reduce the flow to a minimum of 190 cfs.
  - Day 4. Reduce the flow to a minimum of 115 cfs.
  - Day 5. Reduce the flow to a minimum of 65 cfs.
  - Day 7. Release minimum instream flow requirement.

If a spill event occurs in the months of May–July that does not exceed a daily average flow of 400 cfs (daily average flow), but exceeds the 275, 190, or 115 cfs flow levels in the above down ramp schedule, then down ramp the spill according to the lower flow levels in the schedule. For example, start the down ramp the day after daily average spill flow becomes less than 275, 190, or 115 cfs. Spills that do not exceed 115 cfs (daily average flow) will not be down ramped.

### 1.2.4 Operations of Oxbow Powerhouse

The ramping rate and the maximum flow release from Oxbow Powerhouse are to be maintained as described below:

#### Ramping Rate

The Oxbow Powerhouse release shall not cause a stage change greater than 1 foot per hour based on the average stage – discharge relationship at the instream flow study sites in the peaking reach as defined below:

<b>Oxbow Powerhouse Ramping Rate</b>			
<b>Up Ramp</b>		<b>Down Ramp</b>	
<b>Gage Flow<sup>1</sup> (cfs)</b>	<b>Maximum Flow Change<sup>2</sup> (cfs / hr)</b>	<b>Gage Flow (cfs)</b>	<b>Maximum Flow Change (cfs / hr)</b>
≤175	300	≤500	250
>175 – 400	450	>500 – 800	400
>400 – 750	600	>800 – 1300	550
>750	750	>1300	750

<sup>1</sup>Gage Flow is the discharge (cfs) at the Middle Fork American River near Foresthill USGS Gage (No. 11433300) at the beginning of the Oxbow Powerhouse flow change

<sup>2</sup>Maximum Flow Change is the maximum increase in Oxbow Powerhouse release given the Gage Flow.

#### Maximum Flow Release

During dry, critical, and extreme critical water year types (May forecast) Oxbow Powerhouse discharge shall not exceed 900 cfs between the Saturday before Memorial Day and October 15.

### 1.2.5 Recreation Flows

Recreation flow releases are implemented based on the May Bulletin 120 forecast.

Provide the following whitewater boating and Tevis Cup/Western States 100 event recreation flows in the peaking reach (Middle Fork American River below Oxbow Powerhouse):

#### Whitewater Boating

Provide whitewater boating flows by water year type and by season as specified:

<b>Whitewater Boating Requirements</b>					
<b>Water Year Type</b>	<b>Flow Magnitude<sup>1</sup></b>	<b>Timing</b>	<b>Weekends</b>		<b>Weekdays</b>
			<b>1st Saturday before Memorial Day– Labor Day</b>	<b>Labor Day– September</b>	<b>June 1– Labor Day</b>
Wet / Above Normal	800 cfs <sup>2</sup>	3 hours <sup>3</sup> (5 am–8 am)	Saturdays	---	---
	1000 cfs	4 hours (8 am–12 pm)	Saturdays and Sundays	Saturdays	5 weekdays per week
Below Normal	1000 cfs	4 hours (8 am–12 pm)	Saturdays and Sundays	Saturdays	4 weekdays per week
Dry	900 cfs	4 hours (8 am–12 pm)	Saturdays and Sundays	Saturdays	3 weekdays per week
Critical	900 cfs	3 hours (9 am–12 pm)	Saturdays and Sundays	Saturdays	2 weekdays per week
Extreme Critical	900 cfs	3 hours (9 am–12 pm)	Saturdays	---	1 weekday per week

<sup>1</sup>Flow below the confluence of Middle Fork American River and North Fork of the Middle Fork American River, unless otherwise specified (USGS gage No. 11433300).

<sup>2</sup>Target flow magnitude at North Fork American River Above American River Pump Station gage.

<sup>3</sup>This is an “Early Saturday Recreation” flow release designed to provide flow downstream sooner in the day.

If there is a forced or unplanned outage at the Middle Fork Powerhouse, Ralston Powerhouse or Oxbow Powerhouse then whitewater boating flow requirements are suspended until the powerhouse(s) are returned to service.

Whitewater boating flow requirements are superseded by the Tevis Cup and Western States 100 event flows outlined below.

**Tevis Cup and Western States 100 Events**

- Event Coordination
  - Coordinate with representatives of the Tevis Cup and Western States 100 to identify and provide flows suitable for adequate trail crossing conditions for these events (when flows are controllable by the MFP). The Tevis Cup/Western States 100 event recreation flows, when they occur, take precedence over whitewater boating flows. If possible, whitewater boating flows will be provided under a modified schedule (e.g., earlier in the day) that meets Tevis Cup and Western States 100 flows.

**1.3 RESERVOIR MINIMUM POOL REQUIREMENTS**

Minimum pool requirements are implemented on June 1 of each year based on the May Bulletin 120 forecast.

Maintain minimum reservoir pool elevation in French Meadows and Hell Hole reservoirs as detailed below.

<b>MFP Minimum Pool Requirements<sup>1</sup></b>					
<b>Reservoir</b>	<b>Bulletin 120 Forecast<sup>2</sup></b>	<b>June–Sept<sup>3</sup></b>		<b>Sept<sup>4</sup>–May</b>	
		<b>Elevation (ft)</b>	<b>Approximate Storage (ac-ft)</b>	<b>Elevation (ft)</b>	<b>Approximate Storage (ac-ft)</b>
<b>French Meadows Reservoir</b>	≥ 3,400,000 ac-ft (W)	5,208	70,000	5,152	25,000
	2,400,000 – <3,400,000 ac-ft (AN)	5,208	70,000	5,152	25,000
	1,500,000 – <2,400,000 ac-ft (BN)	5,200	62,500	5,152	25,000
	1,000,000 – <1,500,000 ac-ft (D)	5,200	62,500	5,152	25,000
	600,000 – <1,000,000 ac-ft (CD)	5,157	28,000	5,152	25,000
	< 600,000 ac-ft (EC)	5,157	28,000	5,120	8,700
	The spillway gates (tainter gates) must remain open from Nov. 15 to April 1 of each year.				
<b>Hell Hole Reservoir</b>	≥ 3,400,000 ac-ft (W)	4,530	106,500	4,451	50,000
	2,400,000 – <3,400,000 ac-ft (AN)	4,530	106,500	4,451	50,000
	1,500,000 – <2,400,000 ac-ft (BN)	4,530	106,500	4,402	25,000
	1,000,000 – <1,500,000 ac-ft (D)	4,482	70,000	4,402	25,000
	600,000 – <1,000,000 ac-ft (CD)	4,482	70,000	4,402	25,000
	< 600,000 ac-ft (EC)	4,404	26,000	4,341	5,500

<sup>1</sup>Minimum pool elevation requirements are implemented on June 1 of each year based on the California Department of Water Resources Bulletin 120 May forecast.

<sup>2</sup>Unimpaired run-off of American River to Folsom Reservoir for current year, October 1 through September 30, as estimated by the California Department of Water Resources Bulletin 120 on or about the beginning of May.

<sup>3</sup>Minimum pool requirements end on Labor Day.

<sup>4</sup>Minimum pool requirements begin one day after Labor Day.

## 2.0 LITERATURE CITED

Placer County Water Agency (PCWA). 2010. Flow and Reservoir Monitoring Plan. Available in PCWA’s Application for New License – Supporting Document A.

## **TABLES**

**IFRM Table 1. Rubicon River below Hell Hole Dam Minimum Instream Flow.**

Month/Time Period	Minimum Instream Flow by Water Year (cfs)				
	Extreme Critical and Critical	Dry	Below Normal	Above Normal	Wet
Oct	15	20	20	25	25
Nov	15	20	20	25	25
Dec	15	20	20	25	25
Jan	15	20	20	25	25
Feb	15	20	20	25	25
Mar 1–14	15	20	20	25	25
Mar 15–30	31	35	42	55	60
Apr	31	35	42	55	60
May	23	35	42	55	60
Jun 1–14	19	28	31	50	50
Jun 15–30	15	20	20	40	40
Jul	15	20	20	30	30
Aug	15	20	20	30	30
Sep	15	20	20	30	30

**IFRM Table 2. Middle Fork American River below French Meadows Dam Minimum Instream Flow.**

Month/Time Period	Minimum Instream Flow by Water Year (cfs)				
	Extreme Critical and Critical	Dry	Below Normal	Above Normal	Wet
Oct	8.0	9.0	10.0	11.0	13.0
Nov	8.0	9.0	10.0	11.0	13.0
Dec	8.0	9.0	10.0	11.0	13.0
Jan	8.0	9.0	10.0	11.0	13.0
Feb	8.0	9.0	10.0	11.0	13.0
Mar 1–14	8.0	9.0	10.0	11.0	13.0
Mar 15–30	11.0	11.0	11.5	15.5	16.5
Apr	11.0	13.0	13.0	20.0	20.0
May	11.0	13.0	13.0	20.0	20.0
Jun	8.0	11.0	11.5	15.5	16.5
Jul	8.0	9.0	10.0	11.0	13.0
Aug	8.0	9.0	10.0	11.0	13.0
Sep	8.0	9.0	10.0	11.0	13.0



**IFRM Table 3. Middle Fork American River below Middle Fork Interbay Dam Minimum Instream Flow.**

Month/Time Period	Minimum Instream Flow by Water Year (cfs)				
	Extreme Critical and Critical	Dry	Below Normal	Above Normal	Wet
Oct	12.0	24.0	24.0	25.5	25.5
Nov	12.0	24.0	24.0	25.5	25.5
Dec	12.0	24.0	24.0	25.5	25.5
Jan	12.0	24.0	24.0	25.5	25.5
Feb	12.0	24.0	24.0	25.5	25.5
Mar 1–14	12.0	24.0	24.0	25.5	25.5
Mar 15–31	16.5	25.0	32.0	45.0	47.0
Apr	18.0	27.0	40.0	65.0	65.0
May	18.0	27.0	40.0	65.0	65.0
Jun	12.0	24.0	24.0	45.0	47.0
Jul	12.0	18.0	24.0	25.5	34.0
Aug	12.0	18.0	24.0	25.5	34.0
Sep	12.0	18.0	24.0	25.5	34.0

**IFRM Table 4. Duncan Creek below Diversion Dam Minimum Instream Flow <sup>1</sup>.**

Month/Time Period	Minimum Instream Flow by Water Year (cfs) <sup>1</sup>				
	Extreme Critical and Critical	Dry	Below Normal	Above Normal	Wet
Oct	4.0	8.0	8.0	8.0	8.0
Nov	4.0	8.0	8.0	8.0	8.0
Dec	4.0	8.0	8.0	8.0	8.0
Jan	4.0	8.0	8.0	8.0	8.0
Feb	4.0	8.0	8.0	8.0	8.0
Mar 1–14	4.0	8.0	8.0	8.0	8.0
Mar 15–30	8.5	11.0	12.5	16.0	16.0
Apr	13.0	14.0	17.0	24.0	24.0
May	13.0	14.0	17.0	24.0	24.0
Jun	6.5	7.0	8.5	12.0	12.0
Jul	No Diversion <sup>2</sup>	No Diversion <sup>2</sup>	No Diversion <sup>2</sup>	No Diversion <sup>2</sup>	No Diversion <sup>2</sup>
Aug					
Sep					

<sup>1</sup>All minimum flows are the specified minimum flow or natural inflow to the diversion, whichever is less.

<sup>2</sup> If July 1 inflow to the diversion exceeds the May minimum flow requirement, then the July minimum instream flow requirement will be equal to the May minimum instream flow requirement, or natural inflow whichever is less. The intent is to avoid a large flow spikes at the end of the diversion season on July 1.

**IFRM Table 5. North Fork Long Canyon Creek Below Diversion Dam Minimum Instream Flow<sup>1</sup>.**

Month/Time Period	Minimum Instream Flow by Water Year (cfs) <sup>1</sup>				
	Extreme Critical and Critical	Dry	Below Normal	Above Normal	Wet
Oct	2.0	2.0	2.0	2.0	2.0
Nov	2.0	2.0	2.0	2.0	2.0
Dec	2.0	2.0	2.0	2.0	2.0
Jan	2.0	2.0	2.0	2.0	2.0
Feb	2.0	2.0	2.0	2.0	2.0
Mar 1–14	2.0	2.0	2.0	2.0	2.0
Mar 15–30	6.0	10.0	7.0	7.0	7.0
Apr	6.0	10.0	10.0	11.5	11.5
May 1–14	6.0	10.0	10.0	11.5	11.5
May 15–30	2.0	5.0	10.0	11.5	11.5
Jun	2.0	5.0	5.0	6.0	6.0
Jul	No Diversion	No Diversion	No Diversion	No Diversion	No Diversion
Aug					
Sep					

<sup>1</sup>All minimum flows are the specified minimum flow or natural inflow to the diversion, whichever is less.

**IFRM Table 6. South Fork Long Canyon Creek below Diversion Dam Minimum Instream Flow<sup>1</sup>.**

Month/Time Period	Minimum Instream Flow by Water Year (cfs) <sup>1</sup>				
	Extreme Critical and Critical	Dry	Below Normal	Above Normal	Wet
Oct	2.5	5.0	5.0	5.0	5.0
Nov	2.5	5.0	5.0	5.0	5.0
Dec	2.5	5.0	5.0	5.0	5.0
Jan	2.5	5.0	5.0	5.0	5.0
Feb	2.5	5.0	5.0	5.0	5.0
Mar 1–14	2.5	5.0	5.0	5.0	5.0
Mar 15–30	4.5	8.5	8.5	9.5	9.5
Apr	6.0	12.0	12.0	14.0	14.0
May	6.0	12.0	12.0	14.0	14.0
Jun	3.0	5.0	6.0	7.0	7.0
Jul	No Diversion	No Diversion	No Diversion	No Diversion	No Diversion
Aug					
Sep					

<sup>1</sup>All minimum flows are the specified minimum flow or natural inflow to the diversion, whichever is less.

**IFRM Table 7a. Middle Fork American River below Oxbow Powerhouse Minimum Instream Flow.**

Month/Time Period	Minimum Instream Flow by Water Year (cfs)					
	Extreme Critical	Critical	Dry	Below Normal	Above Normal	Wet
Oct	75	75	90	120	150	200
Nov	75	75	90	120	150	200
Dec	75	75	90	120	150	200
Jan	75	75	90	120	150	200
Feb	75	75	90	120	150	200
Mar 1–14	75	75	90	120	150	200
Mar 15–30	75	125	210	290	375	450
Apr	75	125	210	290	375	450
May	75	125	210	290	375	450
Jun	75	100	150	200	250	300
Jul	75	100	150	200	250	300
Aug	75	100	150	200	250	300
Sep 1–14	75	75	120	160	200	250
Sep 15–30	75	75	90	120	150	200

**IFRM Table 7b. Middle Fork American River below Oxbow Powerhouse Annual Maintenance Outage Minimum Instream Flow.**

Month/Time Period	Minimum Instream Flow by Water Year (cfs)				
	Extreme Critical and Critical	Dry	Below Normal	Above Normal	Wet
Up to 30 days during annual maintenance period, beginning within last Sunday in September - October 31 time period.	75	75	110	150	150

**ATTACHMENT A**  
**Feasibility Study**  
**Hell Hole Dam Low Level Outlet Release Capability**

**ATTACHMENT A**  
**Feasibility Study**  
**Hell Hole Dam Low Level Outlet Release Capability**

A technical issue exists related to the magnitude of pulse flow that can safely be released from the Hell Hole Dam Low Level Outlet on a consistent basis. Based on the current engineering assessment, the pulse flow magnitude of 200 cfs, specified in the instream flow measure, can safely and reliably be released on a regular basis from the outlet after modification of the outlet works and river channel are completed as described in Appendix A of the Exhibit E. However, PCWA will increase the frequency of routine inspection and maintenance of the outlet works once pulse flows of 200 cfs are implemented to assure system reliability, consistent with standard Project practices. Any concern regarding system reliability from releases of the 200 cfs pulse flow will be reported promptly to California Division of Safety of Dams (DSOD), FERC, and Resource Agencies (i.e., USDA-FS, CDFG, State Board, and USFWS).

In addition, PCWA will evaluate the potential for increasing the safe and reliable magnitude of flow (pulse flow) through the existing outlet works from 200 cfs up to 600 cfs. PCWA will develop a feasibility study plan for testing higher releases from the outlet works in collaboration with the Resource Agencies and in consultation DSOD and FERC. This study plan will include explicit criteria that will be used to determine whether a flow can be safely and reliably released over the duration of the new FERC License. Once the feasibility study plan is approved by DSOD and FERC, the study will be initiated within one year of approval.

Because the maximum flow feasibility study will include incremental flow steps (e.g., 250 cfs, 300 cfs, etc) and likely will be implemented over a period of several years, following each flow test a draft report providing the results of the test study will be submitted to the aforementioned parties for a 60-day comment. The report will include PCWA's engineering assessment of the study flow that was released and a recommended next step, which would be either proceed to the next flow step, or cease testing, based on the criteria included in the study plan, including the rationale used in the assessment. The goal of this testing is to identify the maximum flow that can safely and reliably be released from the low level outlet over the duration of the FERC License. A final report addressing comments received will be incorporated into a final report within 90-days of the end of the comment period. The final report will be distributed to DSOD, FERC, and Resource Agencies. If approved by DSOD and FERC, the pulse flow release will be increased up to the magnitude deemed safe, with the following conditions:

- The same volume of water used in the interim pulse flow release will be used in the revised pulse flow release (i.e., same volume but the number of days of release will be decreased in accordance with the higher peak flow and modified down ramping schedule); and
- The down ramping rate will be consistent with the rate of change specified in the interim pulse flow release and down ramping of spill schedule.