



**Narrows 2 Facilities**  
**Prioritized Operations and Monitoring Plan**  
**Security Level: Public**

**Yuba River Development Project**  
**FERC Project No. 2246**

December 2014

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# GLOSSARY - DEFINITION OF TERMS, ACRONYMS AND ABBREVIATIONS

Term	Definition
ac-ft	acre-feet
Application for New License	Application for a New License Major Project – Existing Dam
AVM	Acoustic velocity meter
Cal Fish and Wildlife	California Department of Fish and Wildlife
°C	Degrees Celsius
C.F.R.	Code of Federal Regulations
cfs	cubic feet per second
Chief	Chief of the Aquatic Resources Branch , Division of Hydropower Administration and Compliance, FERC
CVRWQCB	Central Valley Regional Water Quality Control Board
CWA	Clean Water Act
DHAC	Division of Hydropower Administration and Compliance, part of the Federal Energy Regulatory Commission
discharge	In this Plan, the estimated flow through a facility at a designated location in terms of cfs.
Englebright Dam	A federal dam managed by the USACE on the Yuba River.
Englebright Rsvervoir	A federal reservoir on the Yuba River formed by Englebright Dam.
FERC or Commission	Federal Energy Regulatory Commission
FERC Project Boundary	The area that YCWA uses for normal Project operations and maintenance; shown as Exhibit G of YCWA’s Application for New License
Federal Power Commission	Predecessor to the Federal Regulatory Commission
°F	Degrees Farenheit
ft	foot or feet
Full Bypass	Narrows 2 Full Bypass, part of the Narrows 2 Facilities
GPS	Global positioning system
ILP	Integrated Licensing Process
in	inch
Marysville gage	USGS’ streamflow gage 11421000, <i>Yuba River near Marysville</i>
mi	mile
mm	Millimeter(s)
MW	megawatt
NMFS	United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service
Narrows 2 Facilities	The Yuba County Water Agency’s Narrows 2 Powerhouse, Narrows 2 Partial Bypass, and Narrows Full Bypass are collectively known as this for the purpose of this plan
Narrows Project	FERC Project No. 1403, a one-unit facility owned and operated by PG&E located on the south side of the Yuba River, approximately 1,200 ft downstream of Englebright Dam
PG&E	Pacific Gas and Electric Company
Partial Bypass	Narrows 2 Partial Bypass, part of the Narrows 2 Facilities
Plan	Narrows 2 Facilities Prioritized Operations and Monitoring Plan
Project	Yuba River Development Project, FERC Project No. 2246
RM	River mile; in this Plan measured from the downstream confluence of the Yuba River with the Feather River at RM 0.0 in an upstream direction
RPS	California Renewable Portfolio Standard

## Glossary (continued)

Term	Definition
SCADA	YCWA's Supervisory Control and Data Acquisition system which remotely adjusts flows.
Smartsville gage	USGS' streamflow gage 11418000, <i>Yuba River Below Englebright Dam, Near Smartsville</i> ; owned and operated by PG&E (i.e., PG&E provides flow data to USGS for publication)
SWRCB	State Water Resources Control Board
Transition or change-over	The decreasing or increasing of the discharge from one facility in coordination with decreasing or increasing the discharge in another facility.
USACE	United States Army Corps of Engineers
USFWS	United States Department of Interior, Fish and Wildlife Service
USGS	United States Geological Survey
Wise Switching Center	PG&E's local operations center equipped to remotely dispatch generation and flows
WSE	Water surface elevation
WY	Water year
YCWA	Yuba County Water Agency
yd <sup>3</sup>	cubic yard



## SECTION 1.0

# INTRODUCTION

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In a letter dated October 8, 2014, the Federal Energy Regulatory Commission's (FERC or Commission) Chief (Chief) of the Aquatic Resource Branch of the Division of Hydropower Administration and Compliance (DHAC) directed the Yuba County Water Agency (YCWA) to develop two plans to minimize the potential for adverse effects to the fishery in the Yuba River downstream of Englebright Dam<sup>1</sup> due to operations of YCWA's Narrows 2 Powerhouse, Narrows 2 Partial Bypass (Partial Bypass) and Narrows 2 Full Bypass (Full Bypass),<sup>2</sup> and to file the plans with FERC for approval.

The Narrows 2 Facilities are part of YCWA's Yuba River Development Project, FERC Project Number 2246 (Project). The initial license for the Project was issued by the Federal Power Commission (FERC's predecessor) to YCWA on May 16, 1963, effective on May 1, 1963. The Federal Power Commission's May 6, 1966, Order Amending License changed the license's effective date to May 1, 1966, for a term ending on April 30, 2016.

In anticipation of the expiration of the initial license, on April 28, 2014, YCWA filed with FERC an Application for a New License Major Project – Existing Dam (Application for New License), which YCWA prepared in conformance with Title 18 of the Code of Federal Regulations (C.F.R.), Subchapter B (Regulations under the Federal Power Act), Part 5 (Integrated Licensing Process).

One of the plans required by the Chief in his October 8, 2014 letter is a *Narrows 2 Facilities Prioritized Operations and Monitoring Plan*. Specifically, the Chief states at pages 3 and 4 of his letter:

...the licensee should develop a *prioritized operations and monitoring plan*. The plan should include an operational protocol and feasibility analysis for avoiding use of the partial and full bypasses (discussed below), to the extent possible. In the event that these alternate release locations are utilized, the plan should include detailed protocol for bringing these release points online, including proposed ramping rates for each release project location (Narrows 2 powerhouse, full bypass, and partial bypass). Due to the interrelatedness of the project with the Narrows Project No. 1403, the licensee may consider coordinating plan

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<sup>1</sup> Englebright Dam was constructed by the California Debris Commission in 1941 and is about 260 feet (ft) high. It is owned, operated and maintained by the United States Army Corps of Engineers (USACE) and the dam, reservoir and associated recreation facilities are not included as Project facilities in FERC licenses for the Yuba River Development Project. When the California Debris Commission was decommissioned in 1986, administration of Englebright Dam and Reservoir passed to the USACE. The primary purpose of the dam is to trap and contain sediment derived from extensive historic hydraulic mining operations in the Yuba River watershed. Englebright Reservoir is about 9 miles (mi) long with a surface area of 815 acres. When the dam was first constructed in 1941, it had a gross storage capacity of 70,000 acre-feet (ac-ft); however, due to sediment capture, the gross storage capacity today is approximately 50,000 ac-ft (USGS 2003).

<sup>2</sup> For the purpose of this Plan, these three facilities are referred to collectively as the "Narrows 2 Facilities."

development with Pacific Gas and Electric Company. Further, the plan should include a monitoring and reporting component, including periodic reporting to the Commission, to determine its effectiveness on avoiding adverse impacts to fishery resources and its continued operational feasibility. Finally, the plan should include an implementation schedule that will encompass the remaining period of the current project license and any subsequent annual operating licenses (if necessary). The plan should be developed in coordination with the resource agencies and any applicable stakeholders and filed with the Commission for approval within 90 days of the date of this letter.

...ramping rates and flow management should be further analyzed to avoid fish strandings and mortality between Englebright Dam and the Smartsville gage. Accordingly, the forthcoming operations monitoring plan should include a revised flow management protocol for all project release locations; and to the extent possible, the Narrows Project. [Emphasis added.]

This *Narrows 2 Facilities Prioritized Operations and Monitoring Plan* (Plan) provides the information required by the Chief in his October 8, 2014 letter for one of the plans.<sup>3</sup>

YCWA coordinated development of the Plan with Pacific Gas and Electric Company (PG&E). However, the Plan does not propose any changes to PG&E's Narrows Project license, or directly or indirectly propose flow management protocols for PG&E's Narrows 1 Powerhouse.<sup>4</sup> The Plan is filed with FERC by YCWA for its Yuba River Development Project.

YCWA provided a draft of the Plan to resource agencies and applicable stakeholders for a 30-day review and written comment period; and addressed in the Plan written comments received during the review period. YCWA offered to meet with any interested parties during the review period. If YCWA did not adopt a written comment, the reason it was not adopted is described in Attachment A to the Plan, which also includes consultation documentation.

## **1.1 Background**

### **1.1.1 Yuba River Development Project**

The Project is located in Yuba, Sierra and Nevada counties, California, on the main stems of the Yuba River, the North Yuba River and the Middle Yuba River, and on Oregon Creek, a tributary

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<sup>3</sup> YCWA filed the second plan, the *Narrows 2 Facilities Streambed Monitoring Plan*, required by the Chief's October 8, 2014 letter, with FERC under separate cover.

<sup>4</sup> The 13.5 megawatt (MW) Narrows 1 Powerhouse, part of the Narrows Project (FERC Project No. 1403), is owned and operated by PG&E. The powerhouse is a one-unit facility commissioned on December 29, 1942, and is located on the south side of the Yuba River approximately 1,200 ft downstream of Englebright Dam. The Narrows Project withdraws water from Englebright Reservoir, and the powerhouse has a maximum flow capacity of 730 cubic ft per second (cfs). The FERC license for PG&E's Narrows Project expires in January 2023.

to the Middle Yuba River. Major Project facilities, which range in elevation from 280 ft to 2,049 ft, include: 1) New Bullards Bar Dam and Reservoir; 2) Our House and Log Cabin diversion dams; 3) Lohman Ridge and Camptonville diversion tunnels; 4) New Colgate and Narrows 2 power tunnels and penstocks; 5) New Colgate, New Bullards Minimum Flow and Narrows 2 powerhouses; and 6) appurtenant facilities and features (e.g., administrative buildings, switchyards, roads, trails and gages). The Project includes 16 developed recreation facilities associated with the New Bullards Bar Reservoir. The existing Project does not include any aboveground open water conduits (e.g., canals or flumes) or any transmission lines.

Figure 1.1-1 shows the Project, including the Narrows 2 Powerhouse and Full Bypass; and the FERC Project Boundary.<sup>5</sup>

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<sup>5</sup> The FERC Project Boundary is the area that YCWA uses for normal Project operations and maintenance. The boundary is shown in Exhibit G of YCWA's Application for New License and may be changed by FERC with cause from time to time during the term of a license.

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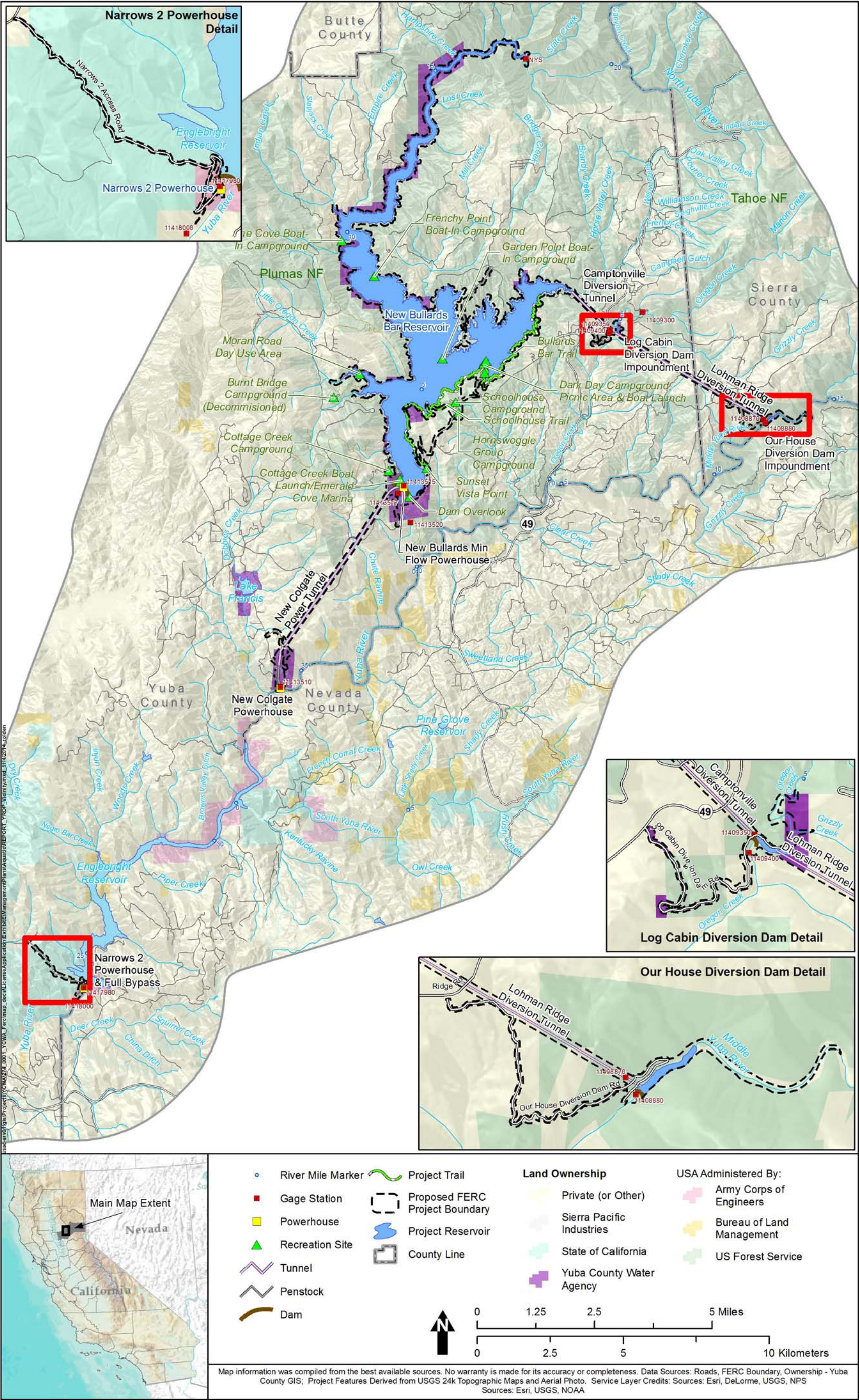


Figure 1.1-1. Yuba County Water Agency's Yuba River Development Project and vicinity.



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## **1.2      Purpose of the Narrows 2 Facilities Prioritized Operations and Monitoring Plan**

The purpose of this Plan, once approved by FERC and implemented, is to minimize the potential for adverse effects to the fishery in the Yuba River downstream of Englebright Dam due to operations of the Narrows 2 Facilities.

YCWA will coordinate, to the extent appropriate, the efforts required under this Plan with other Project resource efforts, including other resource management plans and measures included in the existing FERC Project license.

## **1.3      Goals and Objectives of the Narrows 2 Facilities Prioritized Operations and Monitoring Plan**

The goal of the Plan is to provide the information required by the Chief in his October 8, 2014 letter. Specifically, this information includes:

- A feasibility analysis for avoiding use, to the extent possible, of the Partial Bypass and the Full Bypass.
- If it is not feasible to avoid use of either the Partial or Full bypasses or both, detailed operation protocols for bringing the Partial and/or Full bypasses online, including ramping rates and flow management for each facility with the goal of avoiding fish strandings and mortality in the Yuba River between Englebright Dam and the United States Geological Survey's (USGS) streamflow gage 11418000, *Yuba River Below Englebright Dam, Near Smartsville* (Smartsville gage).
- Monitoring and reporting requirements to FERC regarding the effectiveness of the Plan in avoiding adverse impacts to fishery resources and the Plan's continued operational feasibility.
- An implementation schedule for Plan activities encompassing the remaining period of the Project's existing FERC license and any subsequent annual operating licenses for the Project.

## **1.4      Contents of the Narrows 2 Facilities Prioritized Operations and Monitoring Plan**

This Plan includes the following:

- Section 1.0. Introduction. This section includes introductory information, including a general description of the Project, and the purpose, goal and objectives and contents of the Plan.
- Section 2.0. Description of Narrows 2 Facilities and Historic Operations. This section describes the Narrows 2 Facilities and their historic operations, including flow. This

section also describes the relationship between stage (i.e., water surface elevation and flow) in the Yuba River between the Narrows 2 Facilities and the Smartsville gage.

- Section 3.0. Feasibility Analysis for Avoiding Use of Partial Bypass and for Full Bypass. This section includes YCWA's analysis of the feasibility of avoiding, to the extent possible, use of the Partial Bypass and the Full Bypass.
- Section 4.0. Operational Protocols for Use of the Partial Bypass and of Full Bypass. This section describes YCWA's proposal regarding the general circumstances under which the Partial Bypass and the Full Bypass each would be used from the time FERC approves this Plan until a new license is issued for the Project, and operational protocols to be followed when each bypass is used.
- Section 5.0. Monitoring. This section includes YCWA's methods for monitoring the effectiveness of the Plan, particularly YCWA's proposed operations protocols.
- Section 6.0. Reporting to FERC. This section includes a description of YCWA's program for reporting to FERC regarding the effectiveness of the Plan.
- Section 7.0. Implementation Schedule. This section provides a schedule for implementing the Plan.
- Section 8.0. References Cited. This section lists references cited in this Plan.



## SECTION 2.0

# DESCRIPTION OF NARROWS 2 FACILITIES AND HISTORIC OPERATIONS

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This section describes the Narrows 2 Powerhouse, Partial Bypass and Full Bypass and their historic operations.

## 2.1 Narrows 2 Facilities

The Narrows 2 Facilities are described below. Figure 2.1-1 shows the location of each facility.

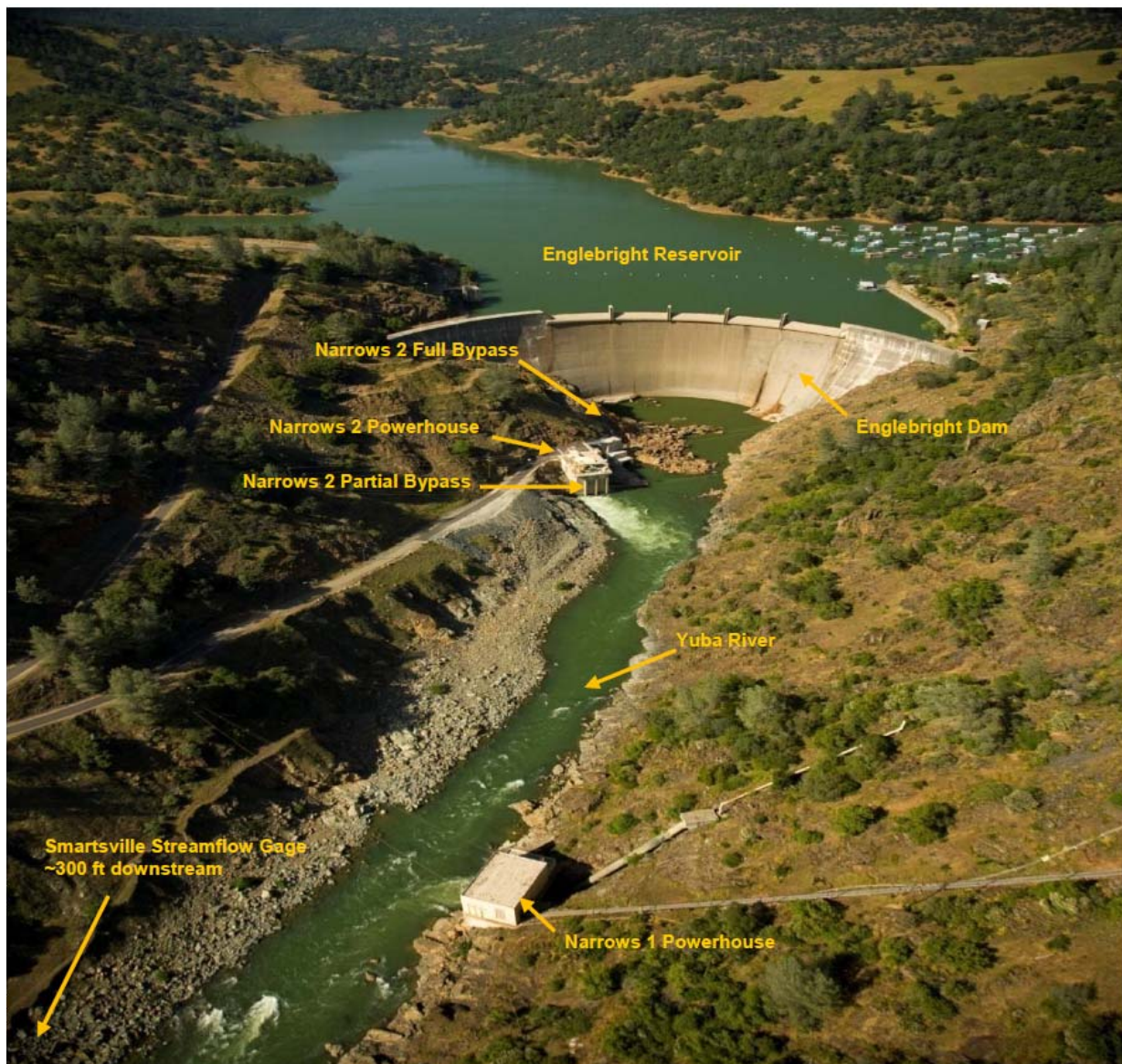


Figure 2.1-1. View of Narrows 2 Facilities.

### **2.1.1 Narrows 2 Powerhouse**

The Narrows 2 Powerhouse is an indoor powerhouse located about 200 ft downstream of Englebright Dam, which is located at river mile (RM)<sup>6</sup> 24.3. The powerhouse, which was constructed in 1968 and 1969, consists of one vertical axis Francis turbine with a capacity of 55 MW. At a head of 236 ft, the maximum discharge<sup>7</sup> of the powerhouse is 3,400 cfs. The powerhouse receives water from Englebright Reservoir via flow from the Narrows 2 Powerhouse Penstock, which is connected to a tunnel that is 20 ft in diameter and concrete lined in the upper 376 ft, and 14 ft in diameter and steel lined for the final 371.5 ft, and passes under the north abutment of Englebright Dam. The penstock has a maximum flow capacity of 3,400 cfs.

The penstock bifurcates upstream of the turbine's spiral case. One branch of the bifurcation conveys water to the Narrows 2 Powerhouse and Partial Bypass, and the other branch conveys water to the Full Bypass.

Releases from the powerhouse draft tube are subsurface from the downstream concrete face of the powerhouse. While the date of the photo shown in Figure 2.1-1 is unknown, as is flow in the river when the photo was taken, the photo shows Narrows 2 Powerhouse operating, as evidenced by the plume emanating from the downstream face of the powerhouse.

### **2.1.2 Narrows 2 Partial Bypass**

The Partial Bypass was constructed as part of and is enclosed within the Narrows 2 Powerhouse. It is a pipe off the Narrows 2 Powerhouse turbine's spiral case, and can discharge into the Yuba River up to 650 cfs at full head through a 36-inch (in.) valve located on the downstream face of the powerhouse above the powerhouse draft tube outlet. Discharges from the Partial Bypass are into the air (Figure 2.1-2).

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<sup>6</sup> For the purpose of this Plan, river miles (RM) are measured from the downstream confluence of the Yuba River with the Feather River at RM 0.0 upstream.

<sup>7</sup> For the purpose of this Plan, "discharge" means the estimated flow through a facility at a designated location in terms of cfs. A discharge may be measured or estimated, and may also be referred to as a "release."



**Figure 2.1-2. Operation of the Partial Bypass at Narrows 2 Powerhouse. The discharge through the Partial Bypass at the time this photo was taken is unknown.**

### **2.1.3 Narrows 2 Full Bypass**

The Full Bypass is a valve and penstock branch off the Narrows 2 Penstock, which can discharge at full head up to 3,000 cfs of water into the Yuba River through a 72-in. diameter fixed-cone valve in a concrete structure immediately upstream of and adjacent to the Narrows 2 Powerhouse. The Full Bypass was constructed in 2006 and began operations in January 2007. Discharges from the Full Bypass are into the air (Figure 2.1-2).





**Figure 2.1-3. Operation of the Full Bypass at a discharge of 100 cfs on October 15, 2014.**

## **2.2 Historic Operations of the Narrows 2 Facilities**

This section describes operational details for the Narrows 2 Facilities: 1) operating decisions; 2) operating regulatory constraints; 3) typical operating flows and facility constraints; 4) planned flow transitions;<sup>8</sup> and 5) flow transition during forced outages. In addition, this section includes plots showing average daily flows through each facility from water year (WY) 2007, when the Full Bypass began operation, through WY 2014; and this section includes a description of stage and flow relationships in the Yuba River near the Narrows 2 Facilities.

### **2.2.1 Operating Decisions**

Under the 1966 YCWA/PG&E power purchase contract, PG&E, in coordination with YCWA, schedules the amounts of water that will flow through the Narrows 1 and 2 powerhouses. The flows can be adjusted remotely by YCWA through its Supervisory Control and Data Acquisition (SCADA) system or by PG&E from its Wise Switching Center, or manually on-site. Dispatching decisions are based on a number of factors, which could potentially change on an hourly or daily basis. These include: minimum flow requirements;<sup>9</sup> water demand; conditions in the California electricity market; capacity and condition of the Narrows 2 and Narrows 1 powerhouse turbines, generators and bypasses; transmission line conditions; and a desire to minimize Englebright Reservoir and Yuba River water surface elevation fluctuations.

<sup>8</sup> For the purpose of this Plan, a “transition” or “change-over” refers to decreasing or increasing the discharge from one facility in coordination with decreasing or increasing the discharge in another facility.

<sup>9</sup> The flow requirements in license 1404 and 2246 are not the same. Article 33 in license 2246 contains flow requirements in the Yuba River below the Narrows 2 Facilities, and compliance with these requirements are monitored at the Smartsville gage and USGS’s streamflow gage 11421000, *Yuba River near Marysville* (Marysville gage). Article 402 in license 1403 contains flow requirements for PG&E’s Narrows Project, and the compliance location is the Smartsville gage.

YCWA and PG&E have agreed to optimize the beneficial use of water downstream in the Yuba River through the coordinated operation of the Narrows 2 and Narrows 1 powerhouses, and will continue to do so through April 30, 2016.

YCWA's and PG&E's coordinated operations may change after April 30, 2016, when the term of the 1966 YCWA/PG&E power purchase contract ends. The extent of any change is unknown at this time and will depend on the terms and conditions in the new Project license, the conditions in any new contracts entered into by YCWA for the sale of the Project power, and any new Narrows 2 and Narrows 1 coordinated operating agreement entered into between YCWA and PG&E.

### **2.2.2 Operating Regulatory Constraints**

Operations of the Narrows 2 Facilities are not constrained by the existing FERC license, except for Article 33 of the license, which establishes minimum stream flows, ramping rates and flow fluctuation limitations. The compliance locations for Article 33 are at the Smartsville gage and Marysville gage; depending on the specific Article 33 flow requirement. The Smartsville gage, which is owned and operated by PG&E (i.e., PG&E provides flow data to USGS for publication) is located on the Yuba River approximately 300 ft downstream of the Narrows 1 Powerhouse (Figure 2.1-1), and the Marysville gage, which is owned and operated by the USGS, is located on the Yuba River downstream of the USACE's Daguerre Point Dam. Stream flow is measured in 15-minute intervals at the Smartsville gage and at the Marysville gage.

YCWA also records flow at 15-minute intervals through the Narrows 2 Penstock using an acoustic velocity meter (AVM) attached to the penstock upstream from the bifurcation that feeds water to either the Narrows 2 Powerhouse and Partial Bypass or to the Full Bypass. Flow in the penstock downstream of the bifurcation is not directly measured. YCWA can estimate flow through each of the Narrows 2 Powerhouse, Partial Bypass and Full Bypass based on: 1) recorded total flow at the AVM; 2) YCWA Operator's logs of when the Full and Partial bypasses are opened and closed; and 3) records of Narrows 2 Powerhouse generation.

There are no other terms or conditions in the Project license, or terms and conditions in any permits, licenses, contracts or agreements, which restrict YCWA's operations of the Narrows 2 Facilities. Specifically, no minimum flow or ramping rate requirements pertain specifically to releases from any of the Narrows 2 Facilities, other than the combined flow of the Narrows 2 Facilities and Narrows 1 Powerhouse as measured at the Smartsville and Marysville gages.

### **2.2.3 Operating Flows and Facility Constraints**

Table 2.2-1 provides a summary of the typical historical flow ranges through the Narrows 2 Powerhouse, the Partial Bypass, the Full Bypass and the Narrows 1 Powerhouse. There are a

great many combinations of potential conditions that could require different operating conditions than those indicated in Table 2.2-1.<sup>10</sup>

**Table 2.2-1. Typical distribution of flows under normal operations (i.e., excluding transition periods) among Narrows 2 Powerhouse (generation only), Partial Bypass, Full Bypass and Narrows 1 Powerhouse.**

Range of Flow Releases to Yuba River (cfs)	Narrows 2 Powerhouse Release (for generation) <sup>1</sup> (cfs)	Partial Bypass Release <sup>1</sup> (cfs)	Full Bypass Release <sup>1</sup> (cfs)	Narrows 1 Powerhouse Release <sup>2</sup> (cfs)
Up to 730	0	≤230	>230 cfs - Used to Supplement Narrows 1 Powerhouse Flow to Meet Minimum Flows Requirements in Article 33	150 - 730
730 - 900	0	≤230	>230 cfs - Used to Supplement Narrows 1 Powerhouse Flow to Meet Minimum Flows Requirements in Article 33	150 - 730
900 - 1,630 <sup>1</sup>	700 – 1,630	Typically not used	Used When Narrows 2 Powerhouse not available	Up to 730
1,630 - 3,400 <sup>1</sup>	700 - 3,400	Typically not used	Used When Narrows 2 Powerhouse not available	Up to 730
3,400 - 4,130	2,670 – 3,400	Typically not used	0	Up to 730
> 4,130	3,400	Typically not used	0	Up to 730

<sup>1</sup> The typical operating flow ranges of Narrows 2 facilities are limited by long-term reliability considerations, such as vibration and cavitation of both the runner and/or Full Bypass; and are as follows: the Narrows 2 Powerhouse between 700 and 3,400 cfs (with physical capacity to release as low as 600 cfs); the Partial Bypass between 0 and 230 cfs (with physical capacity to release as high as 650 cfs); and the Full Bypass between 150 and 3,000 cfs.

<sup>2</sup> The use of the Narrows 1 Powerhouse in this range is dependent on a number of economic and generator factors and can vary from no flow to the maximum Narrows 1 Powerhouse generation capacity. In this range, Narrows 2 Powerhouse alone or Narrows 1 Powerhouse with the Narrows 2 Powerhouse may operate.

The Narrows 2 and Narrows 1 powerhouses may operate at the same time. However, except for flow transitions described below, YCWA does not operate the Full Bypass or the Partial Bypass when the Narrows 2 Powerhouse is operating (i.e., water is passing through the turbine to generate electricity) and, except in very rare instances, does not operate both bypasses at the same time.

## 2.2.4 Planned Flow Transitions

Provided below is a description of YCWA's standard operational practices for planned flow transitions, which includes planned outages, involving the Narrows 2 Facilities. While the facilities have been operated differently on occasion and may be operated differently in the

<sup>10</sup> Because of the higher efficiency of the Narrows 1 Powerhouse at lower flows and the fact that releases through the Narrows 1 Powerhouse result in energy generation that qualifies for California Renewable Portfolio Standard (RPS) credit and revenue and PG&E is required to meet a certain percentage of its total generation through RPS, PG&E prefers at certain times and under certain energy market conditions to run Narrows 1 Powerhouse and to bypass additional flows at the Narrows 2 Powerhouse. PG&E receives all power generated by both powerhouses and PG&E's payments to YCWA under the 1966 YCWA/PG&E power purchase contract are not affected by the relative amounts of power generated by the two powerhouses.

future, only normal operations are described below. When YCWA, in cooperation with PG&E, makes these transitions, YCWA complies with the requirements in its existing FERC license and associated State Water Resource Control Board (SWRCB) water rights permits and licenses. The transitions can be made remotely by PG&E from its Wise Switching Center or by YCWA through its SCADA system, or manually on-site. Typically PG&E requires an operator to be on site at the Narrows 1 Powerhouse when the Narrows 1 Powerhouse unit is started or shut down.<sup>11</sup>

#### **2.2.4.1 Transition from Narrows 2 Powerhouse to Narrows 1 Powerhouse**

If the Narrows 2 Powerhouse is operating and the Narrows 1 Powerhouse is not operating but is available, and release operations are to be partially or fully transitioned to the Narrows 1 Powerhouse, PG&E and YCWA dispatches operators to their respective powerhouses. Once operators are on-site, PG&E first synchronizes the Narrows 1 Powerhouse unit to the electric grid, which requires about 100 cfs of flow through the unit. As soon as the Narrows 1 Powerhouse is synchronized<sup>12</sup> to the electric grid, YCWA reduces flow from the Narrows 2 Powerhouse to compensate for increased releases from the Narrows 1 Powerhouse. As the Narrows 1 Powerhouse unit load is increased, releases from the Narrows 2 Powerhouse are decreased. The result is that either Narrows 1 Powerhouse is operating with all water passing through that powerhouse, or some water is passing both through both powerhouses. In either outcome, the Full and Partial bypasses are not used during the transition. YCWA and PG&E estimate that a complete transition can take between 10 and 30 minutes.

#### **2.2.4.2 Transition from Narrows 2 Powerhouse to Narrows 1 Powerhouse and Full Bypass**

If the Narrows 2 Powerhouse is operating and the Narrows 1 Powerhouse is not operating but is available, and release operations are to be transitioned to the Narrows 1 Powerhouse and augmented with releases from the Full Bypass to meet downstream requirements, then PG&E and YCWA dispatch operators to their respective powerhouses. Once operators are on site, the Full Bypass is opened to release the planned bypass amount and at the same time reduce releases through the Narrows 2 Powerhouse. Then, PG&E synchronizes the Narrows 1 Powerhouse to the electric grid, which requires about 100 cfs of flow. As soon as the Narrows 1 Powerhouse is synchronized to the electric grid, YCWA reduces flow from the Narrows 2 Powerhouse to compensate for increased releases from the Narrows 1 Powerhouse. As the Narrows 1 Powerhouse unit load is increased, releases from the Narrows 2 Powerhouse are decreased and releases through the Full Bypass are held steady.

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<sup>11</sup> For the purpose of this Plan, a “shutdown” means when the flows through a powerhouse unit go to 0 cfs. A transition can include a unit shutdown.

<sup>12</sup> For the purpose of this Plan, “synchronize” means that the unit is connected to the electric grid by adjusting its open-circuit terminal voltage to match the network voltage, by either adjusting its speed or its field excitation. The exact unit speed is not critical.

#### **2.2.4.3 Transition from the Full Bypass to the Narrows 1 Powerhouse**

If the Full Bypass is operating, and some or all releases of water are to be made through the Narrows 1 Powerhouse, PG&E and YCWA dispatch operators to their respective powerhouses. Once the PG&E Operator is on site, YCWA requests that the Narrows 1 Powerhouse unit be placed in-service by synchronizing it to the grid. Once the PG&E Operator confirms that the Narrows 1 Powerhouse unit is synchronized with the grid, YCWA reduces the flow through the Full Bypass by 100 cfs. This is minimum flow from the Narrows 1 Powerhouse unit for synchronization. As soon as the PG&E Operator confirms all systems are normal with the Narrows 1 Powerhouse, YCWA requests that the PG&E Operator start loading the Narrows 1 Powerhouse unit to the required flow, while monitoring flows at the Smartsville gage, and reducing the flow through the Full Bypass until it reaches the desired flow.

#### **2.2.4.4 Transition from Narrows 1 Powerhouse to the Narrows 2 Powerhouse**

If the Narrows 1 Powerhouse is operating and the Narrows 2 Powerhouse is not operating but is available, PG&E and YCWA dispatch operators to their respective powerhouses. YCWA opens the Full Bypass to the same flow as that passing through the Narrows 1 Powerhouse. YCWA typically waits for 10 minutes, which is the approximate time it takes flow from the Full Bypass to reach the Narrows 1 Powerhouse. When the flow from the Full Bypass reaches the Narrows 1 Powerhouse, YCWA calls the PG&E Operator and requests that the load be reduced on the Narrows 1 Powerhouse unit and that the unit be separated from the grid. Once the Narrows 1 Powerhouse unit has been separated from the grid, YCWA starts the Narrows 2 Powerhouse unit. With the Full Bypass in automatic control, as the Narrows 2 Powerhouse starts and is synchronized to the grid, the flow through the unit increases and the Full Bypass automatically closes to maintain the required flow to the Yuba River. Once the Narrows 2 Powerhouse is at the required flow, the Full Bypass closes.

#### **2.2.4.5 Transition from Narrows 1 Powerhouse to the Full Bypass**

This operation only occurs if the Narrows 2 Powerhouse is not available and the Narrows 1 Powerhouse discharge needs to be reduced or the Narrows 2 Powerhouse needs to be shutdown. For a transition of flow from Narrows 1 Powerhouse to the Full Bypass, the operation differs depending upon whether the Narrows 1 Powerhouse will continue to operate after the transition. If the Narrows 1 Powerhouse is to be shutdown at the end of a transition, a PG&E operator is on-site prior to starting the transition. If the Narrows 1 Powerhouse will remain in service following a transition, the transition can be executed by the PG&E Operator located at the Wise Switching Center. Once YCWA calls the PG&E Operator to confirm they are prepared to make the transition, the YCWA operator on-site opens the Full Bypass to the required flow. If the Narrows 1 Powerhouse is to be shutdown, the Full Bypass flow will be the same flow as is being passed by the Narrows 1 Powerhouse. Once the Full Bypass reaches its flow, YCWA waits approximately 10 minutes and then notifies the PG&E Operator to reduce load on the Narrows 1 Powerhouse and separate the unit from the grid. If the Narrows 1 Powerhouse will not be shutdown, the Full Bypass is opened to the flow required for the downstream demand to augment the flow from the Narrows 1 Powerhouse. Once the Full Bypass reaches its flow, YCWA waits



approximately 10 minutes and then notifies the PG&E Operator to reduce load and the Narrows 1 Powerhouse will remain in-service at a reduced load.

#### **2.2.4.6 Transitions Using the Partial Bypass**

Since installation of the Full Bypass in January 2007, the Partial Bypass typically has been used only for a few specific reasons, which include:

- To release flows from the Narrows 2 Facilities when the Narrows 2 Powerhouse or Full Bypass are not in operation, which usually occur during planned outages.
- To obtain safe foot access upstream of the Full Bypass when operation of the Narrows 2 Powerhouse for generation is not possible (i.e., the Full Bypass may spray the area where foot access is necessary upstream of the Narrows 2 Facilities).
- To provide supplemental flow releases at lower levels than the long-term reliability operating ranges of the Full Bypass (i.e., approximately 150 cfs).

#### **2.2.5 Flow Transitions During Forced Outages<sup>13</sup>**

The transition between Narrows 1 or Narrows 2 powerhouse and the Full Bypass can be performed in response to an emergency<sup>14</sup> when a forced outage occurs at either the Narrows 2 Powerhouse or the Narrows 1 Powerhouse. The automated controls for the Full Bypass constantly monitors and captures the flow set-points (i.e., the amount of flow being discharged through the unit) for the Narrows 2 Powerhouse unit so that, in the event of a forced outage, the Full Bypass will release the same flow downstream that was being released immediately prior to the forced outage. This system is designed to maintain flow requirements at the Smartsville and Marysville gages. In comparison, opening of the Full Bypass when the Narrows 1 Powerhouse trips is done remotely by the PG&E's operators in the Wise Switching Center in response to an alarm.

For automated opening of the Full Bypass, the process is started after a 3-minute safety delay during which time a horn is sounded at the exterior of the Full Bypass to warn persons in the area of an imminent release through the Full Bypass. This operation is automated and does not require any manual actions by an operator.<sup>15</sup> YCWA estimates the time from when a powerhouse forced outage occurs to the time the Full Bypass is fully opened to the desired level typically is about 5 minutes, depending on the flow level (i.e., 2 minutes after the warning horn stops). Once a powerhouse forced outage is cleared (i.e., the powerhouse is ready to resume operation), the powerhouse unit is resynchronized to the electrical grid and as flow is increased through the unit, the Full Bypass closes automatically to match the generating unit's target flow set-point that was in place immediately prior to the outage event.

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<sup>13</sup> For the purpose of this Plan, a "forced outage" is defined as a unit trip. Forced outages are not planned.

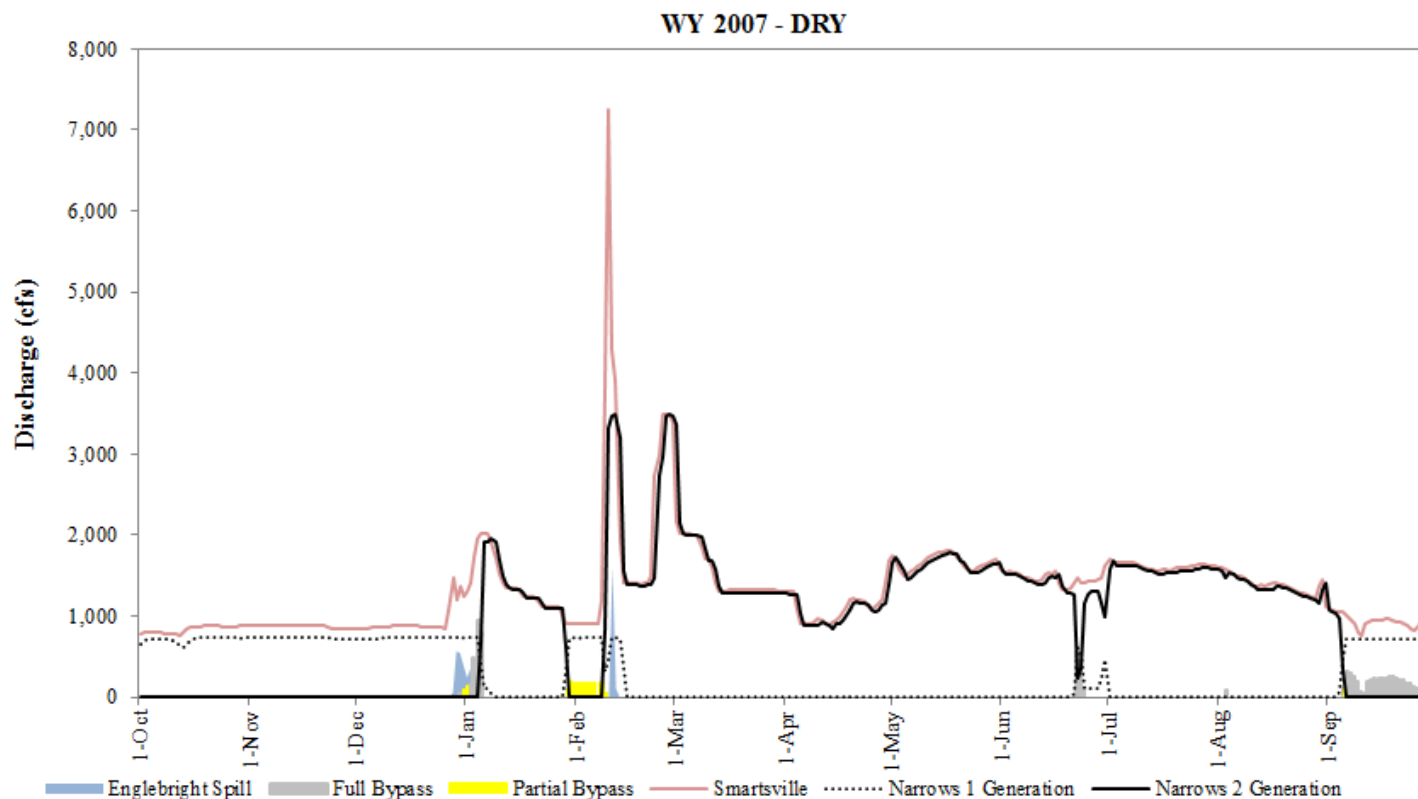
<sup>14</sup> For the purpose of this Plan, an "emergency" is defined as an event that is outside the control of YCWA or PG&E and that poses an imminent danger to the public, the environment or project facilities. An emergency includes equipment failure.

<sup>15</sup> In some cases, such as a momentary unit trip caused by a transmission line outage, YCWA's operators are able to fully restore flow through Narrows 2 Powerhouse before the automatic system begins flow through the Full Bypass.

## **2.2.6 Flow Through Each Facility from WY 2007 through WY 2014**

Figures 2.2-1 through 2.2-8 show estimated 15-minute flows through the Narrows 2 Powerhouse, Partial Bypass and Full Bypass from WY 2007 through WY 2014. The 15-minute hydrology data from which the figures were developed are contained in Attachment B to this Plan. Also included in Attachment B are 15-minute data from the Narrows 1 Powerhouse, Smartsville gage, and spills at Englebright Dam from WY 2007 through WY 2014. Some considerations when viewing the figures are:

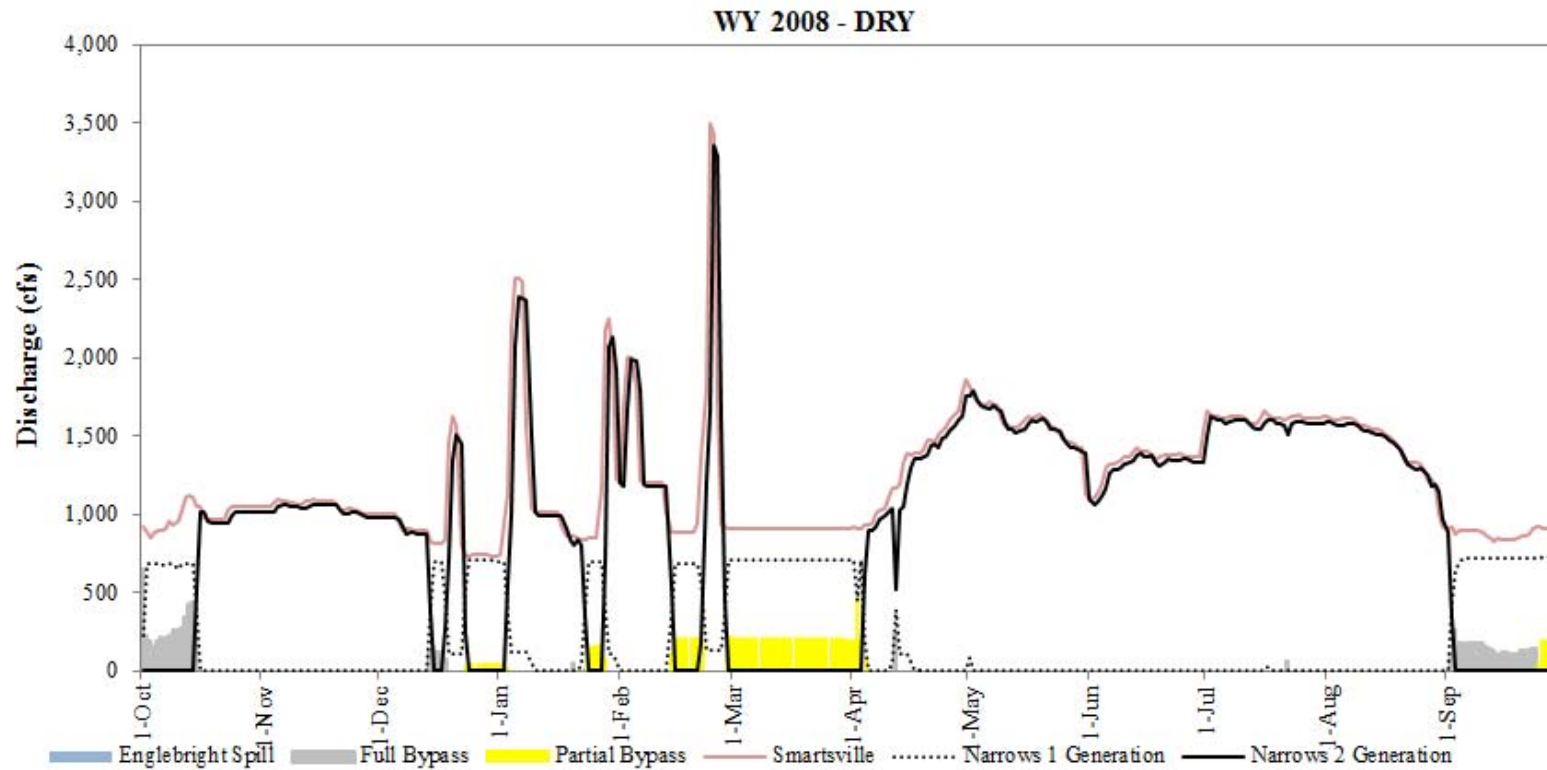
- Most of the flow changes between facilities occurred within relatively short periods of time, especially during spills at Englebright Dam. At other times, flows were relatively constant. Thus the figures are provided to give an overall view of coordinated operations of the facilities.
- Englebright Dam was assumed to be spilling when the reservoir elevation exceeded the elevation of the dam spillway.
- When only one Narrows 2 Facility was operating, the Narrows 2 Penstock AVM-measured flow represents the entire flow through that facility, including changes in rate of flow. However, when more than one Narrows 2 Facility was operating, YCWA estimated the flow through each facility based on the operator's log books.
- The measured releases from the Narrows 2 Facilities and Narrows 1 Powerhouse may not always have equaled the measured flow at the Smartsville gage when Englebright Dam was not spilling because of gaging errors.
- The Narrows 2 Penstock AVM can be used to examine the rate of change through the combined Narrows 2 Facilities or through one Narrows 2 Facility if it is the only one operating. But if more than one Narrows 2 Facility is operating at the same time, the rate of flow change, especially during start-up and shut down, in each facility cannot be estimated, other than in qualitative terms using YCWA operator's log books.



**Figure 2.2-1. Mean daily discharges from Narrows 1 Powerhouse, Narrows 2 facilities, the Smartsville gage, and Englebright Dam spill in Water Year 2007.<sup>16, 17</sup>**

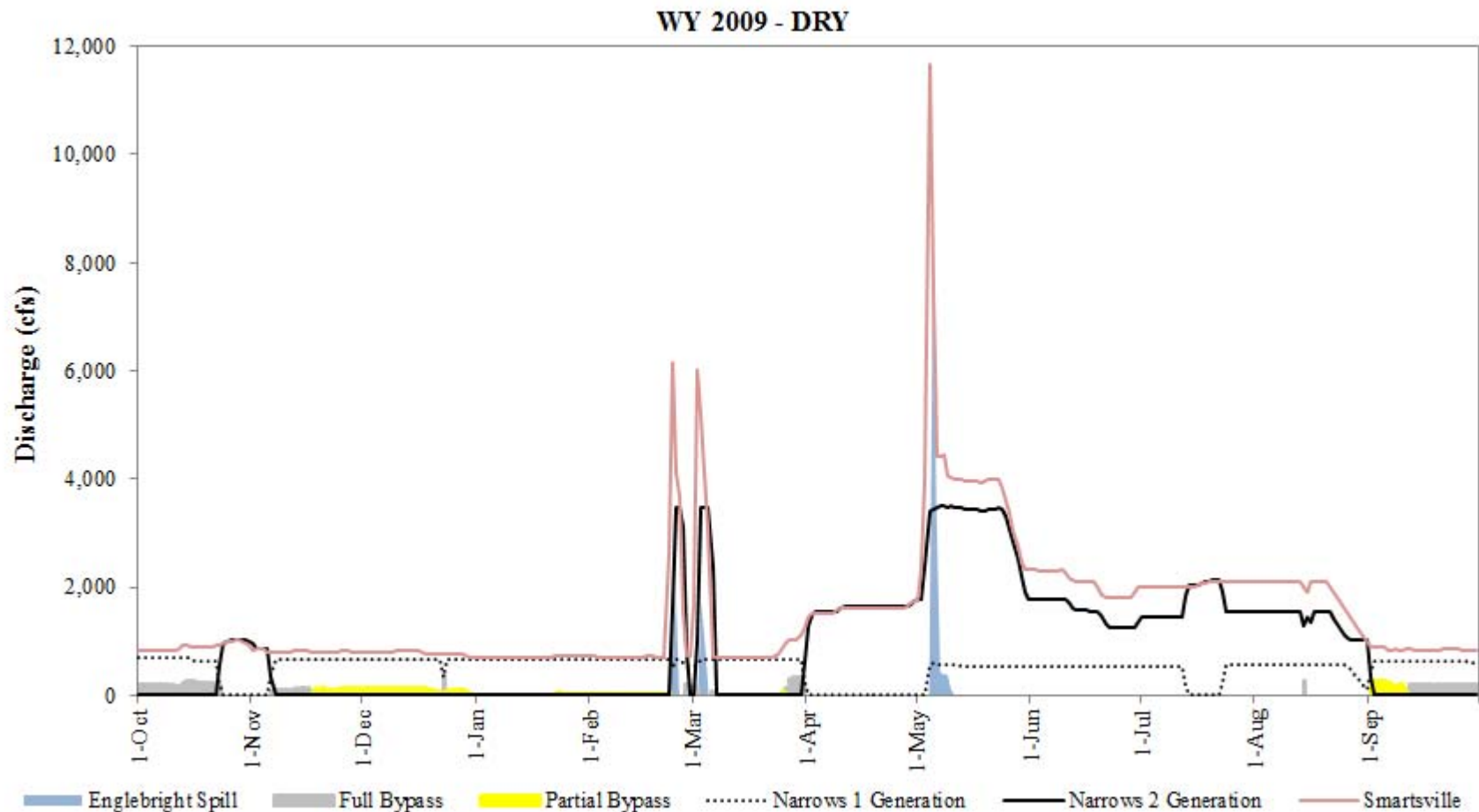
<sup>16</sup> In this figure, Narrows 1 Powerhouse and Smartsville gage data are from PG&E, and the Partial and Full bypass data are estimated by YCWA based on 15-minute flow data from the Narrows 2 Penstock AVM and information in YCWA operators' log books. The Narrows 2 Powerhouse was shut down during the period of October 1, 2006 through December 30, 2006 for the installation of the Full Bypass. Siphons over Englebright Dam were used to provide flow to the Yuba River in addition to Narrows 1 Powerhouse releases. Accordingly, there is a difference between the flow from the Narrows 1 Powerhouse and Smartsville gage flow shown in the figure.

<sup>17</sup> The Narrows 2 Powerhouse was shut down during the period of October 1, 2006 through December 30, 2006 for the installation of the Full Bypass. Siphons over Englebright Dam were used to provide flow to the Yuba River in addition to Narrows 1 Powerhouse releases. Accordingly, there is a difference between the flow from the Narrows 1 Powerhouse and Smartsville gage flow shown in the figure.



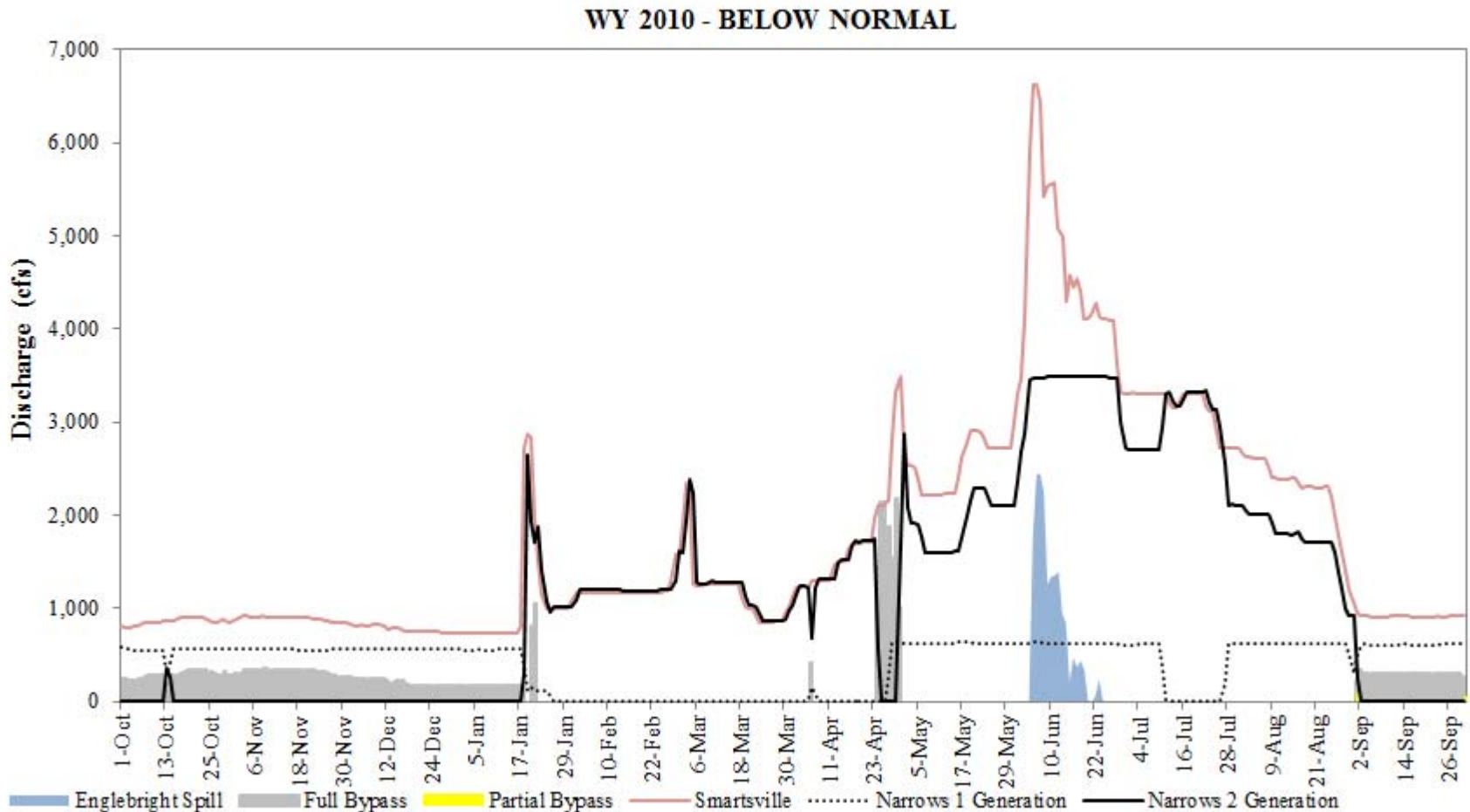
**Figure 2.2-2. Mean daily discharges from Narrows 1 Powerhouse, Narrows 2 facilities, and the Smartsville gage in WY 2008. Englebright Dam did not spill in Water Year 2008.<sup>18</sup>**

<sup>18</sup> In this figure, Narrows 1 Powerhouse and Smartsville gage data are from PG&E, and the Partial and Full bypass data are estimated by YCWA based on flow data from the Narrows 2 Penstock AVM and information in YCWA operators' log books.



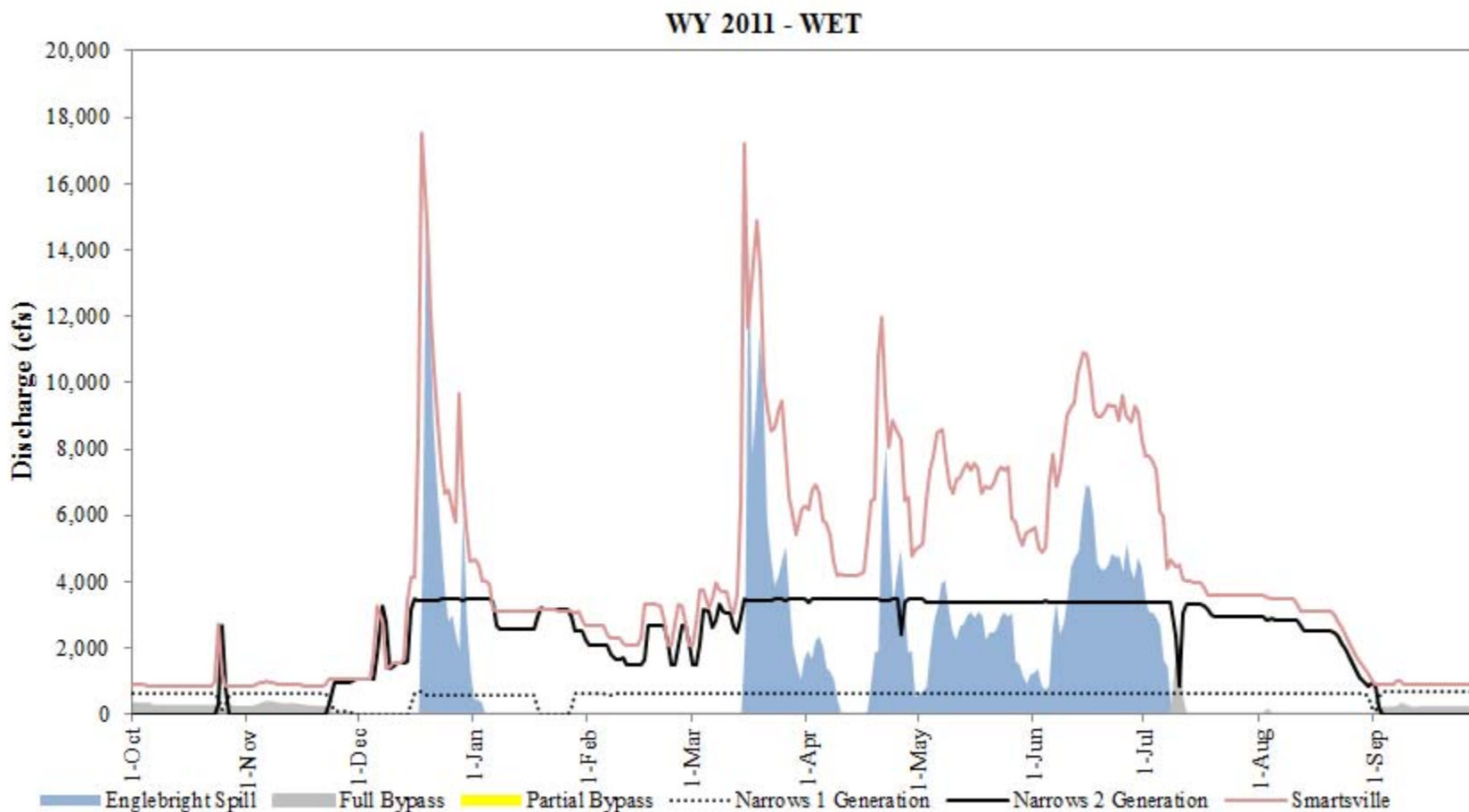
**Figure 2.2-3. Mean daily discharges from Narrows 1 Powerhouse, Narrows 2 facilities, the Smartsville gage, and Englebright Dam spill in Water Year 2009.<sup>19</sup>**

<sup>19</sup> In this figure, Narrows 1 Powerhouse and Smartsville gage data are from PG&E, and the Partial and Full bypass data are estimated by YCWA based on flow data from the Narrows 2 Penstock AVM and information in YCWA operators' log books.



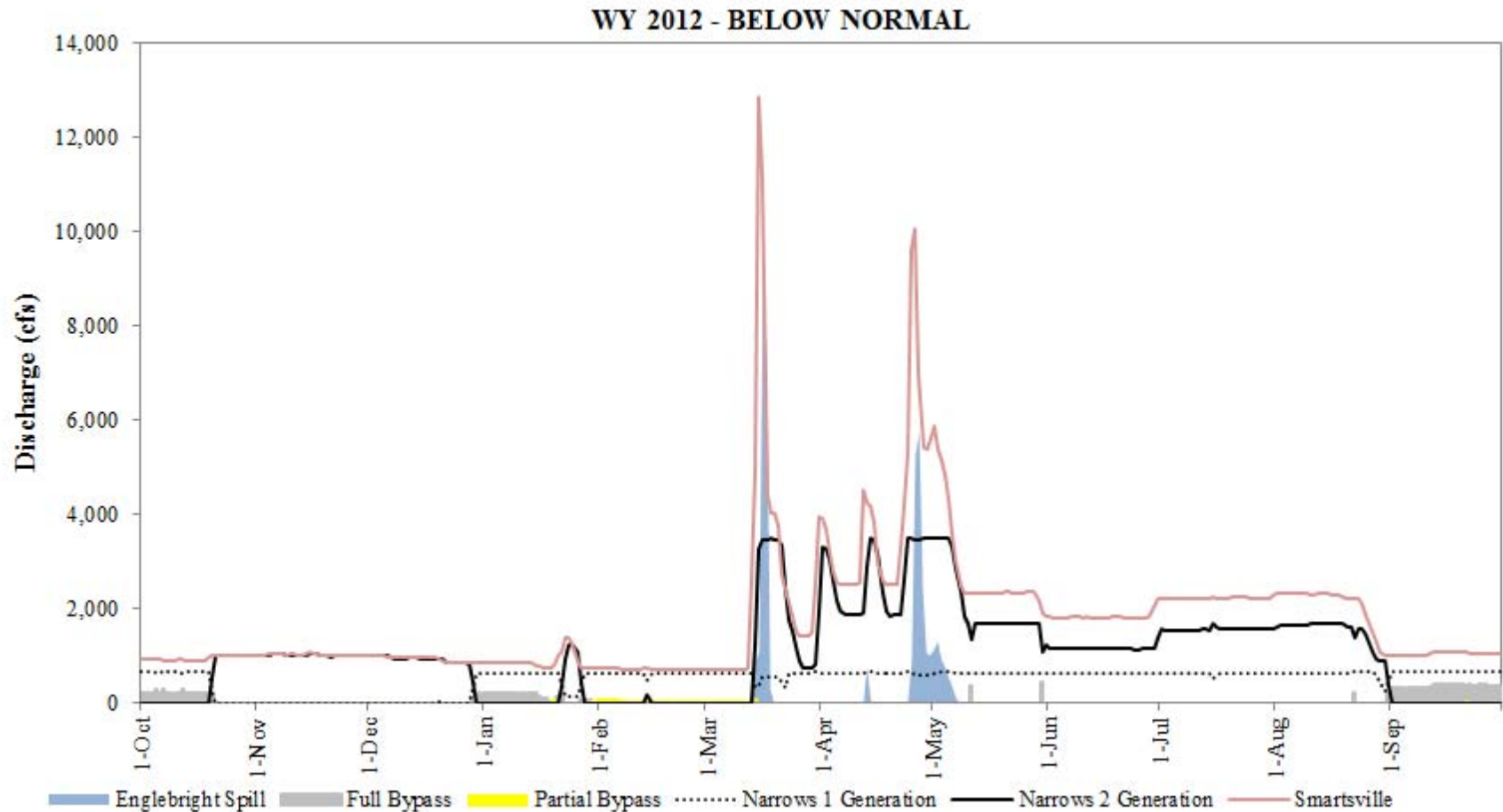
**Figure 2.2-4. Mean daily discharges from Narrows 1 Powerhouse, Narrows 2 Facilities, the Smartsville gage, and Englebright Dam spill in Water Year 2010.<sup>20</sup>**

<sup>20</sup> In this figure, Narrows 1 Powerhouse and Smartsville gage data are from PG&E, and the Partial and Full bypass data are estimated by YCWA based on flow data from the Narrows 2 Penstock AVM and information in YCWA operators' log books.



**Figure 2.2-5. Mean daily discharges from Narrows 1 Powerhouse, Narrows 2 Facilities, the Smartsville gage, and Englebright Dam spill in Water Year 2011.<sup>21</sup>**

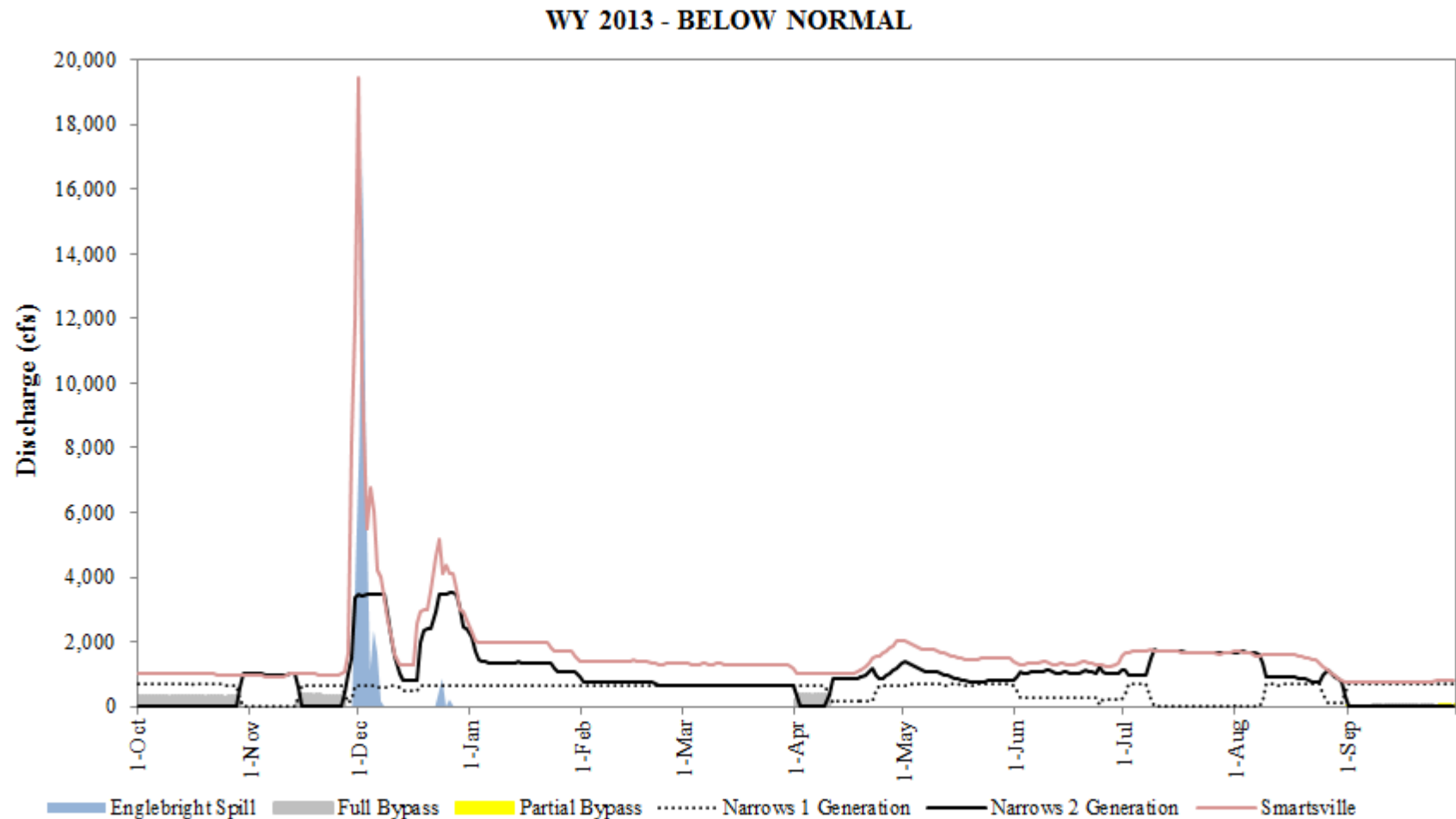
<sup>21</sup> In this figure, Narrows 1 Powerhouse and Smartsville gage data are from PG&E, and the Partial and Full bypass data are estimated by YCWA based on flow data from the Narrows 2 Penstock AVM and information in YCWA operators' log books.



**Figure 2.2-6. Mean daily discharges from Narrows 1 Powerhouse, Narrows 2 Facilities, the Smartsville gage, and Englebright Dam spill in Water Year 2012.<sup>22</sup>**

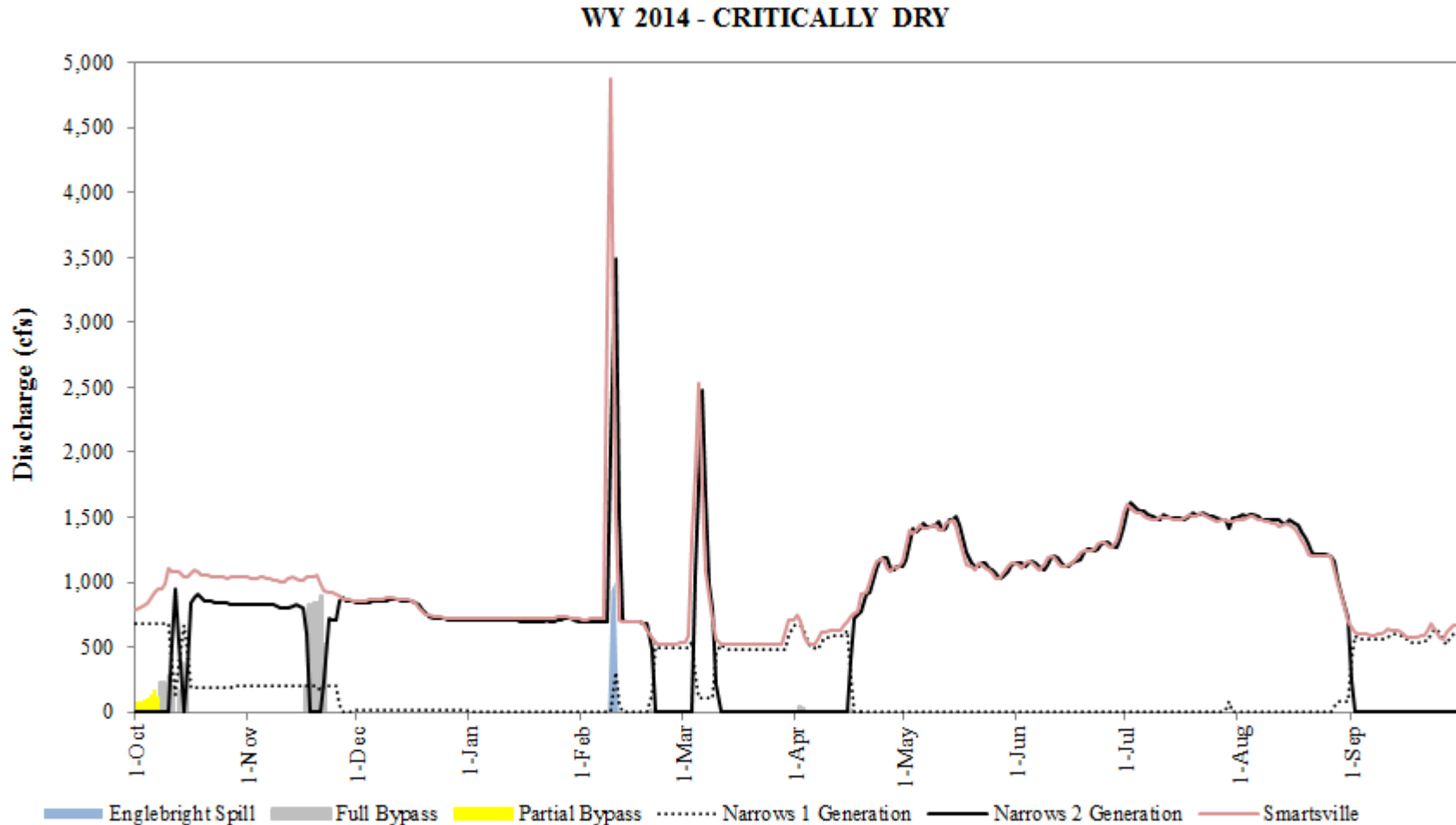
<sup>22</sup> In this figure, Narrows 1 Powerhouse and Smartsville gage data are from PG&E, and the Partial and Full bypass data are estimated by YCWA based on flow data from the Narrows 2 Penstock AVM and information in YCWA operators' log books.





**Figure 2.2-7. Mean daily discharges from Narrows 1 Powerhouse, Narrows 2 Facilities, the Smartsville gage, and Englebright Dam spill in Water Year 2013.<sup>23</sup>**

<sup>23</sup> In this figure, Narrows 1 Powerhouse and Smartsville gage data are from PG&E, and the Partial and Full bypass data are estimated by YCWA based on flow data from the Narrows 2 Penstock AVM and information in YCWA operators' log books.



**Figure 2.2-8. Mean daily discharges from Narrows 1 Powerhouse, Narrows 2 Facilities, the Smartsville gage, and Englebright Dam spill in Water Year 2014.<sup>24</sup>**

<sup>24</sup> In this figure, Narrows 1 Powerhouse and Smartsville gage data are from PG&E, and the Partial and Full bypass data are estimated by YCWA based on flow data from the Narrows 2 Penstock AVM and information in YCWA operators' log books.

Figures 2.2-1 through 2.2-8 show that the Narrows 2 and Narrows 1 powerhouses may operate at the same time. However, typically YCWA does not operate the Full Bypass when the Narrows 2 Powerhouse is operating, or the Full and Partial bypasses at the same time. However, these may be operated at the same time during brief flow transition periods.

The figures also show that, in general, in Wet WYs, such as 2011, Narrows 1 Powerhouse operated at consistent rates. The 2009 WY, which was Dry, also was characterized by relatively steady operational conditions at Narrows 1 Powerhouse, but in the Below Normal WY 2010, operational conditions were more variable. Regardless of WY, Narrows 2 Powerhouse releases fluctuated with the upstream hydrograph, passing upstream flows, and changing flows during potential spill events, which were frequent in Wet WYs. In Dry WYs, Narrows 2 Powerhouse often did not operate for months at a time.<sup>25</sup> In WY 2014, a Critically Dry WY, required releases were just above the Narrows 1 Powerhouse release capacity, so only the Narrows 2 Powerhouse was operated for the majority of the year, and the Narrows 1 Powerhouse was only operated for periods when accretions to the Yuba River were such that the Narrows 1 Powerhouse release capacity was adequate to meet Yuba River required flows.

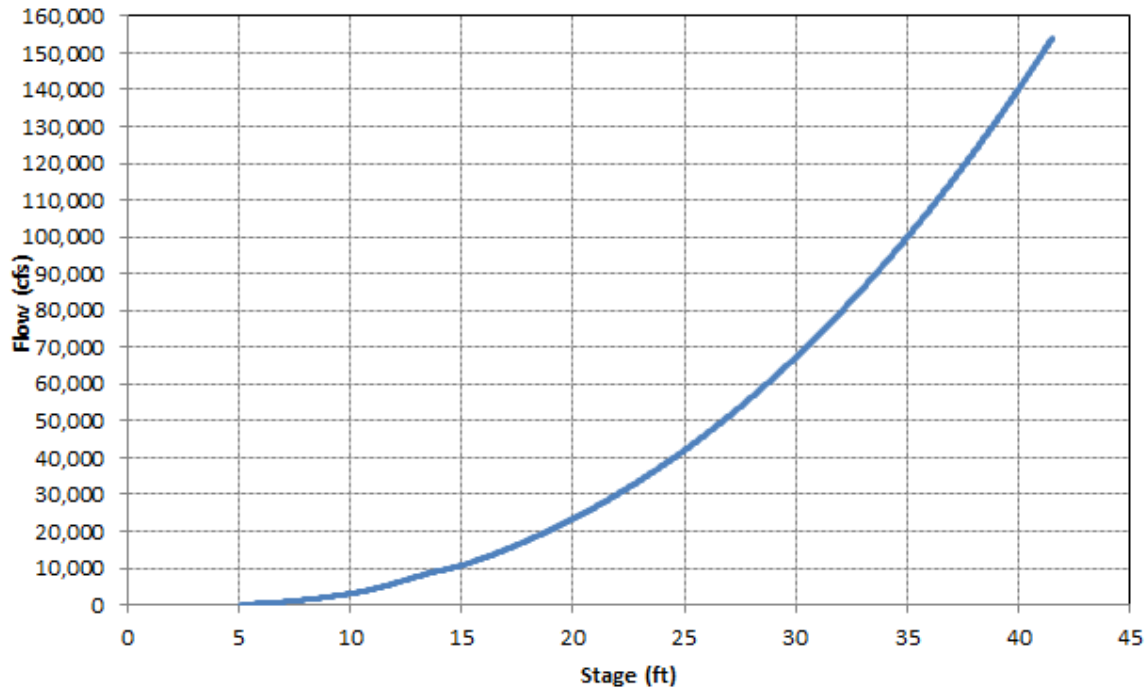
## **2.2.7 Stage-Flow Relationship Downstream of Narrows 2 Facilities**

### **2.2.7.1 Long-Term Stage-Flow Relationships**

Long-term stage data are available in the Yuba River at the Smartsville gage. PG&E collects 15-minute stage data and reports it to USGS at the Smartsville gage. USGS has used the stage and flow data at the gage to develop a stage-flow relationship at the gage, which is shown in Figure 2.2-9.

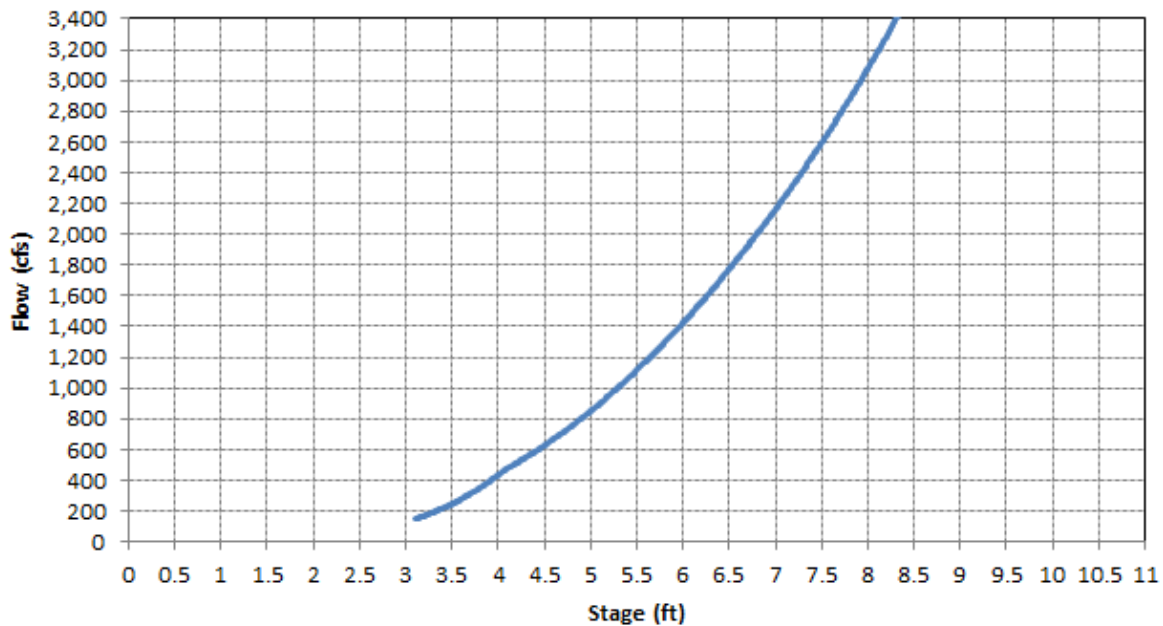
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<sup>25</sup> Normally, YCWA takes its annual outage of the Narrows 2 Powerhouse for 2 to 3 weeks in late August/September, and PG&E takes its annual outage of the Narrows 1 Powerhouse for 3 weeks in July. During these annual outages, routine maintenance occurs. The annual outage can be taken at other times of the year or be longer or shorter in duration.



**Figure 2.2-9. Full stage-flow relationship at Smartsville gage based on PG&E's gage rating.**

Figure 2.2-10 shows this relationship for flows up to 3,400 cfs, which is the maximum capacity of the Narrows 2 Facilities. USGS periodically checks the relationship, and updates the stage-flow curve if needed.

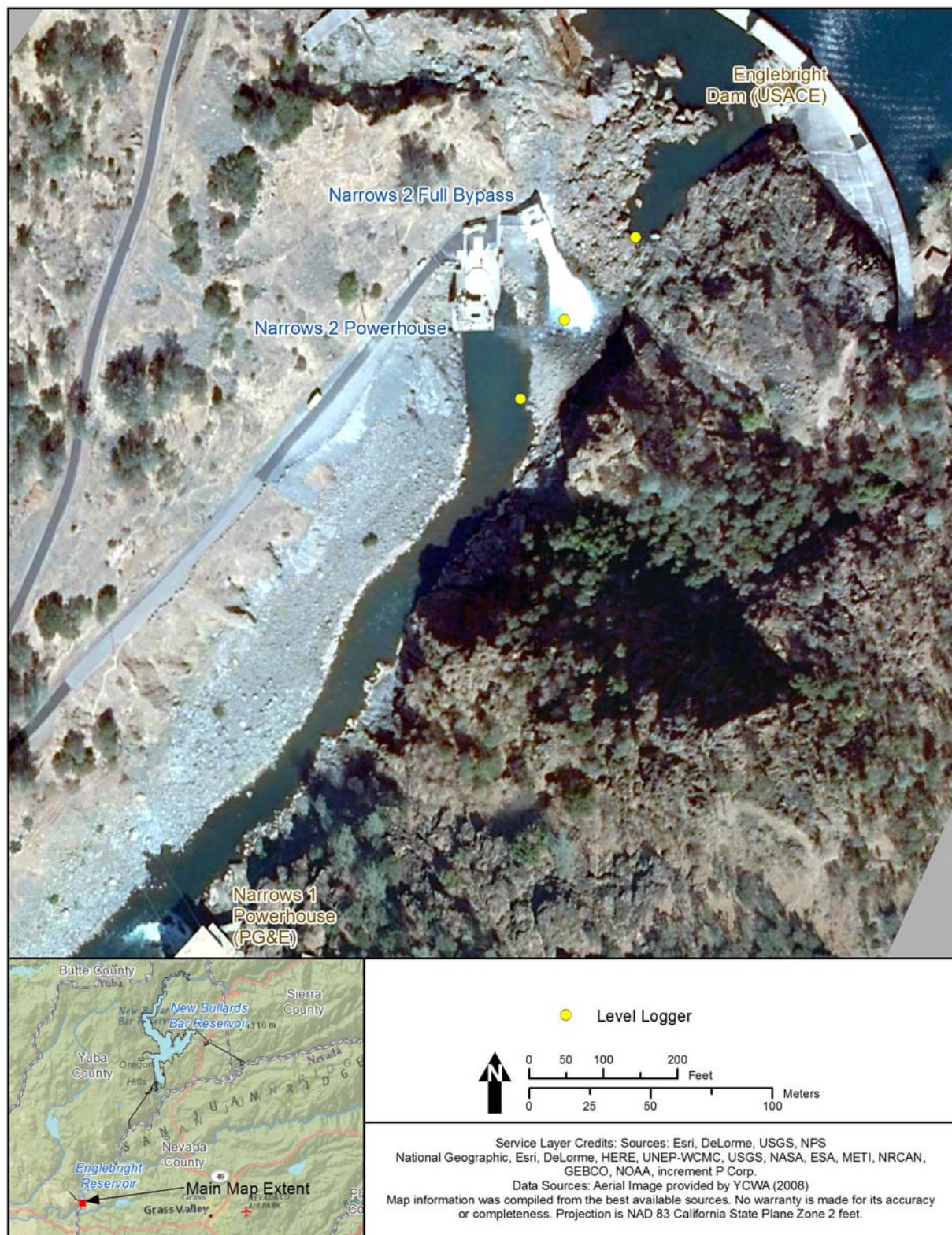


**Figure 2.2-10. Stage-flow relationship at Smartsville gage up to 3,400 cfs based on PG&E's gage rating.**

### **2.2.7.2 Short-Term Stage-Flow Relationships**

Over the course of the Yuba River Development Project relicensing, YCWA placed level loggers in the Yuba River near the Narrows 2 Powerhouse at three locations: 1) in the pool formed directly below Englebright Dam (i.e., Dam Pool); 2) in the pool formed by the Full Bypass (i.e., Bypass Pool); and 3) in the pool downstream from the Narrows 2 Powerhouse (i.e., Powerhouse Pool). The level loggers were deployed to remotely measure water surface elevation (WSE). Each logger included a transducer encased in a small stilling well, and was mounted to bedrock or a large boulder. The level logger recorded pressure (i.e., kilopascal) on 5-minute intervals. Pressure was converted to a WSE (ft) in Hoboware Pro™, a third party program developed by the Onset® Computer Corporation. To compensate for air pressure changes during the period of data collection, a barometer was placed in the reach. The level logger transducers have a manufacturer's stated range of 0 to 30 ft and an accuracy of plus or minus 0.015 ft. Figure 2.2-11 shows the location where these level loggers were installed.

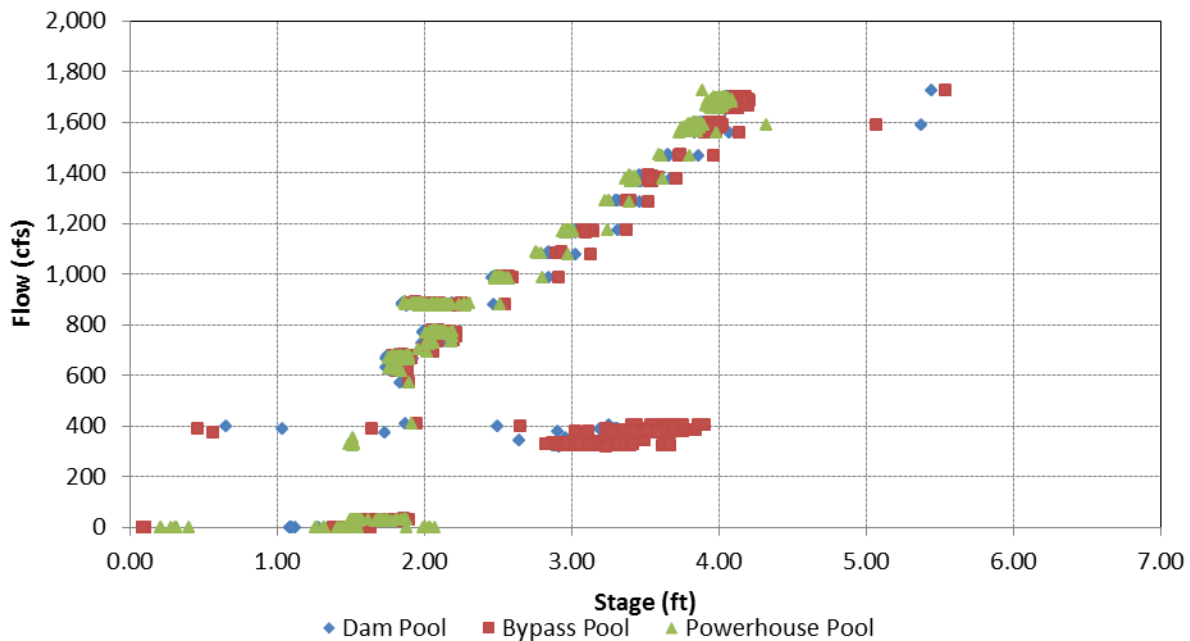




**Figure 2.2-11. Locations where YCWA maintained level loggers in the Yuba River near the Narrows 2 Facilities for relicensing-related studies.**

The level loggers were installed for two periods: 1) hourly data were collected from August 9, 2012 through October 25, 2012, when releases from Narrows 2 Powerhouse and the Full Bypass ranged from 318 cfs to 1,727 cfs; and 2) 15-minute data were collected from August 30, 2014 through September 1, 2014 when flows from the Narrows 2 Powerhouse and the Full Bypass ranged from 25 cfs to 885 cfs.

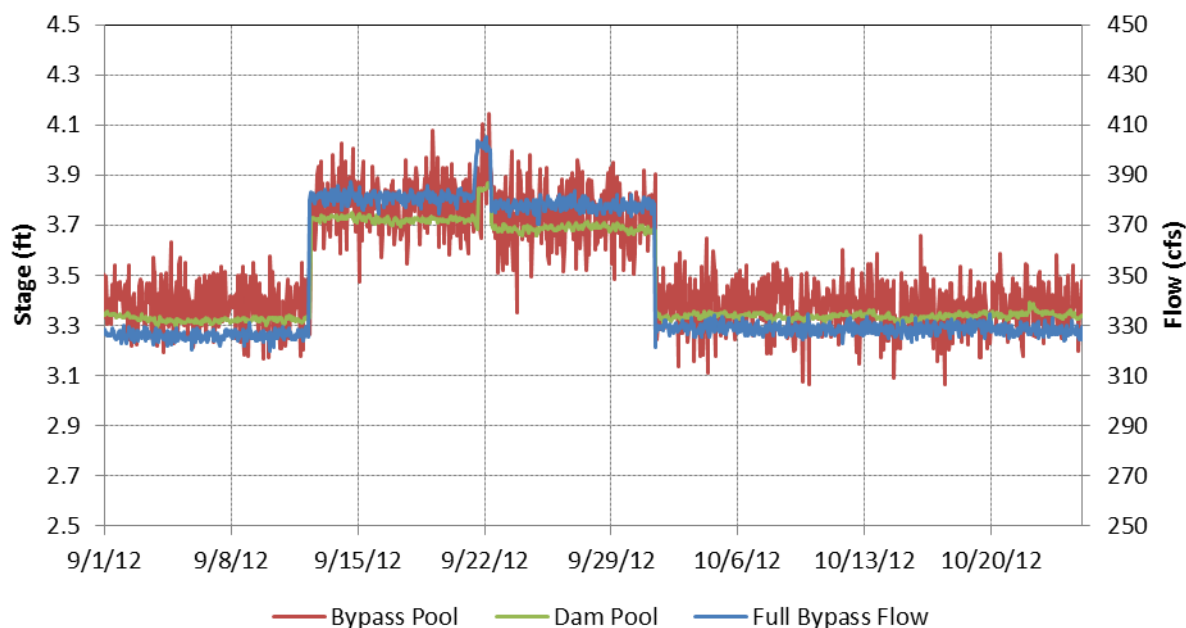
YCWA plotted the flows, as measured by the Narrows 2 AVM, and stages as measured by the level loggers for the two periods to identify a relationship between stage and flow. Figure 2.2-12 shows the stage and flow data collected during the two measurement periods.



**Figure 2.2-12. Historically measured stages at locations around the Narrows 2 Powerhouse and flows as measured by the Narrows 2 AVM.**

A close examination of the stages at the three locations reveals the stage in the Dam Pool and Bypass Pool are virtually identical, indicating there is a strong hydraulic linkage between the two pools. While stages measured in the Bypass Pool reflect turbulence associated with the discharge of the Full Bypass, the stages in the Dam Pool are much more consistent, but respond very similarly to flow changes as the Bypass Pool.

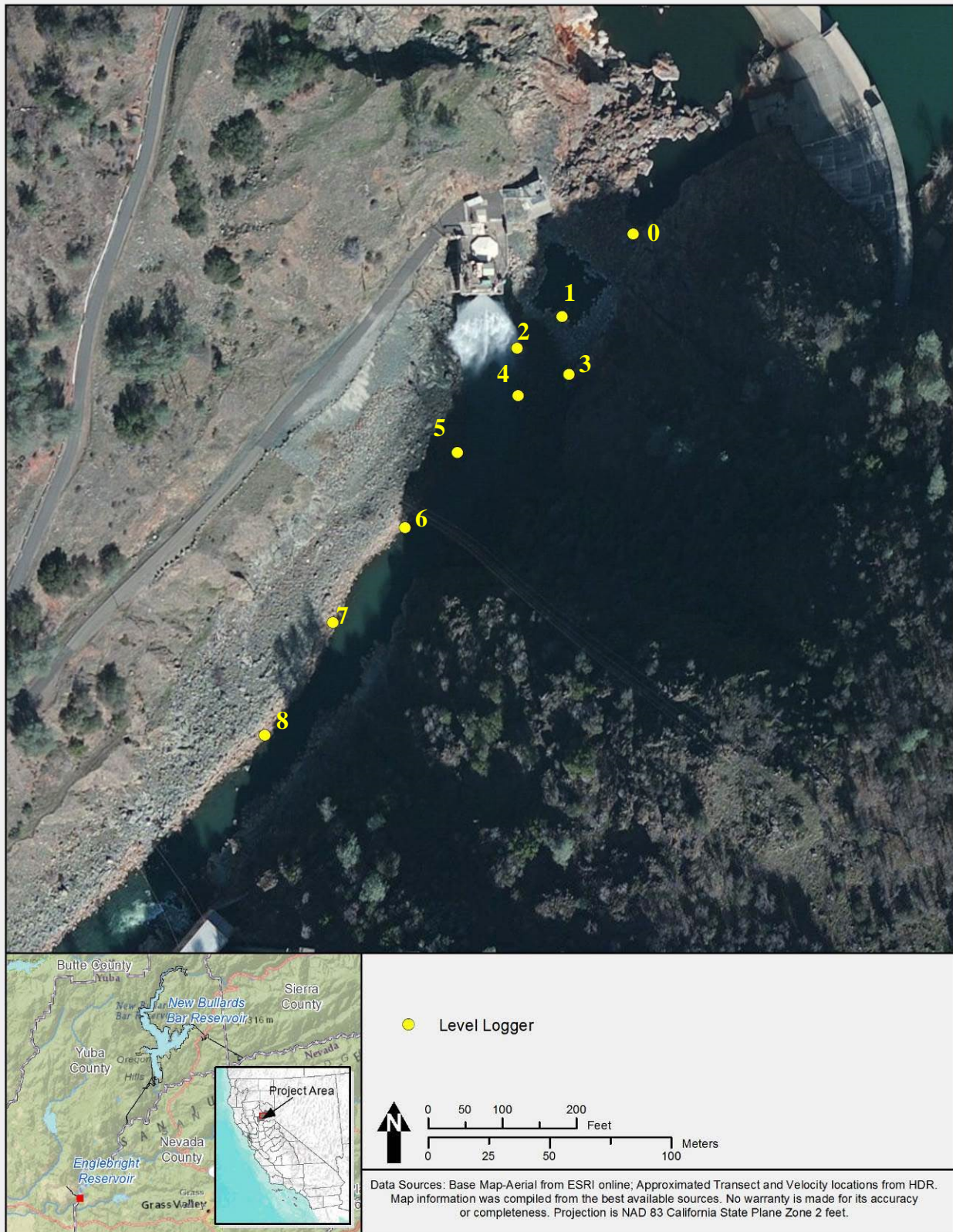
Figure 2.2-13 shows the Full Bypass release and the stages in the Dam Pool and Bypass Pool for September 1, 2012 through October 25, 2012, when only the Full Bypass was operating; there were no releases from the Narrows 2 Powerhouse during this time. During this time, stages in both pools reflect the flow changes from the Full Bypass.



**Figure 2.2-13. Historical stages in the Bypass Pool and Dam Pool and releases from the Full Bypass between September 1, 2012 and October 25, 2012.**

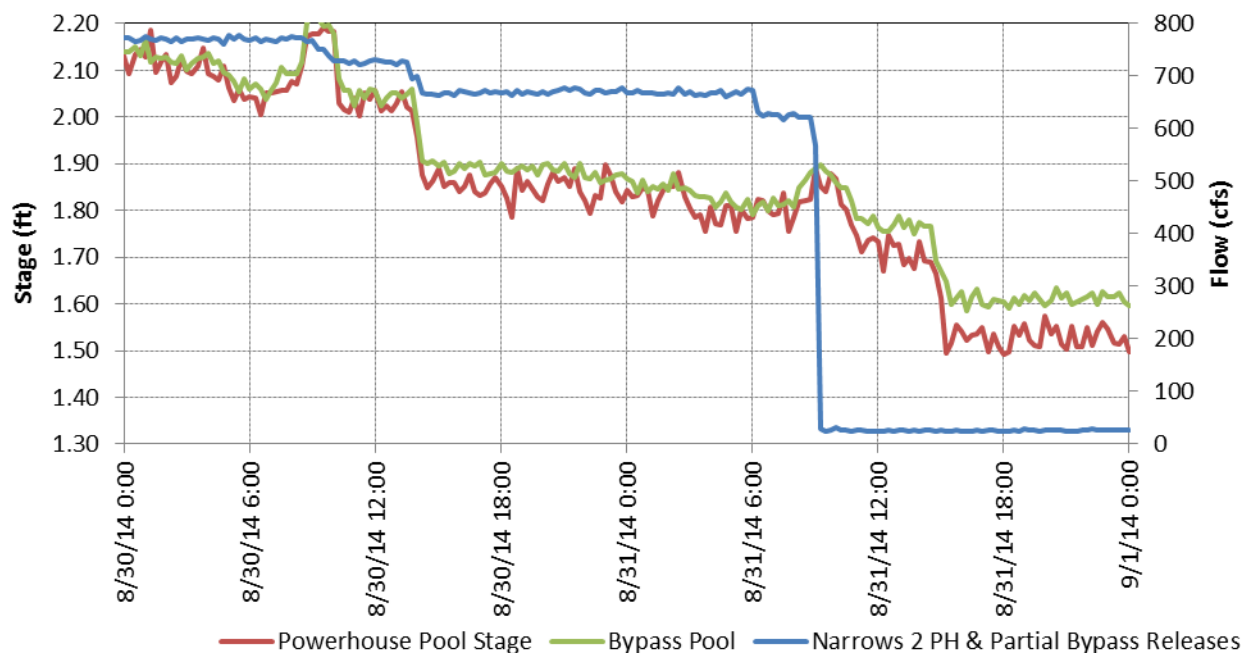
On August 31, 2014, YCWA and PG&E switched flow from Narrows 2 Powerhouse to the Narrows 1 Powerhouse. Prior to the switchover, level loggers, which recorded stage data every 15 minutes, were placed in the Dam Pool, Bypass Pool, and Powerhouse Pool. The locations of the level loggers are shown in Figure 2.2-14.





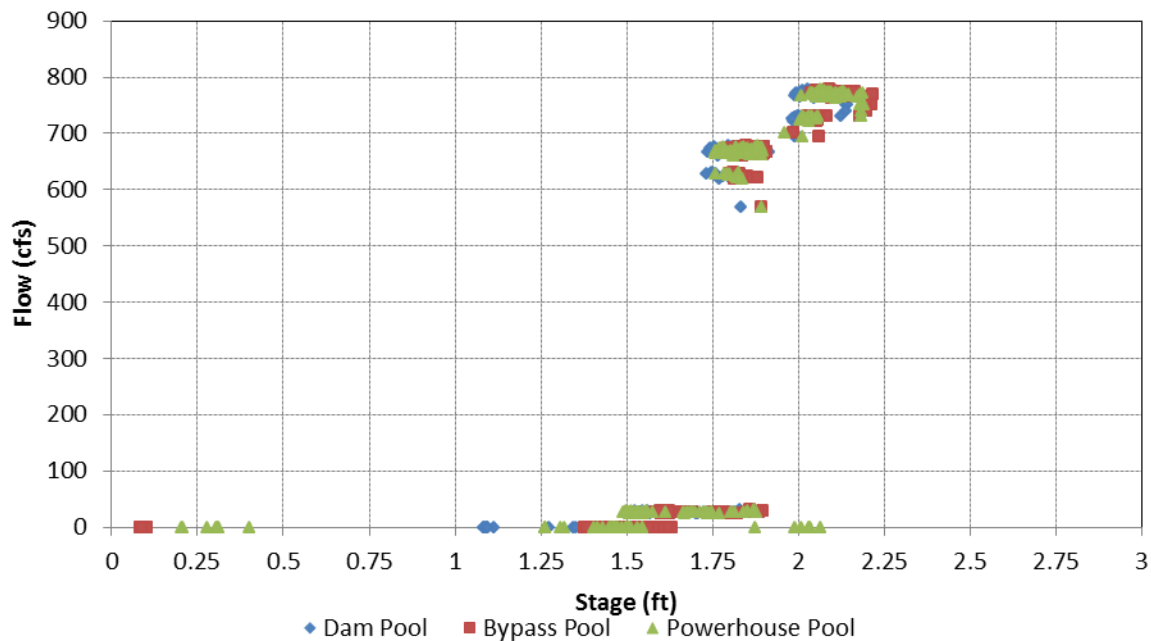
**Figure 2.2-14. Locations where YCWA maintained level loggers in the Yuba River near the Narrows 2 Facilities from August 30 through September 1, 2014.**

Releases prior to the transition were made from the Narrows 2 Powerhouse. After the transition, releases were made from the Partial Bypass. The data indicate that the Bypass Pool stages closely reflect those in the Powerhouse Pool, and that stages in both pools continue to drain when releases from the Narrows 2 Powerhouse drop below 600 cfs. Accordingly, stages in these pools are not directly related to flow for releases from the Narrows 2 Powerhouse below approximately 600 cfs. Figure 2.2-15 shows releases from the Narrows 2 Powerhouse and Partial Bypass and the corresponding stages in the Powerhouse Pool and the Bypass Pool.



**Figure 2.2-15. Measured flows and stages for the Narrows 2 Powerhouse shut down on August 31, 2014.**

YCWA plotted the flows from the Narrows 2 Penstock AVM and stages for three level loggers at locations 0; 1; and 4 in Figure 2.2-14 to identify a relationship between stage and flow. Figure 2.2-15 shows that shutdown of the Narrows 2 powerhouse on 8/31 from a flow of just under 700 cfs to no flow resulted in stage reductions in the Bypass Pool and Powerhouse Pool of less than 4 feet. Figure 2.2-16 shows the stage and flow data collected during the period.

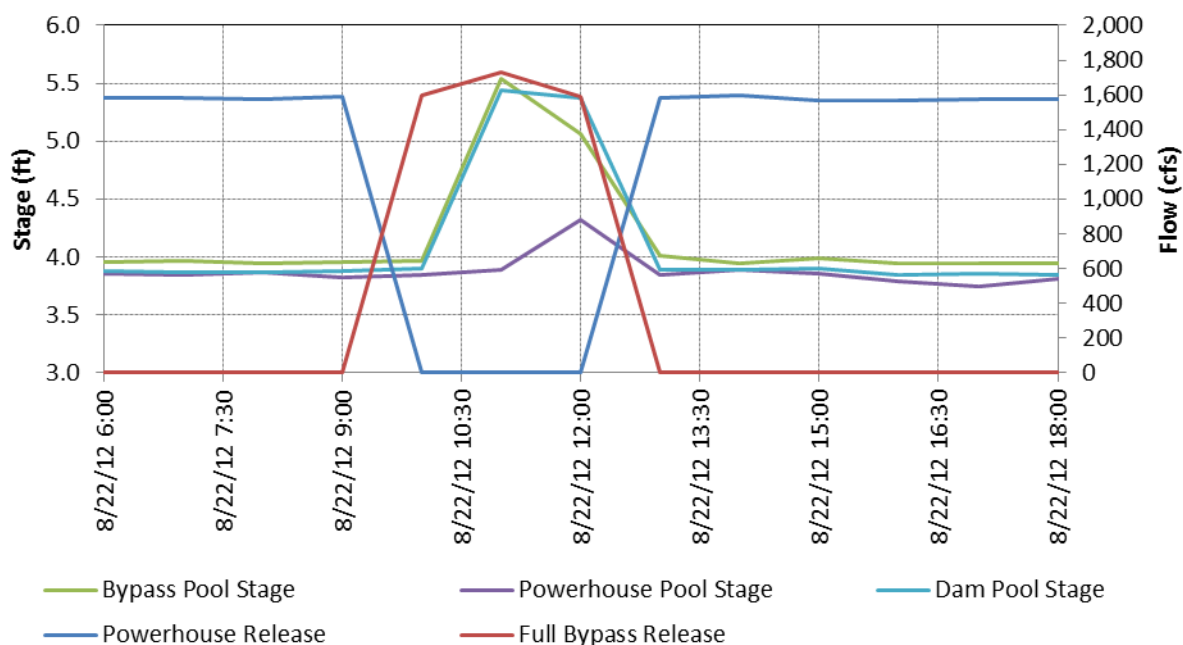


**Figure 2.2-16. Measured flows and stages from the August 30 through September 1, 2014 flow reduction.**

Figure 2.2-16 shows that the pools below the Narrows 2 Powerhouse drain slowly for low flows and the stages in these pools are not directly related to Narrows 2 Powerhouse or Full Bypass releases.

Stages in the Bypass and Dam pools are affected by releases from the Narrows 2 Powerhouse similar to the Powerhouse Pool. The Bypass Pool and Dam Pool are affected differently than the Powerhouse Pool from Full Bypass flows. While the Powerhouse Pool responds similarly regardless of the release mechanism; it is affected by the total flow leaving the Narrows 2 Facilities, the effect of flow on stage is magnified in the Bypass and Dam pools when releases are made from the Full Bypass.

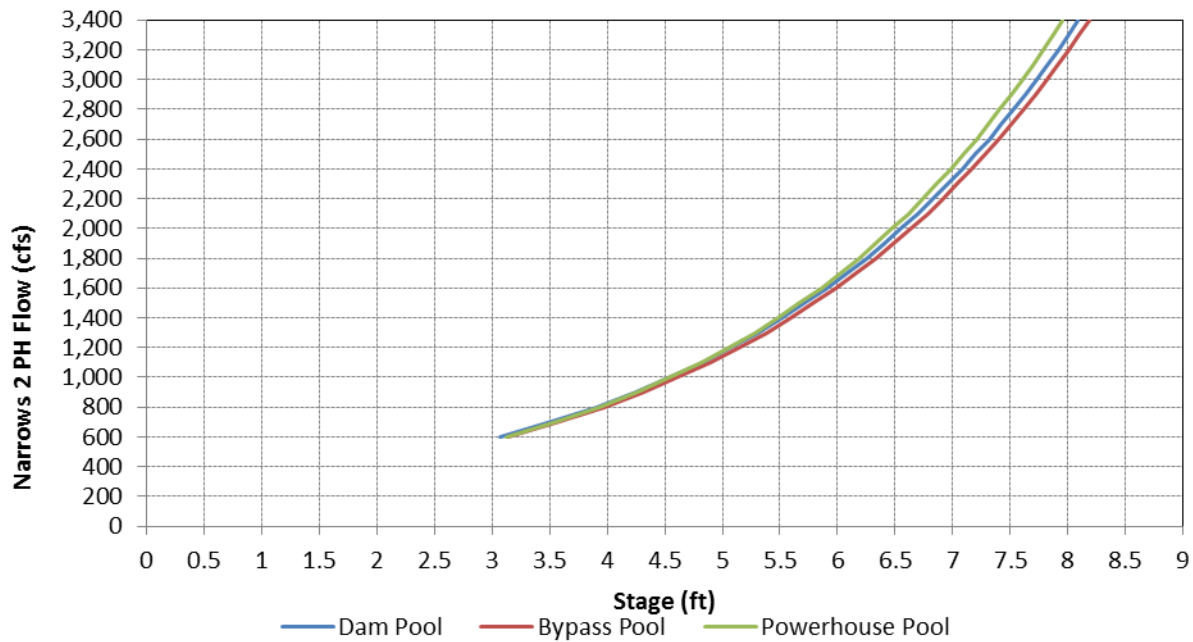
Figure 2.2-17 shows an incident in which the Full Bypass was opened for approximately an hour corresponding to a shutdown of the Narrows 2 Powerhouse, and then a subsequent return to release from the Narrows 2 Powerhouse and a closure of the Full Bypass. Total releases from the Narrows 2 Facilities did not change throughout the operations. During both release-mechanism changes, stages in the Bypass and Dam pools reacted to the change in release from the Full Bypass, whereas stages in the Powerhouse Pool did not have a corresponding change.



**Figure 2.2-17. Pool stages and Narrows 2 Facilities releases corresponding to a switch from the Narrows 2 Powerhouse to the Full and back on August 22, 2012.**

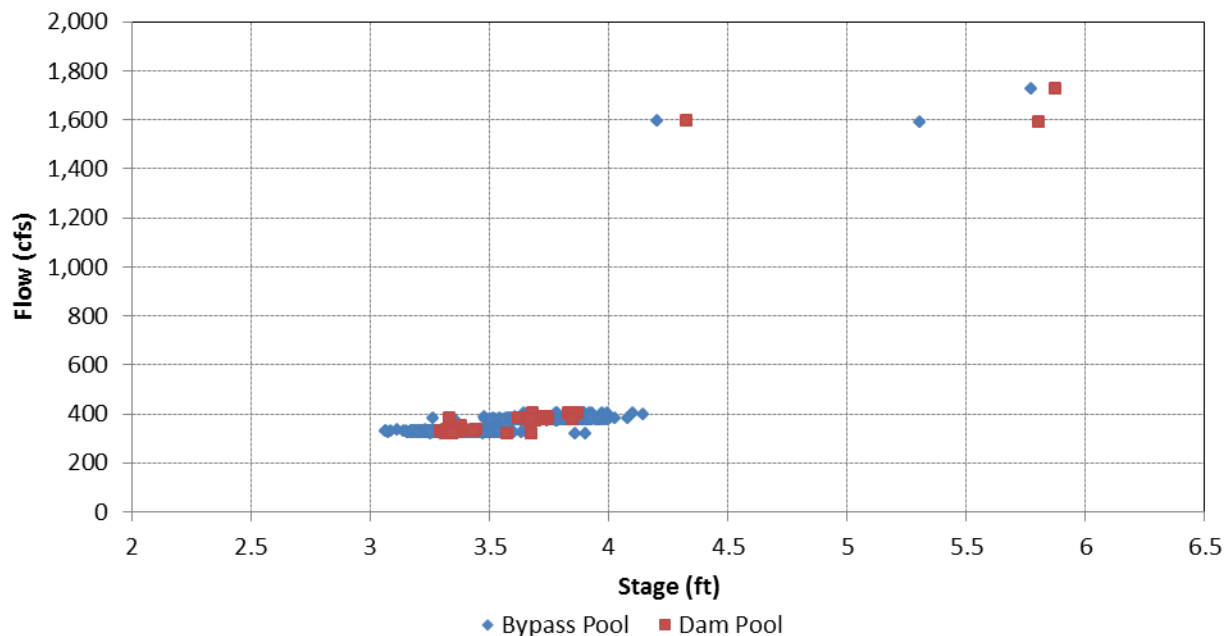
Based on the data from both the relicensing and flow reduction studies, YCWA developed stage-flow relationships at three locations in the Yuba River from Englebright Dam to below the Narrows 2 Powerhouse, for total releases from the Narrows 2 Facility less than 3,400 cfs. These curves were formed by fitting curves to the available data and extrapolating for flows beyond the measured range. As previously mentioned, there appears to be little relationship between flow and stage for flows less than approximately 600 cfs, due to the pools in the vicinity of the Narrows 2 Powerhouse. Figure 2.2-18 shows the stage-flow curves for locations 0, 1 and 4 in Figure 2.2-14.





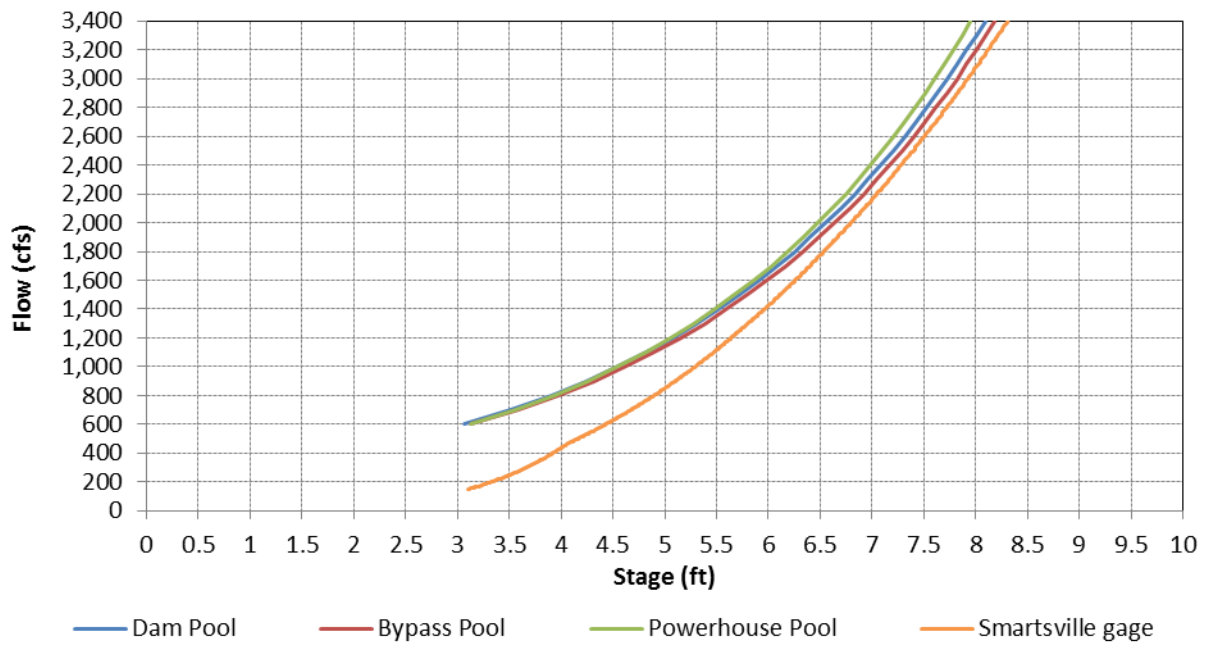
**Figure 2.2-18. Extrapolated stage-flow curves for the three locations in the vicinity of the Narrows 2 Powerhouse using flow measured by the Narrows 2 AVM.**

There are not adequate data to construct a curve for the Bypass and Dam pools for releases from the Full Bypass; however, from Figure 2.2-17, it appears there is approximately a 1.5 ft increase in the Bypass and Dam pools when releases are made through the Full Bypass, relative to the Narrows 2 Powerhouse. Figure 2.2-19 shows the relationship between stage and flow in the Bypass and Dam pools corresponding to periods when the Full Bypass is operating.



**Figure 2.2-19. Measured stages and corresponding flows for the Bypass and Englebright Dam pools when the Narrows 2 Full Flow Bypass is operating.**

Figure 2.2-20 combines the three curves in Figure 2.2-18 with the curves developed using the levels loggers and at the Smartsville gage (Figure 2.2-10). Differences in curves reflect both the ranges of flows and stages used for each curve's development and the general terrain of the location. The three curves shown in Figure 2.2-18 only included flows less than 1,800 cfs, while the Smartsville gage curve was developed to cover flows as high as 150,000 cfs. The level logger-based stage-flow relationships are the best for flows ranging from 600 to 1,800 cfs and have nearly identical slopes to the Smartsville gage stage-flow relationship above 2,000 cfs. Accordingly, the stage-flow relationship from the Powerhouse Pool level logger is the most representative for flows ranging from 600 cfs to 3,400 cfs below the Narrows 2 Powerhouse. The stage-flow relationship for flows less than 400 cfs is not well-correlated to instantaneous flow measurement, and is greatly affected by the flow rate preceding a reduction to less than 600 cfs.



**Figure 2.2-20. Combined stage-flow curves for the four locations between Englebright Dam and the Smartsville gage for flows less than 3,400 cfs.**

The measured stage and flow data used to generate the curves in this section are included in Attachment B.



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## SECTION 3.0

# FEASIBILITY OF AVOIDING USE OF PARTIAL BYPASS AND OF FULL BYPASS

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### 3.1 Overview

This section addresses the feasibility of avoiding use of the Partial Bypass and the Full Bypass. As described in Sections 2.2.3, 2.2.4 and 2.2.5, both the Partial Bypass and the Full Bypass are used: 1) for continuous operation; 2) as part of the transition of release operations between the Narrows 2 Powerhouse and the Narrows 1 Powerhouse; and 3) to maintain downstream flow to comply with regulatory requirements during outages. The feasibility of avoiding use of each bypass is described below for these three types of operation.

### 3.2 Continuous Operation Under Non-Outage Conditions

#### 3.2.1 Full Bypass

YCWA's preference is to use the Full Bypass and not use the Partial Bypass unless it is not feasible to use the Full Bypass. The primary use of the Full Bypass under non-forced outage, continuous operation conditions is to augment flows when the Narrows 1 Powerhouse is operating and the Narrows 2 Powerhouse is not operating and releases are being made to meet downstream regulatory in stream flow requirements and irrigation deliveries. The Narrows 1 Powerhouse release capacity is a maximum of 730 cfs or less depending upon head and mechanical conditions of the powerhouse. Downstream in stream flow requirements at the Marysville gage plus irrigation deliveries can add up to a required flow that is below the normal operating range of the Narrows 2 Powerhouse so that this powerhouse cannot be used to release the required flow. Also, below a flow of about 900 cfs, the Narrows 1 Powerhouse at full capacity plus a bypass flow of up to 170 cfs (730 cfs plus 170 cfs equals 900 cfs) generates more energy than if the Narrows 2 Powerhouse were releasing the total flow of 900 cfs, due to much greater efficiencies of the Narrows 1 Powerhouses at the lower flows. Another important factor is that the Narrows 1 Powerhouse is an RPS facility, and is used by PG&E in meeting its regulatory RPS quota.

It would be infeasible to avoid using the Full Bypass when the Narrows 2 Powerhouse is not available and the downstream demand is greater than the release capacity of the Narrows 1 Powerhouse. Prior to the construction of the Full Bypass, the Partial Bypass was used for the purpose of augmenting Narrows 1 Powerhouse releases when the Narrows 2 Powerhouse was not available.

It would be infeasible to avoid using the Full Bypass during times when downstream demands for in stream flows and irrigation deliveries combined are less than the minimum release capacity of the Narrows 2 Powerhouse of 700 cfs but more than the Narrows 1 Powerhouse capacity, unless more water is released than necessary to meet the downstream demand. Releasing more

water than necessary in order to have all of the flow through the Narrows 2 Powerhouse and no flow through the Full Bypass, or the Narrows 1 Powerhouse, would impact storage in New Bullards Bar Reservoir, resulting in reducing dry year water supply, and potentially impacting the Yuba Accord flow schedule, which in part is based on September 30 storage in New Bullards Bar Reservoir. Also, it would be infeasible to avoid using the Full Bypass without reducing the energy generation output of the coordinated operations of the Narrows 1 and 2 powerhouses and without reducing the RPS qualified energy available to PG&E to meet its RPS quota. Avoiding using the Full Bypass under continuous operation would significantly limit PG&E's ability to use the Narrows 1 Powerhouse. The total release required to meet downstream demands is greater than the release capacity of the Narrows 1 Powerhouse for a significant portion of the time.

### **3.2.2 Partial Bypass**

All of the discussion in Section 3.2.1 for the Full Bypass is applicable to the use of the Partial Bypass for non-forced outage continuous operations, except that the Partial Bypass is only used when the bypass flow required to augment the Narrows 1 Powerhouse release capacity is less than the reliable operating range of the Full Bypass, which is 150 cfs (see Footnote 1 in Table 2.2-1.)

For continuous operation, it is feasible to avoid using the Partial Bypass, except if the Full Bypass is not available for mechanical reasons, which would be an unlikely scenario, or when the required flow needed to meet downstream requirements is more than the release capacity of the Narrows 1 Powerhouse and the remaining release amount is less than the reliable operating range of the Full Bypass, which is 150 cfs. Because the 730 cfs normal maximum release capacity of the Narrows 1 Powerhouse is greater than the minimum release capacity of the Narrows 2 Powerhouse of 700 cfs, the Partial Bypass would only be used for augmenting the Narrows 1 Powerhouse release for continuous operations when the Narrows 2 Powerhouse was not available and the required release is less than 150 cfs plus the Narrows 1 Powerhouse release capacity.

## **3.3 Transition Operations**

### **3.3.1 Full Bypass**

Sections 2.2.4.2 through 2.2.4.5 describe the various transition operations in which the Full Bypass is used. The following is a description of the feasibility of avoiding using the Full Bypass for these various transition operations.

Section 2.2.4.2 describes transition from the Narrows 2 Powerhouse to the Narrows 1 Powerhouse with the Full Bypass being used to augment the Narrows 1 Powerhouse release capacity. For this transition, since the Full Bypass is to be used in continuous operation after the transition, the Full Bypass must be used as described in Section 3.2.1 and that section details the feasibility of not using the Full Bypass in that mode.

Section 2.2.4.3 describes the use of the Full Bypass when transitioning from operation of the Full Bypass to the Narrows 1 Powerhouse. This transition condition occurs when the Narrows 2 Powerhouse has tripped off-line or is in a forced outage condition, and the outage will last for a for more than a few hours and the decision is made to release some or all of the required flow through the Narrows 1 Powerhouse. Since this transition is a result of a forced outage condition of the Narrows 2 Powerhouse, it would be infeasible to not use the Full Bypass. The use of the Full Bypass for outages is more fully discussed in Section 3.4.1.

Section 2.2.4.4 describes the transition from the Narrows 1 Powerhouse to the Narrows 2 Powerhouse when the Full Bypass is used as an intermediate step. This operation is a transition from the Narrows 1 Powerhouse to the Narrows 2 Powerhouse where the Full Bypass is opened as the Narrows 1 Powerhouse is shutdown, and then the Narrows 2 Powerhouse release is increased and the Full Bypass release is reduced until shut off, and the Narrows 2 Powerhouse is releasing all of the flow. The purpose of using the Full Bypass in this operation is to improve reliability in the transition and ensuring compliance with downstream requirements. When the transition from the Narrows 1 Powerhouse to the Narrows 2 Powerhouse is executed after an outage of the Narrows 2 Powerhouse, the Narrows 2 Powerhouse may have been under maintenance. Under that scenario, transitioning to the Full Bypass first allows the YCWA operators more complete control in quickly reacting to any problems with bringing the Narrows 2 Powerhouse on-line where they can immediately increase the release through the Full Bypass to compensate for any operational difficulties at the Narrows 2 Powerhouse. It is feasible to avoid the use of the Full Bypass for the transition from the Narrows 1 Powerhouse to the Narrows 2 Powerhouse when the YCWA operators have confidence that the Narrows 2 Powerhouse will come on-line without any difficulty, but this direct transition is not the preferred method.

Section 2.2.4.5 describes the transition from the Narrows 1 Powerhouse to the Full Bypass (and not continuing the operation to transition flow to the Narrows 2 Powerhouse). This operation would only occur if the Narrows 2 Powerhouse was not available and there was a need to reduce releases from the Narrows 1 Powerhouse or shut down the Powerhouse for mechanical or other functional restrictions on the powerhouse that appear during operation. This is similar to a forced outage of the Narrows 1 Powerhouse except that the transition is not automatically controlled through the Full Bypass controller. It is not feasible to avoid this operation if the Narrows 1 Powerhouse is experiencing operational difficulties without potentially deviating from the downstream flow requirements. This operation is not likely to occur except in an emergency condition at the Narrows 1 Powerhouse, or if the California Independent System Operator were to direct the PG&E operators to reduce the output of the Powerhouse.

### **3.3.2 Partial Bypass**

As described above under Section 3.2.2 the Partial Bypass is only used when the required bypass flow is less than the minimum reliable range of the Full Bypass. The Partial Bypass is not used for any transition operation except for transitions from the Narrows 2 Powerhouse to the Narrows 1 Powerhouse and the bypass flow required to augment the Narrows 1 Powerhouse after the transition is less than the reliable minimum release of the Full Bypass.

## **3.4            Forced Outages**

### **3.4.1        Full Bypass**

One of the primary purposes for constructing the Full Bypass was to ensure compliance with downstream flow requirements during times when the powerhouses trip off-line or have emergencies that impair the release operations of the powerhouse. Under forced outage conditions it is not feasible to avoid using the Full Bypass without having significant impacts on downstream flows and in complying with required in stream flows.

### **3.4.2        Partial Bypass**

Unlike the Full Bypass, which is opened automatically in response to a Narrows 1 or Narrows 2 Powerhouse trip, the use of the Partial Bypass in a forced outage condition would be a manual operation, and would only occur if the Full Bypass was not available. Since the bypass amount under a forced outage would be greater than the minimum reliable release of the Full Bypass there is no need to use the Partial Bypass for a forced outage unless the Full Bypass is not available.

## **SECTION 4.0**

# **GENERAL OPERATIONAL PROTOCOLS FOR USE OF PARTIAL BYPASS AND OF FULL BYPASS**

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This section describes the circumstances under which YCWA would operate the Partial Bypass and the Full Bypass, and the usual operational protocols YCWA would follow when the facilities are used. YCWA recognizes that, if unforeseen circumstances arise, these protocols may be changed for that circumstance.

## **4.1            Circumstances Under Which Partial Bypass and Full Bypass Would be Used**

### **4.1.1            Use of Partial Bypass**

The Partial Bypass would be used in limited circumstances, and YCWA proposes to further limit operations of the Partial Bypass compared to how the Partial Bypass has been used in the past. Since construction of the Full Bypass, the Partial Bypass has been used for continuous operations when the bypass flow to augment the Narrows 1 Powerhouse was less than about 230 cfs. YCWA has determined that the reliable minimum release of the Full Bypass is 150 cfs and, therefore, will use the Full Bypass for all bypass conditions unless the flow needed to augment the Narrows 1 Powerhouse is less than 150 cfs. The Partial Bypass would also be used as a substitute for the Full Bypass described below if the Full Bypass is not available.

### **4.1.2            Use of Full Bypass**

Use of the Full Bypass as described in the previous sections can be summarized as follows;

- For continuous operation when the Narrows 1 Powerhouse is being used and the Narrows 2 Powerhouse is not being used and the downstream demand is greater than the Narrows 1 Powerhouse release capability plus 150 cfs.
- For transition from the Narrows 2 Powerhouse to the Narrows 1 Powerhouse and the Full Bypass when the Full Bypass will continue to be used after the transition to augment the Narrows 1 Powerhouse release.
- For transition from the Narrows 1 Powerhouse to the Narrows 2 Powerhouse.
- For forced outages.

For continuous operation when the Narrows 1 Powerhouse is being used and the Narrows 2 Powerhouse is not being used and the downstream demand is greater than the Narrows 1 Powerhouse release capacity plus 150 cfs, use of the Full Bypass will continue as use is the primary purpose of the Full Bypass in non-forced outage conditions, and releasing water through

the Full Bypass provides PG&E the ability to use the Narrows 1 Powerhouse when the required flow is greater than the Narrows 1 Powerhouse release capacity.

For transition operations from the Narrows 2 Powerhouse to the Narrows 1 Powerhouse and the Full Bypass, the Full Bypass will continue to be used after the transition to augment the Narrows 1 Powerhouse release. This use is required by the fact that the Full Bypass will be used for continuous operation after the transition. The previous paragraph explains the need for the continuous use of the Full Bypass.

For transition from the Narrows 1 Powerhouse to the Narrows 2 Powerhouse, as described in Section 3.3.1, YCWA proposes to continue use of the Full Bypass for this operation once the gravel bar at the outlet of the Full Bypass has been mitigated. Until that time YCWA will avoid using the Full Bypass for this transition, except when YCWA operators believe that bringing the Narrows 2 Powerhouse on-line could be problematic and must first transition to the Full Bypass from the Narrows 1 Powerhouse for operational reliability.

YCWA will continue to utilize the Full Bypass for forced outages utilizing the automated controls of the Full Bypass as described in Section 2.2.5.

## **4.2            Operational Protocols for Use of Partial Bypass and Full Bypass**

### **4.2.1        Protocols for Use of Partial Bypass**

The Partial Bypass would be used if the Full Bypass is not available, and a bypass flow is needed as described in Section 4.2.2, or the flow needed to augment the Narrows 1 Powerhouse release to meet downstream demands is less than 150 cfs. The likelihood of the Full Bypass not being available, and instead having to use the Partial Bypass, is remote, and because this would be an emergency condition, it would require operational protocols that are specific to the unique conditions at that time.

For continuous operation of the Narrows 1 Powerhouse plus the Partial Bypass when the flow needed to augment the Narrows 1 Powerhouse to meet downstream demands is less than 150 cfs, there are two transition scenarios: 1) transition from the Narrows 2 Powerhouse to the Narrows 1 Powerhouse and the Partial Bypass; or 2) when the Narrows 1 Powerhouse plus the Full Bypass are being used to meet downstream demands and these demands reduce such that the bypass flow is less than 150 cfs.

Transition from the Narrows 2 Powerhouse to the Narrows 1 Powerhouse plus the Partial Bypass will be done by first reducing the release from the Narrows 2 Powerhouse and opening the Partial Bypass to the needed bypass flow and then completing the transition as described in Section 2.2.4.1 This operation is likely not needed except for the rare circumstance when the Narrows 2 Powerhouse is not available and the required flow is more than the capacity of the Narrows 1 powerhouse, by no more than 150 cfs. No ramping is proposed for this operation at this time.



Transition from the Full Bypass to the Partial Bypass when the Narrows 1 Powerhouse is operating and the downstream demand is reduced such that the bypass flow is less than 150 cfs will be accomplished by closing the Full Bypass while simultaneously opening the Partial Bypass. This is expected to take several minutes and the resulting flow through the Partial Bypass would be a less than 150 cfs. No ramping is proposed for this operation at this time.

#### **4.2.2 Protocols for Use of Full Bypass**

There are three transitional operations for the Full Bypass. The following describes the protocols to be used for each of these operations.

For transition from the Narrows 2 Powerhouse to the Narrows 1 Powerhouse and the Full Bypass when the Full Bypass will continue to be used after the transition to augment the Narrows 1 Powerhouse release, Section 2.2.4.2 describes this operation, and YCWA does not propose to change this protocol. Ramping rates associated with this transition are inherent in the timing of operation because there is about a 10 minute travel time for flow changes from the Narrows 2 Powerhouse to the Narrows 1 Powerhouse. No ramping is proposed for this operation at this time.

For transition from the Narrows 1 Powerhouse to the Narrows 2 Powerhouse, where the Full Bypass is used as an intermediate step, YCWA does not propose to change this protocol except during the interim period until YCWA has mitigated the gravel bar and associated isolation pool at the outlet of the Full Bypass. During the interim period YCWA proposes to avoid the use of the Full Bypass, for this transition, unless the YCWA operators are concerned about the reliability of the Narrows 2 Powerhouse to successfully operate after an outage. Once the gravel bar has been mitigated, the protocol for this transition operation using the Full Bypass is described in section 2.2.4.4.

The protocol for transitioning from the Narrows 1 Powerhouse to the Narrows 2 Powerhouse without use of the Full Bypass for the interim period until the gravel bar is mitigated is as follows. With the Narrows 1 Powerhouse operating and the Narrows 2 Powerhouse not operating but available, PG&E and YCWA dispatch operators to their respective powerhouses. YCWA first synchronizes the Narrows 2 Powerhouse unit to the electric grid, which requires about 100 cfs of flow through the unit. As soon as the Narrows 2 Powerhouse is synchronized to the electric grid, the load on the Narrows 2 Powerhouse is increased until it is at the required flow. YCWA typically waits for 10 minutes, which is the approximate time it takes flow from the Narrows 2 Powerhouse to reach the Narrows 1 Powerhouse. When the flow from the Narrows 2 Powerhouse reaches the Narrows 1 Powerhouse, YCWA calls the PG&E Operator and requests that the load be reduced on the Narrows 1 Powerhouse unit and that the unit be separated from the grid. No ramping is proposed for this operation at this time.

For forced outages, where the Full Bypass is opened to bypass the flow that was being released from the Narrows 2 Powerhouse or the Narrows 1 Powerhouse the operation is done by an automated controller or, in the case of a Narrows 1 Powerhouse trip, by the PG&E operators and that operation is described in Section 2.2.5. No changes to this operation are proposed and no

changes to the timing of operations are proposed. No ramping is proposed for this operation at this time.

## SECTION 5.0

# MONITORING

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As described in Section 4, YCWA proposes to use the Partial Bypass and the Full Bypass, under certain circumstances. This section describes the monitoring that YCWA will perform regarding the effectiveness of this Plan in avoiding adverse impacts to fishery resources and the Plan's continued operational feasibility.

## 5.1 Monitoring Period

While all stranded fish will be recorded, the Plan focuses on Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha*), Central Valley steelhead (*O. mykiss*), and Central Valley fall-run Chinook salmon (*O. tshawytscha*). Spring-run Chinook salmon and steelhead are listed as threatened under the federal Endangered Species Act. Fall-run Chinook salmon is listed as a federal species of concern by the United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS). Spring-run Chinook salmon is listed as threatened under the California Endangered Species Act. Since the Plan focuses primarily on these anadromous fishes, fieldwork will occur from July through February. This is the period when these anadromous fishes are likely to be in the vicinity of the Narrows 2 Facilities.

Except for monitoring related to use of the Full Bypass, safety dictates that: 1) no monitoring will occur when Englebright Dam is spilling; 2) no monitoring will occur until YCWA's operations staff has locked out the facilities (i.e., assured the facilities will not increase flows that could endanger the field crew in the river). Monitoring related to use of the Full Bypass is not subject to these safety concerns because it does not require a field crew work in the river area, as described below.

Further, monitoring will only occur in daylight. Monitoring will not occur in darkness for both safety reasons and because, even with the use of auxiliary lights, monitoring would be difficult and ineffective in the dark. If an event occurs in darkness or such that a field crew could not be present to complete the monitoring in daylight, the monitoring will occur the next day as soon as possible in daylight.

## 5.2 Monitoring Area

Monitoring during the monitoring period will be triggered by three events: 1) use of the Partial Bypass; 2) non emergency use of the Full Bypass; and 3) a significant flow reduction from the combined releases of the Narrows 2 Facilities. The area that will be monitored for each of these events is commensurate with the area affected by the event, and is described below.

- Partial Bypass. The area that will be monitored in relation to use of the Partial Bypass is the north bank of the Yuba River from the Narrows 2 Powerhouse downstream for approximately 250 ft, which is the extent of the spray from the Partial Bypass when

operating at full capacity. There are no gravel bars in this area, so monitoring will focus on the north river bank.

- Full Bypass. The area that will be monitored in relation to use of the Full Bypass is the south bank, including gravel bars, of the Yuba River from the Full Bypass downstream for approximately 400 ft, which is the extent of the spray and flow effects from the Full Bypass when operating at full capacity. This includes the location of the pool where fish have been observed isolated after use of the Full Bypass.
- Flow Reduction from Combined Discharge of Narrows 2 Facilities. The area that will be monitored in relation to a significant flow reduction from the combined discharges of the Narrows 2 Facilities is the north and south banks and gravel bars of the Yuba River from the Narrows 2 Powerhouse downstream to Narrows 1 Powerhouse.

### **5.3            Monitoring Triggers**

Monitoring will occur only during the monitoring period and will be triggered as follows:

- Partial Bypass. As soon as possible after the Partial Bypass ceases operations (i.e., flow through the Partial Bypass goes to 0 cfs) and the field crew has safe access to the monitoring area.
- Full Bypass. As soon as possible after the Full Bypass ceases operations (i.e., flow through the Partial Bypass goes to 0 cfs).
- Significant Flow Reduction from Combined Discharge of Narrows 2 Facilities. As soon as possible after the trigger occurs and the field crew has safe access to the monitoring area, whenever YCWA reduces the combined discharge from the Narrows 2 Facilities such that the decrease is more than 250 cfs in any 1 hour for flow reductions below 1,500 cfs and more than 400 cfs in any 1 hour when flows are above 1,500 cfs. These flow reduction rates were selected based on the flow-stage relationship of the Narrows 2 Facilities in the Powerhouse Pool. As shown in Figure 2.2-18, a 250 cfs flow reduction at the lower end of the flow-stage curve would result in about a 1 foot stage reduction and at flows just above 1,500 cfs a 400 cfs reduction would also result in just under a 1 foot stage reduction.

### **5.4            Monitoring Methods**

The primary objective of this monitoring is to visually determine the presence or absence of stranded fish.

#### **5.4.1        Partial Bypass**

Potential stranding areas will be surveyed by walking the bank to look for the presence of stranded fish.

The survey will begin on the bank adjacent to the Partial Bypass and continue slowly downstream searching edgewater, backwater, perched habitats, and exposed bars for stranded fish. Particular attention will be given to the area of the bank previously wetted by the Partial Bypass and in spaces between large boulders, and areas where fish were observed stranded in the past.

If stranded live fish are found, the surveyors will record for each stranded fish species:

- If the fish is a Chinook salmon or steelhead, the field crew will not handle the fish, including fish rescue, unless the field crew has specifically obtained appropriate authorization from NMFS and Cal Fish and Wildlife.<sup>26</sup> If not and a live Chinook salmon or steelhead is found stranded or isolated in a pool, within 24 hours of finding the fish, YCWA will contact NMFS and Cal Fish and Wildlife via email to request the agencies provide assistance in rescuing the fish. YCWA will coordinate with the agencies for the fish rescue.
- The number of fish (i.e., counted if possible, but if more than 15 fish, estimated abundance) by species.
- The field crew will measure each individual fish if the field crew has the necessary permits/approvals to handle the fish, or if more than 15 fish are found, estimate the number and size of fish in size bins of 0 to 50 millimeters (mm), 50 to 100 mm, 100 to 150 mm, 150 mm to 200 mm, and larger than 200 mm. If the field crew does not have the necessary permits to handle the fish, they will estimate the size and number of fish in the above bins.
- If the fish is alive and appropriate permits/approvals for handling have been acquired by the field crew, they will rescue the fish by returning it to the water and note apparent condition (i.e., signs of stress), and a description of how and where the fish was returned to the flowing water in the main channel (i.e., preferred method will be to fill a bucket with water from the nearby main channel, use a hand net to capture the stranded fish and place it in the bucket, and place the bucket in the main channel so the fish can swim out of the bucket into the flowing water). Behavior of the fish (e.g., actively swims away or lethargic) as it leaves the bucket will be documented.
- If the fish is dead, condition of the carcass (i.e., gravid, spent, signs of hemorrhaging, rigor mortis, state of decomposition, and wounds likely inflicted by predators). Deceased fish will be marked (i.e., tail removed) and returned to the water to prevent it from being re-documented during future surveys.
- Location of stranding, including global positioning system (GPS) coordinate, distance from main channel and Partial Bypass, estimate of how far above the flowing water in the main channel stranding occurred, depth of water at stranding location, and dominant/subdominant substrate at and nearby the stranding location.

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<sup>26</sup> Upon approval of this Plan by FERC, YCWA will make a good faith effort to obtain the necessary permits/approvals for field crew it believes will be in the field performing the surveys.

- Temperature of the water (i.e., degrees Celsius [°C] to the nearest tenth of a degree) if the stranded fish is found in water, and the temperature of the water in the main channel nearest to the stranded fish.
- Photographs of where stranding occurred to document the dimensions, general habitat features, and degree of isolation from the main channel. The degree of isolation and ability of fish to return to the main river will be visually assessed based on fish size (i.e., body depth) and the depth, continuity, and direction of flow between the stranding location and the main channel.

In addition, the field crew will record for each stranding survey:

- Fifteen-minute discharge through the Partial Bypass, Narrows 2 Powerhouse, Full Bypass, and Narrows 1 Powerhouse and spill over Englebright Dam, if occurring, in the 4 hours before the survey began, and flow at the Smartsville gage. The discharges and flow will be estimated as described for the discharges and flows in Section 2.2.3.
- The time the survey was triggered.
- The time the survey began and ended.
- Weather conditions during the survey.
- Conditions in the monitoring area and any incidental observations.
- If a fish rescue occurs, documentation of which agencies were contacted, when they were contacted, and other details of the rescue.

#### **5.4.2 Significant Flow Reduction from Combined Discharge of Narrows 2 Facilities**

Potential stranding areas will be surveyed by walking the bank, boating or wading (i.e., due to lack of visibility, facing the sun or at an oblique angle to the sun to avoid shadows) and observers will wear polarized sun glasses.

Field crews will consist of two persons experienced in fish identification, and with the necessary permits/approvals to perform the surveys.

The field crew will use a boat and, from upstream to downstream, search edgewater, backwater, perched habitats, and exposed bars for stranded fish. The field crew will exit the boat to perform surveys where it is safe to do so and when needed. Particular attention will be given to exposed isolated pools and large interstitial spaces that were wetted and are now dry, and areas where fish were observed stranded in the past.

If stranded live fish are found, the field crew will record the same information as described for the Partial Bypass. In addition, the field crew will record for each stranding survey the same information as described for the Partial Bypass.



### **5.4.3 Use of Full Bypass**

The survey method will be YCWA's operations staff using binoculars observing from the Narrows 2 Powerhouse deck any stranded fish in the monitoring area.

If stranded live fish are observed, the operator will contact the appropriate field crew. The field crew will record the same information as described for the Partial Bypass. In addition, the field crew will record for each stranding survey the same information as described for the Partial Bypass.

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## **SECTION 6.0**

# **REPORTING TO FERC**

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By January 15 of each year from the time the Commission approves this Plan until a new license becomes effective for the Project, unless otherwise approved by the Commission, YCWA will file with the Commission a letter report summarizing the results of YCWA's monitoring in the previous calendar year. The letter report will include any YCWA-proposed modifications to the protocols, as described in Section 4 of this Plan, the Partial Bypass and Full Bypass. The letter report will also describe any uses of the Bypass or Partial Bypass in the monitoring period during the previous calendar year.

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## **SECTION 7.0**

# **IMPLEMENTATION SCHEDULE**

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YCWA will implement the protocols, monitoring and reporting described in Sections 4.0, 5.0 and 6.0, respectively, upon Commission approval of this Plan and will continue implementing these operational protocols, monitoring and reporting until such time as otherwise authorized by the Commission or until a new license is issued, whichever occurs first.

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## SECTION 8.0

# REFERENCES CITED

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United States Army Corps of Engineers (USACE). 2009. Department of the Army. Regional General Permit Number 60 for Repair and Protection Activities in Emergency Situations. Available online: <<http://www.spk.usace.army.mil/Missions/Regulatory/Permitting/RegionalandProgrammaticGeneralPermits.aspx>>. Sacramento, California.

United States Geological Survey (USGS). 2003. Open-File Report 03-383. Bathymetric and Geophysical Surveys of Englebright Lake, Yuba-Nevada Counties, California. 2003.

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**Narrows 2 Facilities  
Prioritized Operations and Monitoring Plan**

**Attachment A  
Consultation Documentation**

**Yuba River Development Project  
FERC Project No. 2246**

December 2014

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**From:** Lynch, Jim  
**Sent:** Saturday, November 22, 2014 9:11 AM  
**To:** 'Larry Thompson'; 'John Wooster'; daniel\_welsh@fws.gov; 'Alison Willy'; 'Anna Ewing (Anna.ewing@wildlife.ca.gov)'; Hoobler, Sean@Wildlife (Sean.Hoobler@wildlife.ca.gov); 'Parker Thaler'; 'Traci Van Thull'; 'blancapaloma@msn.com'; Doug.Grothe@usace.army.mil  
**Cc:** 'Curt Aikens'; Geoff Rabone (grabone@ycwa.com); 'Ward, David M (hydro)'; Pitts, Sheila  
**Subject:** Yuba Project: Draft Narrows 2 Facilities Prioritized Operations and Monitoring Plan for Your Review - Written Comments due by COB 12/22/14  
**Attachments:** Attachment B.zip; Priorities Operations Plan - JML112214.doc

In a letter dated October 8, 2014, FERC directed YCWA to develop two plans to minimize the potential for adverse effects to the fishery in the Yuba River downstream of the USACE's Englebright Dam due to operations YCWA's Narrows 2 Powerhouse, Narrows 2 Partial Bypass (Partial Bypass) and Narrows 2 Full Bypass (Full Bypass) due to stranding, and to file the plans with FERC by January 6, 2015 for approval. FERC directed that YCWA develop the plans in consultation with the resource agencies and applicable stakeholders.

Attached for your review is a draft of the *Narrows 2 Facilities Prioritized Operations and Monitoring Plan*, the second of the two plans.

**We would appreciate any written comments you may have on the attached plan by close of business on MONDAY, DECEMBER 22, 2014.**

If we have any questions or need clarifications regarding your written comments, we will contact you. All written comments on the plan received by December 22 will be included in Attachment A to the plan. We will revise the plan based on written comments received by December 22, and file the plan with FERC by January 6, 2015. If we do not adopt a written proposed change to the plan received by December 22, we will include in Attachment A to the final plan that we file with FERC the reason we did not adopt the proposed change.

Within the 30-day review period, we would be pleased to discuss the plan with you if you would like to do so, but written comments on the *Narrows 2 Facilities Prioritized Operations and Monitoring Plan* would still be due by December 22, 2014.

The other plan, *Streambed Monitoring Below Englebright Dam Plan*, was provided to you on November 14, 2014 with written comments due to YCWA by close of business on December 15, 2014. As with the above plan, all written comments on the *Streambed Monitoring Below Englebright Dam Plan* received by December 15 will be included in Attachment A to that plan. We will revise the plan based on written comments received by December 15, and file that plan with FERC by January 6, 2015. If we do not adopt a written proposed change to the *Streambed Monitoring Below Englebright Dam Plan* received by December 15, we will include in Attachment A to that final plan that we file with FERC the reason we did not adopt the proposed change.

If you have any questions regarding the two plans or would like to schedule a time to discuss either or both of the plan, please contact Jim Lynch.

Curt Aikens  
General Manager  
Yuba County Water Agency  
Direct: 530-741-5015  
Main: 530-741-5000

*This email was sent to the above agencies and applicable stakeholders on behalf of the above party by:*

James Lynch  
Senior Vice President, Hydropower Services

HDR  
2379 Gateway Oaks Drive, Suite 200  
Sacramento, CA 95833  
**D** 916.679.8740 **M** 916.802.6247  
James.Lynch@hdrinc.com

[hdrinc.com/follow-us](http://hdrinc.com/follow-us)

**From:** Ewing, Anna@Wildlife <Anna.Ewing@wildlife.ca.gov>  
**Sent:** Thursday, December 18, 2014 4:19 PM  
**To:** Lynch, Jim; Larry Thompson; John Wooster; Daniel\_Welsh@fws.gov; Willy, Alison; Hoobler, Sean@Wildlife; Thaler, Parker@Waterboards; Traci Van Thull; blancapaloma@msn.com; Doug.Grothe@usace.army.mil; Lawson, Beth@Wildlife; Lynch, MaryLisa@Wildlife  
**Cc:** Aikens, Curt@YCWA; Geoff Rabone (grabone@ycwa.com); Ward, David M (hydro); Pitts, Sheila  
**Subject:** RE: Yuba Project: Draft Narrows 2 Facilities Prioritized Operations and Monitoring Plan for Your Review - Written Comments due by COB 12/22/14  
**Importance:** High

Jim,

With the intense amount of workload (including emails received) the CDFW Region 2 FERC Program is currently experiencing, we were unable to review and provide comments on this Plan by your requested December 15 deadline. We will do our best to review and provide comments on the Plan before YCWA files with FERC on January 6, however we may end up just having to provide comments on the filed version.

Thanks,

Anna

Anna Ewing, Senior Environmental Scientist Specialist  
FERC Program Coordinator  
California Department of Fish and Wildlife  
North Central Region  
1701 Nimbus Road  
Rancho Cordova, CA 95670  
[Anna.Ewing@wildlife.ca.gov](mailto:Anna.Ewing@wildlife.ca.gov)  
(916) 358-2384

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**From:** Lynch, Jim [<mailto:Jim.Lynch@hdrinc.com>]  
**Sent:** Saturday, November 22, 2014 9:12 AM  
**To:** Larry Thompson; John Wooster; [Daniel\\_Welsh@fws.gov](mailto:Daniel_Welsh@fws.gov); Willy, Alison; Ewing, Anna@Wildlife; Hoobler, Sean@Wildlife; Thaler, Parker@Waterboards; Traci Van Thull; [blancapaloma@msn.com](mailto:blancapaloma@msn.com); [Doug.Grothe@usace.army.mil](mailto:Doug.Grothe@usace.army.mil)  
**Cc:** Aikens, Curt@YCWA; Geoff Rabone ([grabone@ycwa.com](mailto:grabone@ycwa.com)); Ward, David M (hydro); Pitts, Sheila  
**Subject:** Yuba Project: Draft Narrows 2 Facilities Prioritized Operations and Monitoring Plan for Your Review - Written Comments due by COB 12/22/14

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**We would appreciate any written comments you may have on the attached plan by close of business on MONDAY, DECEMBER 22, 2014.**

If we have any questions or need clarifications regarding your written comments, we will contact you. All written comments on the plan received by December 22 will be included in Attachment A to the plan. We will revise the plan based on written comments received by December 22, and file the plan with FERC by January 6, 2015. If we do not adopt a written proposed change to the plan received by December 22, we will include in Attachment A to the final plan that we file with FERC the reason we did not adopt the proposed change.

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If you have any questions regarding the two plans or would like to schedule a time to discuss either or both of the plan, please contact Jim Lynch.

Curt Aikens  
General Manager  
Yuba County Water Agency  
Direct: 530-741-5015  
Main: 530-741-5000

*This email was sent to the above agencies and applicable stakeholders on behalf of the above party by:*

James Lynch  
Senior Vice President, Hydropower Services

HDR  
2379 Gateway Oaks Drive, Suite 200  
Sacramento, CA 95833  
D 916.679.8740 M 916.802.6247  
James.Lynch@hdrinc.com

[hdrinc.com/follow-us](http://hdrinc.com/follow-us)



**Narrows 2 Facilities  
Prioritized Operations and Monitoring Plan**

**Attachment B**

**15-Minute Hydrology for Narrows 2 Powerhouse,  
Full Bypass, Partial Bypass Narrows 1 Powerhouse,  
Englebright Dam Spills and Smartsville Gage  
WYs 2007 through 2013  
(on DVD)**

**Yuba River Development Project  
FERC Project No. 2246**

December 2014

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# ATTACHMENT B

## **15-Minute Hydrology for Narrows 2 Powerhouse, Full Bypass, Partial Bypass Narrows 1 Powerhouse, Englebright Dam Spills and Smartsville Gage from WYs 2007 through 2014 on Digital Versatile Disc**

Due to format of the material in this Attachment B to YCWA's final Prioritized Operations and Monitoring Plan, YCWA cannot e-file this material with FERC. Instead, YCWA is filing with FERC the material on Compact Disc (CD). Copies of the material on CD may be obtained upon request by contacting Jim Lynch, relicensing consultant to YCWA via telephone at (916) 679-8740 or via email at [James.Lynch@hdrinc.com](mailto:James.Lynch@hdrinc.com).

The following material is included on this CD as one zip file:

- Historical Hydrology Below Englebright, WYs 2007 through 2014 (.dss file-format, approximately 2 MB)
- Historical Smartsville Monthly Exceedances (MS Excel .xlsb file, approximately 3 MB)
- Historical WY Data (MS Excel .xlsb file, approximately 1 MB)