SECTION 3.0

ENVIRONMENTAL ANALYSIS

This section has three subsections. Section 3.1 provides a general description of the river basin in which the Project occurs, including descriptions of existing water projects. Section 3.2 provides the temporal and geographic scope of the cumulative effects analysis in this Exhibit E, and describes past, present and reasonably foreseeable future actions considered in the analysis. Section 3.3 explains the effects of YCWA's proposed Project on environmental resources using the information included in YCWA's PAD, information developed through YCWA's FERC-approved studies, and other information otherwise developed or obtained by YCWA.[1]

3.1 General Description of the River Basin

3.1.1 Existing Water Projects in the Yuba River Basin

Sixteen existing water projects occur in the Yuba River Basin. Eight of the water projects are licensed or exempt from licensing by FERC. Together, these eight projects have a combined FERC-authorized capacity of 783.6 MW, of which the Yuba River Development Project has approximately 46 percent of the total capacity. The remaining eight non-FERC-licensed projects do not contain generating facilities. Each of these water projects is described briefly below.

3.1.1.1 Yuba River Development Project

The existing Yuba River Development Project is described in Section 2.1.1.

3.1.1.2 South Feather Power Project

The 117.5-MW South Feather Power Project, FERC Project No. 2088, is a water supply/power project constructed in the late 1950s/early 1960s and is owned and operated by the South Feather Water and Power Agency (SFWPA). None of the project facilities or features is located in the Yuba River watershed except for the Slate Creek Diversion Dam, which is located on a tributary to the North Yuba River. Slate Creek Diversion Dam and the associated tunnel have the capacity to divert up to 848 cfs of water out of Slate Creek, and to convey it to Sly Creek Reservoir on Lost Creek, a tributary to the South Fork Feather River. SFWPA's water rights limit its Slate Creek diversions to 600 cfs during January 1 through July 1 and to 300 cfs during July 2 through December 31. At times, diversions are limited to 500 cfs due to high water elevations in Sly Creek Reservoir. In anticipation of the expiration of the initial license, on March 31, 2009, SFWPA filed with FERC an application for a new license on March 6, 2007, and FERC issued a

[1] Because a voluminous amount of information exists or has otherwise been developed for many resource areas, YCWA has made a good faith effort to bring forward the most important and relevant information into Section 3.3. However, if readers want a more comprehensive understanding of the totality of available information, data and study results, readers should review other relicensing materials, including YCWA's PAD and the technical memoranda, which can be found on FERC's ELibrary as referenced by FERC accession number provided in Table 1.4-4 of Section 1.4.4.5 of this Amended FLA.

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Final Environmental Impact Statement (FEIS) in June 2009. Since the initial license expired, SFWPA has operated the project under annual licenses from FERC and is expected to continue to do so until a new license is issued.

3.1.1.3 Deadwood Creek Project

The 19.6-MW Deadwood Creek Project, FERC Project No. 6780, is a power project currently owned and operated by and licensed to Hydro Sierra. The project includes two diversion dams, one on Deadwood Creek, a tributary to the North Yuba River that enters the river near the upstream end of New Bullards Bar Reservoir, and the other on Owl Gulch, a tributary to Deadwood Creek, and one powerhouse located on the shore of New Bullards Bar Reservoir. The project does not include any storage reservoirs or out-of-basin transfers. The initial license for the project expires on August 31, 2038.

3.1.1.4 Yuba-Bear Hydroelectric Project

The 79.3-MW Yuba-Bear Hydroelectric Project, FERC Project No. 2266, is owned and operated by the Nevada Irrigation Districts (NID). It is a water supply/power project constructed in the mid-1960s, though some project facilities were initially constructed in the late 1800s. The project includes a storage reservoir on the Middle Yuba River (Jackson Meadows Reservoir) with a gross storage capacity of 69,205 ac-ft, and five storage reservoirs on Canyon Creek (Jackson, French, Faucherie, Sawmill and Bowman reservoirs) with a combined gross storage capacity of 90,790 ac-ft. The project also includes a diversion with a maximum capacity of about 450 cfs via the Milton-Bowman Diversion Dam from the Middle Yuba River to Bowman Lake on Canyon Creek, and a diversion with a maximum capacity of about 300 cfs via the Bowman-Spaulding Canal from Bowman Lake on Canyon Creek to PG&E's Fuller Lake on the South Yuba River. In anticipation of the expiration of the initial license on April 30, 2013, NID filed with FERC an application for a new license on April 15, 2011, and FERC issued a FEIS in December 2014. Since the initial license expired, NID has operated the project under annual licenses from FERC and is expected to continue to do so until a new license is issued.

3.1.1.5 Francis Dam

Francis Dam is located on Dobbins Creek, a tributary to the Yuba River, in Yuba County and forms Lake Francis. This dam and lake are operated by YCWA for consumptive uses and recreation, and they also provide backup water supplies and water for fire suppression. The dam does not include hydropower facilities and is not under FERC's jurisdiction.

3.1.1.6 Drum-Spaulding Project

PG&E's 190-MW Drum-Spaulding Project, FERC Project No. 2310, is located on the South Yuba River, Bear River, North Fork of the North Fork American River and tributaries to the Sacramento River Basin in Nevada and Placer counties, California. Major reservoirs of the project include Lake Spaulding (74,773 ac-ft) on the South Yuba River and Fordyce Lake (49,903 ac-ft) on Fordyce Creek upstream of Lake Spaulding. In addition, the project includes numerous smaller reservoirs on tributaries to the South Yuba River, and diversions from the

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South Yuba River to Deer Creek via the South Yuba Canal (maximum capacity of ~126 cfs) and to the Bear River via the Drum Canal (maximum capacity of ~840 cfs). In anticipation of the expiration of the initial license on April 30, 2013, PG&E filed with FERC an application for a new license on April 12, 2011, and FERC issued a FEIS in December 2014. Since the initial license expired, PG&E has operated the project under annual licenses from FERC and is expected to continue to do so until a new license is issued.

3.1.1.7 Englebright Dam

Englebright Dam, which is about 260 ft high and forms Englebright Reservoir, was constructed by the California Debris Commission in 1941. The dam is owned by the United States. 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 mi long with a surface area of 815 ac. Englebright Reservoir when first constructed had a gross storage capacity of 70,000 ac-ft; however, due to sediment capture, the gross storage capacity today is approximately 50,000 ac-ft (USGS 2003). The dam does not include hydropower facilities and is not under FERC's jurisdiction.

3.1.1.8 Narrows Project

The 12 MW Narrows 1 Powerhouse, part of PG&E's 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 Yuba River near Grass Valley and near the Yuba River Development Project's Narrows 2 Powerhouse. The project withdraws water from the USACE's Englebright Reservoir, has a normal maximum gross head of 240 ft, and a maximum flow capacity of 730 cfs. The FERC license for this project expires in January 2023.

3.1.1.9 Wildwood Dam

Wildwood Dam is located on Deer Creek upstream of the Yuba River and is operated by NID. This dam forms Lake Wildwood, which is operated for consumptive uses and recreation. The dam does not include hydropower facilities and is not under FERC's jurisdiction.

3.1.1.10 Scotts Flat Project

NID's 0.8-MW Scotts Flat Project, FERC Project No. 5930, is composed of Scotts Flat Dam and Reservoir and Scotts Flat Powerhouse on Deer Creek. The project is exempt from the FPA's license requirements.

3.1.1.11 Los Verjeles Dam

Los Verjeles Dam is located on Dry Creek upstream of Collins Lake. This dam forms Lake Mildred, which is owned and operated by Thousand Trails for consumptive uses and recreation. Consumptive water from the lake is transported via a 7.5-mi ditch. This project was purchased

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by Thousand Trails from Yuba Investment Company in 1984. The dam does not include hydropower facilities and is not under FERC's jurisdiction.

3.1.1.12 Virginia Ranch Dam Project

Virginia Ranch Dam Project is a 152-foot high dam with a crest length of 2,800 ft located on Dry Creek. This dam was completed and put into service in 1963 by the Browns Valley Irrigation District (BVID) as part of the 1-MW Virginia Ranch Dam Project (FERC Project No. 3075), which is exempt from the FPA's license requirements.. This dam forms Collins Lake, which has a surface area of 975 ac and a gross storage capacity of 57,000 ac-ft. The NMWSE at Collins Lake is 1,183 ft. The outlet works consist of a 42 inch Howell-Bunger valve and a 3,800 ft tunnel to the west of the dam. This tunnel is used to deliver water to the lands within BVID. Dry Creek flows south from the dam and into the Yuba River at a point about 8 mi downstream from the dam.

3.1.1.13 Hallwood-Cordua Diversion

The Hallwood-Cordua Diversion, a gravity flow diversion facility located on the north bank of the Yuba River just upstream of Daguerre Point Dam, has a diversion capacity of 625 cfs. The diversion is operated by the Cordua Irrigation District (CID). The diversion does not include hydropower facilities and is not under FERC's jurisdiction.

3.1.1.14 South Yuba-Brophy Diversion

The South Yuba-Brophy Irrigation Diversion is located approximately 1,000 ft upstream of Daguerre Point Dam on the south side of the lower Yuba River. The diversion is operated by YCWA for the purpose of supplying water to YCWA's South Member Units for deliveries to their customers to irrigate approximately 103,000 ac of land in western Yuba County. The diversion does not include hydropower facilities and is not under FERC's jurisdiction.

3.1.1.15 Browns Valley Diversion

BVID maintains a screened diversion on the northern bank of the lower Yuba River, upstream of the other Daguerre Point Dam diversion facilities (USACE 2001). The facility is rated for diverting up to 65 cfs and BVID may divert up to 9,500 ac-ft per year of water during the months of April to August. The diversion does not include hydropower facilities and is not under FERC's jurisdiction.

3.1.1.16 Daguerre Point Dam

Daguerre Point Dam, which is about 25 ft high and 575 ft wide, was constructed by the California Debris Commission and has no storage capacity. The dam was constructed in 1906 and rebuilt in 1964. The primary purpose of the dam is to stabilize the relocated Yuba River channel. The dam is owned by the United States, and is not part of the Project. When the California Debris Commission was decommissioned in 1986, administration of Daguerre Point

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Dam passed to the USACE. The dam does not include hydropower facilities and is not under FERC's jurisdiction.

3.1.2 The River Basin

This section provides a description of the general setting of the Project Vicinity. The discussion focuses primarily on the Yuba River Basin, and especially the Project Area. A general description of the Feather River downstream of the Yuba River confluence and the Sacramento River is also provided for reference.

The Yuba River drains approximately 1,339 sq mi of the western Sierra Nevada, including portions of Sierra, Placer, Yuba and Nevada counties, and is supplied by water from the North Yuba, the Middle Yuba and the South Yuba rivers.

The average annual unimpaired flow of the Yuba River from 1975 to 2004 at the USGS Smartsville Gage at RM 23.9, which is upstream of the confluence with Deer Creek, is 2,340,000 ac-ft, and the annual unimpaired flow has ranged from a maximum of approximately 4,700,000 ac-ft in 1995 to a minimum of approximately 360,000 ac-ft in 1977.

Figure 3.1-1 is a gradient profile of the Yuba River and its tributaries from the most upstream Project facility on each tributary to the Yuba River confluence with the Feather River, and Figure 3.1-2 shows sub-basins (i.e., drainage areas) in the Yuba River Basin.

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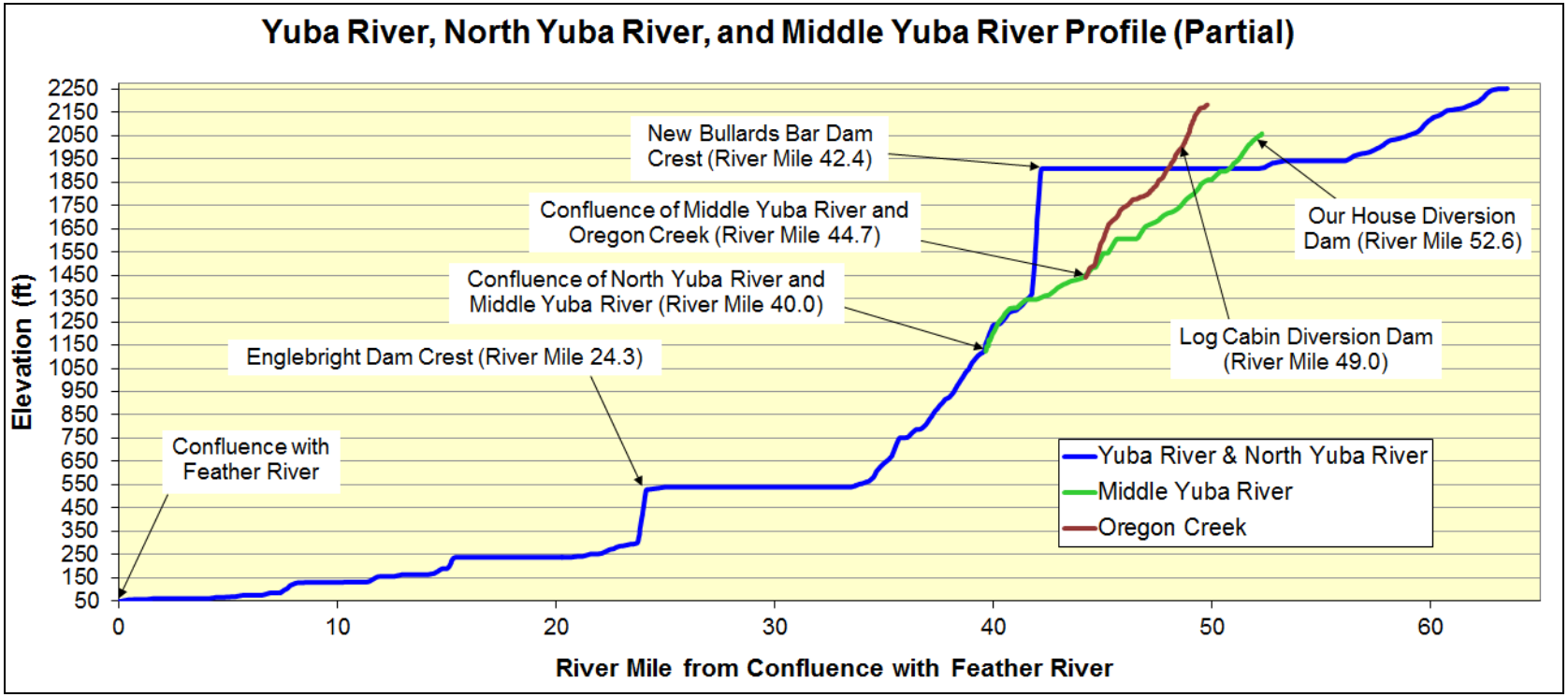

Figure 3.1-1. Streambed gradient of the Yuba River from the most upstream Project facility on each tributary to the Yuba River confluence with the Feather River.

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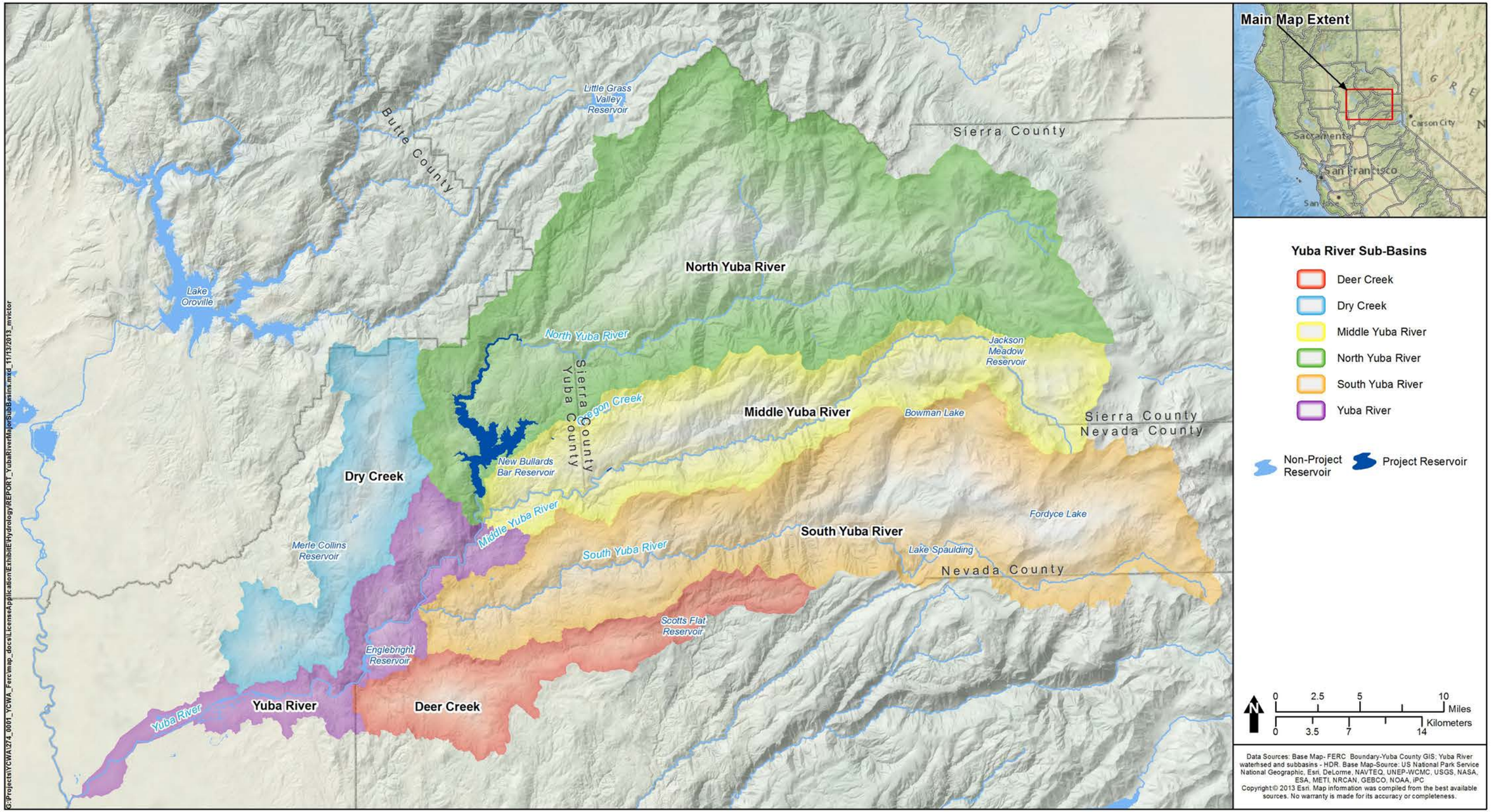

Figure 3.1-2. Yuba River sub-basins.

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3.1.2.1 North Yuba River Sub-basin

The North Yuba River originates at Yuba Pass at an elevation of 6,701 ft near State Highway 49 in Sierra County. The highway follows the river downstream from the community of Downieville for about 14 mi, where the river departs from Highway 49 and flows westward to where it enters the Project's New Bullards Bar Reservoir. The reservoir was completed in 1969, is the sole storage reservoir for the Project, and is located between RM 2.4 and 17.8. In total, the North Yuba River is about 43.3 mi long.

Flow in the sub-basin upstream of New Bullards Bar Reservoir is unrestricted (i.e., no significant dams or water diversions) except for the Slate Creek Diversion Dam, a part of SFWPA's South Feather Power Project. Section 3.1.1.2 describes the SFWPA's diversion facilities that export water from the North Yuba River sub-basin. Slate Creek Diversion Dam and the associated tunnel have the capacity to divert up to 848 cfs of water out of Slate Creek, and to convey it to Sly Creek Reservoir on Lost Creek, a tributary to the South Fork Feather River. The average annual volume of water exported from the North Yuba River watershed through the Slate Creek Diversion Dam by SFWPA during the period from WY 1990 to WY 2016 was 73,601 ac-ft, which is 3.5 percent of the average annual volume of total unimpaired runoff of the Yuba River Watershed at Smartsville for this period, as published by DWR. Exports from 1990 to 2016 ranged from an average annual volume of 29,960 ac-ft in Critically Dry WYs to 101,134 ac-ft in Wet WYs. (Table 3.1-1.) None of this water returns to the Yuba River watershed,

New Bullards Bar Reservoir is deep and thermally stratified, and has a retention time of about 6 months. The reservoir has a dendritic shape with three arms. The narrow center arm is the longest of the three arms at about 13 mi and extends up the North Yuba River to just upstream of the Slate Creek confluence. The slightly wider northeast arm extends upstream about 4 mi, and is formed primarily by Willow and Badger creeks. The northwest arm, the shortest of the three arms at about 1-mi long, is formed by Little Oregon and Burnt Bridge creeks. The portion of the reservoir north of New Bullards Bar Dam near Garden Point is the widest portion of the reservoir at about 2 mi wide. Most of the land surrounding New Bullards Bar Reservoir is primitive (i.e., no roads or residential communities).

The reservoir has a total storage capacity of 966,103 ac-ft with a minimum operating level of 234,000 ac-ft, leaving 732,103 ac-ft of regulated capacity. YCWA typically operates New Bullards Bar Reservoir by capturing winter and spring runoff from rain and snowmelt. Consequently, New Bullards Bar Reservoir reaches its peak storage at the end of the spring runoff season, and then is gradually drawn down as water is released into the North Yuba River. Water is released through the New Bullards Bar Minimum Flow Powerhouse at the base of the dam, and through the New Colgate Power Tunnel and New Colgate Powerhouse, which discharges to the main stem of the Yuba River. The reservoir usually reaches its lowest elevation in mid-winter. The annual drawdown in normal water years is about 90 ft. The reservoir does not undergo any significant daily changes in elevation.

New Bullards Bar Reservoir is used to provide irrigation water to about 90,000 ac of farmland in western Yuba County. Releases of water from storage are made during the spring and summer to provide flows that are diverted downstream at Daguerre Point Dam at RM 11.6 on the main

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stem of the Yuba River. Water is released from storage in the fall for diversion at Daguerre Point Dam for rice stubble decomposition and waterfowl habitat.

New Bullards Bar Reservoir is also the main flood control facility for the lower Yuba River area. Twenty-three percent (170,000 ac-ft) of the usable capacity of the reservoir is held in reserve from October through May for flood control purposes.

In addition to providing power and downstream water supply, YCWA pumps water directly from New Bullards Bar Reservoir to supply water to the Cottage Creek Water Treatment Plant for domestic and recreational uses adjacent to the reservoir. This pumping averages approximately 6 ac-ft per year. This relatively minimal level of pumping does not affect Project operations.

New Bullards Bar Dam (RM 2.4) is the fourth dam constructed in the Bullards Bar area. The first dam was a timber crib, rock-filled diversion dam that was constructed in 1899, and washed out a year later. In 1900, a 30-ft-tall masonry rock dam was built to replace the washed out dam. The rock dam is still in place and is located about 1,000 ft downstream of the existing New Bullards Bar Dam. YCWA maintains the masonry rock dam as a weir to measure instream flow releases from New Bullards Bar Dam. The third dam was Bullards Bar Dam, a 200-ft-tall concrete-arch dam constructed by a group of investors led by Harry Payne Whitney in 1922-1923 and acquired by PG&E a few years later. Bullards Bar Dam was inundated in 1969 when New Bullards Bar Dam and Reservoir began operation. Bullards Bar Dam is located about 1-mi upstream from New Bullards Bar Dam in New Bullards Bar Reservoir, and is not normally exposed.

The drainage area at New Bullards Bar Dam is 488.6 sq mi, approximately 49.4 sq mi of which lie upstream of SFWPA's Slate Creek Diversion Dam.

From New Bullards Bar Dam, the North Yuba River flows southwest another 2.4 miles to where it converges with the Middle Yuba River to form the main stem of the Yuba River. This confluence is at an elevation of about 1,350 ft near the unincorporated town of North San Juan. The total drainage area of the North Yuba River is 491 sq mi.

3.1.2.2 Middle Yuba River Sub-basin

The Middle Yuba River originates at an elevation of approximately 7,200 ft along the northern side of Meadow Lake Hill, and flows westerly for about 41.4 mi to the Project's Our House Diversion Dam located at RM 12.6, southwest of the community of Camptonville near the Sierra/Nevada county line.

Like the North Yuba River, the Middle Yuba River basin is steep, rugged, sparsely populated, and mostly vegetated with coniferous forests. Middle Yuba River flows upstream of the Project are reduced by upstream projects. NID's Jackson Meadows Reservoir (RM 47.1) and Milton Diversion Dam (RM 44.9), both parts of NID's Yuba-Bear Hydroelectric Project, affect flows entering the Project. Jackson Meadows Reservoir has a gross storage capacity of 67,435 ac-ft of water and the Milton Diversion Dam can divert up to 450 cfs of water from the Middle Yuba River to Bowman Lake on Canyon Creek, a tributary to the South Yuba River. Section 3.1.1.4

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describes NID's diversion facilities that export water from the Middle Yuba River sub-basin. NID exports water from the Middle Yuba River sub-basin through the Milton-Bowman Diversion Dam and Conduit to Bowman Lake on Canyon Creek, a tributary to the South Yuba River. The average annual volume of water exported from the Middle Yuba River sub-basin to Bowman Lake through the Milton-Bowman Tunnel by NID during the period 1990 to 2016 was 59,519 ac-ft, which is 2.8 percent of the average annual volume of total unimpaired runoff of the Yuba River Watershed at Smartsville during this period, as published by DWR. Exports from 1990 to 2016 ranged from an average annual volume of 43,091 ac-ft in Critically Dry WYs to 71,108 ac-ft in Wet WYs. (Table 3.1-1.) Most of the water exported out of the Middle Yuba River Sub-basin does not return to the Yuba River watershed.

Our House Diversion Dam and its associated Lohman Ridge Diversion Tunnel can divert about 810 cfs of water from the Middle Yuba River to Oregon Creek. The dam has no appreciable storage capacity. The diversion pool fluctuates passively (i.e., storage is not actively exercised by the operator, but depends on the balance between diversion and inflow) from a minimum pool when natural inflows are at or below the downstream minimum flow requirement and no diversion is occurring, to a maximum pool size of approximately 280 ac-ft when inflows are greater than diversion capacity and the facility is spilling. The drainage area at Our House Diversion Dam is 144.8 sq mi, 39.8 sq mi of which lie upstream of NID's Milton Diversion Dam.

From Our House Diversion Dam, the Middle Yuba River flows west about 12.6 mi to where it converges with the North Yuba River at elevation 1,350 ft. The total drainage area of the Middle Yuba River is 210 sq mi.

Oregon Creek, a tributary to the Middle Yuba River, originates at an elevation of approximately 5,600 ft and flows southwesterly for about 21.4 mi to where it converges with the Middle Yuba River. The basin is steep, rugged, sparsely populated, and mostly vegetated with coniferous forests.

No dams or diversions occur upstream of the one Project facility on Oregon Creek: Log Cabin Diversion Dam at RM 4.3. The dam and its associated Camptonville Diversion Tunnel can divert about 1,100 cfs of water from Oregon Creek to New Bullards Bar Reservoir. The dam has no appreciable storage capacity. The diversion pool fluctuates passively from a minimum pool when natural inflows are at or below the downstream minimum flow requirement and no diversion is occurring, to a maximum pool size of approximately 90 ac-ft when inflows are greater than diversion capacity and the facility is spilling. The drainage area at the dam is approximately 29.1 sq mi.

3.1.2.3 South Yuba River Sub-basin

The South Yuba River originates at an elevation of about 7,200 ft near Castle Peak and Donner Lake, and flows southwest to its confluence with the main stem of the Yuba River (RM 31.0) near the community of Bridgeport at Englebright Reservoir at an elevation of about 527 ft. The total drainage area of the South Yuba River is 352 sq mi.

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The majority of the basin is steep, rugged, and sparsely populated, with small communities in the lower elevation areas.

No Project facilities are located on the South Yuba River.

NID's Yuba-Bear Hydroelectric Project has five reservoirs on Canyon and Jackson creeks, tributaries to the South Yuba River, with a total of 90,647 ac-ft of storage. The largest of these facilities is Bowman Lake, with a gross storage capacity of 68,363 ac-ft. Water is diverted from Bowman Lake through NID's Bowman-Spaulding Canal, which has a maximum capacity of 300 cfs, to PG&E's Fuller Lake on the South Yuba River. From Fuller Lake, PG&E passes water via PG&E's Spaulding #3 Powerhouse into PG&E's Lake Spaulding on the South Yuba River with a gross storage capacity of 75,912 ac-ft.

Besides Lake Spaulding, PG&E's Drum-Spaulding Project has 18 reservoirs on the South Yuba River and its tributaries, with a total of 144,644 ac-ft of storage. At Spaulding Dam, PG&E can divert a combined total of 947 cfs out of the South Yuba River sub-basin into the Drum and South Yuba canals. Water from the Drum Canal continues to the Drum Forebay and then to the Drum Afterbay on the Bear River, where the water is used by both NID's Yuba-Bear Hydroelectric Project and PG&E's Drum-Spaulding Project. Water from the South Yuba Canal continues to PG&E's Deer Creek Powerhouse, which releases into the South Fork of Deer Creek, a tributary to Deer Creek that flows into the Yuba River downstream of Englebright Dam. Water is diverted out of the South Yuba Canal into the Bear River by PG&E through the South Yuba Canal Waste Gate, part of PG&E's Drum-Spaulding Project. Deer Creek water is diverted by NID at its Cascades, East Side and Mountain View canals. Therefore, most of the water diverted into the South Yuba Canal by PG&E does not return to the Yuba River watershed.

Section 3.1.1.6 describes the Drum-Spaulding Project facilities that export water from PG&E's Lake Spaulding on the South Yuba River to the Bear River via PG&E's Drum Canal. The export of water from the South Yuba River during the period 1990 to 2016 averaged 335,998 ac-ft of water annually, which is 15.8 percent of the average annual volume of total unimpaired runoff of the Yuba River Watershed at Smartsville during this period, as published by DWR. Exports from 1990 to 2016 from this sub-basin have ranged from an average annual volume of 221,643 ac-ft in Critically Dry WYs to 427,187 ac-ft in Wet WYs. (Table 3.1-1.)

3.1.2.4 Summary of Exports from North Yuba, Middle Yuba and South Yuba Sub-basins

As discussed in Sections 3.1.2.1, 3.1.2.2 and 3.1.2.3, SFWPA, NID and PG&E divert substantial amounts of water upstream from the Project for water deliveries and power generation. PG&E provides a portion of the water it diverts to NID and Placer County Water Agency (PCWA). A minor portion of the water diverted from the Middle Yuba River and South Yuba River sub-basins is conveyed to the Deer Creek sub-basin, and Deer Creek is a tributary to the Yuba River. However most of this water does not return to the Yuba River watershed, and none of the other water diverted by these projects returns to the Yuba River watershed. Table 3.1-1 lists, for the WY 1990 to WY 2016 period, the historical annual average amounts of water exported out of the North, Middle and South Yuba River sub-basins by SFWPA, NID and PG&E, respectively,

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upstream of the Project, the average annual amounts by WY type, and those amounts as percentages of the total unimpaired runoff of the Yuba River basin for each corresponding WY type. As shown in Table 3.1-1, the average annual amount of total exports is 22 percent of the average annual unimpaired runoff of the Yuba River basin at Smartsville for this period, and these total exports range from an average of 34 percent in Critically Dry WYs to 15 percent in Wet WYs.

Table 3.1-1. Exports of water from Yuba River Sub-basins from WY 1990 through 2016 averaged by WY type.

Water Year Type[1]	SFWPA from North Yuba River Sub-Basin[2]	NID from the Middle Yuba River Sub-Basin[3]	PG&E (with deliveries to NID and PCWA) from the South Yuba River Sub-Basin[4]	Total Exports	Yuba River Basin Unimpaired Runoff at Smarstville[5]	Total Exports as Percent of Unimpaired Runoff
	(ac-ft)					(%)
Wet	101,134	71,108	427,187	599,429	3,868,638	15%
Above Normal	89,850	71,869	390,512	552,231	2,499,928	22%
Below Normal	67,749	58,023	312,909	438,681	1,654,992	27%
Dry	57,491	45,288	270,560	373,339	1,114,903	33%
Critically Dry	29,960	43,091	221,643	294,694	878,211	34%
Average	**73,601**	**59,519**	**335,998**	**469,117**	**2,128,348**	--
Percent of Unimpaired	**3.5%**	**2.8%**	**15.8%**	**22.0%**	--	--

[1] Refer to Section 2.2.3.1.1 of this Exhibit E for a description of Smartsville Index WY types.

[2] Volumes derived from flow records of USGS Gage 11413250, *Slate Creek Tunnel nr Strawberry Valley, CA.*

[3] Volumes derived from flow records of USGS Gage 11408000, *Milton-Bowman Tunnel Outlet nr Graniteville, CA.*

[4] Volumes derived from USGS Gages 11414200, *South Yuba Canal nr Emigrant Gap, CA*, plus USGS Gage 11414170, *Drum Canal at Tunnel Outlet nr Emigrant Gap, CA*, minus USGS Gage 11408000, *Milton-Bowman Tunnel Outlet nr Graniteville, CA.*

[5] As published by DWR.

3.1.2.5 Yuba River Sub-basin

Two Project facilities are located on the mainstem Yuba River: 1) New Colgate Powerhouse (RM 34.2) located at the north side of the river about 1.7 mi upstream of Englebright Reservoir; and 2) Narrows 2 Powerhouse (RM 24.2), located at the north side of the river about 0.1-mi downstream of Englebright Dam. PG&E's Narrows 1 Powerhouse, part of PG&E's Narrows Project, is located on the opposite side of the Yuba River, about 0.25-mi downstream of the Narrows 2 Powerhouse.[2]

From the confluence of the North Yuba River and the Middle Yuba River, the Yuba River flows southwest about 40 mi to its confluence with the Feather River in Marysville, California, at an elevation of approximately 60 ft. The total drainage area of the Yuba River downstream of the confluence of the North Yuba River and Middle Yuba River is 95 sq mi.

Rural agricultural areas and semi-rural agricultural communities flank the mainstem Yuba River as it leaves the Sierra foothills and enters the Central Valley (YCIT 2004). The area is primarily used for annual field and vegetable crops, tree crops, and livestock grazing (YCDA 2005). To the south of the Yuba River downstream of Englebright Dam is a feature known as the Yuba

[2] The existing FERC license for PG&E's Narrows Project expires in 2023.

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Goldfields – an area of over 8,000 ac of hydraulic mine tailings (CDWR 1999). At one time, as many as 12 large bucket-type dredges worked in the Goldfields, unearthing riches and leaving behind mountains of aggregate. Now, just one dredge is active. At times, some water flows in this area become sub-surface, flowing through and within the aggregate field of hydraulic mining deposits.

The main stem of the Yuba River includes USACE's Englebright and Daguerre Point dams, which are described in Sections 3.1.7 and 3.1.16, respectively.

The "lower Yuba River" is sometimes used to refer to the 24.3-mi section of the river between Englebright Dam and the confluence with the Feather River southwest of Marysville. Instream flow requirements are specified for the Yuba River at the Smartsville Gage, located approximately 2,000 ft downstream of Englebright Dam, and at the USGS Marysville Gage (RM 6.2). Below the Smartsville Gage, accretions, local inflow and runoff contribute, on average, approximately 200,000 ac-ft per year to the Yuba River. Much of the accretion flows are contributed by Deer and Dry creeks. The total drainage area of Deer Creek is 89 sq mi and the total drainage area of Dry Creek is 108 sq mi. Deer Creek flows into the Yuba River at approximately RM 23.4. Dry Creek flows into the Yuba River at RM 13.9, approximately 2.3 mi upstream of Daguerre Point Dam. The flow in Dry Creek is regulated by BVID's operation of Collins Lake, located on Dry Creek about 8 mi upstream from its confluence with the Yuba River. In recent years, irrigation diversions from the Yuba River at Daguerre Point Dam and upstream at BVID's Pumpline Diversion Facility have totaled approximately 262,000 ac-ft per year.

3.1.2.6 Feather River, Sacramento River and Delta

The Yuba River discharges into the Feather River, whose basin encompasses a broad variety of terrain, climate, historic use, and flora and fauna. Over 80 percent of the upper Feather River watershed is federally owned land managed by the Forest Service as part of the PNF. Approximately 11 percent of the upper Feather River watershed is alluvial valleys that are predominantly privately owned and used for livestock grazing. The rest of the land is used for other agricultural purposes, urban development and wildlife habitat.

Water originating from the Feather River drainages provides significant amounts of water to California's State Water Project, which provides water to meet urban and agricultural demands. The Feather River Basin also produces significant forest and agricultural outputs. Flow in the lower Feather River is controlled mainly by releases from Oroville Reservoir, the second largest reservoir in the Sacramento River Basin and part of DWR's Oroville Project (FERC Project No. 2100), and by flows from the Yuba and Bear rivers. As with many Sierra Nevada foothill streams and rivers, the Feather River Basin has historically been influenced by large-scale gold mining operations. To a lesser degree, gold mining operations still continue within the western slope watersheds.

The Feather River flows into the Sacramento River, the largest river in California, which provides water for municipal, agricultural, recreational, and environmental purposes throughout northern and southern California. Most of the Sacramento River flow is controlled by

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Reclamation's Shasta Dam and Reservoir, and river flow is augmented by imports of Trinity River water through clear and spring creek tunnels to Keswick Reservoir. Immediately below Keswick Dam, the river is deeply incised in bedrock with very limited riparian vegetation.

The upper Sacramento River is often defined as the portion of the river from Princeton (RM 163; downstream extent of salmonid spawning in the Sacramento River) to Keswick Dam (the upstream extent of anadromous fish migration and spawning). The Sacramento River is an important corridor for anadromous fishes moving between the ocean and Delta, and upstream river and tributary spawning and rearing habitats. The upper Sacramento River is differentiated from the river's "headwaters" which lie upstream of Shasta Reservoir. The upper Sacramento River provides a diversity of aquatic habitats, including fast-water riffles and shallow glides, slow-water deep glides and pools, and off-channel backwater habitats (Reclamation 2004).

The lower Sacramento River is generally defined as the portion of the river from Princeton to the Delta at approximately Chipps Island (near Pittsburg). The lower Sacramento River is predominantly channelized, leveed and bordered by agricultural lands. Aquatic habitat in the lower Sacramento River is characterized primarily by slow water glides and pools, is depositional in nature, and has lower water clarity and habitat diversity, relative to the upper portion of the river.

The Delta is a vast, low-lying inland region located east of the San Francisco Bay Area, at the confluence of the Sacramento and San Joaquin rivers. Geographically, this region forms the eastern portion of the San Francisco estuary, which includes San Francisco, San Pablo and Suisun bays. An interconnected network of water channels and man-made islands, the Delta stretches nearly 50 mi from Sacramento south to the City of Tracy, and spans almost 25 mi from Antioch east to Stockton (Public Policy Institute of California 2007). The Delta is a complex area for both anadromous fisheries production and distribution of California water resources for numerous beneficial uses. Approximately 42 percent of the state's annual runoff flows through the Delta's maze of channels and sloughs, which surround 57 major reclaimed islands and nearly 800 un-leveed islands (WEF Website 2006). The Delta also includes the federal Central Valley Project (CVP) Jones Pumping Plant and the State Water Project (SWP) Banks Pumping Plant in the south Delta (export pumps). Water withdrawn from the Delta provides for much of California's water needs, including both drinking water and water for agricultural irrigation purposes.

3.1.2.7 Potentially-Affected Yuba River Stream Reaches

Table 3.1-2 provides descriptions of the stream reaches in the Yuba River Basin potentially affected by continued Project operations.

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Table 3.1-2. Stream reaches in the Yuba River Basin potentially affected by continued Project operations.

River	Reach	Description
North Yuba River	New Bullards Bar Reservoir	Approximately 15.4 mi of the North Yuba River canyon from the NMWSE of New Bullards Bar Reservoir at RM 17.8 to New Bullards Bar Dam at RM 2.4.
	New Bullards Bar Dam	Approximately 2.4 mi of the North Yuba River from the New Bullards Bar Minimum Flow Release Powerhouse at RM 2.4 to the confluence of the North Yuba River with the Middle Yuba River at RM 0.0.
Oregon Creek	Log Cabin Diversion Dam Impoundment	Approximately 0.2 mi of Oregon Creek from the NMWSE of the Log Cabin Diversion Dam impoundment at RM 4.5 to the Log Cabin Diversion Dam at RM 4.3.
	Log Cabin Diversion Dam Reach	Approximately 4.3 mi of Oregon Creek from the Log Cabin Diversion Dam at RM 4.3.to the confluence of Oregon Creek with the Middle Yuba River at RM 0.0.
Middle Yuba River	Our House Diversion Dam Impoundment	Approximately 0.4 mi of the Middle Yuba River from the NMWSE of the Our House Diversion Dam impoundment at RM 13.0 to Our House Diversion Dam at RM 12.6.
	Our House Diversion Dam Reach	Approximately 7.9 mi of the Middle Yuba River from Our House Diversion Dam at RM 12.6 to the confluence of the Middle Yuba River with Oregon Creek at RM 4.7.
	Oregon Creek Reach	Approximately 4.7 mi of the Middle Yuba River from the confluence of the Middle Yuba River and Oregon Creek at RM 4.7 to the confluence of the Middle Yuba River with the North Yuba River at RM 0.0.
Yuba River	Middle/North Yuba River Reach	Approximately 5.8 mi of the Yuba River from the confluence of the North Yuba River with the Middle Yuba River at RM 40.0 to the New Colgate Powerhouse at RM 34.2.
	New Colgate Powerhouse Reach	Approximately 2.0 mi of the Yuba River from New Colgate Powerhouse at RM 34.2 to the NMWSE of USACE's Englebright Reservoir at RM 32.2.
	Englebright Reservoir	Approximately 7.9 mi of the Yuba River from the NMWSE of USACE's Englebright Reservoir at RM 32.2 to Englebright Dam at RM 24.3.
	Narrows	Approximately 1.9 mi of the Yuba River from Englebright Dam at RM 24.2 to approximately 1.8 mil below Narrows 1 Powerhouses.
	Garcia Gravel Pit	Approximately 10.6 mi of the Yuba River from the end of the Narrows Reach at RM 22.3 USACE's Daguerre Point Dam at RM 11.7.
	Daguerre Point Dam[1]	Approximately 8.2 mi of the Yuba River from Daguerre Point Dam at RM 11.7 to the downstream end of the Yuba Goldfield at RM 3.5.
	Simpson Lane	Approximately 3.5 mi of the Yuba River from the Yuba Goldfield at RM 3.5 to the confluence of the Yuba River with the Feather River at RM 0.0.

[1] In the Yuba Accord proceeding, this reach and the "Narrows 2 Powerhouse Reach" have been referred to as the "above USACE's Daguerre Point Dam" and "below USACE's Daguerre Point Dam" reaches.

3.1.2.8 Yuba River Basin Streams and Tributaries

Table 3.1-3 provides a list of named tributaries and named secondary tributaries to the Yuba River. Some of the tributaries are intermittent or ephemeral in nature and contribute water to the Yuba River during only part of the year.

Table 3.1-3. Streams and tributaries to the North, Middle, South, and main stem of the Yuba River.

Tributary	Secondary Tributaries
UPSTREAM OF THE YUBA RIVER DEVELOPMENT PROJECT	
North Yuba River	Salmon Creek
	Haypress Creek
	Jim Crow Creek
	Downie River
	Woodruff Creek
	Goodyears Creek
	Fiddle Creek
	Cherokee Creek
	Canyon Creek

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Table 3.1-3. (continued)

Tributary	Secondary Tributaries
UPSTREAM OF THE YUBA RIVER DEVELOPMENT PROJECT (cont'd)	
Middle Yuba River	Pass Creek
	East Fork Creek
	Wolf Creek
	Bloody Run
	Kanaka Creek
	Indian Creek
South Yuba River	Rattlesnake Creek
	Fordyce Creek
	Rucker Creek
	Fall Creek
	Canyon Creek
	Scotchman Creek
	Poorman Creek
	Humbug Creek
	Spring Creek
	Rock Creek
	Rush Creek
	Shady Creek
	French Corral Creek
WITHIN THE YUBA RIVER DEVELOPMENT PROJECT AREA	
North Yuba River	Slate Creek
	Deadwood Creek
	Hampshire Creek
	Lost Creek
	Empire Creek
	Indian Creek
	Mill Creek
	Willow Creek
	Little Oregon Creek
	Cottage Creek
UPSTREAM OF THE YUBA RIVER DEVELOPMENT PROJECT	
Middle Yuba River	Grizzly Creek
	Oregon Creek
	Moonshine Creek
	Clear Creek
	Yellowjacket Creek
Yuba River	Sweetland Creek
	Dobbins Creek
DOWNSTREAM OF THE YUBA RIVER DEVELOPMENT PROJECT	
Yuba River	Woods Creek
	Deer Creek
	Sanford Creek
	Dry Creek

Source: USGS, National Hydrology Dataset (NHD) (USGS n.d.).

3.1.2.9 Yuba River Basin Dams

There are approximately 46 major dams and diversions in the Yuba River Basin, with a combined storage capacity of 1,358,113 ac-ft of water (Table 3.1-4). Thirty-eight of these dams are upstream of the Project and account for about 17 percent of the total storage capacity. Within the Project Area, two major dams occur with a combined storage capacity of 1,036,103 ac-ft (i.e., 75 percent of the combined storage capacity of the basin). Seven dams, which can store about 8 percent of the combined storage capacity of the basin, are downstream of the Project.

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Table 3.1-4. Owners and capacities of dams and diversions in the Yuba River Basin.

Owner	FERC Project No.	River / Tributary	Dam / Diversion	Reservoir Gross Storage Capacity (ac-ft)
UPSTREAM OF THE YUBA RIVER DEVELOPMENT PROJECT				
North Yuba River				
SFWPA	2088	Slate Creek	Slate Creek Diversion Dam	none
Middle Yuba River				
NID	2266	Middle Yuba River	Jackson Meadows Dam	67,435
NID	2266	Middle Yuba River	Milton Main and South Dam	295
NID	2266	Wilson Creek	Wilson Creek Diversion Dam	none
South Yuba River				
NID	2266	Jackson Creek	Jackson Lake Dam	1,330
NID	2266	Canyon Creek	French Lake Dam	13,940
NID	2266	Canyon Creek	Faucherie Lake Dam	3,980
NID	2266	Canyon Creek	Sawmill Lake Dam	3,034
NID	2266	Canyon Creek	Bowman-Spaulding Conduit Diversion Dam	none
NID	2266	Canyon Creek	Bowman Lake Dam	68,383
NID	2266	Texas Creek	Texas Creek Diversion Dam	none
PG&E	2310	Texas Creek	Upper Rock Lake Dam	207
PG&E	2310	Texas Creek	Lower Rock Lake Dam	48
PG&E	2310	Texas Creek	Culbertson Lake Dam	3,150
PG&E	2310	Texas Creek	Upper Lindsey Lake Dam	180
PG&E	2310	Texas Creek	Middle Lindsey Lake Dam	1,100
PG&E	2310	Texas Creek	Lower Lindsey Lake Dam	293
PG&E	2310	Fall Creek	Feeley Lake Dam	739
PG&E	2310	Fall Creek	Carr Lake Dam	150
NID	2266	Clear Creek	Clear Creek Diversion	none
NID	2266	Fall Creek	Fall Creek Diversion Dam	none
NID	2266	Trap Creek	Trap Creek Diversion	none
PG&E	2310	Rucker Creek	Blue Lake Dam	1,163
PG&E	2310	Rucker Creek	Rucker Lake Dam	648
NID	2266	Rucker Creek	Rucker Creek Diversion	none
PG&E	2310	Unnamed Creek	Fuller Lake Dam	1,127
PG&E	2310	Fordyce Creek	Meadow Lake Dam	4,935
PG&E	2310	Fordyce Creek	White Rock Lake Dam	570
PG&E	2310	Fordyce Creek	Lake Sterling Dam	1,764
PG&E	2310	Fordyce Creek	Fordyce Lake Dam	49,903
PG&E	2310	South Yuba River	Kidd Lake Dam	1,505
PG&E	2310	South Yuba River	Upper Peak Lake Dam	1,736
PG&E	2310	South Yuba River	Lower Peak Lake Dam	484
PG&E	2310	South Yuba River	Lake Spaulding Dam	75,912
YCWA	--	Dobbins Creek	Lake Francis Dam	1,905
WITHIN YUBA RIVER DEVELOPMENT PROJECT AREA				
North Yuba River				
YCWA	2246	Middle Yuba River	Our House Diversion Dam	none
YCWA	2246	Oregon Creek	Log Cabin Diversion Dam	none
YCWA	2246	North Yuba River	New Bullards Bar Dam	966,103
USACE	--	Yuba River	Englebright Dam	70,000
DOWNSTREAM OF THE YUBA RIVER DEVELOPMENT PROJECT				
Yuba River				
NID	--	South Fork Deer Creek	Cascade Canal Diversion Dam	none
NID	--	Deer Creek	Scotts Flat Dam	49,000
NID	--	Deer Creek	Deer Creek Diversion Dam	none
Lake Wildwood Assoc.	--	Deer Creek	Anthony House Dam	3,840
BVID	3075	Dry Creek	Virginia Ranch Dam	57,000
USACE	--	Yuba River	Daguerre Point Dam	none

Figure 3.1-3 depicts the general location of each of the dams in Table 3.1-4.

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Key Number	Dam/Diversion
1	Upper Rock Lake Dam
2	Meadow Lake Dam
3	Peak Lake Upper Dam
4	Upper Feeley Lake Dam
5	Peak Lake Lower Dam
6	Lake Fordyce Dam
7	Blue Lake Dam
8	Culbertson Lake Dam
9	White Rock Lake Dam
10	Upper Lindsey Lake Dam
11	Lake Spaulding No. 3 Dam
12	Lake Spaulding No. 2 Dam
13	Kidd Lake Dam South
14	Lake Sterling Dam
15	Fuller Lake Dam
16	Lower Lindsey Lake Dam
17	Deer Creek Diversion Dam
18	Middle Lindsey Lake Dam
19	Sawmill Lake Dam
20	Lower Rock Lake Dam
21	Kidd Lake Dam
22	Lake Spaulding No. 1 Dam
23	Carr Lake Dam
24	French Lake Dam
25	Faucherie Dam
26	Bowman Lake Dam
27	Jackson Lake Dam
28	Jackson Meadows Dam
29	Milton Diversion Dam
30	Texas Creek Diversion Dam
31	Fall Creek Diversion Dam
32	Bowman-Spaulding Diversion Dam
33	Trap Creek Diversion Dam
34	Rucker Lake Dam
35	Clear Creek Diversion Dam
36	Rucker Creek Diversion Dam
37	Wilson Creek Diversion Dam
38	Cascade Canal Diversion Dam
39	Anthony House Dam
40	Scotts Flat Dam
41	Virginia Ranch Dam
42	Lake Francis Dam
43	Slate Creek Diversion Dam
44	Our House Diversion Dam
45	Log Cabin Diversion Dam
46	New Bullards Bar Dam
47	Englebright Dam
48	Daguerre Point Dam
49	Los Verjeles Dam

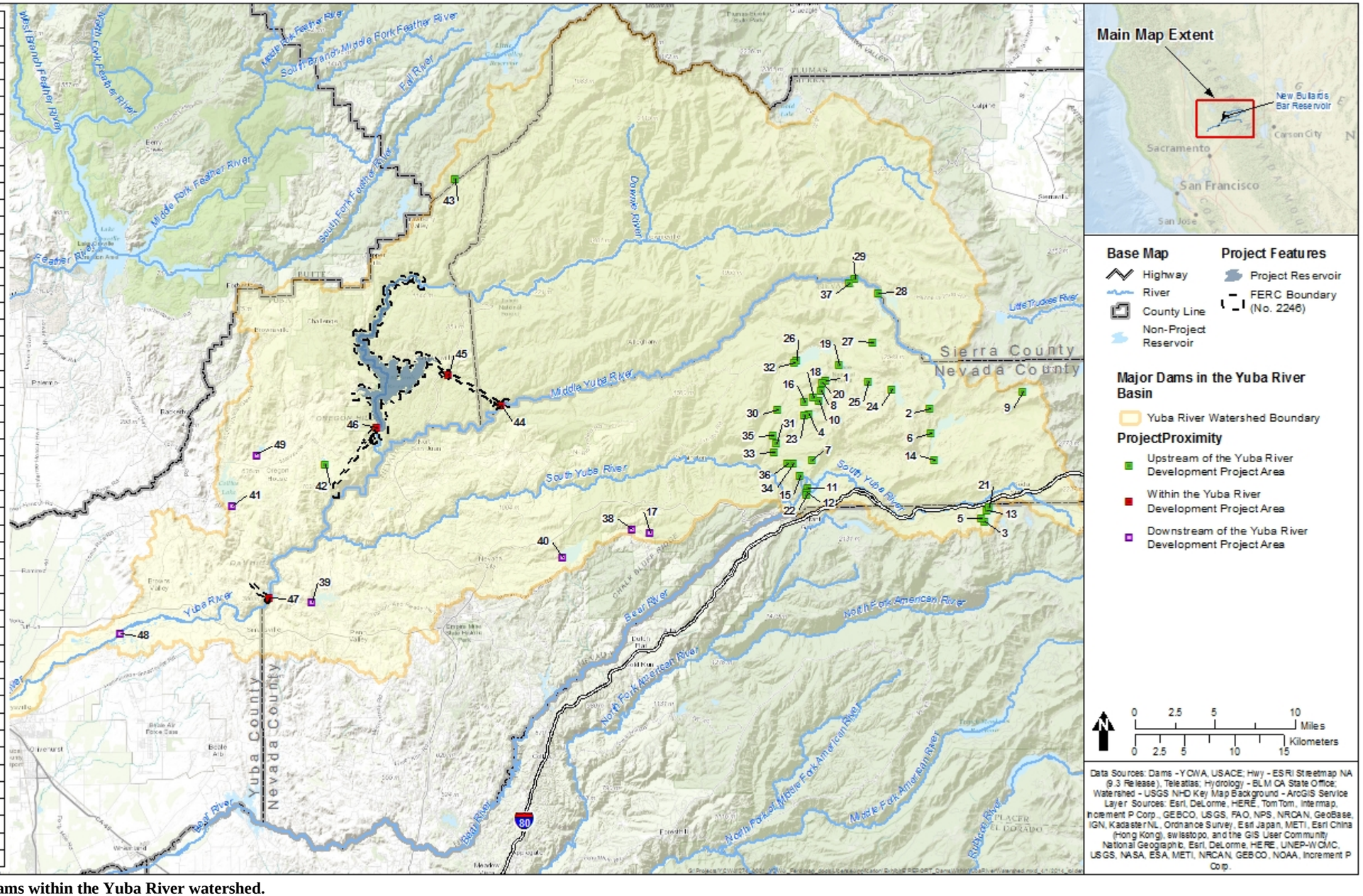

Figure 3.1-3. General location of dams within the Yuba River watershed.

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3.1.3 Climate

The Project Region,[3] which includes the sub-basins shown in Figure 3.1.2-2, encompasses two different climate terrains. One typifies the high Sierra climates of the eastern Project Region, and the other typifies the Central Valley lowlands in the western Project Region. The transition zone in between these two climate terrains shares characteristics of each of these terrains. The lower elevation areas, west and south of New Bullards Bar Reservoir, experience hot, dry summers and cool winters with substantial rainfall, but no appreciable snowfall. The higher elevation areas constitute much of the North, Middle and South Yuba river watersheds, and are characterized by significant winter snowfall accumulation at elevations over 4,000 to 5,000 ft. The snowpack then melts during the spring and early summer months, eventually giving way to warm, dry summers. Areas of moderate elevation (i.e., between 500 and 4,000 ft) in the Project Region experience a mélange of the high-elevation and low-elevation climate: predominantly rainy winters with heavier precipitation than low-elevation areas, occasional snowfall with short-lived accumulation, and the ubiquitous warm, dry summers. Overall, the climate within the Project Region has the typical characteristics of a mixed-elevation Mediterranean climate.

The National Weather Service maintains a monitoring station (Number 048207) at Sierra City, California, at an elevation of approximately 4,700 ft, located near the confluence of the North Yuba River and Haypress Creek, which is representative of the Project Region's higher-elevation climate. July air temperatures at Sierra City range from an average high of 86.6 degrees Fahrenheit (°F) to an average low of 52.6°F. The average high temperature for January is 47.2°F, while the average low temperature is 28°F. Average annual snowfall at Sierra City totals 100.4 inches in depth, 84 percent of which occurs from December through March. Annual mean total precipitation at Sierra City is 63.83 inches, most of which (i.e., 65 percent) occurs from December through March. The summer months of June through August produce just 3 percent of the total annual average precipitation. The remaining 32 percent of precipitation in the area occurs during spring and fall.

The National Weather Service monitoring station at Marysville (Number 045385) provides a climate history representative of the lower-elevation areas in the Project Region. These areas occupy the eastern Central Valley and rolling, western Sierra foothills, and can experience high summer temperatures, mostly unmitigated by the "Delta breezes" that are present further south and west in California's Central Valley. July air temperatures at Marysville average a high of 96.4°F, and a low of 62.0°F. Average January high and low temperatures are 54.1°F and 38.0°F, respectively. Annual average precipitation totals 21.59 inches, and falls exclusively as rain, with 67 percent falling during the winter months from December through March. June through August precipitation averages only one-quarter of an inch, generally resulting from rare summer thunderstorms (WRCC 2009).

[3] For the purpose of this exhibit, "Project Region" is defined as the area surrounding the Project on the order of a county or national forest.

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3.1.4 Major Land Uses

Lands within the Project-affected sub-basins have a patchwork of ownership. At the upper elevations above Englebright Dam, the Forest Service manages a majority of the public land as parts of the PNF and TNF. Other land managers and owners above elevation 3,000 ft include private corporations such as timber companies. Below elevation 3,000 ft, land is predominantly privately owned, with small portions owned and managed by the Forest Service as part of the TNF or PNF, or administered by the BLM as part of the Sierra Resource Management Area (SRMA).

The portions of land within the Project Area managed by federal agencies are administered according to their respective resource management plans: the TNF LRMP, as amended, and the PNF LRMP, as amended, for the Forest Service and the Sierra Resource Management Plan (SRMP), as amended, for BLM. The Forest Service LRMP divides the TNF into 109 Management Areas. The Project occupies lands within six of the Management Areas (i.e., Forty-Niner, Pendola, Oregon, Bullards, Moonshine and South Yuba). In addition the Project occupies land within the Challenge Management Area under the Plumas LRMP. The Project Area within the TNF and PNF boundaries is predominantly managed for timber, grazing and recreation

BLM's SRMP was developed to address necessary administrative changes in consumptive uses, and the need for BLM to coordinate resource protection protocols between Nevada and California agencies.

The counties are the primary agencies for establishing land use policies for private land within the river basins and sub-basins. The county general plans provide the land use policies for each county. The Yuba County General Plan was adopted in 1996, and is currently being revised. Nevada County and Sierra County also adopted their general plans in 1996. The Yuba County General Plan features two community-specific plans near the Project Area: Camptonville (population 242) and Log Cabin (population 282). In general, the majority of Yuba, Sierra and Nevada county lands in the Project Region upstream of Englebright Reservoir are designated for agricultural, timber, grazing and open space uses. At the lower elevations of the Project-affected sub-basins, downstream of Englebright Dam, the lands are more often designated as residential and agricultural.

3.1.5 Major Water Uses

The CVRWQCB, in its Basin Plan (CVRWQCB 1998) identifies streams and watersheds with unique HU numbers.[4] The Project and the area downstream of the Project falls within two Basin Plan HUs: 1) HU 517, which includes all waters of the North, Middle and South Yuba rivers upstream of USACE's Englebright Dam, including New Bullards Bar Reservoir; and 2) HU 515.3, which includes the Yuba River from USACE's Englebright Dam to the Feather River. Designated beneficial uses of surface water in these units are shown by HU in Table 1.3.9-1.

[4] Basin Plan HU codes do not correspond to Hydrologic Unit Code (HUC) numbers as defined by the Water Resources Council; the RWQCB uses the HU codes primarily for state-level water quality purposes.

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3.2 Scope of Cumulative Effects Analysis

The Council on Environmental Quality regulations require that EISs describe direct and indirect effects of the proposed action (40 C.F.R. § 1502.16(a) & (b)). These regulations define "effects" to include cumulative effects (40 C.F.R. § 1508.8). These regulations state that a

> Cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. (40 C.F.R. §1508.7.)

Following on FERC's SD2,[5] this Exhibit E addresses the following six resource areas, which have the potential to be cumulatively affected by the continued operation of the Project in combination with other activities:

- geologic and soil resources
- water resources
- aquatic resources, including anadromous fish and EFH
- mule deer
- riparian vegetation
- threatened and endangered anadromous fish

Provided below are the geographic and temporal scopes of the cumulative affects analysis for these resources, and the past, present and reasonably foreseeable future actions considered in the analysis.

3.2.1 Geographic Scope for Analysis of Cumulatively Affected Resources

The geographic scope of the cumulative effects analysis defines the physical limits or boundaries of the proposed action's effect on the resources. Because the proposed action would affect the resources differently, the geographic scope for each resource may vary. FERC's SD2[6] described the geographic scope for cumulative effects as follows:

> For water and aquatic resources (with the exception of anadromous fish), riparian vegetation, and geologic and soil resources, we define the geographic scope as extending upstream on the North Yuba River above

[5] Page 24 of FERC's April 18, 2011 SD2.
[6] Page 25 of FERC's April 18, 2011 SD2.

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> New Bullards Bar reservoir to the confluence of Slate Creek, on the Middle Yuba River upstream of the high water line of Our House diversion pool, on Oregon Creek upstream of the influence of deliveries from the Lohman Ridge tunnel and downstream on the main stem Yuba River to the mixing zone of the Yuba River and the Feather River.
>
> - At this time, we have tentatively determined a cumulative geographic scope for anadromous fish and EFH that includes the Yuba River Basin downstream to the confluence with the Feather River, the lower Feather River, to the lower Sacramento River, and through the Sacramento-San Joaquin Delta to the San Francisco Bay.
>
> For mule deer, the scope for the cumulative analysis is the range of the migratory Downieville/Nevada City and Bucks Mountain/Mooretown deer herds.

3.2.2 Temporal Scope for Analysis of Cumulatively Affected Resources

The temporal scope of the cumulative effects analysis includes a discussion of past, present, and future actions and their effects on each resource that could be cumulatively affected. Based on FERC's SD2,[7] for any resource identified as potentially having cumulative effects, the temporal scope will look 30 to 50 years into the future, based on the potential term of a new license, concentrating on the effect on the resource from reasonably foreseeable future actions. The historical discussion will, by necessity, be limited to the amount of available information for each resource.

3.2.3 Past, Present and Reasonably Foreseeable Future Actions Considered for Analysis of Cumulatively Affected Resources

According to the requirements of 18 C.F.R. Section 5.18(b)(2), a license application must:

> Include a brief discussion of past, present, and future actions, and their effects on resources based on the new license term (30-50 years). Highlight the effect on the cumulatively affected resources from reasonably foreseeable future actions. Discuss past actions' effects on the resource in the Affected Environment section.

Each of these actions is discussed below without consideration of the added effects, if any, of the Project. Incremental effects of the Project when taken in combination with these actions are discussed in the appropriate resource sections.

[7] Page 25 of FERC's April 18, 2011 SD2.

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3.2.3.1 Past and Present Actions

Past and present actions contribute to the current condition of the resources, and are intrinsically embedded in the base line (i.e., existing conditions), and are discussed where appropriate in the specific resource sections of this Exhibit E. Sections 6.2 and 6.3 of the APDBA included with this Amended FLA also discuss past and present actions with cumulative impacts on the environment. These activities include timber harvesting, grazing, mining, operation of USACE's Englebright and Daguerre Point dams and water deliveries. These activities affect the resources identified for cumulative effects analysis in SD2, and are outside the Commission's authority to regulate.

Timber harvesting and grazing, which occur both on federal and private land, affect habitat for mule deer and water resources (i.e., both water quantity and water quality, including temperature), which in turn affect aquatic resources, riparian vegetation and threatened and endangered species.

Mining, which also occurs on both federal and private land in the watershed, affects water quality, especially the metal contaminant concentrations. Also notably, hydraulic mining has had drastic affects on geology and soils in the Yuba River, especially with regards to channel morphology, substrate and riparian vegetation. While these effects are most obvious in the Yuba River downstream of Englebright Dam, mining also has affected the water quality and watershed geomorphology upstream of the dam.

Englebright and Daguerre Point dams affect geology and soils, water resources, aquatic resources, riparian habitat and anadromous fish. The purpose of Englebright Dam is to trap sediment which as described above was released into the watershed by historic hydraulic mining, while the purpose of Daguerre Point Dam is also to trap sediment and to stabilize the relocated Yuba River channel north of approximately 10,000 ac of mine tailings still remaining in the lower Yuba River watershed, now known as "the Yuba Goldfield." The USACE has undertaken two voluntary conservation measures associated with ESA consultations regarding Daguerre Point Dam to enhance geomorphic processes. The first undertaking is implementation of a Gravel Augmentation Implementation Plan (GAIP) that includes injecting a mixture of coarse sediment in gravel (2-64 mm) and cobble (64-256 mm) size ranges into the Yuba River about 115 ft downstream of the Narrows 1 Powerhouse. Seven separate gravel injection efforts occurred from 2007 through 2016, with approximately 32,700 tons of gravel/cobble injected. During the 2007 pilot program, 500 tons were injected, whereas about 5,000 tons were injected each year from 2011 through 2015. Due to favorable flow conditions, USACE injected about 7,200 tons during summer 2016. USACE's work includes conducting redd surveys to investigate whether Chinook salmon and steelhead are utilizing areas where gravel injection has occurred for spawning. USACE's long-term plan calls for continuing gravel/cobble injection until the estimated coarse sediment storage deficit is eradicated, and then it calls for subsequent injections as needed to maintain the sediment storage volume in the event that floods export material downstream.

The second USACE undertaking is implementation of a Large Woody Material Management Program (LWMMP) that includes placement of LWM in the lower Yuba River to enhance

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rearing conditions for spring-run Chinook and steelhead. The USACE initiated a Pilot Study in fall 2013, and a long-term LWMMP is anticipated to occur within 1 year following the USACE's completion of the Pilot Study.

As discussed in Section 3.1.2.4, non-Project diversions and exports of water to watersheds outside the Yuba River by other users affect flows in Project-affected reaches. Table 3.1-1 lists, for the WY 1990 to WY 2016 period, the historical annual average amounts of water exported out of the North, Middle and South Yuba River sub-basins by SFWPA, NID and PG&E, upstream of the Project. As shown in Table 3.1-1, the average annual amount of total exports is 22 percent of the average annual unimpaired runoff of the Yuba River basin at Smartsville for this period, and these total exports range from an average of 34 percent in Critically Dry WYs to 15 percent in Wet WYs.

For use of water within the Yuba River basin, the largest diversions are made for deliveries to YCWA's Member Units. For the period of 2006 to 2015 these diversion have been as much as 305,000 ac-ft in a year and have averaged 262,000 ac-ft per year, which is 12.3 percent of the average annual volume of total unimpaired runoff of the Yuba River Watershed at Smartsville for this period, as published by DWR. These non-Project water diversions for use in-basin and the exports of water to basins outside the Yuba River basin described above may affect water resources, including quantity, quality and temperature, geology and soils, aquatic resources, riparian vegetation and threatened and endangered species.

Other past and present activities in the area that could interact with the Project to affect resources cumulatively include other water and hydroelectric projects in the watershed, which are described in Section 3.1.1. FERC has the authority to regulate some of these other projects.

3.2.3.2 Reasonably Foreseeable Future Actions

The past and present actions described above are likely to continue in the future, though the magnitudes of particular actions may change. Section 8.4.4 of the APDBA included with this Amended FLA also discusses reasonably foreseeable future actions with cumulative impacts on the environment. Timber harvesting and grazing are declining. Hydraulic mining was prohibited in the watershed in the late 1800's, but other forms of mining continue, and past mining activities continue to have environmental effects. The USACE continues to maintain Englebright and Daguerre Point dams. Annual water demands are projected to increase. NID expects its demand for consumptive uses will increase from a recent historical average of 140,000 ac-ft to 201,000 ac-ft by 2062 and PCWA anticipates its demand for consumptive uses will increase from 115,000 ac-ft to 118,000 ac-ft by 2062. However, information in the documents filed with FERC by NID and PG&E for the relicensings of the Yuba Bear Hydroelectric Project and the Drum-Spaulding Project, respectively, indicate that, for their proposed projects and under future 2062 conditions, exports will not change significantly compared to the historical exports by these projects in the recent past. This is because the amounts of water that these projects have diverted in the recent past have been limited only by the capacities of their project facilities, and have been significantly greater than either their present consumptive demands or their projected future consumptive demands. Thus, NID and PG&E project relicensing model results indicate that there will be only small changes in these

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projects' exports from the Middle and South Yuba river sub-basins, even though there will be much larger increases in the consumptive demands that are partially supplied by these exports.[8] For similar reasons, it is expected that SFWPA's exports from Slate Creek will not change significantly in the future.

YCWA projects that its annual demands will increase by approximately 20,000 ac-ft per year with the completion of the Wheatland Project, which would deliver surface water to portions of the Wheatland Water District in southern Yuba County currently irrigated by groundwater. Within the next 50 years, FERC is expected to issue new licenses for non-exempt hydroelectric projects in the basin. Section 3.1.1 describes the license status of each of these projects, some of which are in various stages of relicensing.[9]

Several comments on YCWA's DLA cited the on-going work of the Yuba Salmon Forum (YSF) and NMFS' 2009 Draft Recovery Plan for Sacramento River salmonids (Draft Recovery Plan),[10] and argued that YCWA should include actions concerning upstream fish passage at Englebright Dam and introductions of anadromous fish into streams in the Yuba River watershed upstream of Englebright Dam in the Amended FLA's cumulative impacts analysis. (See March 3, 2014 FWN's comments, pp. 36-37; March 3, 2014 Cal Fish and Wildlife's comments, p. 50; March 3, 2014 USFWS' comments, pp. 7-8; and March 3, 2014 NMFS' comments, Encl. A, pp. 2-3.) However, although the YSF prepared some technical reports regarding potential habitat conditions in streams on the Yuba River watershed and potential fish-passage measures, the YSF has not developed any specific proposed actions and no longer regularly meets.

Parties to the YSF have formed the Yuba Salmon Partnership Initiative (YSPI) and currently are negotiating a settlement agreement to expand the Yuba River watershed's contribution to recovery of anadromous salmonids in the Central Valley, which may include reintroduction actions. However, those negotiations have not concluded and the cost and feasibility of any reintroduction actions still is being evaluated. Moreover, neither the 2009 Draft Recovery Plan, nor the 2014 Final Recovery Plan, contains any specific proposed actions for fish passage or introductions of anadromous fish into these streams. Also, before any project to introduce anadromous fish into these streams could proceed, there would have to be detailed plans, funding, possibly Congressional approval, NEPA and CEQA review, and permitting. For these reasons, it is uncertain if or when any such actions may occur, and it is very uncertain what components (e.g., fish ladders or fish-collection facilities) would be included in any such project and where fish would be released into and collected from such streams. YCWA, therefore, has

[8] See Supplement Number 1, *Updated Runs of the Yuba-Bear HEC-ResSim Water Balance/Operations Model,* to Amended Exhibit E, Appendix E12, in PG&E's Amended Final License Application for a New License, FERC Project No. 2310-193, Pacific Gas and Electric Company, August 2012.

[9] To investigate hydroelectric conditions under reasonably foreseeable future actions, YCWA provides in this Exhibit E a Water Balance/Operations Model scenario that includes expected inflow into the Project based on Forest Service's proposed FPA Section 4(e) flow conditions for SFWPA's South Feather Power Project, NID's Yuba-Bear Hydroelectric Project and PG&E's Drum-Spaulding Project (i.e., *With-YCWA Proposed Project (Future)* model run scenario). The scenario also includes anticipated future water deliveries, which occur both upstream and downstream of the Project. The scenario is for the year 2062, since this is the most distant water delivery forecast, and it is uncertain how the deliveries will increase over time or when the new licenses for the upstream projects will be issued.

[10] NMFS issued a Final Recovery Plan in 2014.

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not included any fish passage or fish introduction actions as reasonably foreseeable actions in the cumulative impacts discussions in this Exhibit E.

FWN also argued that an update of the SWRCB's Bay-Delta Water Quality Control Plan, potential related changes in Feather River flows, and the Bay-Delta Conservation Plan (BDCP) should be included in the Amended FLA's cumulative impacts analysis. (March 3, 2014 FWN's comments, pp. 37-39.) YCWA has not included any potential SWRCB update of the Bay-Delta Water Quality Control Plan or any related changes in Feather River flows in the cumulative impacts discussions of this Amended FLA because the SWRCB's process to update this plan has not proceeded far enough for YCWA or the Commission to know what amendments to this plan may be adopted in the future. The California Department of Water Resources (CDWR) and the USDOI, Bureau of Reclamation (Reclamation) now are pursuing possible development of the proposed BDCP Delta conveyance facilities through the California WaterFix Project. California Water Fix is a controversial $15,000,000,000 plan proposed by Governor Edmond G. Brown Jr. and CDWR to build two large, 40-foot diameter tunnels to carry fresh water from the Sacramento River under the Delta toward the intake stations for the SWP and the CVP. YCWA has not included any potential changes in Project operations that may occur because of the California WaterFix Project because it is not possible at this time to know whether or not the California WaterFix Project will be implemented, or, if it is implemented, how its implementation might affect Project operations.

Another potential future action being contemplated by the USACE's is the lower Yuba River Ecosystem Restoration Feasibility Study, which undertakes to develop a National Ecosystem Restoration plan to address federal interests in ecosystem restoration in the Yuba River watershed consistent with USACE's guidelines and policies. YCWA is the non-federal co-sponsor of this study. Under current planning guidelines, USACE is supposed to develop a Chief's Report within 3 years at a budget of approximately $3,000,000. USACE recently requested a waiver from these requirements. If the waiver is granted, the completion of the feasibility study may be as late as June 2019. YCWA, therefore, has not included any ecosystem restoration actions being contemplated by USACE in its feasibility study as reasonably foreseeable future actions in the cumulative impacts discussions in this Exhibit E.

3.3 Proposed Action and Action Alternatives

Section 3.3 is further divided into subsections, by major resource areas:

- Geology and Soils (Section 3.3.1)
- Water Resources (Section 3.3.2)
- Aquatic Resources (Section 3.3.3)
- Terrestrial Resources (Section 3.3.4)
- Threatened and Endangered Species (Section 3.3.5)
- Recreation Resources (Section 3.3.6)
- Land Use (Section 3.3.7)

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- Cultural Resources (Section 3.3.8)
- Aesthetic Resources (Section 3.3.9)
- Socioeconomic Resources (Section 3.3.10)
- Air Quality (Section 3.3.11)
- Noise (Section 3.3.12)

Excluding Section 3.3.5,[11] each of the above resource areas is divided into the following five subsections:

- YCWA's Studies. Each resource area begins with a list of the pertinent relicensing studies as directed by FERC and conducted by YCWA. The information developed for each study is intended to supplement existing, relevant and reasonably available information. The studies are not discussed in a serial order in each resource area. Instead, the relevant information from each study is incorporated into each subsection as appropriate in the context of the resource area.
- Affected Environment. This subsection uses existing, relevant and reasonably available information included in the PAD and the results of YCWA's studies to describe the condition of the environment under the existing Project. In general, the affected environment discussion is divided into major areas of interest within each resource area. For instance, the terrestrial resources section (Section 3.3.4) is divided into botanical and wildlife, and under botanical the following areas are discussed: 1) special-status and CESA-listed plants; 2) vegetation distribution and abundance; 3) riparian habitat and wetlands; and 4) non-native invasive plants (NNIP). The affected environment is the baseline (No Action Alternative) against which YCWA's proposed Project and any proposed alternatives to YCWA's proposed Project are measured.
- Environmental Effects. This subsection describes the beneficial and adverse direct and indirect effects of YCWA's proposed Project, which includes YCWA's proposed environmental measures. This section describes how each of YCWA's proposed measures is expected to protect or enhance the existing environment, including, where possible, a non-monetary quantification of the anticipated environmental benefits of the measure.

  Cumulative effects are also discussed in this section for a sub-set of resource areas. FERC's April 18, 2011 revised SD2 listed "*water resources and aquatic resources, including anadromous fish, EFH, geologic and soil resources, riparian vegetation, and mule deer as resources that have the potential to be cumulatively affected*"[12] by the

[11] Although Section 3.3.5 discusses YCWA's studies and includes analysis of both the affected environment and potential environmental effects, Section 3.3.5 is organized by ESA-listed species under USFWS's jurisdiction. YCWA has included in Volume IV of Exhibit E, an Applicant-Prepared Draft BA that addresses Project effects on ESA-listed species under NMFS' jurisdiction and an Applicant-Prepared Draft EFH Assessment that addresses Project effects on Chinook salmon EFH.

[12] Page 24 of FERC's April 18, 2011 SD2. Cumulative effects on anadromous fish are discussed in detail in the APDBA and cumulative effects on EFH are discussed in detail in the APDEFH Assessment, both of which are included in Volume IV of this Amended FLA.

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continued operation of the Project when taken in combination with other past, present or reasonably foreseeable future actions in the basin.

- YCWA's Proposed Environmental Measures. The proposed environmental measures subsection presents YCWA's proposed environmental measures designed to address Project effects on that resource area. Appendix E2 includes the full text of each environmental measure that would be included in YCWA's proposed Project.
- Comments on DLA. This subsection discusses any measures recommended by agencies and other Relicensing Particiants in their comments on the DLA that were not adopted by YCWA and the reason why the were not adopted.
- Unavoidable Adverse Effects. This subsection describes any adverse environmental effects under YCWA's proposed Project that can not be mitigated, including whether the effect is short- or long-term, minor or major, and cumulative or site-specific.

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