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CDF	California Department of Forestry and Fire Protection
FERC or Commission	Federal Energy Regulatory Commission
FRAP	Fire and Resource Assessment Program
mm	millimeter
msl	mean sea level

NPS	National Park Service
NRR	Natural Resources Report
PAD	Pre-Application Document
Project	Kaweah Project
RESSED	reservoir sedimentation database
RM	river mile
SCE	Southern California Edison Company
SD	Supporting Document
SEKI	Sequoia Kings Canyon National Parks
SIEN	Sierra Nevada Network of the National Park Service's Sierra Nevada Network Inventory and Monitoring Program
TSR	Technical Study Report
USACE	U.S. Army Corps of Engineers
USDA-FS	U.S. Department of Agriculture-Forest Service
USGS	U.S. Geological Survey
WY	Water Year

7.7 GEOMORPHOLOGY AFFECTED ENVIRONMENT

This section summarizes existing information regarding channel geomorphology and associated fluvial processes in the river reaches (bypass reaches)[1] associated with the Kaweah Project (Project), and existing erosion, mass soil movement, slumping, or other forms of instability affecting these reaches. Descriptions and maps showing the existing geology, topography, and soils in the Project vicinity and potential erosion at Project facilities are included in Section 7.6 – Geology and Soils. Section 7.8 – Riparian Resources includes a description of the vegetation cover along the streambanks and shorelines.

Channel geomorphology is a description of the channel form (morphology), including dimensions, gradient, planform, and pattern. Fluvial processes and hydrology refer to the flow, sediment supply, and sediment transport that create and maintain the channel morphology. Information directly related to channel morphology and sediment transport are not specifically required by the Federal Energy Regulatory Commission (FERC or Commission) regulations, however, this information is important to understanding channel maintenance processes and the aquatic and riparian habitat study reaches in relationship to Project operations.

7.7.1 Information Sources

This section was prepared utilizing the following information sources:

- A National Resource Condition Assessment for Sequoia and Kings National Parks. Appendix 3 – Erosion and Mass Wasting (Austin 2013);
- Channel-reach morphology in mountain drainage basins (Montgomery and Buffington 1997);
- FERC Approval of Erosion Monitoring Filing (FERC 1999);
- Google Earth © imagery;
- Hydrology and Water Resources. Sierra Nevada Ecosystem Project: Final Report to Congress, vol. II, Assessments and Scientific Basis for Management Options (Kattleman 1996);
- Hydrology of the Sierra Nevada Network National Parks: Status and Trends (Andrews 2012);
- Kaweah River Investigation, California, Final Feasibility Report (U.S. Army Corps of Engineers [USACE] 1996);

[1] A bypass reach is a segment of a river downstream of a diversion facility where Project operations result in the diversion of a portion of the water from that reach.

- Recent fire activity in the Project vicinity from the California Department of Forestry and Fire Protection (CDF 2018);
- Recent visual assessment of channel conditions in the Project vicinity by Southern California Edison Company (SCE) in 2018;
- The Reservoir Sedimentation Database (RESSED). Reservoir Sediment Data for Lake Kaweah (United States Geological Survey [USGS] 2015);
- Pre-Application Document (PAD) for the Kaweah Project (SCE 2016); and
- AQ 5 – Geomorphology Technical Study Report (AQ 5 – TSR) (SCE 2019a), which is included in Supporting Document A (SD A).

7.7.2 Regional Setting

The Kaweah River Watershed (Watershed) is situated in the mountains and foothills of the western slope of the Sierra Nevada. The rivers in the Watershed flow generally westward, with elevations of ridges in the upper watersheds higher than 8,400 feet above mean sea level (msl) (Map 7.7-1). The Kaweah River from its headwater tributaries to Lake Kaweah is the steepest river in the United States dropping over 10,500 feet in 37.5 miles (280 feet per mile) (Austin 2013). This is the only river in the United States that drops 10,000 feet or more in less than 100 miles. In the vicinity of the Project, elevations range from approximately 2,585 feet above msl at the Kaweah No. 1 Diversion Dam on the East Fork Kaweah River to 921 feet above msl at the Kaweah No. 2 Powerhouse on the Kaweah River (Map 7.7-1; Figure 7.7-1).

The Kaweah River and East Fork Kaweah River in the Study Area are steep, coarse-bedded rivers (e.g., abundant large cobbles, boulders, very large boulders, and bedrock). Very little gravel exists in the system and finer substrate (sand) exists in the pools or in the velocity shadow of large substrate. Sediment transport and deposition dynamics in boulder, bedrock-dominated system are mediated by the resistant channel boundary. The entire system is sediment supply-limited and seasonally-transported bedload (e.g., gravel, cobble) is found in relatively rare, discrete deposits mantling the coarse (boulder, bedrock) and much less frequently transported channel. Coarse, granitic sand is present throughout the river system, with deposits in some low gradient areas that are expansive and deep. The sand is mobile, as can easily be observed in the field during any modest flow, and larger episodes of sand transport are likely semi-annual.

The longitudinal profiles for the Kaweah River and its tributaries are shown in Figure 7.7-1. The Marble Fork Kaweah River has the overall steepest gradient of the Kaweah River tributaries (10%). The overall channel gradient of the East Fork and Middle Fork of the Kaweah River are 7% and 8%, respectively. The overall gradients of the North Fork and South Fork of the Kaweah River are 5% and 7%, respectively. Localized slopes in the upper tributaries can be much greater, up to 31%.

The upper Watershed is characterized by steep, deeply incised channels within rugged canyons. These channels have limited geomorphic landform development, and are confined by narrow V-shaped valley bottoms and steep-side slopes with a prevalence of bedrock and coarse substrate. Channels with these characteristics are generally not sensitive to changes in flow and sediment regimes. This includes all of the Marble Fork, Middle Fork, and East Fork Kaweah rivers.

The lower Watershed in the vicinity of the Kaweah River downstream of the East Fork Kaweah River confluence and in the lower reaches of the North Fork and South Fork of the Kaweah River is characterized by lower gradient and wider channels with floodplains. The channel surrounded by rolling foothills within a wider valley. These river segments exhibit alluvial deposition. Where aggradation is present, the bed consists of a coarse deposit of large cobbles, small and large boulders, and erratic very large boulders interspersed with bedrock outcrops or deep, bedrock-bounded pools.

Information on geology and soils in the vicinity of the Project is provided in Section 7.6 – Geology and Soils.

7.7.3 Channel Geomorphology in the Bypass Reaches Associated with the Project

The bypass reaches associated with the Project include:

- Kaweah River from the Kaweah No. 2 Diversion to the Kaweah No. 2 Powerhouse Tailrace (4.1 miles); and
- East Fork Kaweah River from the Kaweah No. 1 Diversion to the confluence with the Kaweah River (4.7 miles).

Specific details regarding gradient and channel morphology are provided below and are summarized in Table 7.7-1. Sediment supply and transport, including hydrology, in the bypass reaches are provided in Section 7.7.4.

7.7.3.1 Kaweah River Bypass Reach

The Kaweah River Bypass Reach is comprised of two sub-reaches based on similar geomorphic and hydrologic characteristics: (1) from the Kaweah No. 2 Diversion Dam to the confluence with the East Fork Kaweah River; and (2) from the confluence with the East Fork Kaweah River to the Kaweah No. 2 Tailrace. The characteristics of each of the sub-reaches are described below. The channel upstream and downstream of the bypass reach is also described below.

Kaweah River from Kaweah No. 2 Diversion Dam to the East Fork Kaweah River Confluence

GRADIENT

The Kaweah River Bypass Reach immediately downstream of the Kaweah No. 2 Diversion to the confluence with the East Fork Kaweah River has an overall 3% gradient (Figure 7.7-1).

CHANNEL MORPHOLOGY

The channel has short alternating segments dominated by bedrock, step-pool formations, or boulder cascades (Map 7.7-2). The substrate is primarily comprised of large and small boulders (Table 7.7-2). A representative photograph of the channel is shown in Figure 7.7-3c.

Kaweah River from East Fork Kaweah River Confluence to the Kaweah No. 2 Tailrace

GRADIENT

Downstream of the confluence with the East Fork Kaweah River, the Kaweah River channel gradient is more moderate, approximately 2% (Figure 7.7-2).

CHANNEL MORPHOLOGY

Downstream of the confluence with the East Fork Kaweah River, the bypass channel is primarily comprised of pool-riffle and plane-bed segments (0.4 to greater than 1 mile in length) interspersed with short bedrock segments (typically 0.1 mile or less in length) (Map 7.7-2). Boulder-sized substrate dominates in the first 2.6 miles downstream from the East Fork Kaweah River confluence with the Kaweah River (River Mile [RM] 8.4 and RM 5.8), transitioning to cobble-dominated substrate downstream to the tailrace (Table 7.7-2). Representative photographs of this river channel are provided in Figures 7.7-3d through 7.7-3f.

Upstream and Downstream of the Bypass Reach

Upstream of the Kaweah No. 2 Diversion Dam (RM 10 to RM 9.0), the channel is similar to the 0.6-mile segment immediately downstream from the diversion, with a gradient of 3% (3.6 miles) (Figures 7.7-3a and 7.7-3b). Downstream from the Kaweah No. 2 Tailrace, the channel characteristics (gradient, channel morphology, and substrate) were similar to the downstream-most segment of the bypass reach (RM 5.8 to the tailrace). Gradients decrease to less than 0.5%. Representative photographs of the Kaweah River segment downstream of the bypass reach are shown in Figures 7.7-3g and 7.7-3h.

7.7.3.2 East Fork Kaweah River Bypass Reach

East Fork Kaweah River from Kaweah No. 1 Diversion Dam to Confluence with the Kaweah River

The gradient and channel morphology of East Fork Kaweah River is homogenous throughout the bypass reach as described below. The channel characteristics upstream of the diversion dam are also summarized.

GRADIENT

The channel gradient of the East Fork Kaweah River Bypass Reach is 5% (Figure 7.7-2).

CHANNEL MORPHOLOGY

The East Fork Kaweah River Bypass Reach has short alternating segments dominated by bedrock, step-pool formations, or boulder cascades (Map 7.7-2). The channel has frequent bedrock/large boulder exposures usually with coarse steps, with shorter channel segments where smaller sized material collects (cobble/gravel) or there is a shallow mantling of alluvial material. These relatively small depositional features typically occurred at drainage confluences. The channel contains more cobble and gravel-sized material in the 0.4-mile segment immediately upstream of the confluence with the Kaweah River. Representative photographs of the channel are provided in Figure 7.7-4.

Upstream of the Bypass Reach

Upstream of the Kaweah No. 1 Diversion Dam (RM 5.2 to RM 4.7) the channel characteristics were similar to the bypass reach (gradient, channel morphology, and substrate) (Map 7.7-2). The channel gradient of the East Fork Kaweah River is 5% upstream of the Kaweah No. 1 Diversion Dam (Figure 7.7-2).

7.7.4 Sediment Supply and Transport

Each of the major tributaries to the Kaweah River provide increased hydrology (flow) and sediment supply. Typically, downstream of the confluence of each tributary the channel gradient decreases, the channel and valley floor becomes wider, and more sediment is present. Natural hydrology and sediment supply reaches in the vicinity of the Project include the following:

- Kaweah River from the Marble and Middle Fork Kaweah River confluence to the East Fork Kaweah River Confluence;
- Kaweah River from the East Fork Kaweah River Confluence to the North Fork Kaweah River Confluence;
- Kaweah River downstream of the North Fork Kaweah River to the South Fork Kaweah River;

- Kaweah River downstream of the South Fork Kaweah River; and
- East Fork Kaweah River.

The natural hydrology is modified at the Project diversions (Kaweah No. 1 and Kaweah No. 2 diversions). The diverted flow (with the exception of water delivered for consumptive purposes) reenters the natural river reaches in a downstream direction at the Kaweah No. 3, Kaweah No. 1, and Kaweah No. 2 powerhouses, respectively. The locations are labeled on Map 7.7-2.

This section describes potential sediment contribution to the bypass reaches from hillslope mass wasting and bank erosion and the relative capacity of the reaches to transport and store sediments.

7.7.4.1 Sediment Supply

Mass Wasting

Mass wasting (e.g., falls, slides, and flows) of valley walls can be a source of sediment, particularly in mountain streams and rivers. These sediments are re-worked and mobilized by subsequent high flows.

The National Park Service (NPS) conducted an assessment of mass wasting in the Watershed, including areas susceptive to large mass wasting events. Portions of the watersheds upstream of the bypass reaches (Marble, Middle, and East forks of the Kaweah River) were identified as areas where large mass wasting events have the potential to occur. Specifically, areas in the upper Watershed which are steep (>40% slope) with poor vegetative cover have the highest susceptibility for the occurrence of a large mass wasting event (Austin 2013).

Surveys completed by SCE in the Project vicinity in July 2015 did not identify evidence of any recent hillslope mass wasting events adjacent to the bypass reaches. An aerial survey in summer 2018 also did not find any evidence of mass wasting into the bypass reaches. The potential for large mass wasting events on the hillslopes adjacent to the bypass reaches is relatively low. However, in summer 2018, a rock fall above the Kaweah No. 1 Flowline damaged the flume, although the event did not supply sediment to the channel. Although the hillslopes are steep in some areas, there have been no fires >500 acres in the watershed during the 2010s (CDF 2018) and the hillslopes are well-vegetated.

Streambank Erosion

Streambank erosion is a natural process, but acceleration of this process can lead to disproportionate increases in sediment supply, channel instability, adjacent land loss, and habitat loss/degradation. Excessive streambank erosion can be a large source of sediment in a watershed. Streambank erosion is driven by the characteristics of the bank (e.g., bank materials, vegetation, etc.) and hydraulic/gravitational forces. Accelerated bank erosion is often a response of the channel as it re-adjusts to a stable position from changes in the Watershed that may have altered the flow and/or sediment regimes.

In the upper 3.2-mile portion of the Kaweah River Bypass Reach (RM 5.8 to RM 9.0) and in the entire East Fork Kaweah River Bypass Reach (RM 0.0 to RM 4.7), the potential for bank erosion is very low due to the presence of bedrock and coarse boulder substrates that stabilize the streambed and banks. In the lower 1-mile segment of the Kaweah River Bypass Reach (RM 5.8 to RM 4.85), the potential for excessive bank erosion is also generally low because the streambanks are well vegetated with riparian trees and shrubs, and various grasses.

7.7.4.2 Sediment Conditions in the Bypass River Reaches

Fine Sediment in Pools

As part of the AQ 5 – TSR (SCE 2019a, SD A), the amount of residual fine sediment in pools in the bypass reaches was characterized using the V* index developed by the U.S. Department of Agriculture-Forest Service (USDA-FS) (Lisle and Hilton 1991, 1992; and Hilton and Lisle 1993). Analysis of residual fine sediment in pools, V* (Hilton and Lisle 1993), was conducted in 5 to 10 pools at each of the sampling locations in the bypass and comparison reaches. Pools with V* values that were relatively low (less than 0.1) were approximated by visual estimation using a snorkel and mask (Hilton and Lisle 1993). In cases where V* was likely higher than 0.1, a more rigorous, quantitative approach was taken to estimate the fraction of fine sediment (Hilton and Lisle 1993). Estimates of V* were made for each of the sampled pools and a weighted average V* of the pools within each study reach was calculated (weighted by total pool volume). The V* value calculated for each pool is an index that quantifies the proportion of the residual pool volume that is filled with fine sediment. Excess collection of fine sediment in pools is a possible indication of insufficient magnitude or frequency of sediment transporting flows that are needed to maintain channel morphology and aquatic habitat.

Fine sediment in pools was limited to a small proportion of the residual pool volume. In 48 of the 60 sampling sites V* values were less than 0.10. Twelve sampling sites had V* values greater than 0.10, with the highest value of 0.18. The results of the V* measurements are provided in Table 7.7-3. The table summarizes the residual pool measurements, the average volume of fine sediment stored in each pool, and the calculated V*.

Based on visual observations of the pool substrate, the majority of the pools contained bedrock or boulders. Cobble and/or coarse gravels were also often, though not always, observed within each of the pools surveyed. In most cases, the fine sediment was a thin coating (less than 0.1 feet thick) located within the interstitial spaces of the coarse bed material. At pool locations where thicker fine sediment deposits were present, the deposits were located primarily along the margins of the residual pool in slack water areas, or in the velocity shadow of larger boulders. In some cases, the primary sediment deposits consisted of a large, discrete mantle of fine gravel and coarse sand more than a foot thick overlying bedrock in an otherwise sediment-free pool.

The volume weighted average V* for each reach (Table 7.7-3) was 0.1 or less, except in the comparison reach upstream of the East Fork Kaweah No. 1 Diversion (V* = 0.14) and in the lowest gradient reach, Kaweah River downstream of Kaweah No. 1 Powerhouse and upstream of Kaweah No. 2 Powerhouse (V* was 0.12).

Particle Size Composition and Fine Sediment Content of Spawning Gravels

As part of the AQ 5 – TSR (SCE 2019a, SD A), bulk sediment samples were collected from sites in the bypass reaches to determine the particle size distribution (composition) and fine sediment content in potential spawning gravels. The bulk sediment samples provide a quantitative measure of spawning gravel particle size composition, including that portion of spawning substrates, which are comprised of fine sediments. Bulk samples were collected in typical trout spawning habitat (i.e., pool tail out, pocket gravel, or riffles). Details of sampling methods are provided in AQ 5 – TSR (SCE 2019a, SD A).

Fisheries literature indicates that most trout (rainbow and brown) spawning occurs in medium to coarse gravel (based on the Udden-Wentworth scale) of 8–64 millimeters (mm) (Kondolf and Wolman 1993; Reiser and Bjornn 1979; Grost et al. 1991). Fine sediment (<1 mm and <6.4 mm) in the gravel can affect egg incubation (e.g., reduce water flow and dissolved oxygen delivery to eggs) and fry emergence. Gravel within a constructed redd typically has less fine sediment than it did before redd construction (Kondolf 2000) because the process of redd construction winnows fine sediments from the unspawned gravel deposit. To account for this cleaning effect, the amount of fine sediment content in the bulk samples was adjusted using regression equations developed by Kondolf (2000):

- Percent of fine sediment <1 mm in winnowed gravels = 0.67 x Initial gravel percent <1 mm particle size
- Percent of fine sediment <6.4 mm in winnowed gravels = 0.58 x Initial gravel percent <6.4 mm particle size

The criteria developed by Kondolf (1988, 2000) were used for this study to determine if gravels would support high spawning success:

- Percentage finer than 1 mm should be less than 14%; and
- Percentage finer than 6.4 mm should be less than 30%.

The fine sediment content at each potential spawning gravel site prior to spawning, and as predicted after redd construction, were analyzed.

Based on the aforementioned criteria, the D_{50} of the 32 bulk samples at the sampling locations were within the typical size range of spawning material used by trout (8 to 64 mm) except for four samples in the Kaweah River downstream of the East Fork Kaweah River Confluence and upstream of the Kaweah No. 1 Powerhouse and four samples in the East Fork Kaweah upstream of the confluence with the Kaweah River. The spawning gravel samples at the sites that were not in the typical spawning size range were all smaller than those typically used by trout. Larger sized gravels were not present at those sites.

Fine sediment within potential spawning gravels was generally within the criteria to support high reproductive success; however, spawning gravels were generally very limited in the river due to the high gradient of the rivers. The statistical results from the analyses of bulk sediment samples are presented in Table 7.7-4. Histogram and cumulative particle size distribution curves from each bulk sample are available in Appendix A. The amount of fine sediment within the potential spawning gravel sample is shown in Table 7.7-5.

Fine sediment <1 mm was relatively low in all of the all gravel samples. After accounting for winnowing during spawning, all 32 gravel samples had <1 mm fine sediment concentrations less than the Kondolf (1988, 2000) 14% value (sample range 0.0 to 9.8%) (Table 7.7-5). Fine sediment content <6.4 mm for 25 of the 32 of the gravel samples was within the Kondolf (1988, 2000) <30% criteria after accounting for winnowing during spawning (Table 7.7-5). Three of the eight samples in the Kaweah River downstream of the East Fork Kaweah Confluence and upstream of the Kaweah No. 1 Powerhouse slightly exceeded the 6.4 mm <30% criteria (37.6%, 31.4%, and 31.6%). All four of the gravel samples in the East Fork Kaweah River Upstream of the Confluence with the Kaweah River exceeded the 6.4 mm fine sediment criteria (31.8%, 45.2%, 57.95%, 58.0%).

7.7.4.3 Flows Necessary to Maintain Geomorphic Processes in Bypass River Reaches

Comparison of Existing and Unimpaired Hydrologic Regimes

A comparison of existing and unimpaired hydrologic regimes (high-flow magnitude, duration, and frequency) in bypass and comparison reaches was developed. The magnitude and frequency of annual instantaneous peak flows were analyzed using the methods published in Guidelines for Determining Flood Flow Frequency – Bulletin 17C (England et al. 2018). Flood frequency estimates were generated using the USGS software PeakFQ, following methods detailed in the User's Manual for Program PeakFQ Annual Flood - Frequency Analysis Using Bulletin 17B Guidelines (Flynn et al. 2006; Veilleux et al. 2014). Flood frequency model parameters (skew and variance) for the Kaweah River Basin used in the PeakFQ model were published in Regional Skew for California, and Flood Frequency for Selected Sites in the Sacramento–San Joaquin River Basin (Parrett et al. 2011). Existing and unimpaired flood frequency curves were plotted together to facilitate comparison of changes in peak discharge (existing versus unimpaired) for recurrence intervals ranging from 1.005 to 100 years.

Existing annual instantaneous peak flow records were obtained from USGS and SCE gage data (Table 7.7-6). Unimpaired annual instantaneous peak flow was developed by adding the appropriate flowline diversion or powerhouse inflow, at the time of the instantaneous peak, to the existing values. Existing and unimpaired annual peak discharge comparisons were for water years (WY) 1994 through WY 2018. The mass balance approach for each of the eight reaches is shown in Table 7.7-7.

The frequency and duration of average daily flows for existing and unimpaired conditions was also compared for each reach. The duration of flows (i.e., number of days) equaling or exceeding the 1.5-year unimpaired annual peak daily average flow magnitude were tallied for each water year in the available gaging records. The 1.5-year annual peak daily average flow recurrence interval was selected as the threshold for comparing flow durations because it is a commonly recurring annual high flow event, and because it is typically considered to be a geomorphically significant flow (near bankfull flow) that moves sediment and structures channels.

Annual instantaneous peak flow exceedance plots for each Project bypass reach under existing and unimpaired conditions show that the existing and unimpaired instantaneous peak stream flows are similar and within the analysis error range (95% confidence limits). The annual instantaneous peak flood frequency analysis for recurrence intervals from 1.005 year up to 100 years for all Project reaches are summarized in Table 7.7-8 and Figures 7.7-5a-h. The lack of difference in annual peak flood recurrence intervals between existing and unimpaired flows indicates that annual peak flows have not been substantially altered by Project operations in the bypass reaches.

The difference in the frequency (duration) of days that flows equaled or exceed the unimpaired 1.5-year annual daily average flow magnitude for each bypass reach is shown in Table 7.7-9. Under existing conditions, the average number of days each year that exceed the unimpaired 1.5-year flow event ranged from 1.2 to 2.6 days less than under unimpaired conditions (Table 7.7-9). The frequency of existing daily flows exceeding the 1.5-year unimpaired flow event was 87 to 93% of what would occur under unimpaired flows.

Initiation of Sediment Transport Conditions under Different Flow Regimes at Selected Quantitative Study Sites

As part of the AQ 5 – TSR (SCE 2019a, SD A), the flow required to initiate sediment movement was determined by calculating the discharges required to initiate sand, gravel, and/or cobble transport at the instream flow modeling transects [AQ 1 – TSR (SCE 2019b, SD A)]. Initiation of motion was determined using the hydraulic model estimates of bed shear stress (τ) and the Shield's criterion that defines the critical shear stress (τ^*_{ci}) at which incipient motion occurs. Wilcock's (1996) method was used to calculate bed shear stress and the Wilcock and Crowe (2003) method was used to calculate the critical shear stress needed to initiate sediment movement for mixed-size sediment. Calculation of bed shear stress and initiation of motion are described in more detail in AQ 5 – TSR, Appendix A (SCE 2019a, SD A).

At each study transect, hydraulic modeling was performed for 30 different discharges (low to high flow). Flow depth, velocity, and substrate size at each cell along the transects (i.e., cells were typically less than a few feet wide) were used to calculate sediment movement. The discharge at which initiation of motion occurred for 10% of the sand (0.1 to 0.2 inch), gravel (0.2 to 3 inches), or cobble (3 to 12 inches) substrate size classes within the wetted portion of the cross-section in each reach was used as the "initiation of motion" threshold for each substrate size.

Estimates of the flow required to initiate motion of sand, gravel substrate were modeled at a total of 61 transects within the four AQ 1 – Instream Flow Study modeling sites [AQ 1 – TSR (SCE 2019b, SD A)]. Table 7.7-10 depicts the modeled discharge at which 10% of the particles of each size class (sand, gravel, and cobble) within the wetted channel in each reach moved. As expected, the smaller substrates (sand, gravel) move at lower flows and the matrix substrate of the channel (e.g., cobbles) moved at higher flows. Cobbles move near the average daily Q 1.5 year flow. There is little difference between the existing and unimpaired average daily Q 1.5 flows (Table 7.7-10); therefore, little difference would exist between the frequency of cobble transport under existing conditions versus unimpaired conditions.

Figures 7.7-6a-d depict existing and unimpaired daily discharge exceedance plots (all daily flows WY 1994 – WY 2018) for each reach with superimposed discharges for the modeled sand, gravel, and cobble transport (10% of the sediment). The plots also include the average daily Q 1.5 year and instantaneous peak Q 1.5 year flow values. Differences between the existing versus unimpaired percent exceedance values for each of the transport flows (sand, gravel, cobble, average daily Q 1.5 year, instantaneous peak Q 1.5 year values) can be seen on the plots. Table 7.7-11 shows the percent exceedance differences. For the sand transport (lowest flow) the existing versus unimpaired differences range from 1.5 to 12%, for gravel transport the differences range from <1.1 to 5.5%, and for cobble the differences range from <1.1 to 1.4%. In general, the exceedance plots show limited effect of existing conditions on sediment transport as compared to unimpaired conditions.

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TABLES

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Table 7.7-1. Geomorphic Characteristics of the Bypass Reaches Associated with the Kaweah Project

Bypass Reaches	River Mile	Reach Length (miles)	Gradient	Channel Morphology and Substrate
Kaweah River Bypass Reach				
Kaweah River from Kaweah No. 2 Diversion Dam to East Kaweah River Confluence	9.0-8.4	0.6	3%	Alternating bedrock, step-pool, and cascade channel types. Channel has frequent bedrock/large boulder exposures with coarse steps.
Kaweah River from East Fork Kaweah River Confluence to Kaweah No. 2 Powerhouse Tailrace	8.4-4.85	3.55	1.9%	Alternating sections of plane-bed and pool-riffle channel types with short bedrock sections interspersed. Channel substrate is small boulders with cobbles and gravels and short bedrock and large boulder segments.
East Fork Kaweah River Bypass Reach				
East Fork Kaweah River from Kaweah No. 1 Diversion Dam to Kaweah River Confluence	4.7-0	4.7	5%	Alternating bedrock, step-pool, and cascade channel types. Channel has frequent bedrock/large boulder exposures with coarse steps.

Table 7.7-2. Substrate Size Classes Observed during Helicopter Overflight of the Bypass Reaches Associated with the Kaweah Project and Reaches Upstream and Downstream of the Project Facilities

River Mile[1]		Substrate Size Classes Observed[2]					
Begin	End	Bedrock	Large Boulder	Small Boulder	Large Cobble	Small Cobble	Gravels
Kaweah River							
0.5 Mile Upstream of the Kaweah No. 2 Diversion Dam							
9.5	9		x	x	x	x	x
Kaweah No. 2 Diversion Dam to Kaweah No. 2 Tailrace							
9	8.2		x	x	x	x	x
8.2	7.1			x	x		
7.1	7	x					
7	6.6			x	x	x	x
6.6	6.5	x			x		
6.5	5.9		x	x	x		x
5.9	5.8	x					
5.8	5.5				x	x	x
5.5	5	x			x	x	x
5	4.9			x	x		
4.9	4.85	x	x				
Kaweah No. 2 Tailrace to Lake Kaweah							
4.85	4.45			x	x	x	x
4.45	4.2				x		
4.2	4.15	x			x		
4.15	3.9				x	x	x
3.9	3.8		x	x	x		
3.8	3.2				x	x	x
3.2	3.15	x			x		
3.15	2.9				x	x	x
2.9	2.8	x	x				
2.8	1.42				x	x	x
1.42	1.37			x	x		
1.37	1.1				x	x	x
1.1	0			x	x	x	x

River Mile[1]		Substrate Size Classes Observed[2]					
Begin	End	Bedrock	Large Boulder	Small Boulder	Large Cobble	Small Cobble	Gravels
East Fork Kaweah River							
0.5 Mile Upstream of the Kaweah No. 1 Diversion Dam							
5.2	4.7	x	x	x	x		
Kaweah No. 1 Diversion Dam to Confluence with the Kaweah River							
4.7	3.4	x	x	x	x		
3.4	3.35		x	x	x	x	x
3.35	3.2	x	x	x	x		
3.2	0.4	x	x	x	x	x	x
0.4	0.35			x	x	x	x
0.35	0.3	x	x				
0.3	0		x		x		x

[1] Substrate were mapped during a low-level helicopter flight and are presented at a scale to show general trends in substrate along the river reaches in the vicinity of the Project, and does not show detailed bed or bank substrate that would be generated during on-the-ground reach scale or mesohabitat mapping.

[2] Sands are generally present throughout.

Table 7.7-3. V* Measurement Results 2018

River/Reach	Pool Number	River Mile	Avg. Length (ft)	Avg. Width (ft)	Pool Bed Surface Area (ft^2)	Avg. Residual Pool Volume (ft^3)	Avg. Fines Thickness (ft)	Avg. Fines Surface Area (ft^2)	Avg. Volume Fine Sediment (ft^3)	Calculated V*
Kaweah River										
Kaweah River Upstream of Kaweah No. 3 Powerhouse	1	9.73	33.00	20.00	660.00	2,145.00	trace[1]	--	--	<0.001
	2	9.76	84.00	32.00	2,688.00	53.76	trace[1]	--	--	<0.001
	3	9.74	45.00	42.00	1,890.00	3,402.00	trace[1]	--	---	<0.001
	4	9.79	45.00	46.00	2,070.00	3,105.00	trace[1]	--	--	<0.001
	5	9.81	111.00	38.00	4,218.00	5,483.40	trace[1]	--	--	<0.001
	6	9.84	90.00	33.00	2,970.00	5,049.00	trace[1]	--	--	<0.001
	7	9.86	45.00	60.00	2,700.00	2,700.00	trace[1]	--	--	<0.001
	8	9.89	60.00	35.00	2,100.00	2,625.00	trace[1]	--	--	<0.001
	9	9.94	117.00	46.00	5,382.00	5,382.00	trace[1]	--	--	<0.001
	10	10.01	75.00	60.00	4,500.00	13,500.00	trace[1]	--	--	<0.001
									Weighted Average V*	**<0.001**
Kaweah River Downstream of Kaweah No. 3 Powerhouse and Upstream of the East Fork Kaweah River Confluence	1	8.80	59.00	21.00	1,239.00	1,239.00	trace[1]	--	--	<0.001
	2	8.78	68.00	33.00	2,244.00	2,244.00	0.70	648.00	479.52	0.09
	3	8.76	93.00	39.00	3,627.00	3,627.00	0.75	368.30	282.51	0.02
	4	8.71	87.00	24.00	2,088.00	2,088.00	trace[1]	--	--	<0.001
	5	8.69	81.00	45.00	3,645.00	3,645.00	trace[1]	--	--	<0.001
	6	8.68	60.00	39.00	2,340.00	1,872.00	0.50	93.50	44.88	0.01
	7	8.67	84.00	48.00	4,032.00	6,048.00	1.30	428.91	603.55	0.10
	8	8.58	96.00	48.00	4,608.00	4,608.00	trace[1]	--	--	<0.001
	9	8.56	153.00	60.00	9,180.00	13,770.00	1.10	1,346.40	1,454.42	0.18
									Weighted Average V*	**0.07**

River/Reach	Pool Number	River Mile	Avg. Length (ft)	Avg. Width (ft)	Pool Bed Surface Area (ft²)	Avg. Residual Pool Volume (ft³)	Avg. Fines Thickness (ft)	Avg. Fines Surface Area (ft²)	Avg. Volume Fine Sediment (ft³)	Calculated V*
Kaweah River Downstream of East Fork Kaweah Confluence and Upstream of Kaweah No. 1 Powerhouse	1	6.91	222.00	45.00	9,990.00	16,983.00	0.11	7,055.09	758.42	0.04
	2	8.00	330.00	42.00	13,860.00	13,860.00	0.23	16,995.37	3,903.63	0.15
	3	6.86	90.00	31.00	2,790.00	5,859.00	0.08	2,328.00	196.43	0.17
	4	7.09	123.00	59.00	7,257.00	13,062.60	0.06	5,689.98	355.62	0.03
	5	7.85	276.00	65.10	1,7967.60	32,341.68	0.25	17,165.51	4,205.55	0.09
									Weighted Average V*	**0.10**
Kaweah River Downstream of Kaweah No. 1 Powerhouse and Upstream of Kaweah No. 2 Powerhouse	1	5.05	372.00	54.00	20,088.00	24,105.60	0.29	19,974.78	5,742.75	0.09
	2	5.13	159.00	41.00	6,519.00	11,734.20	0.18	4,987.12	903.92	0.12
	3	5.20	195.00	50.60	9,867.00	17,760.60	0.24	10,320.92	2,488.08	0.12
	4	5.25	180.00	38.00	6,840.00	13,680.00	0.12	5,097.60	597.38	0.14
	5	6.40	54.00	33.00	1,782.00	2,494.80	0.09	1,301.40	122.01	0.05
									Weighted Average V*	**0.12**
Kaweah River Downstream of Kaweah No. 2 Powerhouse	1	3.51	285.00	25.00	7,125.00	6,412.50	0.09	5,700.00	498.75	0.10
	2	3.71	450.00	60.00	27,000.00	27,000.00	0.11	21,380.28	2,371.88	0.07
	3	3.76	99.00	51.00	5,049.00	13,127.40	0.60	375.00	225.00	0.08
	4	3.81	237.00	55.00	13,035.00	20,856.00	0.18	10,238.40	1,855.71	0.08
	5	3.91	54.00	32.00	1,728.00	2,592.00	0.03	1,473.19	49.11	0.04
	6	3.98	285.00	18.00	5,130.00	7,695.00	0.80	499.38	399.50	0.03
	7	4.08	144.00	12.00	1,728.00	2,592.00	trace[1]	--	--	<0.001
	8	4.14	348.00	57.00	19,836.00	37,688.40	trace[1]	--	--	<0.001
	9	4.20	285.00	225.00	64,125.00	96,187.50	1.00	1,500.00	1,500.00	0.02
	10	4.34	291.00	51.00	14,841.00	22,261.50	trace[1]	--	--	<0.001
									Weighted Average V*	**0.03**

River/Reach	Pool Number	River Mile	Avg. Length (ft)	Avg. Width (ft)	Pool Bed Surface Area (ft^2)	Avg. Residual Pool Volume (ft^3)	Avg. Fines Thickness (ft)	Avg. Fines Surface Area (ft^2)	Avg. Volume Fine Sediment (ft^3)	Calculated V*
East Fork Kaweah River										
East Fork Kaweah River Upstream of the Kaweah No. 1 Diversion	1a	5.51	45.00	30.00	1,350.00	1,350.00	0.10	1,298.64	124.45	0.09
	2a	5.46	57.00	52.00	2,964.00	3,556.80	0.19	2,453.66	465.17	0.15
	3a	5.45	66.00	47.00	3,102.00	3,102.00	0.02	2,450.25	40.84	0.01
	4a	5.42	75.00	47.00	3,525.00	5,640.00	0.08	4,080.00	306.00	0.06
	1b	5.52	45.00	46.00	2,070.00	2,691.00	0.31	1,603.80	501.19	0.24
	2b	5.56	120.00	39.00	4,680.00	4,680.00	0.25	3,982.65	975.75	0.15
	3b	5.60	75.00	37.00	2,775.00	2,775.00	0.45	2,480.98	1,108.69	0.37
	4b	5.64	57.00	23.00	1,311.00	1,704.30	0.20	976.05	193.18	0.21
	5b	5.68	144.00	35.30	5,083.20	6,099.84	0.42	3,698.82	1,554.66	0.10
									Weighted Average V*	**0.14**
East Fork Kaweah River Downstream of the Kaweah No. 1 Diversion	1	4.60	105.00	28.50	2,992.50	2,993.00	trace[1]	--	--	<0.001
	2	4.64	105.00	20.00	2,100.00	2,100.00	trace[1]	--	--	<0.001
	3	4.67	54.00	22.00	1,188.00	1,188.00	trace[1]	--	--	<0.001
	4	4.40	103.00	22.00	2,266.00	2,266.00	trace[1]	--	--	<0.001
	5	4.41	80.00	16.00	1,280.00	1,280.00	trace[1]	--	--	<0.001
									Weighted Average V*	**<0.001**
East Fork Kaweah River Upstream of Confluence with Kaweah River	1	0.11	126.00	45.00	5,670.00	4,536.00	0.40	5,670.00	559.08	0.06
	2	0.12	42.00	47.00	1,974.00	1,974.00	0.12	1,566.00	182.70	0.11
	3	0.19	93.00	37.00	3,441.00	3,096.90	0.14	2,437.15	345.26	0.08
	4	0.22	201.00	38.00	7,638.00	11,457.00	0.12	1,566.00	182.70	0.11
	5	0.25	42.00	42.00	1,764.00	529.20	trace[1]	--	--	<0.001
									Weighted Average V*	**0.06**

[1] A visual estimate was conducted in which little or no fine sediment was observed.

Table 7.7-4. Sediment Statistics of Spawning Gravel Samples

Sample	Habitat Type	River Mile	Geometric Mean (mm)	D_{84} (mm)	D_{50} (mm)	D_{16} (mm)
Kaweah River						
Kaweah River Upstream of Kaweah No. 3 Powerhouse						
Sample 1.1	MCP	8.97	9.70	54.40	15.49	1.73
Sample 1.2	MCP	8.97	12.59	75.20	25.23	2.11
Sample 2.1	MCP	8.97	8.85	41.85	16.34	1.87
Sample 2.2	MCP	8.97	10.91	70.73	15.00	1.68
Kaweah River Downstream of Kaweah No. 3 Powerhouse and Upstream of the East Fork Kaweah River Confluence						
Sample 1.1	HGR	8.85	13.36	68.37	36.81	2.61
Sample 1.2	HGR	8.85	11.20	60.50	33.86	2.07
Sample 2.1	HGR	8.51	7.42	36.75	10.40	1.50
Sample 2.2	HGR	8.51	8.32	39.17	14.02	1.77
Kaweah River Downstream of East Fork Kaweah Confluence and Upstream of Kaweah No. 1 Powerhouse						
Sample 1.1	SRN	8.37	8.87	46.57	19.95	1.69
Sample 1.2	SRN	8.37	8.71	56.48	11.08	1.34
Sample 2.1	SRN	8.37	10.33	97.24	8.12	1.10
Sample 2.2	SRN	8.37	7.77	45.34	13.52	1.33
Sample 1.1	MCP	7.84	4.41	17.57	3.02	1.11
Sample 1.2	MCP	7.84	6.34	30.54	5.33	1.32
Sample 2.1	MCP	7.84	8.45	54.94	6.19	1.30
Sample 2.2	MCP	7.84	8.46	59.17	4.43	1.21
Kaweah River Downstream of Kaweah No. 1 Powerhouse and Upstream of Kaweah No. 2 Powerhouse						
No Samples Collected						
Kaweah River Downstream of Kaweah No. 2 Powerhouse						
Sample 1.1	LGR	4.68	9.83	41.54	17.56	2.33
Sample 1.2	LGR	4.68	7.66	36.86	14.65	1.59
Sample 2.1	LGR	4.68	10.84	47.98	14.82	2.45
Sample 2.2	LGR	4.68	7.69	34.70	11.54	1.71

Sample	Habitat Type	River Mile	Geometric Mean (mm)	D_{84} (mm)	D_{50} (mm)	D_{16} (mm)
East Fork Kaweah River						
East Fork Kaweah River Upstream of the Kaweah No. 1 Diversion						
Sample 1.1	MCP	4.79	23.56	93.50	51.46	5.93
Sample 1.2	MCP	4.79	18.32	75.19	34.01	4.47
Sample 2.1	MCP	4.79	10.24	37.81	12.20	2.78
Sample 2.2	MCP	4.79	25.52	104.76	56.27	6.22
East Fork Kaweah River Downstream of the Kaweah No. 1 Diversion						
Sample 1.1	HGR	4.64	8.42	39.09	9.07	1.81
Sample 1.2	HGR	4.64	5.82	17.18	7.84	1.97
Sample 2.1	STP	4.69	20.15	36.03	20.05	11.27
Sample 2.2	STP	4.69	15.54	32.84	15.07	7.35
East Fork Kaweah River Upstream of Confluence with Kaweah River						
Sample 1.1	MCP	0.1	4.64	12.07	5.87	1.78
Sample 1.2	MCP	0.1	3.07	7.67	3.03	1.23
Sample 2.1	MCP	0.1	1.77	2.88	1.63	1.08
Sample 2.2	MCP	0.1	1.45	2.08	1.43	1.01

Table 7.7-5. Fine Sediment Content of Spawning Gravel Samples

Location	Habitat Type[1]	River Mile	Gravel Prior to Cleaning: Cumulative Percent Finer than 1 mm	Gravel Prior to Cleaning: Cumulative Percent Finer than 6.4 mm	Gravel Following Winnowing of Fine Sediment: Cumulative Percent Finer than 1 mm	Gravel Following Winnowing of Fine Sediment: Cumulative Percent Finer than 6.4 mm
Kaweah River						
Kaweah River Upstream of Kaweah No. 3 Powerhouse						
Sample 1.1	MCP	8.97	7.07	30.26	4.73	17.55
Sample 1.2	MCP	8.97	5.27	27.10	3.53	15.72
Sample 2.1	MCP	8.97	6.43	28.76	4.31	16.68
Sample 2.2	MCP	8.97	6.17	32.29	4.13	18.73
Kaweah River Downstream of Kaweah No. 3 Powerhouse and Upstream of the East Fork Kaweah River Confluence						
Sample 1.1	RUN	8.85	6.07	24.01	4.07	13.92
Sample 1.2	RUN	8.85	7.61	25.98	5.10	15.07
Sample 2.1	HGR	8.51	9.39	36.17	6.29	20.98
Sample 2.2	HGR	8.51	6.76	33.03	4.53	19.16
Kaweah River Downstream of East Fork Kaweah Confluence and Upstream of Kaweah No. 1 Powerhouse						
Sample 1.1	SRN	8.37	6.32	33.73	4.23	19.56
Sample 1.2	SRN	8.37	8.00	42.55	5.36	24.68
Sample 2.1	SRN	8.37	13.09	46.72	8.77	27.10
Sample 2.2	SRN	8.37	10.76	37.04	7.21	21.48
Sample 1.1	MCP	7.84	11.83	64.75	7.93	37.55
Sample 1.2	MCP	7.84	7.51	54.07	5.03	31.36
Sample 2.1	MCP	7.84	7.58	50.74	5.08	29.43
Sample 2.2	MCP	7.84	9.37	54.50	6.28	31.61
Kaweah River Downstream of Kaweah No. 1 Powerhouse and Upstream of Kaweah No. 2 Powerhouse						
No Samples Collected						
Kaweah River Downstream of Kaweah No. 2 Powerhouse						
Sample 1.1	LGR	4.68	5.03	25.46	3.37	14.77
Sample 1.2	LGR	4.68	7.99	32.85	5.35	19.05
Sample 2.1	LGR	4.68	5.30	27.34	3.55	15.85
Sample 2.2	LGR	4.68	7.30	33.54	4.90	19.45

Location	Habitat Type[1]	River Mile	Gravel Prior to Cleaning		Gravel Following Winnowing of Fine Sediment	
			Cumulative Percent Finer than 1 mm	Cumulative Percent Finer than 6.4 mm	Cumulative Percent Finer than 1 mm	Cumulative Percent Finer than 6.4 mm
East Fork Kaweah River						
East Fork Kaweah River Upstream of the Kaweah No. 1 Diversion						
Sample 1.1	MCP	0.1	2.67	17.05	1.79	9.89
Sample 1.2	MCP	0.1	3.01	18.93	2.02	10.98
Sample 2.1	MCP	0.1	5.43	27.74	3.64	16.09
Sample 2.2	MCP	0.1	2.53	16.48	1.70	9.56
East Fork Kaweah River Downstream of the Kaweah No. 1 Diversion						
Sample 1.1	HGR	4.64	6.37	38.10	4.27	22.10
Sample 1.2	HGR	4.64	4.34	38.80	2.91	22.50
Sample 2.1	STP	4.69	0.00	1.93	0.00	1.12
Sample 2.2	STP	4.69	1.07	10.10	0.72	5.86
East Fork Kaweah River Upstream of Confluence with Kaweah River						
Sample 1.1	MCP	4.79	4.68	54.84	3.13	31.81
Sample 1.2	MCP	4.79	9.94	77.90	6.66	45.18
Sample 2.1	MCP	4.79	9.23	99.92	6.18	57.95
Sample 2.2	MCP	4.79	14.58	99.98	9.77	57.99

Table 7.7-6. Project Flow Gages Used in Existing and Unimpaired Hydrology Comparison

Gage Name	SCE Gage Number	USGS Station Number	Period of Record	Latitude, Longitude
Kaweah River				
Marble Fork Kaweah River below No. 3 Conduit near Potwisha, CA	208	USGS 11207500	10/01/1975-09/30/2002	36°31'10", 118°48'00"
Middle Fork Kaweah River below No. 3 Conduit near Hammond, CA	206a	USGS 11208565	10/01/2001-present	36°29'10", 118°50'08"
Kaweah River below Conduit No. 2 near Hammond, CA	203	USGS 11208600	10/01/1993-present	36°29'04", 118°50'06"
Kaweah River Conduit No. 2 near Hammond, CA	204a		12/08/2005-present	36°29'10", 118°50'09"
Kaweah River Conduit No. 2 at Powerhouse near Hammond, CA	205a	USGS 11208818	10/01/2002-present	36°27'42", 118°52'46"
Middle Fork Kaweah River Conduit No. 3 A Power Plant near Hammond, CA	206a	USGS 11208565	10/01/2002-present	36°29'10", 118°50'08"
East Fork Kaweah River				
East Fork Kaweah River near Three Rivers, CA	201	USGS 11208730	06/01/1952-present	36°27'05”, 118°47'15"
	201a		10/01/1995-present	36°27'05”, 118°47'15"
East Fork Kaweah River Conduit 1 near Three Rivers, CA	202		10/01/2002-present	36°27'05", 118°47'19"
East Fork Kaweah River Conduit 1 at Power Plant near Hammond, CA	200a	USGS 11208800	10/01/2002-present	36°27'55", 118°51'43"

Table 7.7-7. Mass Balance Approach and USGS and SCE Gages Used for Determining Existing and Unimpaired Flow in Study Reaches

Existing Flow	Unimpaired Flow
Kaweah River Upstream of Kaweah No. 3 Powerhouse	
1994-2002: Sum of Kaweah No. 2 Flowline (USGS 11208570 [SCE 204a]) and the main Kaweah River downstream of the Kaweah No. 2 Diversion (USGS 11208600 [SCE 203]) minus the discharge of the Kaweah No. 3 Powerhouse (Sum of SCE 210 & SCE 208 gages). 2002-2018: Sum of Kaweah No. 2 Flowline (USGS 11208570 [SCE 204a]) and the main Kaweah River downstream of the Kaweah No. 2 Diversion (USGS 11208600 [SCE 203]) minus the discharge of the Kaweah No. 3 Powerhouse (SCE 206a).	1994-2002: Sum of Kaweah No. 2 Flowline (USGS 11208570 [SCE 204a]), the main Kaweah River downstream of the Kaweah No. 2 Diversion (USGS 11208600 [SCE 203]), and the discharge of the Kaweah No. 3 Powerhouse (Sum of SCE 210 & SCE 208 gages). 2002-2018: Sum of Kaweah No. 2 Flowline (USGS 11208570 [SCE 204a]), the main Kaweah River downstream of the Kaweah No. 2 Diversion (USGS 11208600 [SCE 203]), and the discharge of the Kaweah No. 3 Powerhouse (SCE 206a.
Kaweah River Downstream of Kaweah No. 3 Powerhouse and Upstream of the East Fork Kaweah River Confluence	
1994-2018: Main Kaweah River downstream of the Kaweah No. 2 Diversion (USGS 11208600 [SCE 203]).	1994-2018: The discharge of Kaweah No. 2 Flowline (USGS 1208570 [SCE 204a]) and the main Kaweah River downstream of the Kaweah No. 2 Diversion (USGS 11208600 [SCE 203]).
Kaweah River Downstream of East Fork Kaweah Confluence and Upstream of Kaweah No. 1 Powerhouse	
1994-2018: Sum of main Kaweah River downstream of the Kaweah No. 2 Diversion (USGS 11208600 [SCE 203]) and the East Fork Kaweah River downstream of the Kaweah No. 1 Diversion (11208730 [SCE 201]).	1994-2002: Sum of Flowline 2 (USGS 11208570 [SCE 204a]), the main Kaweah River downstream of the Kaweah No. 2 Diversion (USGS 11208600 [SCE 203]), East Fork Kaweah River downstream of the Kaweah No. 1 Diversion (11208730 [SCE 201]), and the Kaweah No. 1 Flowline (USGS 11208720 [SCE 202]). 2002-2018: Sum of Flowline 2 (USGS 11208570 [SCE 204a]), the main Kaweah River downstream of the Kaweah No. 2 Diversion (USGS 11208600 [SCE 203]), East Fork Kaweah River downstream of the Kaweah No. 1 Diversion (11208730 [SCE 201]), and the Kaweah No. 1 Flowline (USGS 11208720 [SCE 202]).
Kaweah River Downstream of Kaweah No. 1 Powerhouse and Upstream of Kaweah No. 2 Powerhouse	
1994-2018: Sum main Kaweah River downstream of the Kaweah No. 2 Diversion (USGS 11208600 [SCE 203]), the East Fork Kaweah River downstream of the Kaweah No. 1 Diversion (11208730 [SCE 201]), and the Kaweah No. 1 Flowline (USGS 11208720 [SCE 202]).	1994-2002: Sum of Flowline 2 (USGS 11208570 [SCE 204a]), the main Kaweah River downstream of the Kaweah No. 2 Diversion (USGS 11208600 [SCE 203]), East Fork Kaweah River downstream of the Kaweah No. 1 Diversion (11208730 [SCE 201]), and the Kaweah No. 1 Flowline (USGS 11208720 [SCE 202]).

	2002-2018: Sum of Flowline 2 (USGS 11208570 [SCE 204a]), the main Kaweah River downstream of the Kaweah No. 2 Diversion (USGS 11208600 [SCE 203]), East Fork Kaweah River downstream of the Kaweah No. 1 Diversion (11208730 [SCE 201]), and the Kaweah No. 1 Flowline (USGS 11208720 [SCE 202]).
Kaweah River Downstream of Kaweah No. 2 Powerhouse	
1994-2018: Same as unimpaired flow upstream of Powerhouse No. 2 (see above).	1994-2018: Same as unimpaired flow upstream of Powerhouse No. 2 (see above).
East Fork Kaweah River Upstream of the Kaweah No. 1 Diversion	
1994-2018: Sum of East Fork Kaweah River downstream of the Kaweah No. 1 Diversion (11208730 [SCE 201]) and the Kaweah No. 1 Flowline (USGS 11208720 [SCE 202]).	1994-2002: Sum of East Fork Kaweah River downstream of the Kaweah No. 1 Diversion (11208730 [SCE 201]) and the Kaweah No. 1 Flowline (USGS 11208720 [SCE 202]). 2002-2018: Sum of East Fork Kaweah River downstream of the Kaweah No. 1 Diversion (11208730 [SCE 201]) and the Kaweah No. 1 Flowline (USGS 11208720 [SCE 202]).
East Fork Kaweah River Downstream of the Kaweah No. 1 Diversion	
1994-2018: East Fork Kaweah River downstream of the Kaweah No. 1 Diversion (11208730 [SCE 201]).	1994-2002: Sum of East Fork Kaweah River downstream of the Kaweah No. 1 Diversion (11208730 [SCE 201]) and the Kaweah No. 1 Flowline (USGS 11208720 [SCE 202]). 2002-2018: Sum of East Fork Kaweah River downstream of the Kaweah No. 1 Diversion (11208730 [SCE 201]) and the Kaweah No. 1 Flowline (USGS 11208720 [SCE 202]).
East Fork Kaweah River Upstream of Confluence with Kaweah River	
1994-2018: East Fork Kaweah River downstream of the Kaweah No. 1 Diversion (11208730 [SCE 201]).	1994-2002: Sum of East Fork Kaweah River downstream of the Kaweah No. 1 Diversion (11208730 [SCE 201]) and the Kaweah No. 1 Flowline (USGS 11208720 [SCE 202]). 2002-2018: Sum of East Fork Kaweah River downstream of the Kaweah No. 1 Diversion (11208730 [SCE 201]) and the Kaweah No. 1 Flowline (USGS 11208720 [SCE 202]).

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Table 7.7-8. Peak Flow of Existing and Unimpaired Hydrologic Regimes for all Project Study Reaches

		Study Reach															
		Kaweah River Upstream of Kaweah No. 3 Powerhouse		Kaweah River Downstream of Kaweah No. 3 Powerhouse and Upstream of the East Fork Kaweah River Confluence		Kaweah River Downstream of East Fork Kaweah Confluence and Upstream of Kaweah No. 1 Powerhouse		Kaweah River Downstream of Kaweah No. 1 Powerhouse and Upstream of Kaweah No. 2 Powerhouse		Kaweah River Downstream of Kaweah No. 2 Powerhouse		East Fork Kaweah River Upstream of the Kaweah No. 1 Diversion		East Fork Kaweah River Downstream of the Kaweah No. 1 Diversion		East Fork Kaweah River Upstream of Confluence with Kaweah River	
Annual Exceedance	Recurrence Interval	Existing	Unimpaired	Existing	Unimpaired	Existing	Unimpaired	Existing	Unimpaired	Existing	Unimpaired	Existing	Unimpaired	Existing	Unimpaired	Existing	Unimpaired
1.00	1.01	291.3	341.8	323.0	341.8	469.3	504.8	497.3	504.8	504.8	504.8	149.8	149.8	141.4	149.8	141.4	149.8
0.99	1.01	345.9	402.6	381.5	402.6	554.1	593.7	585.3	593.7	593.7	593.7	176.3	176.3	166.9	176.3	166.9	176.3
0.98	1.02	420.0	484.5	460.4	484.5	668.6	713.3	703.9	713.3	713.3	713.3	212.0	212.0	201.5	212.0	201.5	212.0
0.98	1.03	449.8	517.2	492.0	517.2	714.4	761.0	751.2	761.0	761.0	761.0	226.2	226.2	215.3	226.2	215.3	226.2
0.96	1.04	525.6	600.0	572.2	600.0	830.5	881.7	871.0	881.7	881.7	881.7	262.3	262.3	250.4	262.3	250.4	262.3
0.95	1.05	569.6	647.8	618.5	647.8	897.7	951.3	940.1	951.3	951.3	951.3	283.2	283.2	270.7	283.2	270.7	283.2
0.90	1.11	756.8	849.5	814.7	849.5	1182.0	1245.0	1231.0	1245.0	1245.0	1245.0	371.2	371.2	356.7	371.2	356.7	371.2
0.80	1.25	1087.0	1199.0	1157.0	1199.0	1677.0	1752.0	1736.0	1752.0	1752.0	1752.0	524.3	524.3	507.2	524.3	507.2	524.3
0.70	1.43	1428.0	1556.0	1507.0	1556.0	2183.0	2267.0	2250.0	2267.0	2267.0	2267.0	680.6	680.6	661.7	680.6	661.7	680.6
0.67	1.50	1550.0	1684.0	1632.0	1684.0	2365.0	2451.0	2434.0	2451.0	2451.0	2451.0	736.5	736.5	717.2	736.5	717.2	736.5
0.60	1.67	1818.0	1959.0	1904.0	1959.0	2758.0	2848.0	2830.0	2848.0	2848.0	2848.0	857.5	857.5	837.5	857.5	837.5	857.5
0.57	1.75	1947.0	2092.0	2036.0	2092.0	2948.0	3040.0	3022.0	3040.0	3040.0	3040.0	916.1	916.1	895.9	916.1	895.9	916.1
0.50	2.00	2293.0	2445.0	2385.0	2445.0	3453.0	3549.0	3530.0	3549.0	3549.0	3549.0	1072.0	1072.0	1051.0	1072.0	1051.0	1072.0
0.43	2.33	2712.0	2870.0	2806.0	2870.0	4062.0	4158.0	4140.0	4158.0	4158.0	4158.0	1259.0	1259.0	1238.0	1259.0	1238.0	1259.0
0.40	2.50	2913.0	3072.0	3008.0	3072.0	4353.0	4449.0	4430.0	4449.0	4449.0	4449.0	1348.0	1348.0	1328.0	1348.0	1328.0	1348.0
0.30	3.33	3792.0	3950.0	3883.0	3950.0	5617.0	5708.0	5691.0	5708.0	5708.0	5708.0	1736.0	1736.0	1719.0	1736.0	1719.0	1736.0
0.20	5.00	5214.0	5352.0	5287.0	5352.0	7643.0	7712.0	7701.0	7712.0	7712.0	7712.0	2357.0	2357.0	2348.0	2357.0	2348.0	2357.0
0.10	10.00	8258.0	8299.0	8255.0	8299.0	11920.0	11910.0	11920.0	11910.0	11910.0	11910.0	3669.0	3669.0	3686.0	3669.0	3686.0	3669.0
0.05	20.00	12270.0	12100.0	12110.0	12100.0	17490.0	17310.0	17360.0	17310.0	17310.0	17310.0	5371.0	5371.0	5437.0	5371.0	5437.0	5371.0
0.04	25.00	13810.0	13550.0	13580.0	13550.0	19600.0	19360.0	19420.0	19360.0	19360.0	19360.0	6019.0	6019.0	6105.0	6019.0	6105.0	6019.0
0.03	40.00	17500.0	16990.0	17090.0	16990.0	24660.0	24220.0	24320.0	24220.0	24220.0	24220.0	7565.0	7565.0	7709.0	7565.0	7709.0	7565.0
0.02	50.00	19500.0	18830.0	18980.0	18830.0	27370.0	26820.0	26950.0	26820.0	26820.0	26820.0	8395.0	8395.0	8572.0	8395.0	8572.0	8395.0
0.01	100.00	26830.0	25530.0	25860.0	25530.0	37270.0	36270.0	36500.0	36270.0	36270.0	36270.0	11430.0	11430.0	11740.0	11430.0	11740.0	11430.0
0.01	200.00	36210.0	33980.0	34570.0	33980.0	49810.0	48150.0	48520.0	48150.0	48150.0	48150.0	15260.0	15260.0	15760.0	15260.0	15760.0	15260.0
0.002	500.00	52560.0	48480.0	49610.0	48480.0	71430.0	68490.0	69130.0	68490.0	68490.0	68490.0	21880.0	21880.0	22760.0	21880.0	22760.0	21880.0

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Table 7.7-9. Summaries of Existing and Unimpaired Daily and Peak Q 1.5 Flows and Average Annual Days Exceeding Each for the Study Reaches

Study Reach	Site ID	Existing Average Daily Q 1.5	Unimpaired Average Daily Q 1.5	Existing Average Annual Days > Unimpaired Daily Q 1.5	Unimpaired Average Annual Days > Unimpaired Daily Q 1.5	Difference in Annual Days > Daily Q 1.5	Existing Percent of Unimpaired (%)
Kaweah River Downstream of Kaweah No. 3 Powerhouse and Upstream of the East Fork Kaweah River Confluence	DS PH3	985	1,069	17.2	19.8	2.6	87
Kaweah River Downstream of East Fork Confluence and Upstream of Kaweah No. 1 Powerhouse	US PH1	1618	1,658	12.8	14.6	2.0	88
Kaweah River Downstream of Kaweah No. 1 Powerhouse and Upstream of Kaweah No. 2 Powerhouse	US PH2	1,583	1,658	14.0	16.1	2.0	87
East Fork Kaweah River Downstream of the Kaweah No. 1 Diversion	EF DS Div 1	431	454	17.2	18.4	1.2	93

Table 7.7-10. Summaries of Discharge (Q) at 10% Incipient Motion for Sand, Gravel, and Cobble in Project Reaches with Existing and Unimpaired Q values at a 1.5 Recurrence Interval

Study Reach	Site ID	Q 10% (cfs)			Existing Average Daily Q 1.5 (Peak Q 1.5) (cfs)	Unimpaired Average Daily Q 1.5 (Peak Q 1.5) (cfs)
		Sand	Gravel	Cobble		
Kaweah River Downstream of Kaweah No. 3 Powerhouse and Upstream of the East Fork Kaweah River Confluence	DS PH3	112	277	848	985 (1,632)	1,069 (1,684)
Kaweah River Downstream of East Fork Confluence and Upstream of Kaweah No. 1 Powerhouse	US PH1	567	751	>1,900[1]	1,618 (2,365)	1,658 (2,451)
Kaweah River Downstream of Kaweah No. 1 Powerhouse and Upstream of Kaweah No. 2 Powerhouse	US PH2	295	482	1677	1,583 (2,434)	1,658 (2,451)
East Fork Kaweah River Upstream of Confluence with Kaweah River	EF US Confl	207	>240[2]	>240[2]	431 (717)	454 (737)

[1] Less than 10% of the cobbles moved at the highest flow modeled in the AQ 1 – Instream Flow Study, 1,900 cfs.

[2] No gravel or cobble moved in this reach at flows less than the highest flow modeled in the AQ 1 – Instream Flow Study, 240 cfs. Gravel and cobble were only present in the margin of the channel and much higher flows were needed to initiate movement.

Table 7.7-11. Percent Change in Exceedance of the Q 10% Flow for Existing and Unimpaired Flows by Sediment Type in Study Reaches

Reach	Percent Change in Exceedance (%)				
	Sand	Gravel	Cobble	Average Q 1.5	Peak Q 1.5
Kaweah River Downstream of Kaweah No. 3 Powerhouse and Upstream of the East Fork Kaweah River Confluence	12	5.5	1.4	7.9	3.1
Kaweah River Downstream of East Fork Confluence and Upstream of Kaweah No. 1 Powerhouse	3.9	2.7	<0.3	2.4	3.5
Kaweah River Downstream of Kaweah No. 1 Powerhouse and Upstream of Kaweah No. 2 Powerhouse	5.7	5.5	0.6	4.5	0.7
East Fork Kaweah River Downstream of the Kaweah No. 1 Diversion	1.5	<1.1	<1.1	5.1	2.7

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FIGURES

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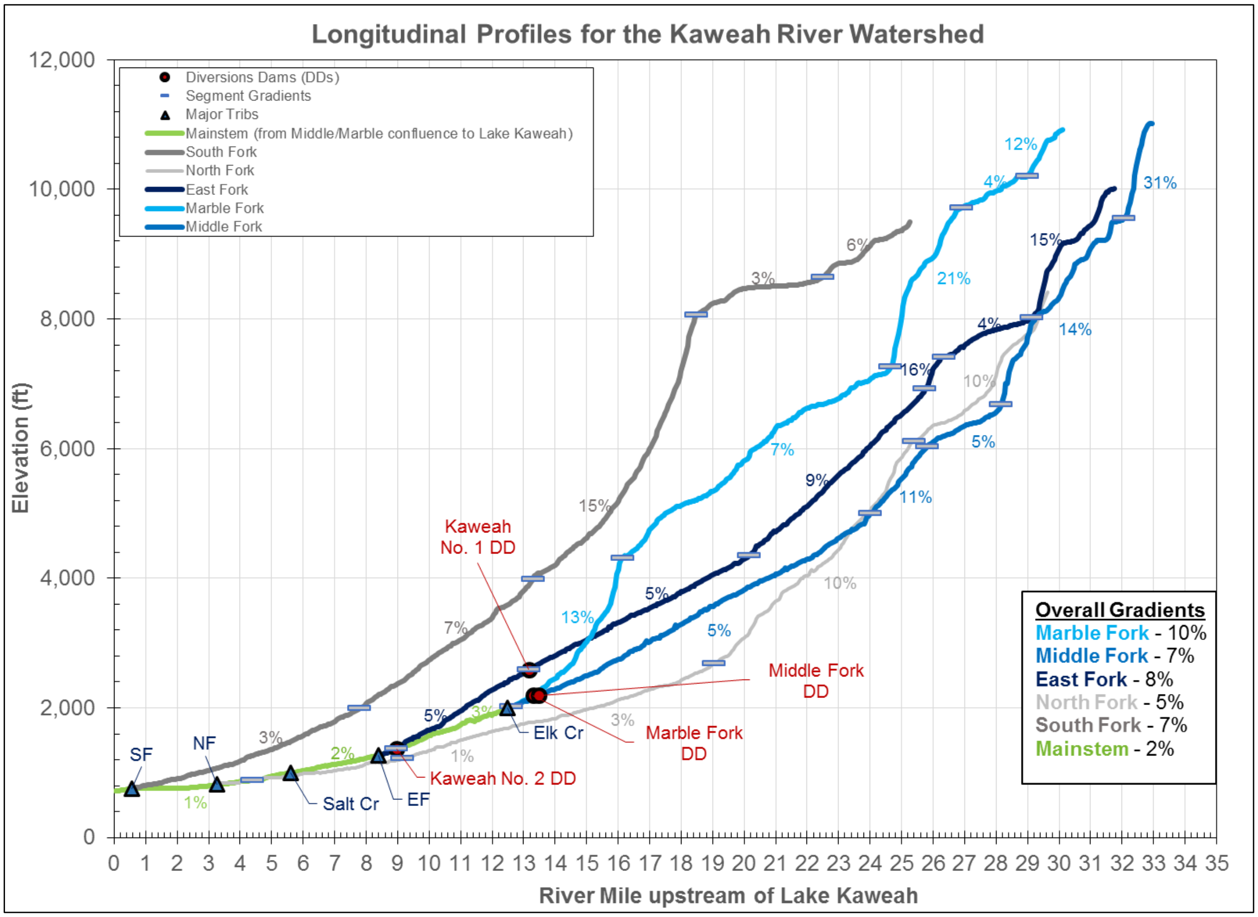
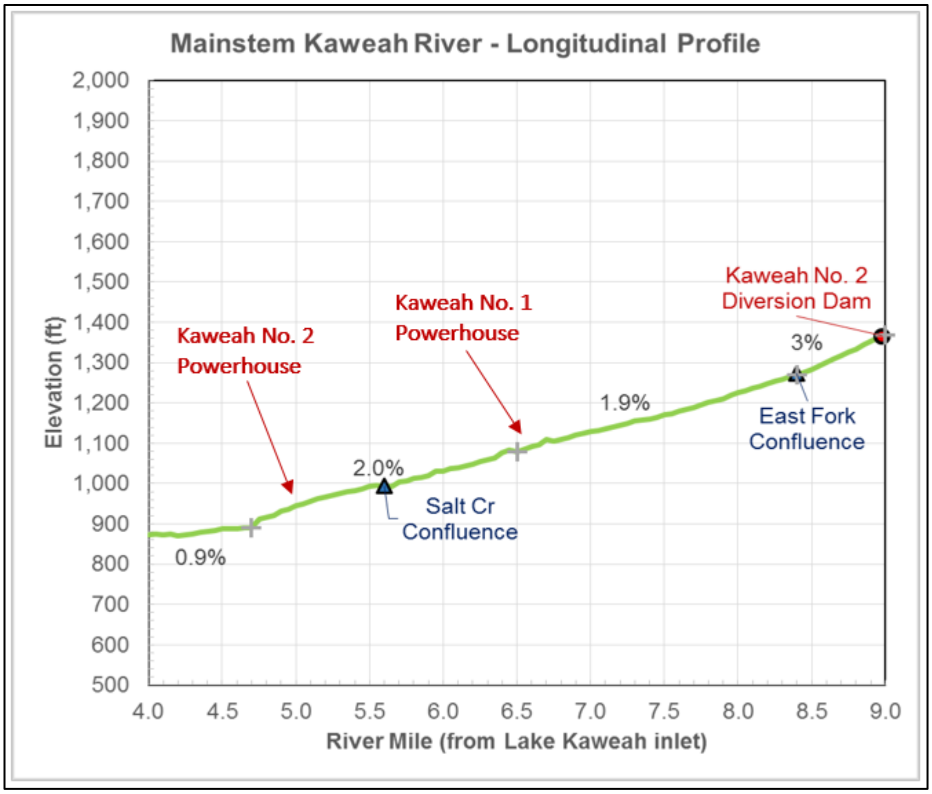
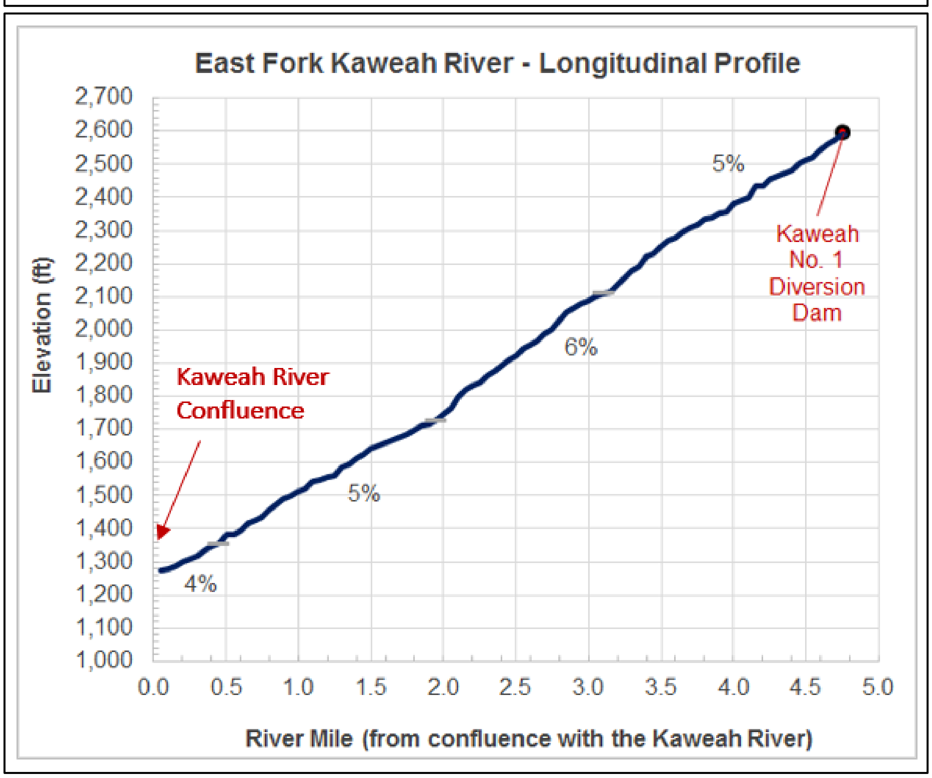


Longitudinal profiles developed from 10 m DEM data. Blue lines indicate gradient breaks.

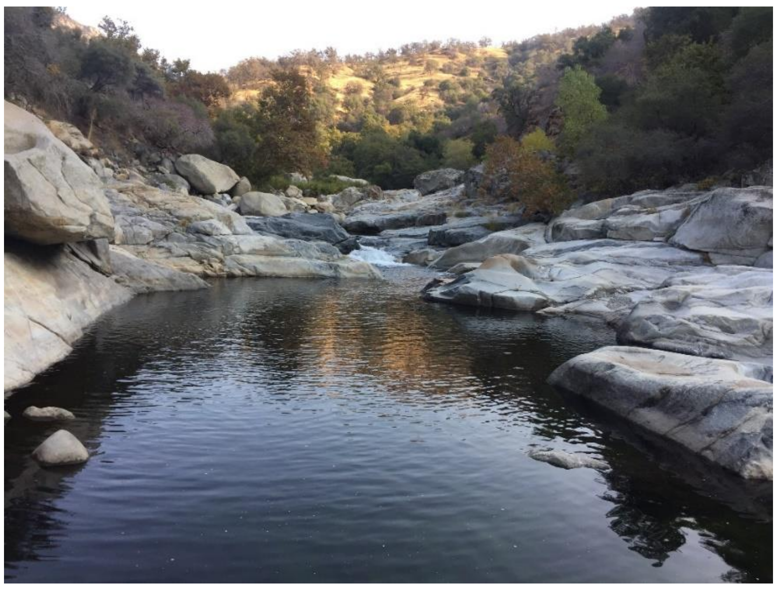
Figure 7.7-1. Longitudinal Profiles of Rivers in the Kaweah River Watershed (Marble, Middle, East, North, South, and Mainstem)



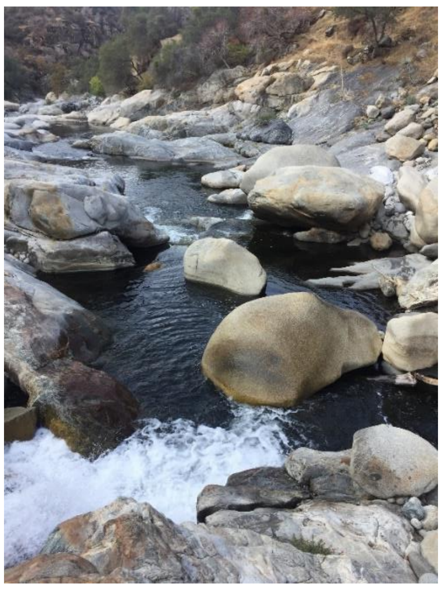


Longitudinal profiles developed from 10 m DEM data. Gray lines indicate gradient breaks.

Figure 7.7-2. Longitudinal Profiles for the Kaweah River (top) and East Fork Kaweah River (bottom) Bypass Reaches

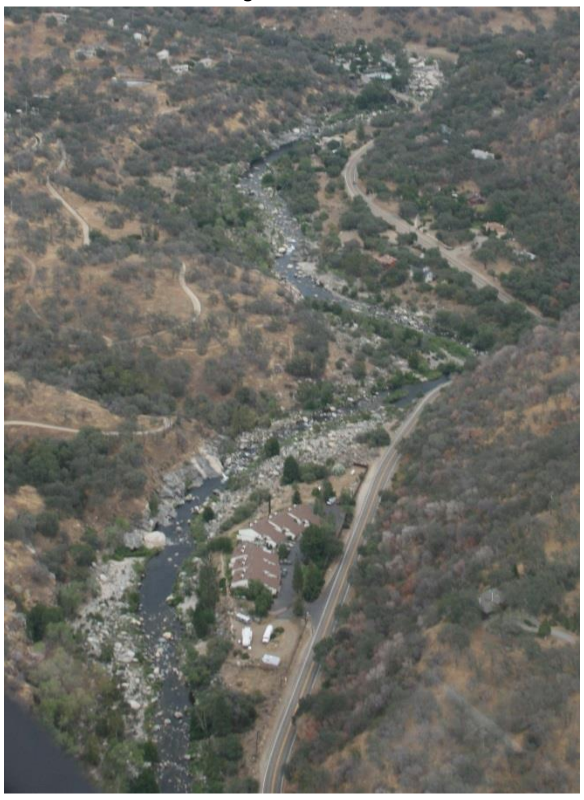


a. Near RM 9.5, facing upstream



b. Near RM 9.75, facing downstream

c. Near RM 8.7, facing downstream



d. Near RM 7.6, facing upstream

e. Near RM 6.7, facing upstream

f. At tailrace outflow, RM 4.87, facing downstream

g. Near RM 4.6, facing upstream

h. Near RM 2.9

Figure 7.7-3a-h. Representative Photographs of the Kaweah River Channel Morphology in the Vicinity of the Project

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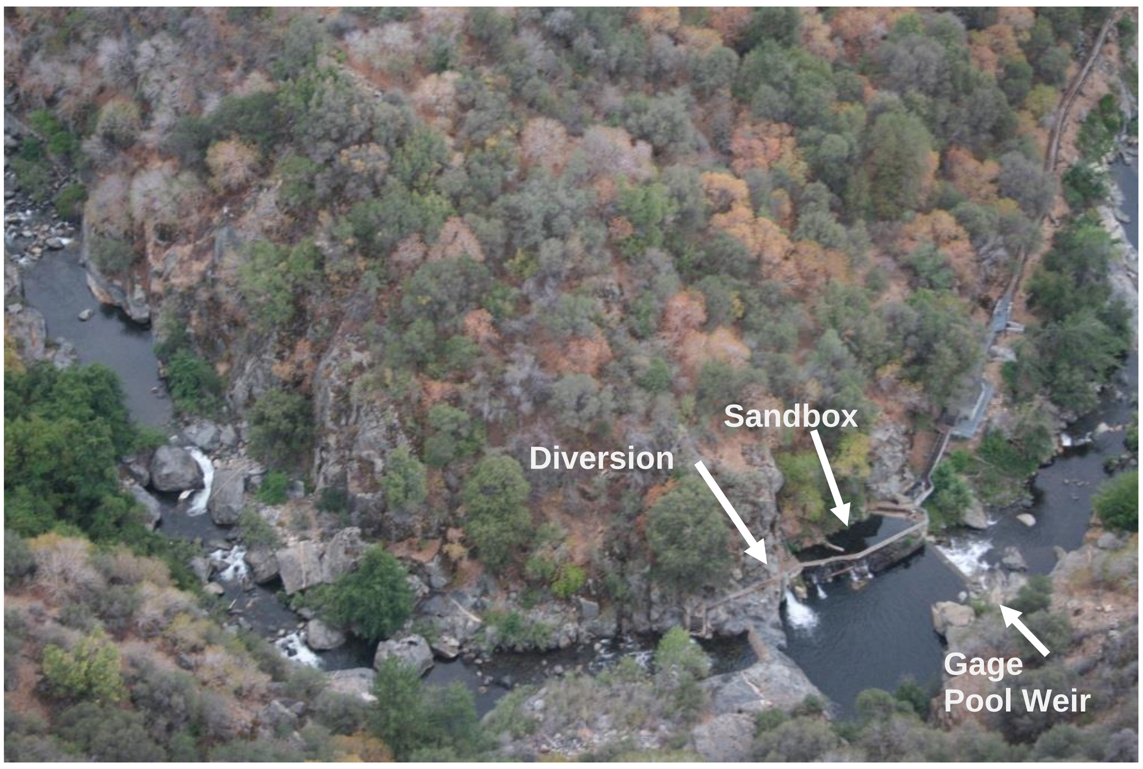
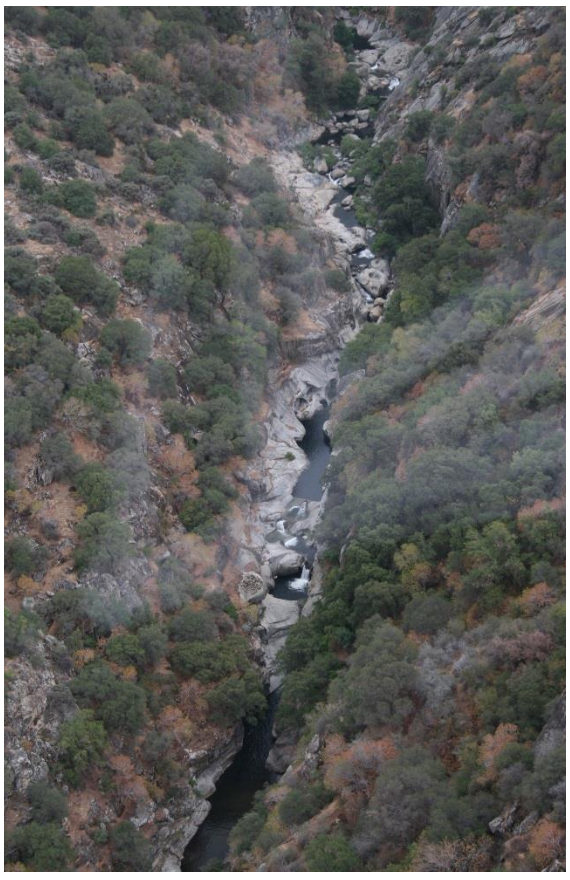
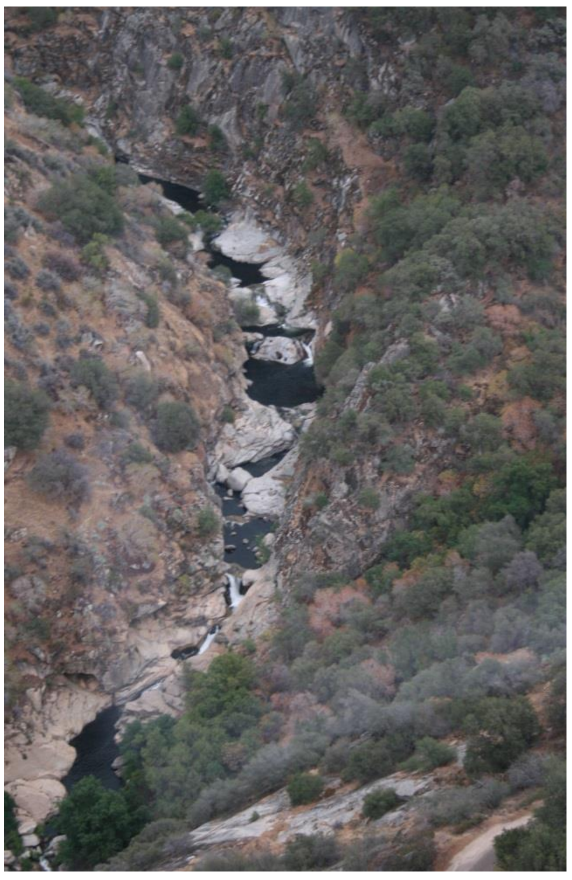


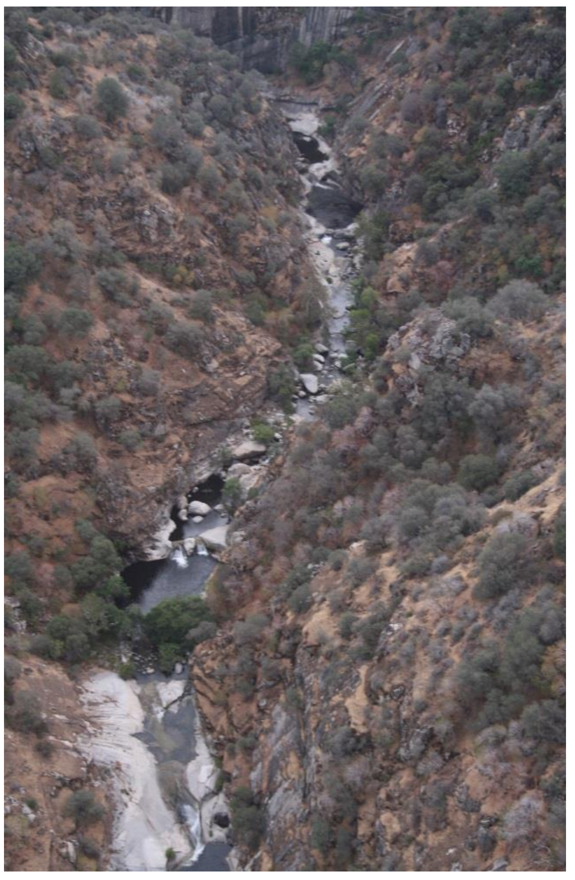
At Diversion



Near RM 3.3



Near RM 2.4



Near RM 1.7

At the Confluence with the Kaweah River

Figure 7.7-4. Representative Photographs of the East Fork Kaweah River Channel Morphology in the Vicinity of the Project

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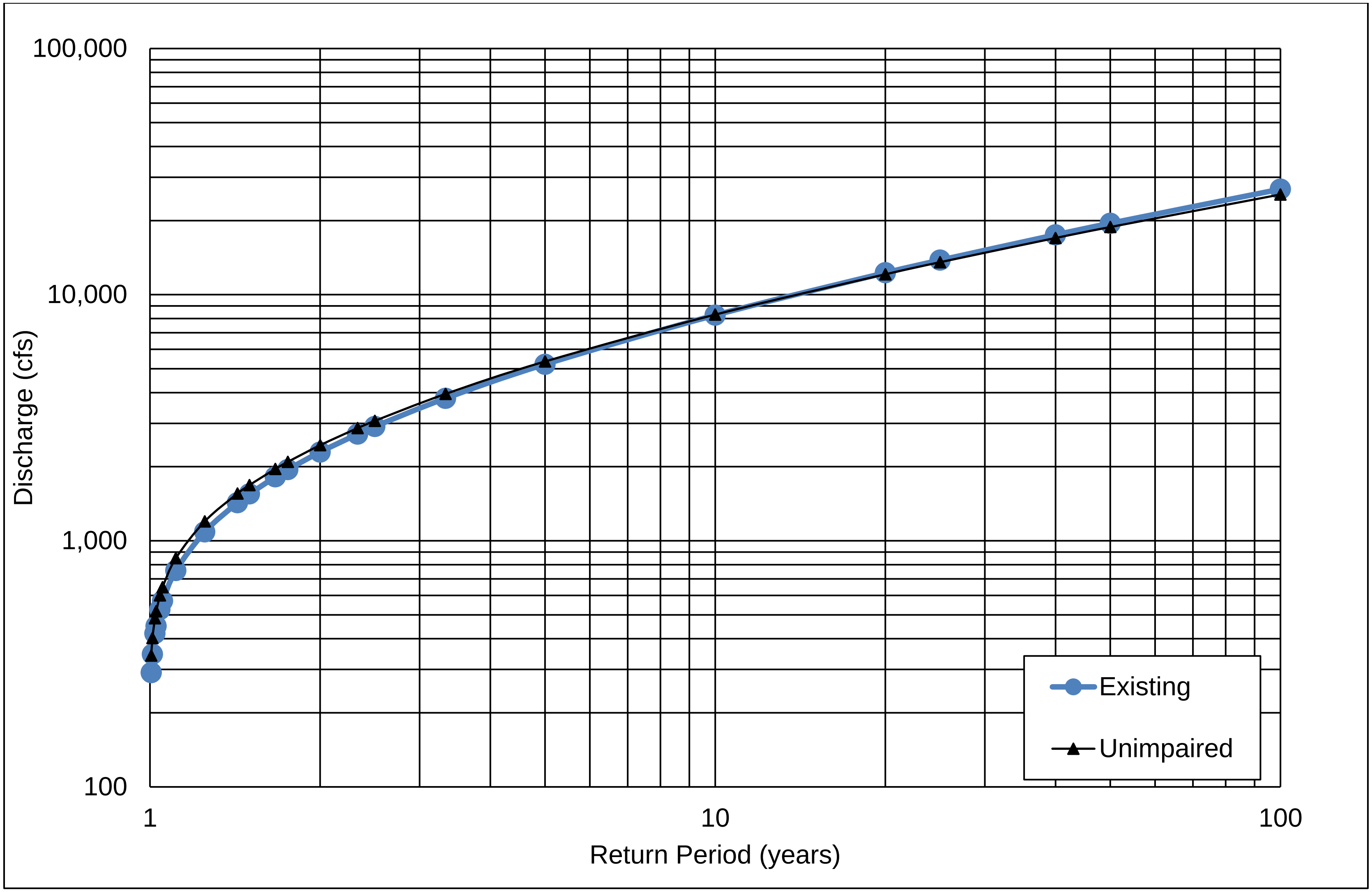

Figure 7.7-5a. **Flood Frequency for Existing and Unimpaired Flows in the Kaweah River Upstream of Kaweah No. 3 Powerhouse**

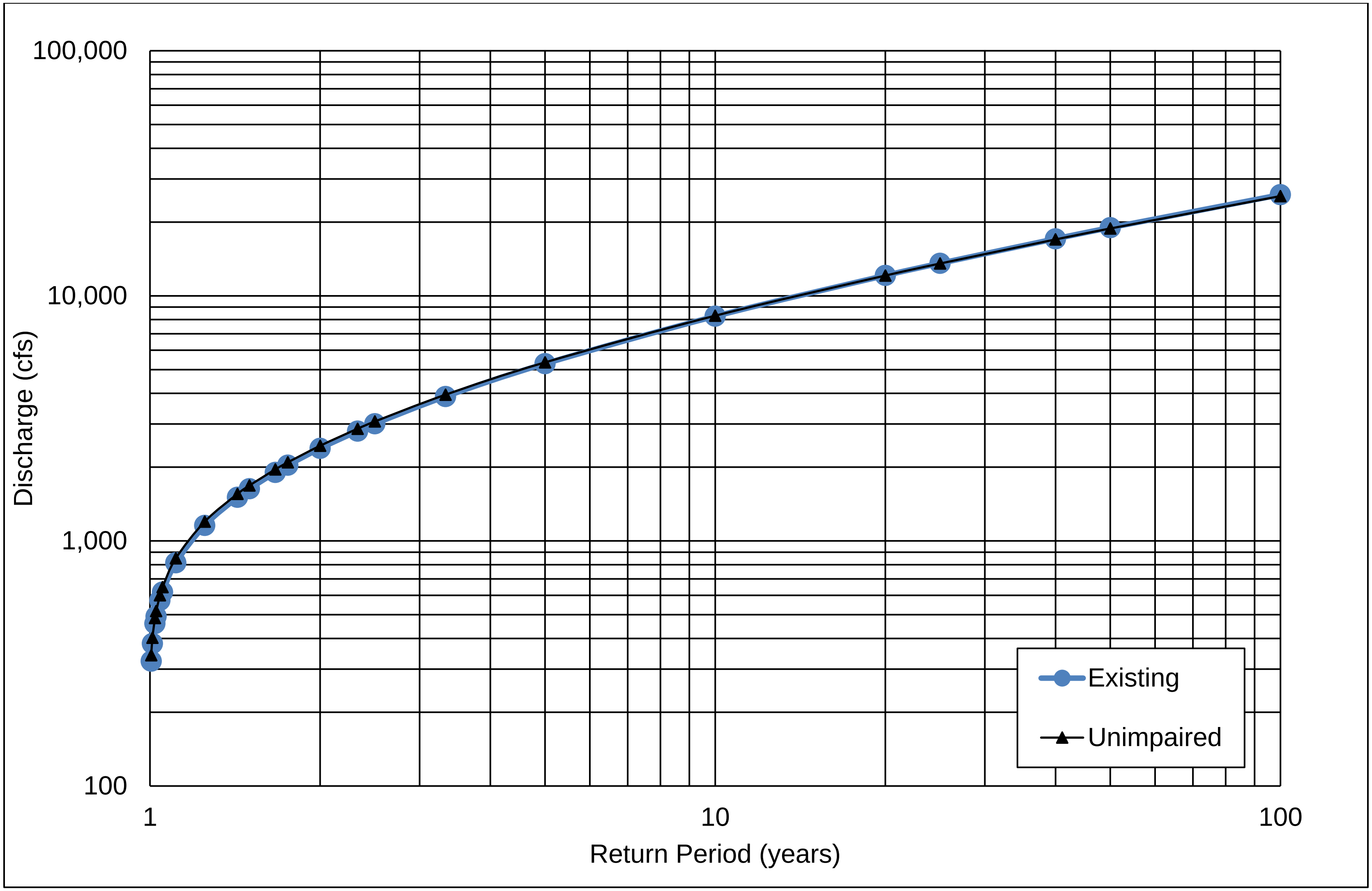

Figure 7.7-5b. Flood Frequency for Existing and Unimpaired Flows in the Kaweah River Downstream of Kaweah No. 3 Powerhouse and Upstream of the East Fork Kaweah River Confluence

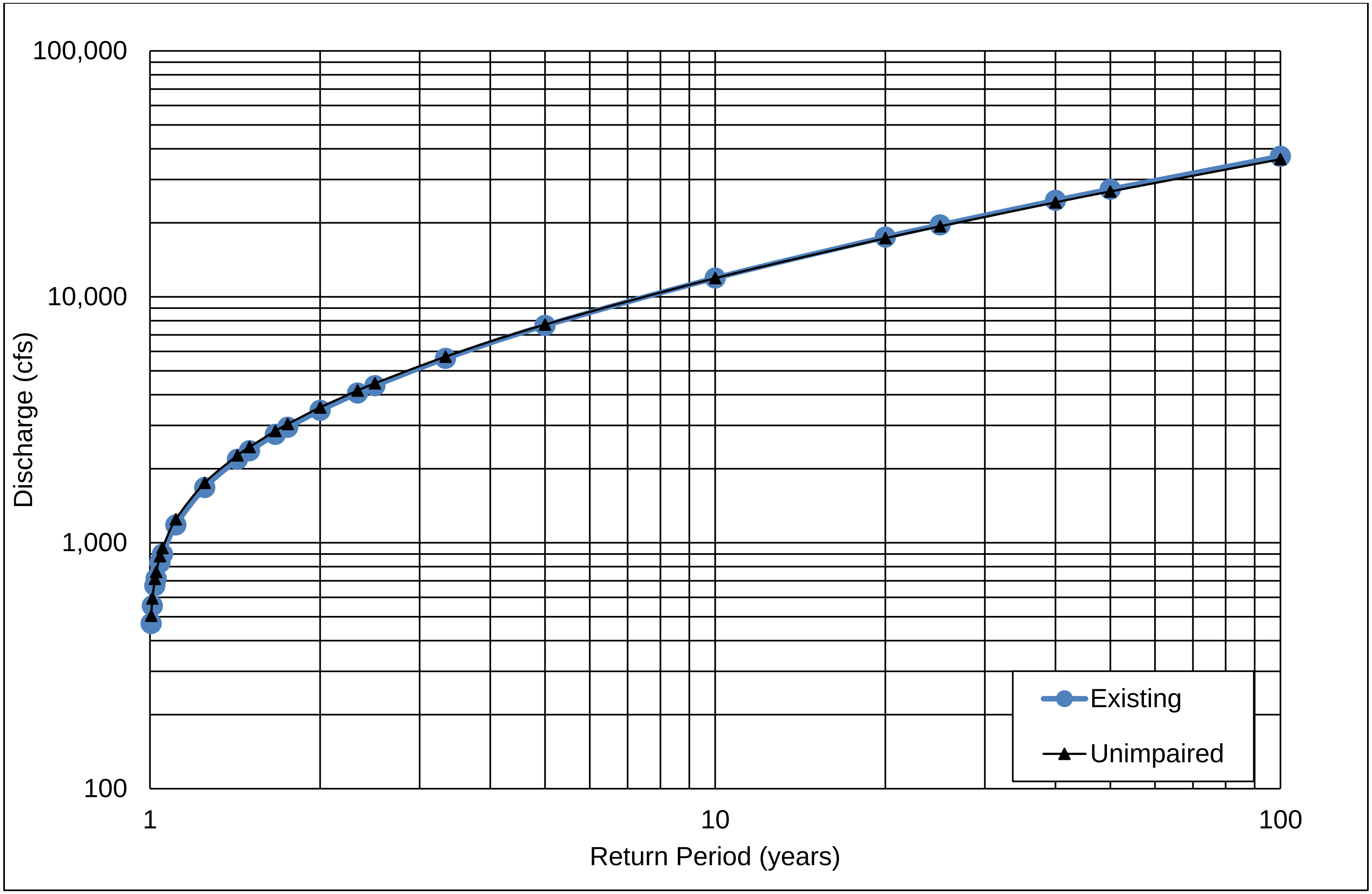

Figure 7.7-5c. Flood Frequency for Existing and Unimpaired Flows in the Kaweah River Downstream of East Fork Kaweah Confluence and Upstream of Kaweah No. 1 Powerhouse

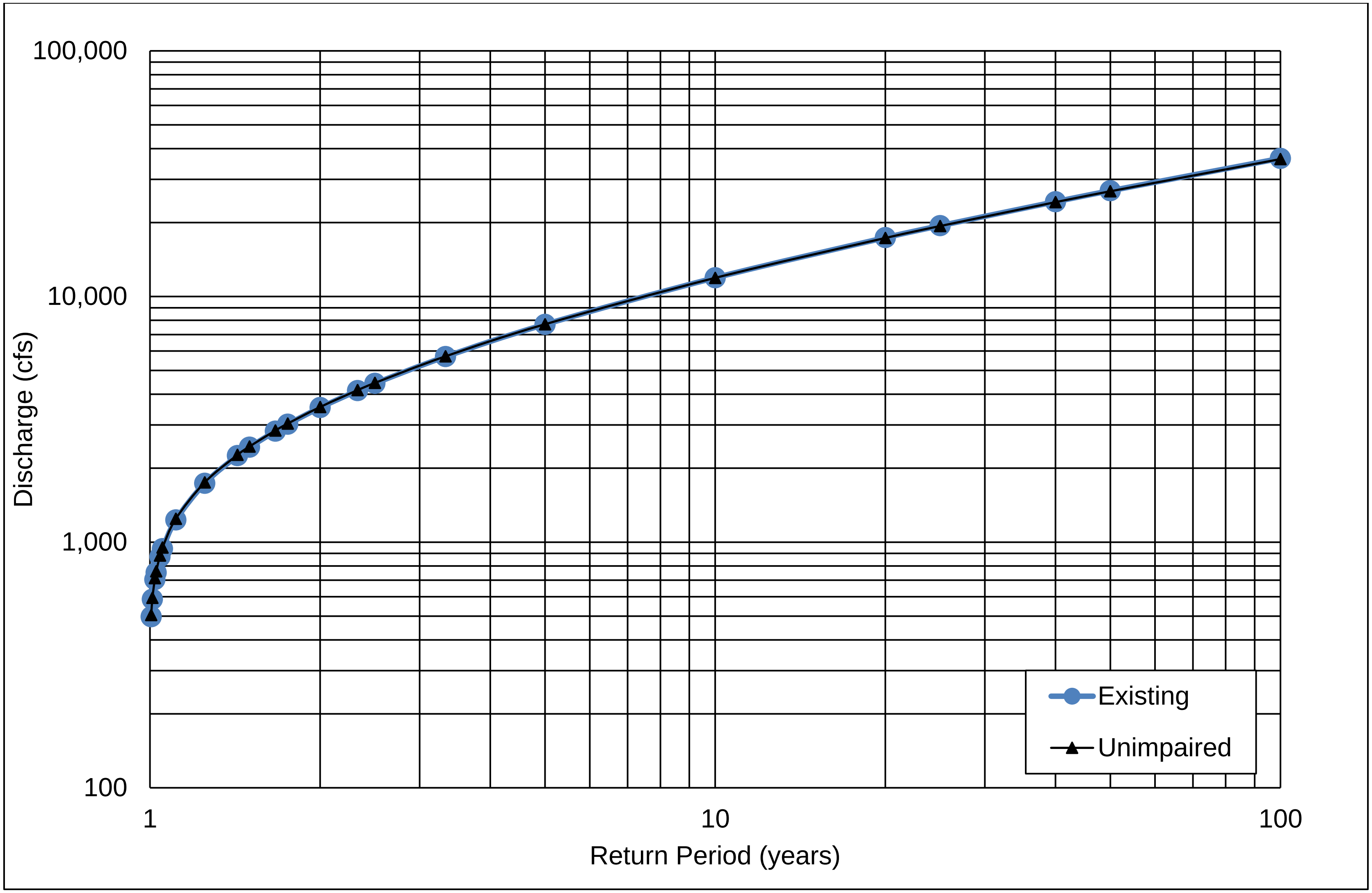

Figure 7.7-5d. Flood Frequency for Existing and Unimpaired Flows in the Kaweah River Downstream of Kaweah No. 1 Powerhouse and Upstream of Kaweah No. 2 Powerhouse

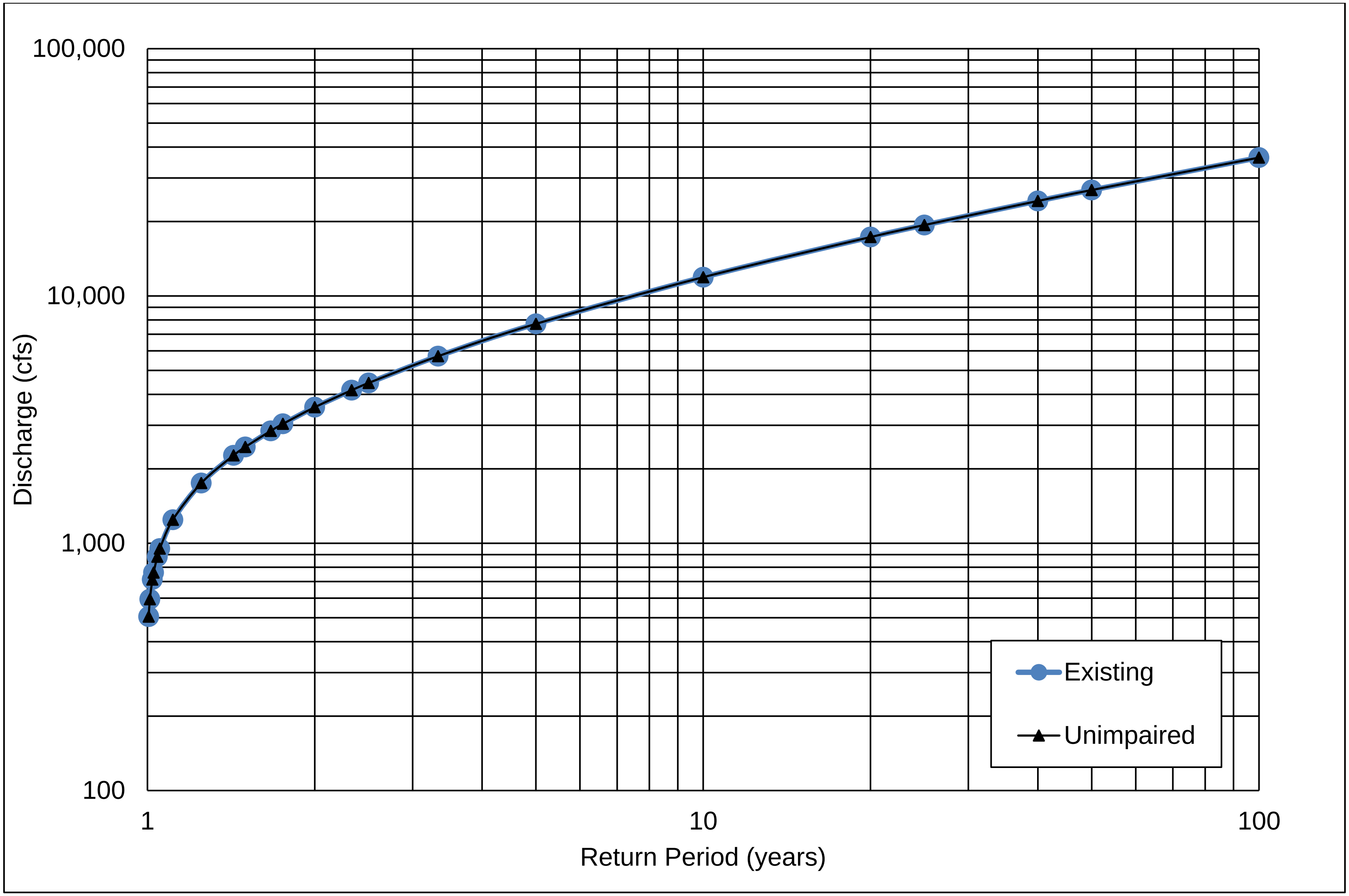

Figure 7.7-5e. Flood Frequency for Existing and Unimpaired Flows in the Kaweah River Downstream of Kaweah No. 2 Powerhouse

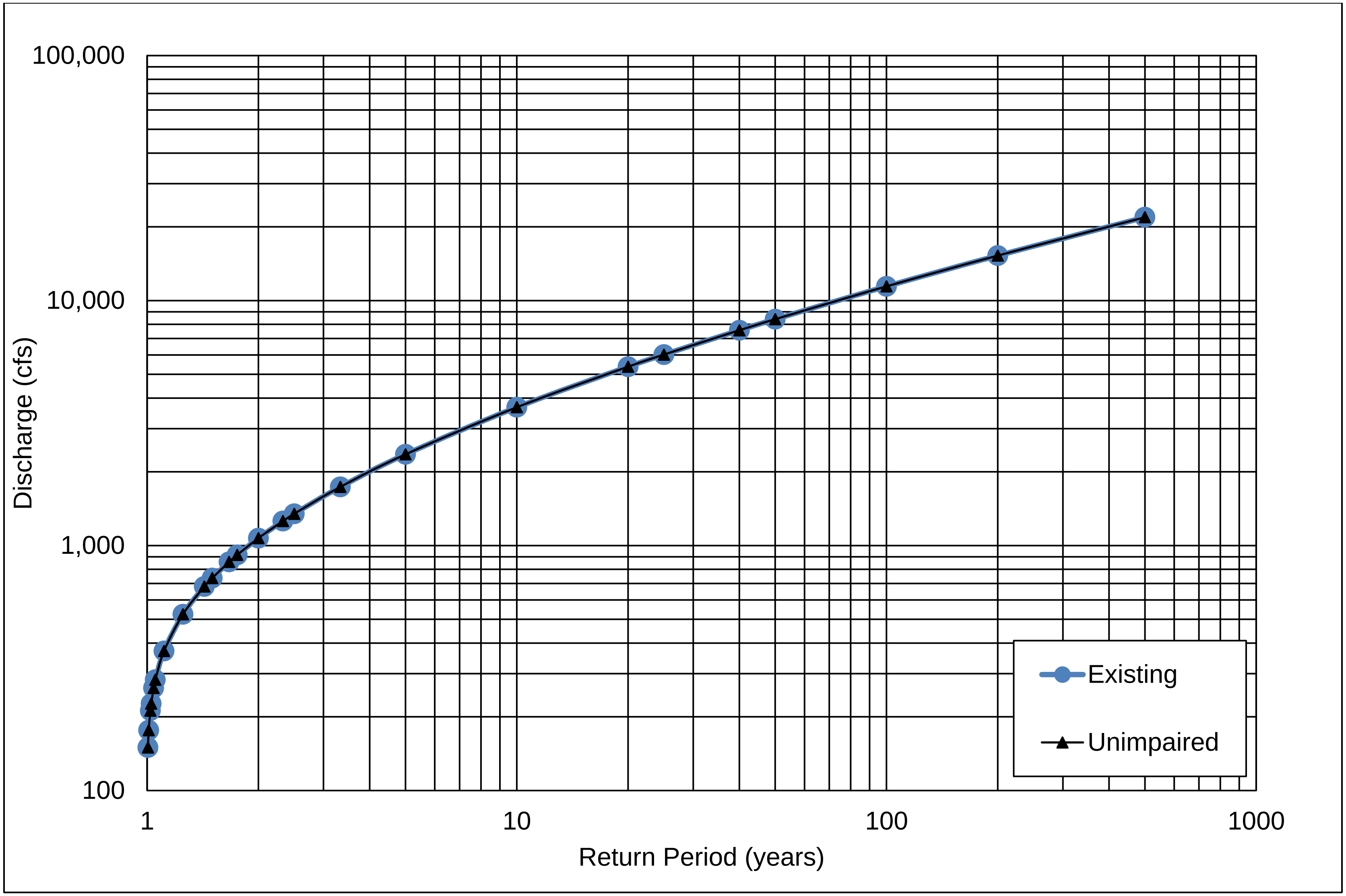

Figure 7.7-5f. Flood Frequency for Existing and Unimpaired in the East Fork Kaweah River Upstream of the Kaweah No. 1 Diversion

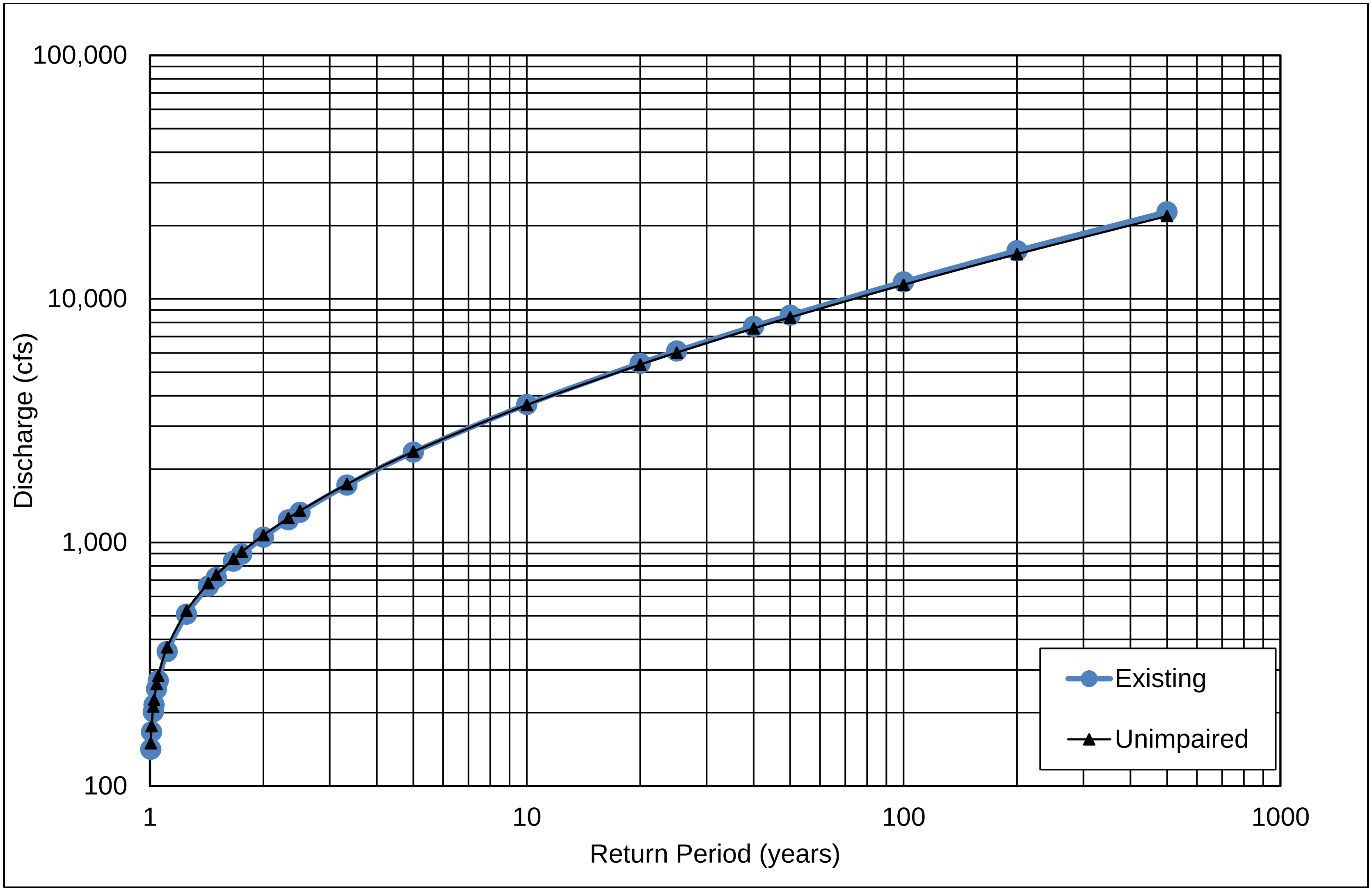

Figure 7.7-5g. Flood Frequency for Existing and Unimpaired Flows in the East Fork Kaweah River Downstream of the Kaweah No. 1 Diversion

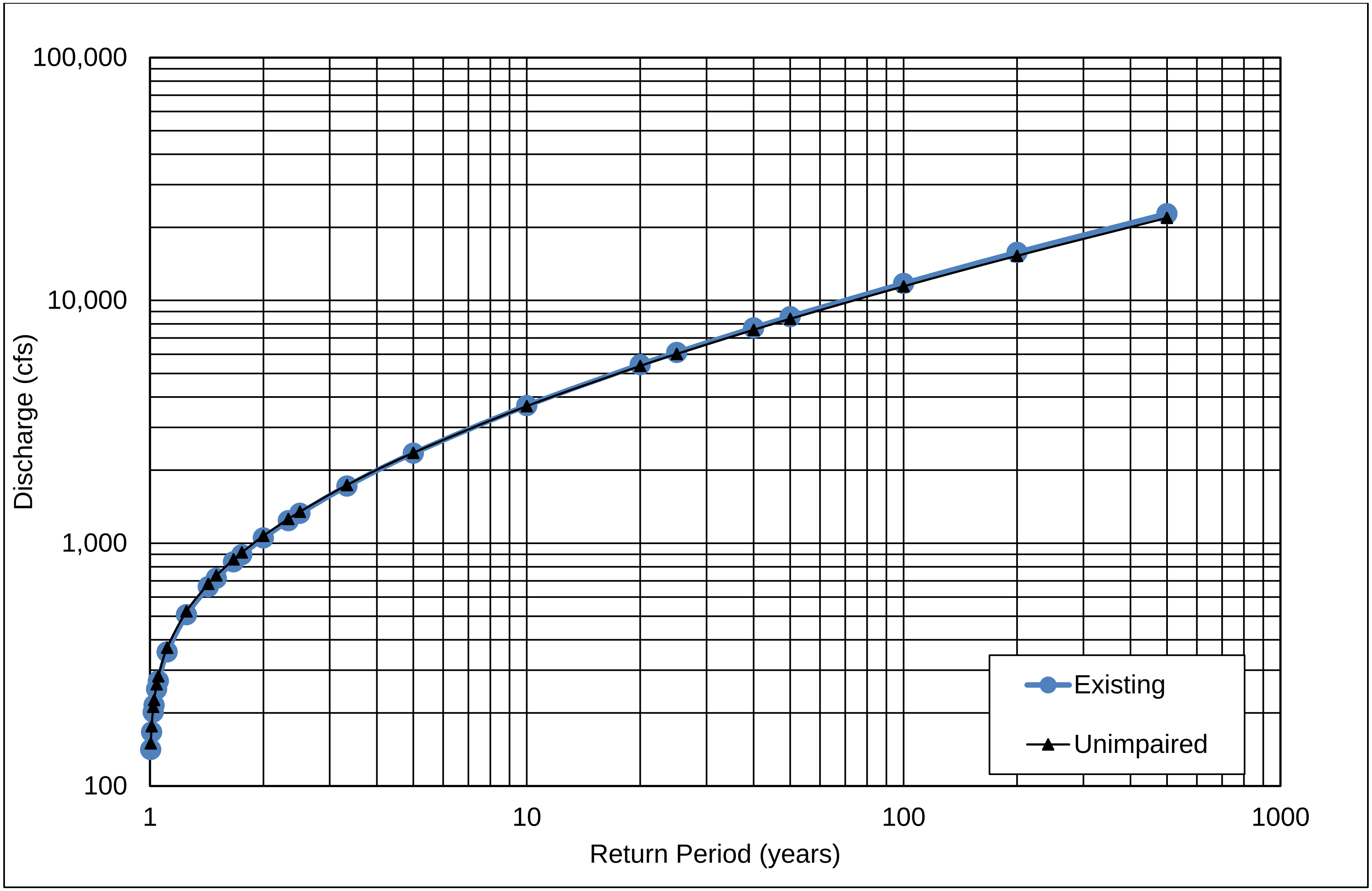

Figure 7.7-5h. Flood Frequency for Existing and Unimpaired Flows in the East Fork Kaweah River Upstream of Confluence with Kaweah River

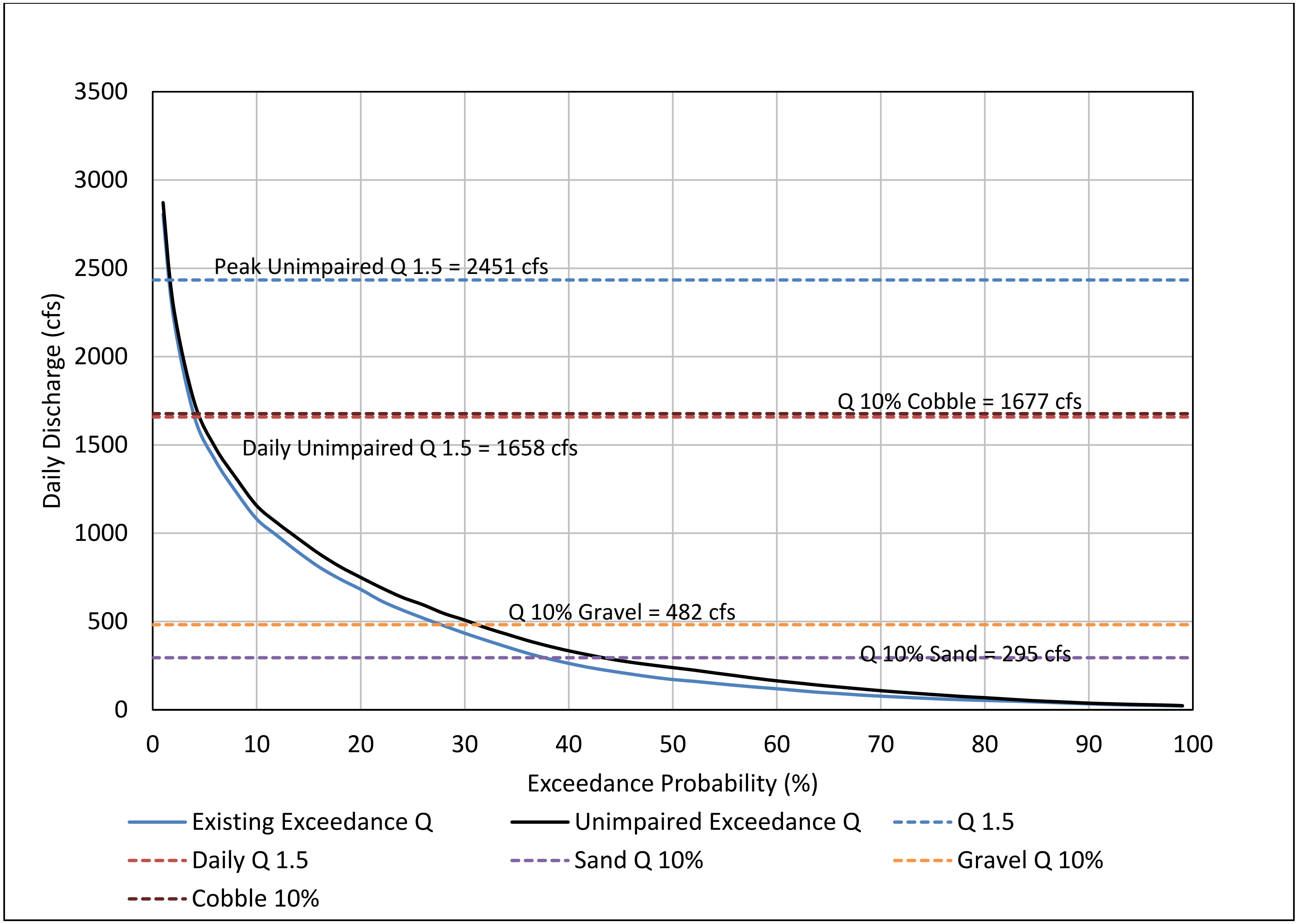

Figure 7.7-6a. Daily Discharge Exceedance Probability with Q Values at Incipient Motion for Key Particle Size Classes for the Kaweah River Downstream of the Kaweah No. 1 Powerhouse and Upstream of Kaweah No. 2 Powerhouse

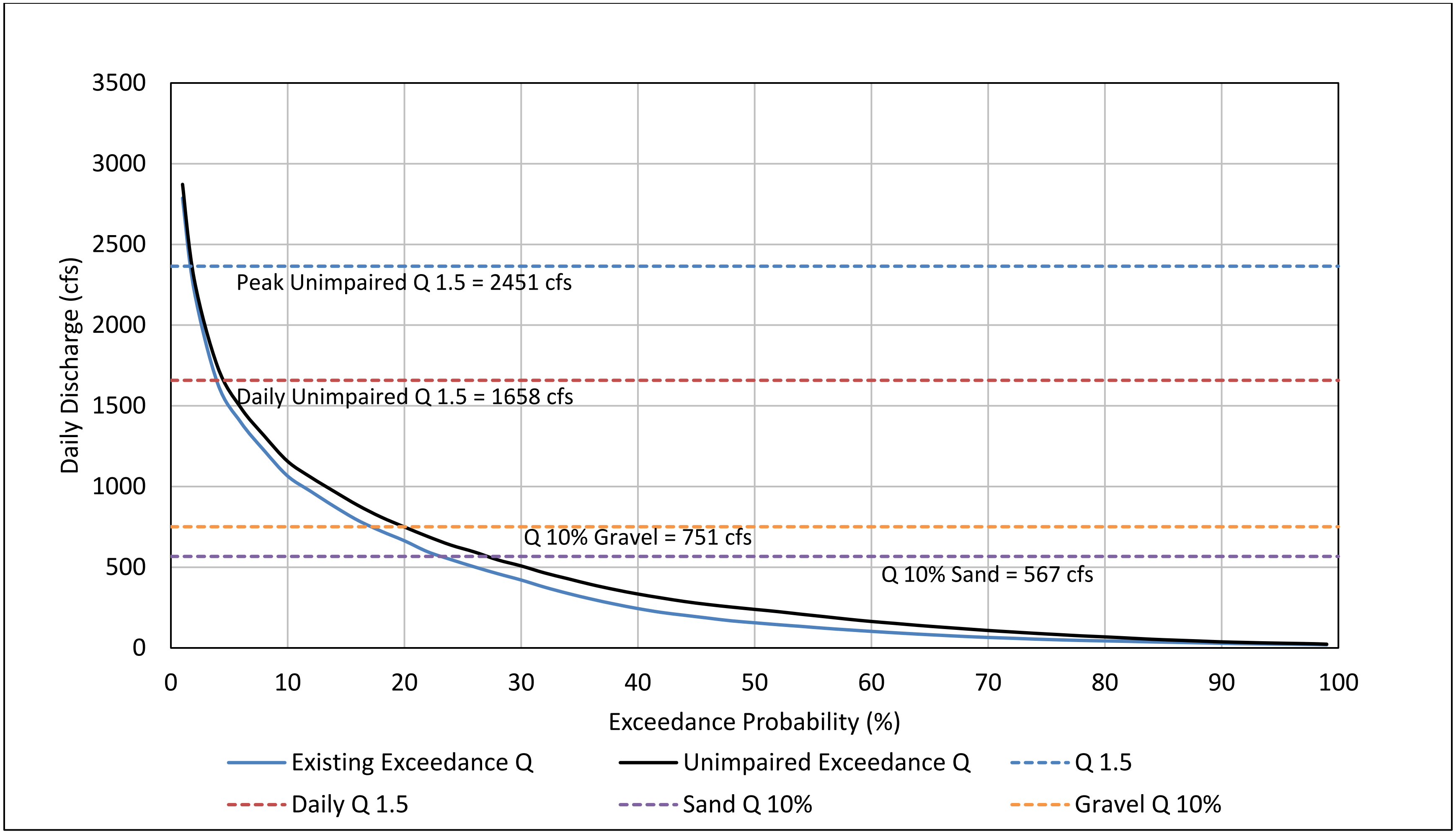

Figure 7.7-6b. Daily Discharge Exceedance Probability with Q Values at Incipient Motion for Key Particle Size Classes for the Kaweah River Downstream of the East Fork Kaweah Confluence and Upstream of the Kaweah No. 1 Powerhouse

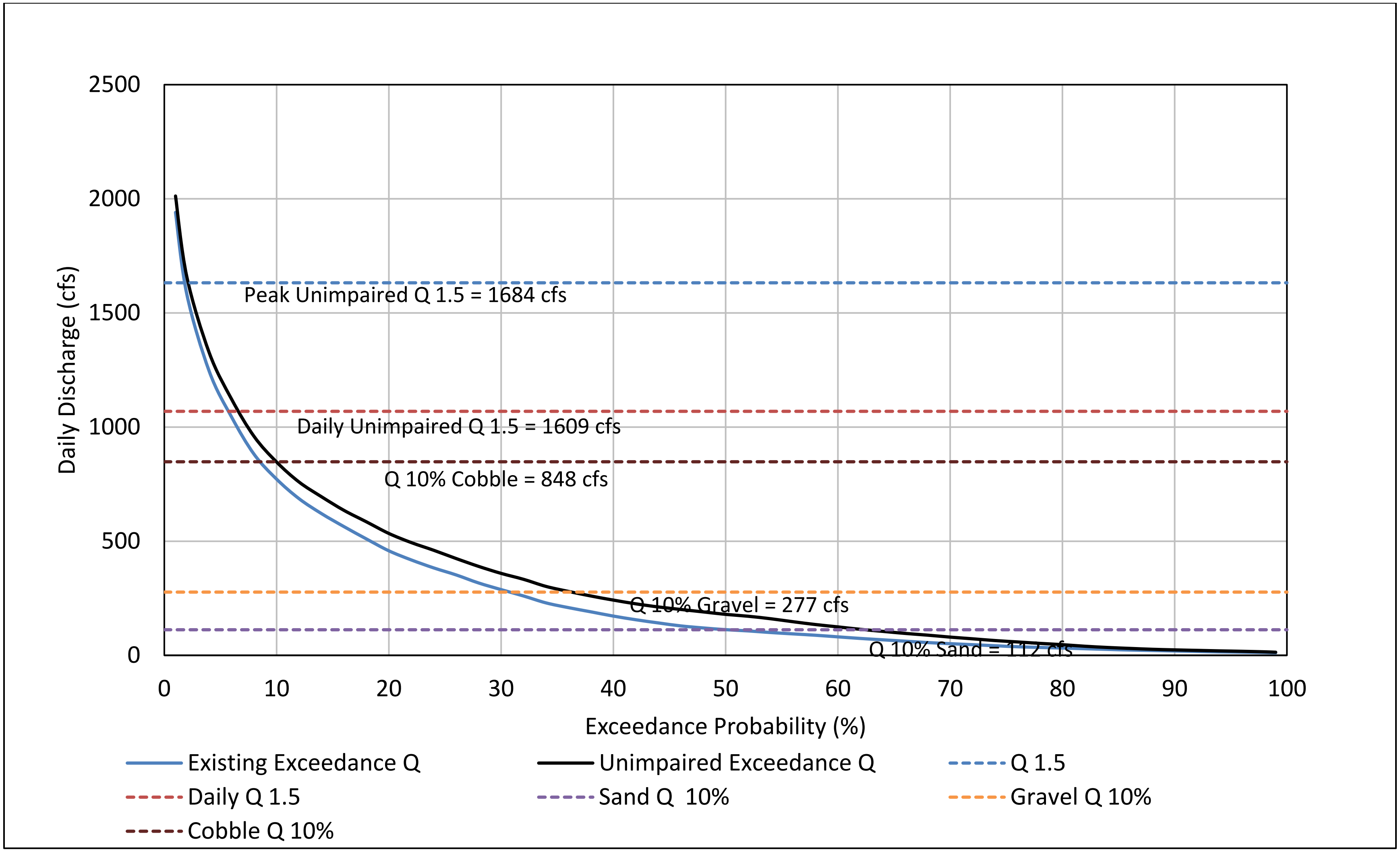

Figure 7.7-6c. Daily Discharge Exceedance Probability with Q Values at Incipient Motion for Key Particle Size Classes for the Kaweah River Downstream of Kaweah No. 3 Powerhouse and Upstream of the East Fork Kaweah River Confluence

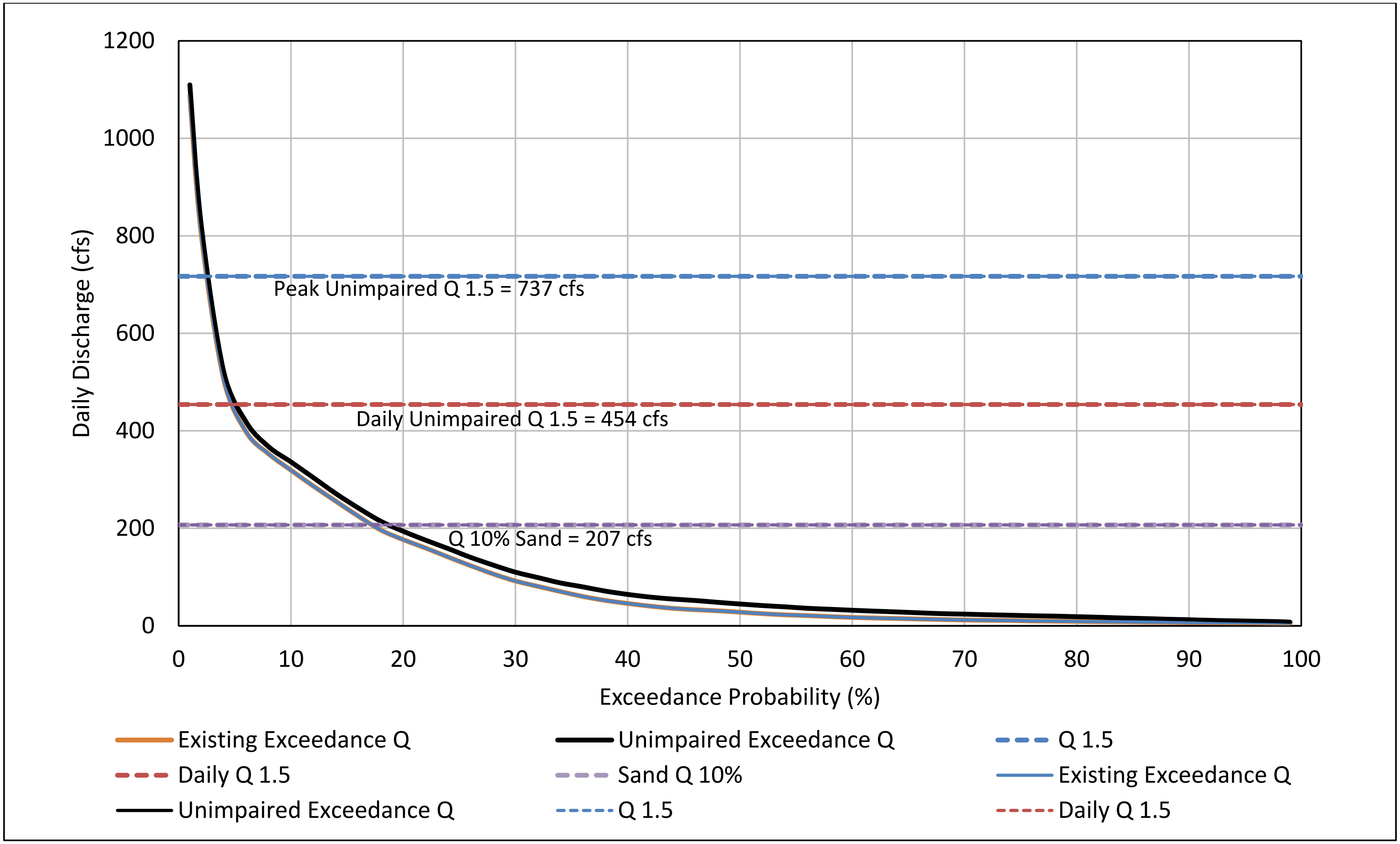

Figure 7.7-6d. **Daily Discharge Exceedance Probability with Q Values at Incipient Motion for Key Particle Size Classes for East Fork Kaweah River Upstream of Confluence with Kaweah River**

MAPS

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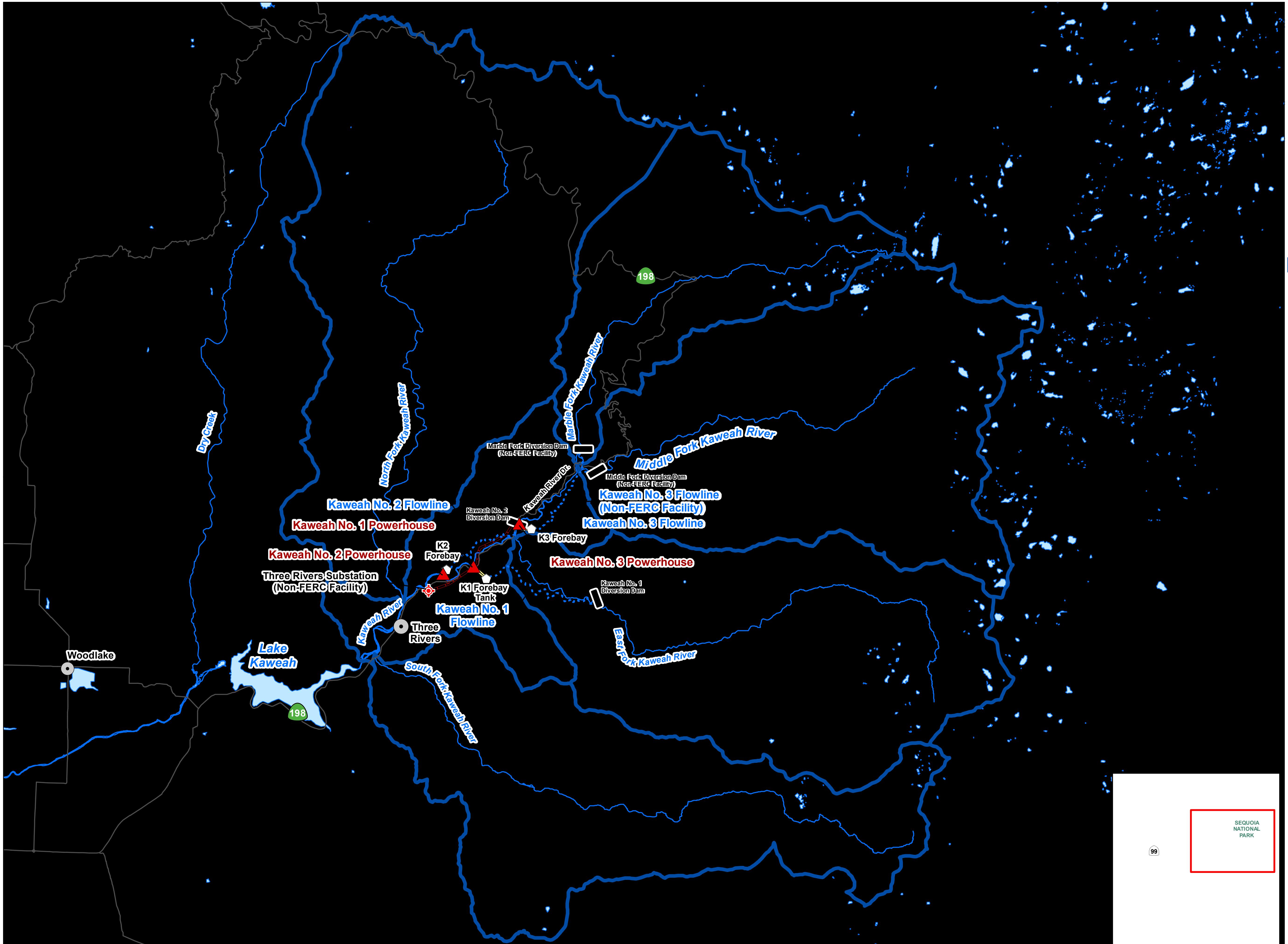

SCE Facilities

- Powerhouse
- Diversion
- Utility
- Forebay
- Flowline
- Penstock
- Transmission Line

Other Features

- City/Town
- Highway/Road
- Watercourse
- Water Body
- Watershed Boundary

Elevations

- <2000'
- 2000'-3000'
- 3000'-4000'
- 4000'-5000'
- 5000'-6000'
- 6000'-7000'
- 7000'-8000'
- 8000'-9000'
- 9000'-10,000'
- >10,000'

[redacted]

Kaweah Project - FERC Project No. 298

Map 7.7-1

Topography in the Kaweah River Watershed

N S W E

0 0.5 1 2 Miles

Date: 5/20/2019

Projection: UTM Zone 11
Datum: NAD 83

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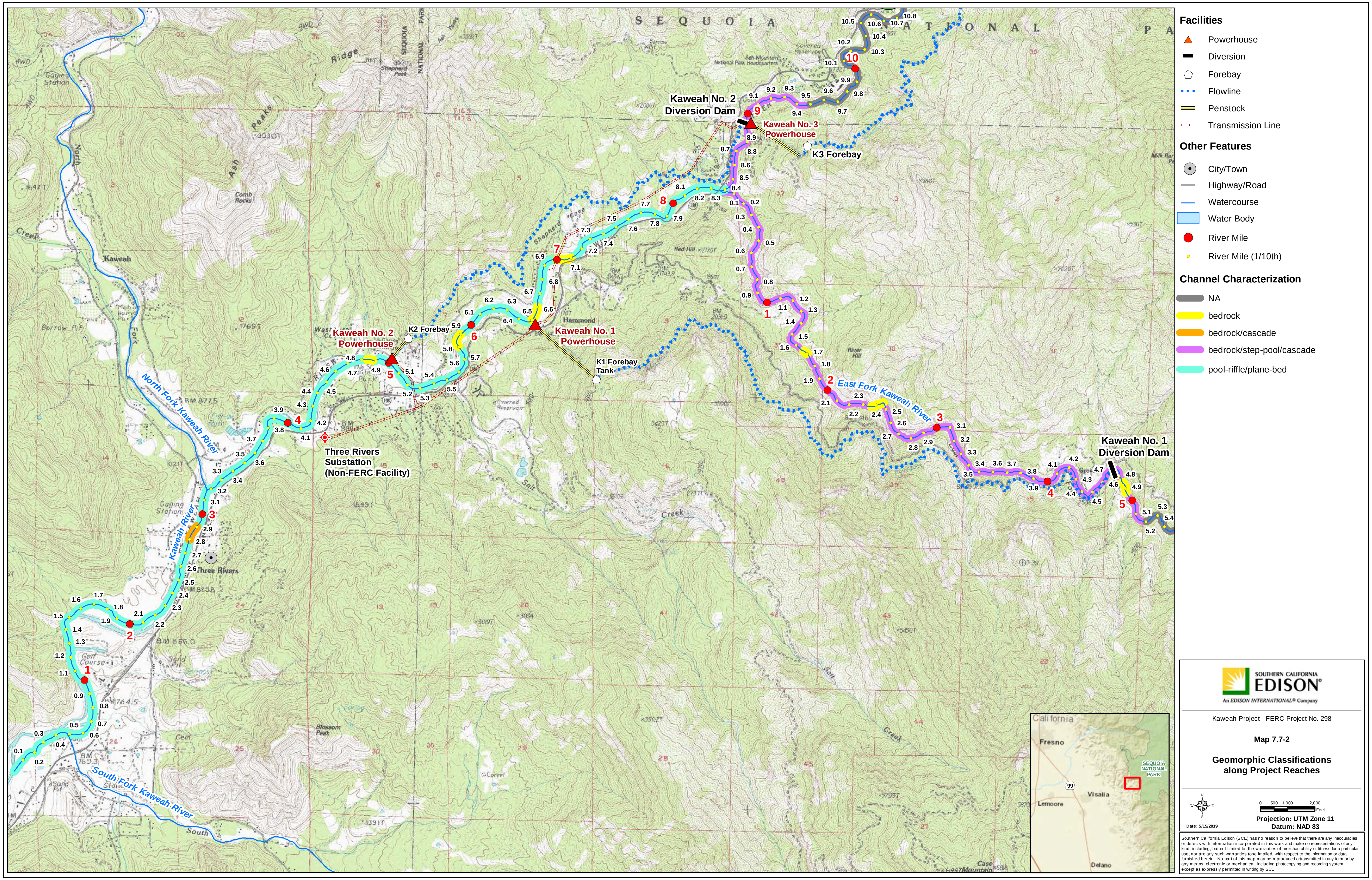

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APPENDIX A

Spawning Gravel Bulk Sample Frequency Distributions

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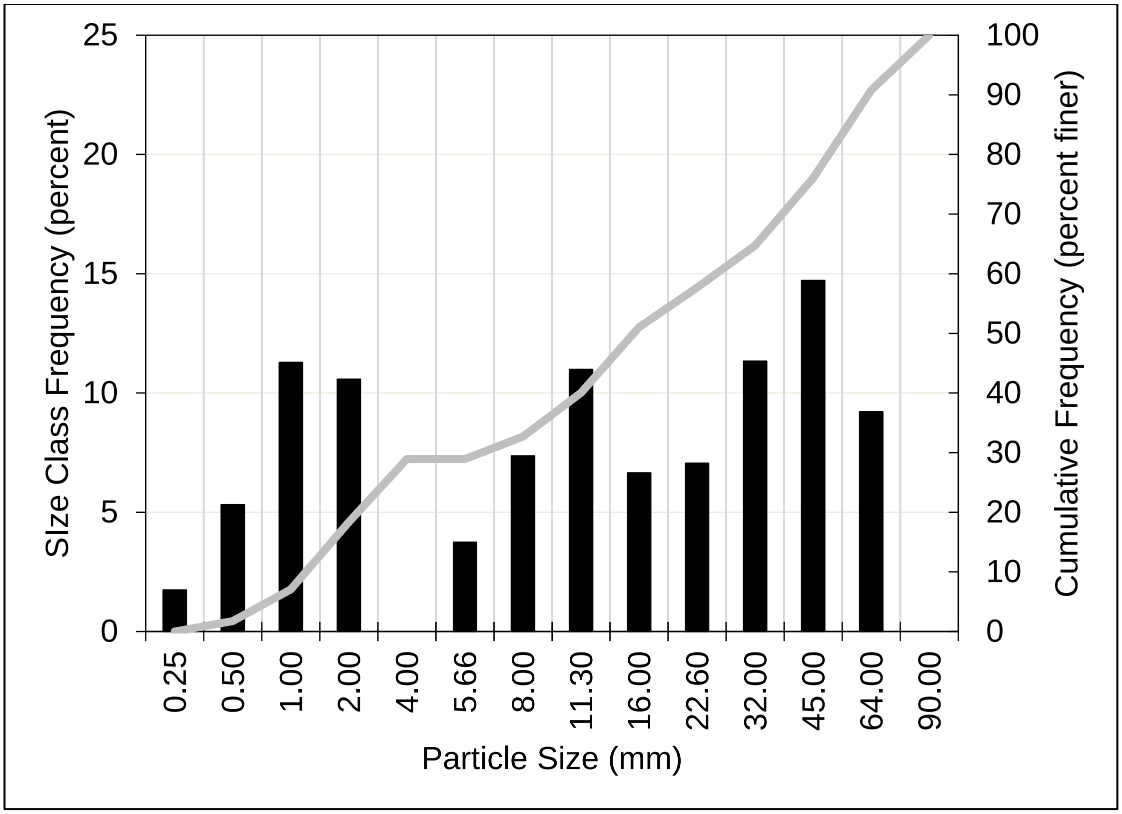

Figure A-1. **Kaweah River Upstream of Kaweah No. 3 Powerhouse Spawning Gravel: Histogram and Cumulative Particle Size Distribution, Sample 1 Subsample 1**

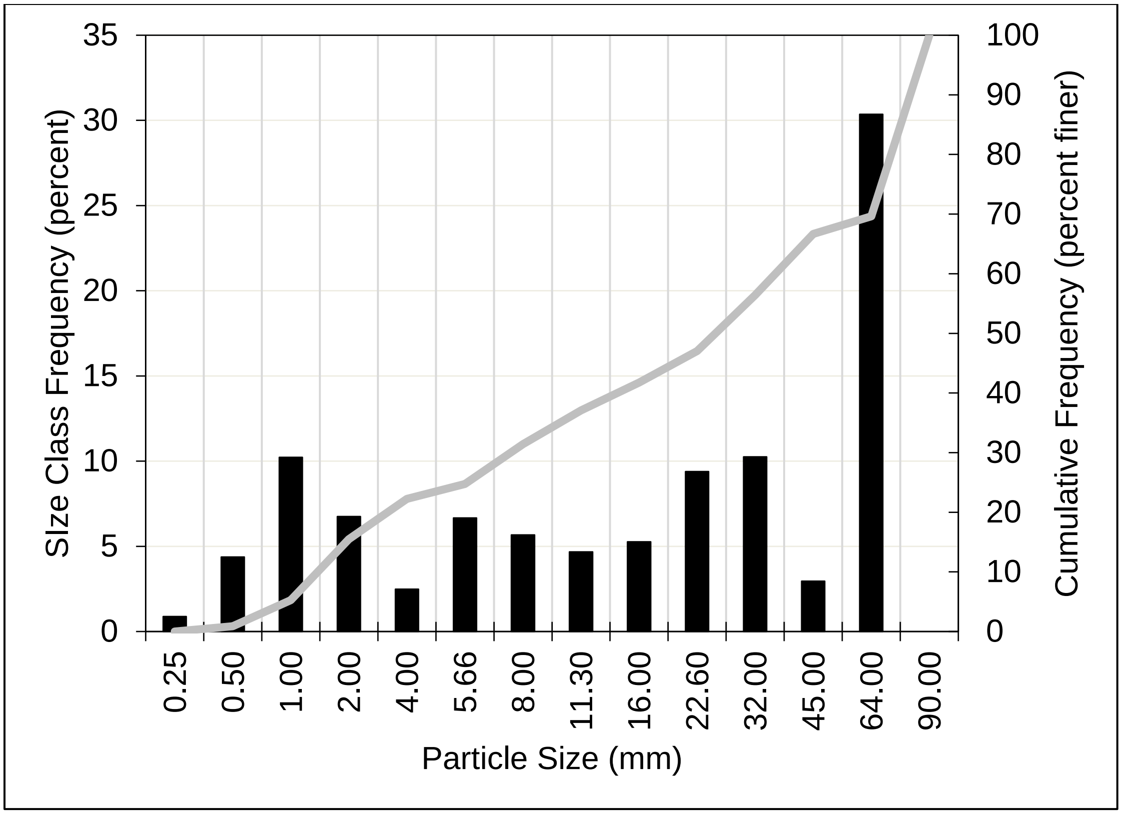

Figure A-2. Kaweah River Upstream of Kaweah No. 3 Powerhouse Spawning Gravel: Histogram and Cumulative Particle Size Distribution, Sample 1 Subsample 2

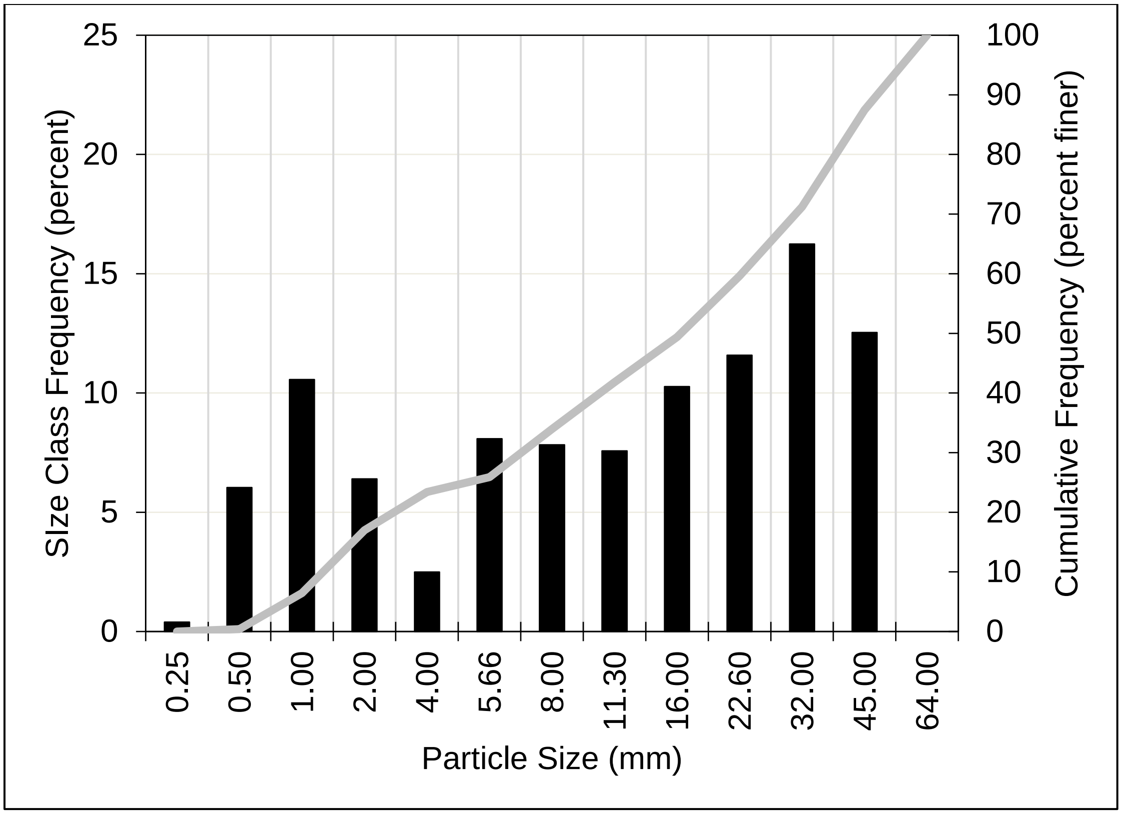

Figure A-3. Kaweah River Upstream of Kaweah No. 3 Powerhouse Spawning Gravel: Histogram and Cumulative Particle Size Distribution, Sample 2 Subsample 1

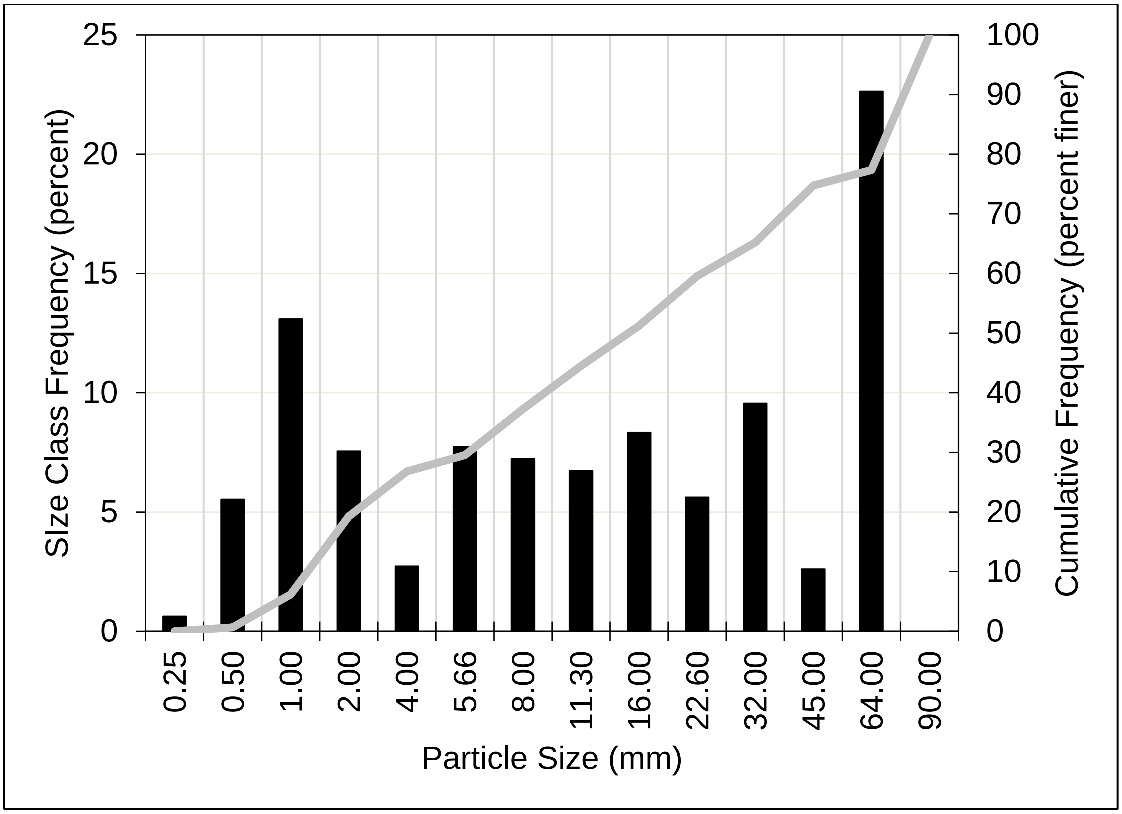

Figure A-4. **Kaweah River Upstream of Kaweah No. 3 Powerhouse Spawning Gravel: Histogram and Cumulative Particle Size Distribution, Sample 2 Subsample 2**

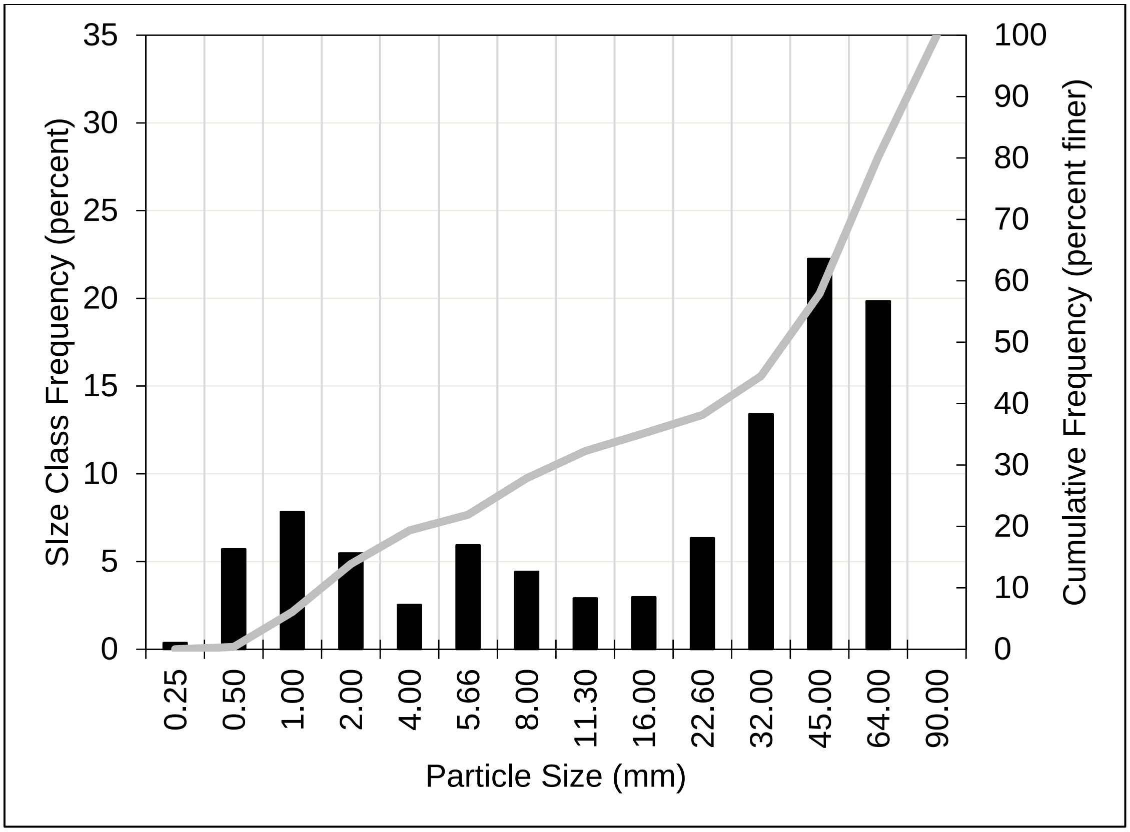

Figure A-5. **Kaweah River Downstream of Kaweah No. 3 Powerhouse and Upstream of the East Fork Kaweah River Confluence Spawning Gravel: Histogram and Cumulative Particle Size Distribution, Sample 1 Subsample 1**

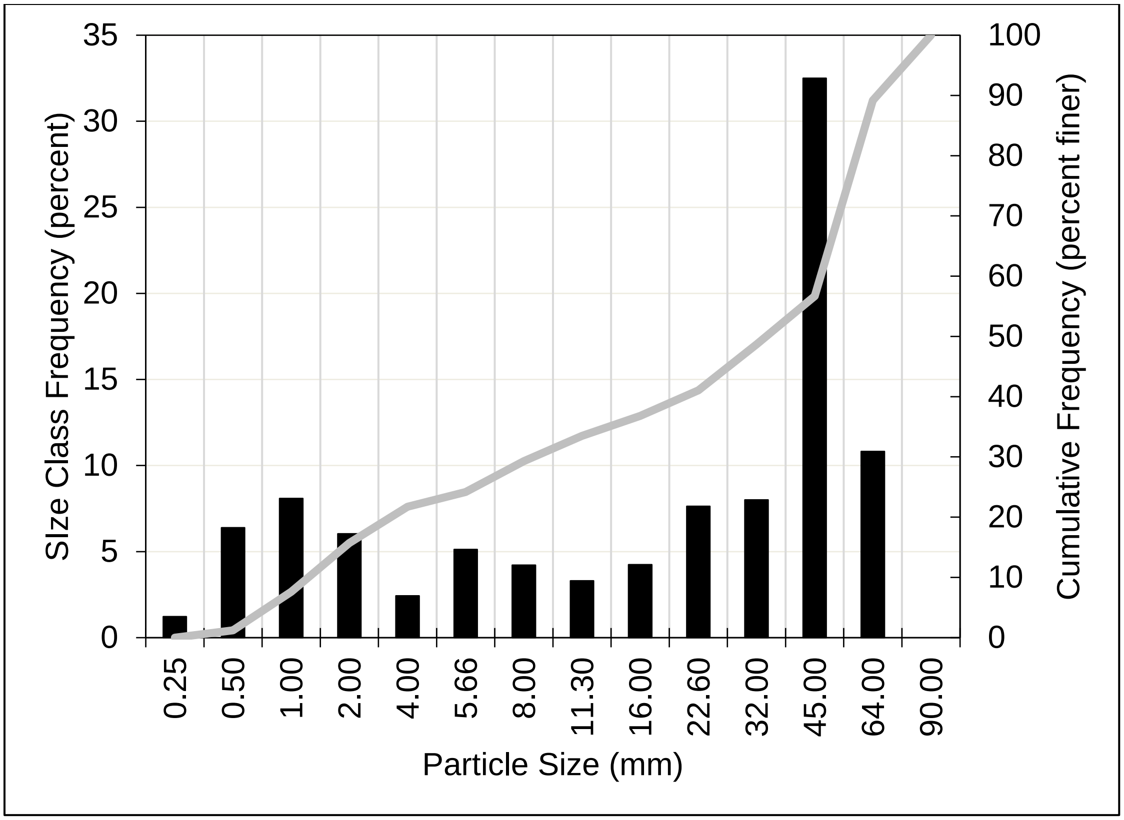

Figure A-6. **Kaweah River Downstream of Kaweah No. 3 Powerhouse and Upstream of the East Fork Kaweah River Confluence Spawning Gravel: Histogram and Cumulative Particle Size Distribution, Sample 1 Subsample 2**

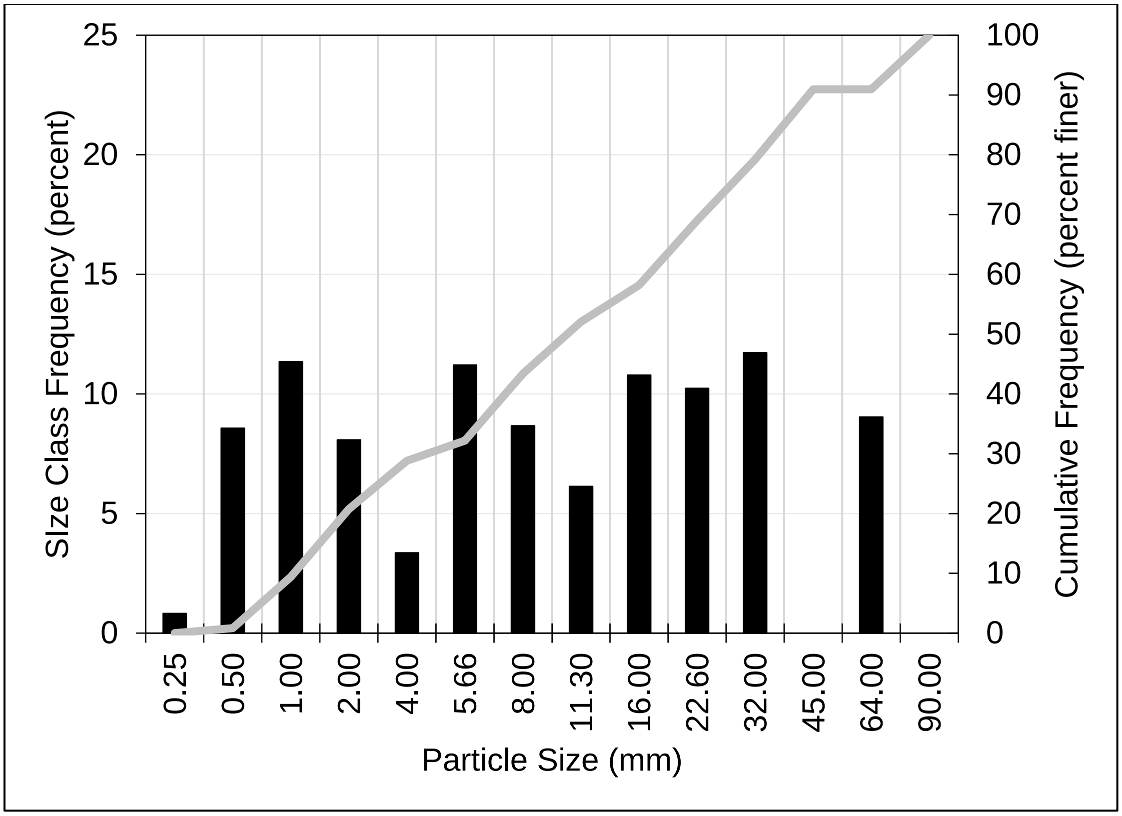

Figure A-7. Kaweah River Downstream of Kaweah No. 3 Powerhouse and Upstream of the East Fork Kaweah River Confluence Spawning Gravel: Histogram and Cumulative Particle Size Distribution, Sample 2 Subsample 1

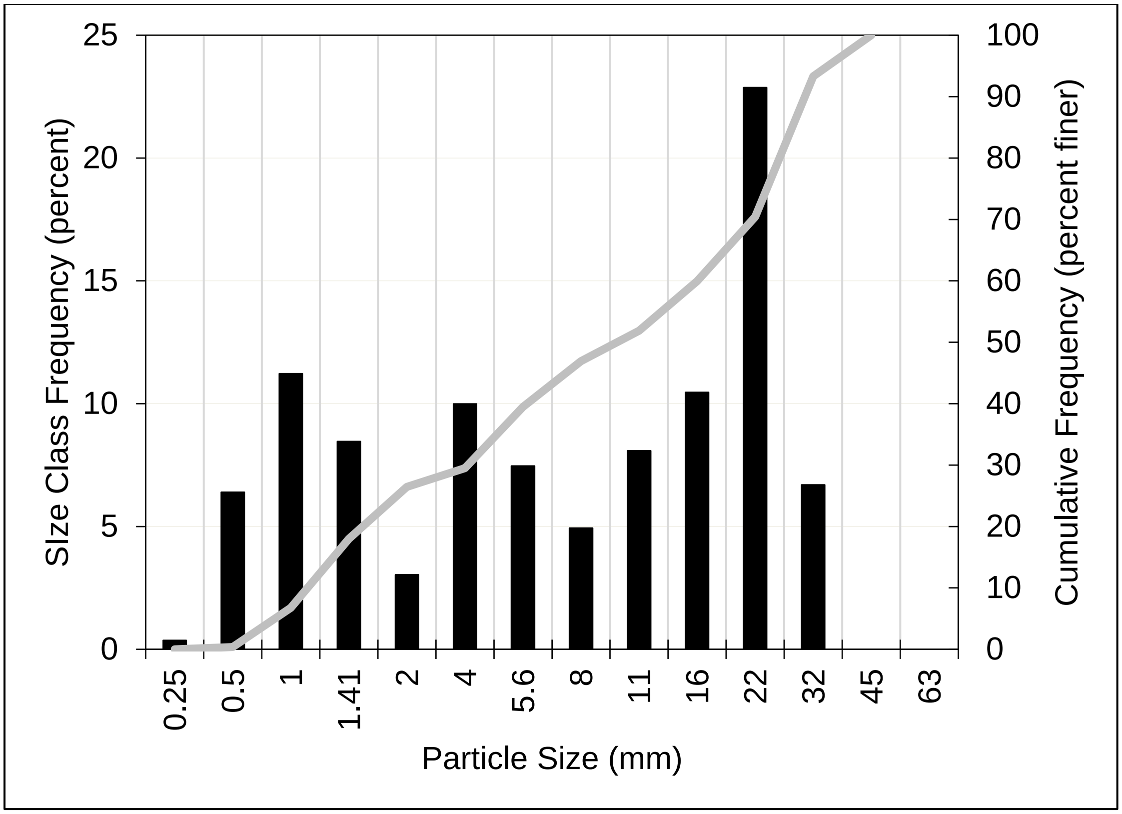

Figure A-8. **Kaweah River Downstream of Kaweah No. 3 Powerhouse and Upstream of the East Fork Kaweah River Confluence Spawning Gravel: Histogram and Cumulative Particle Size Distribution, Sample 2 Subsample 2**

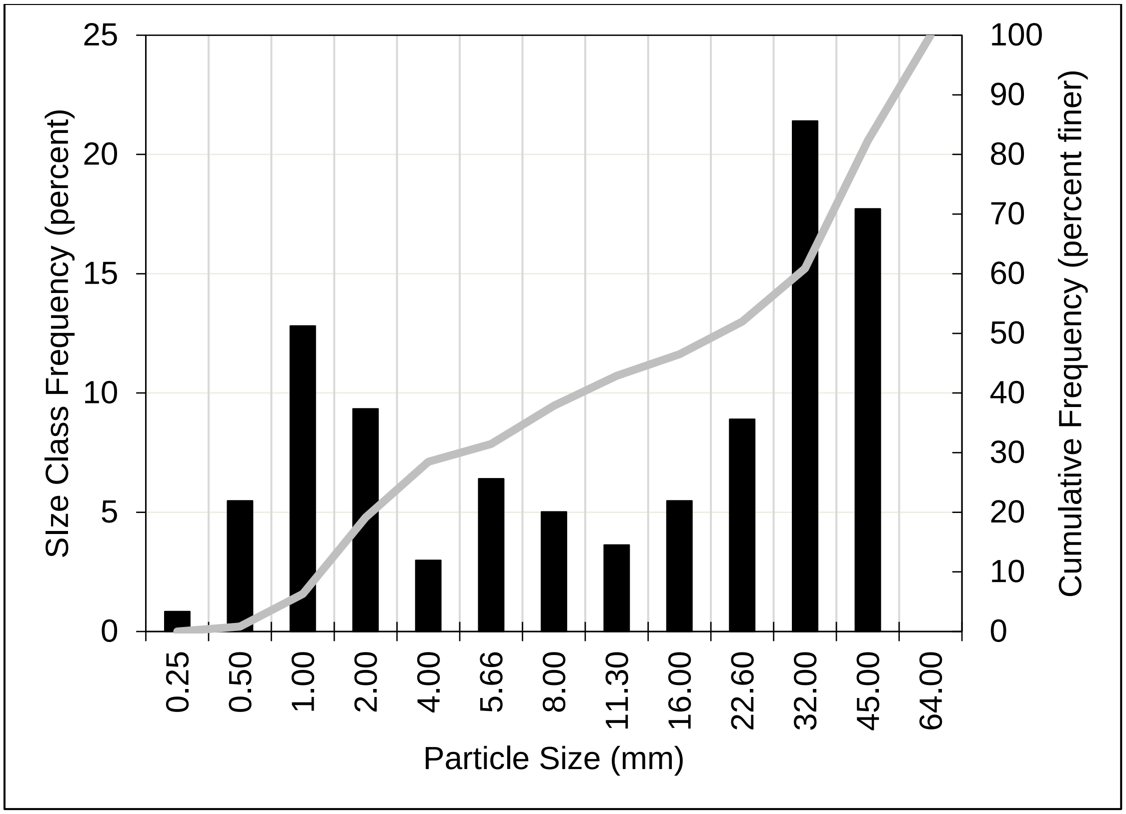

Figure A-9. Kaweah River Downstream of East Fork Kaweah Confluence and Upstream of Kaweah No. 1 Powerhouse: Histogram and Cumulative Particle Size Distribution, Sample 1 Subsample 1

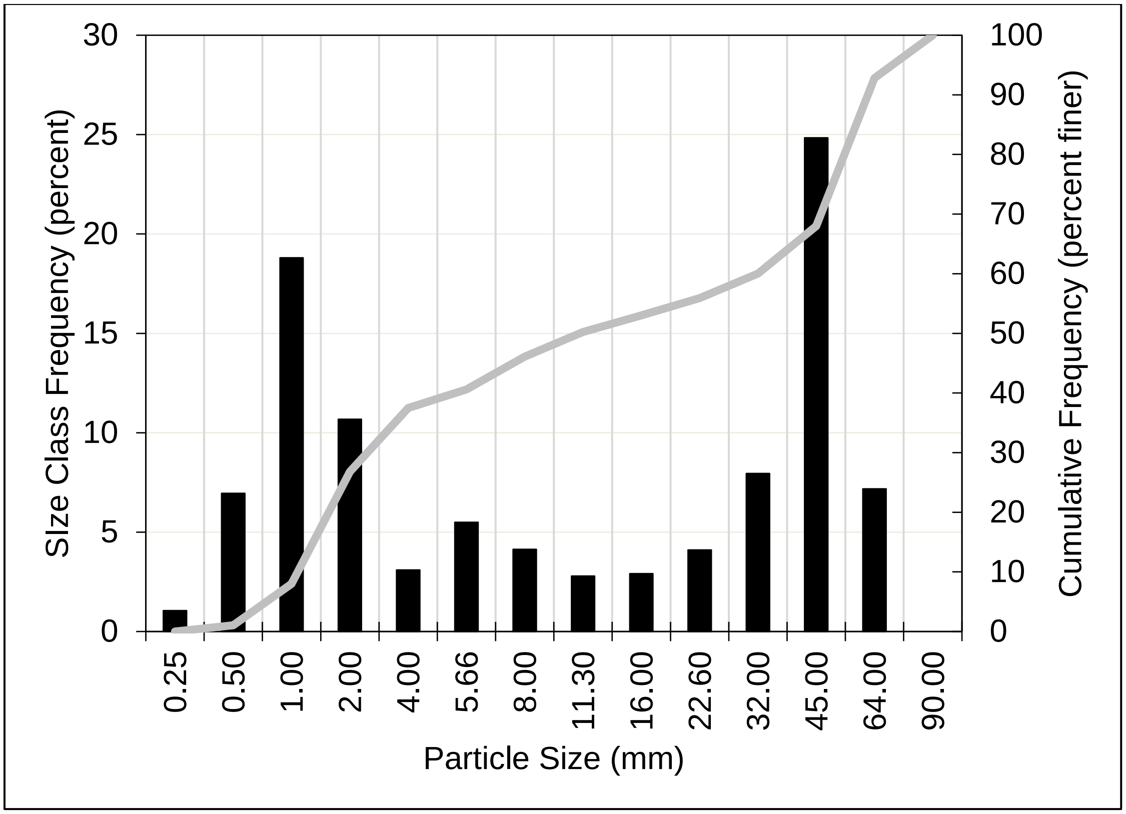

Figure A-10. Kaweah River Downstream of East Fork Kaweah Confluence and Upstream of Kaweah No. 1 Powerhouse: Histogram and Cumulative Particle Size Distribution, Sample 1 Subsample 2

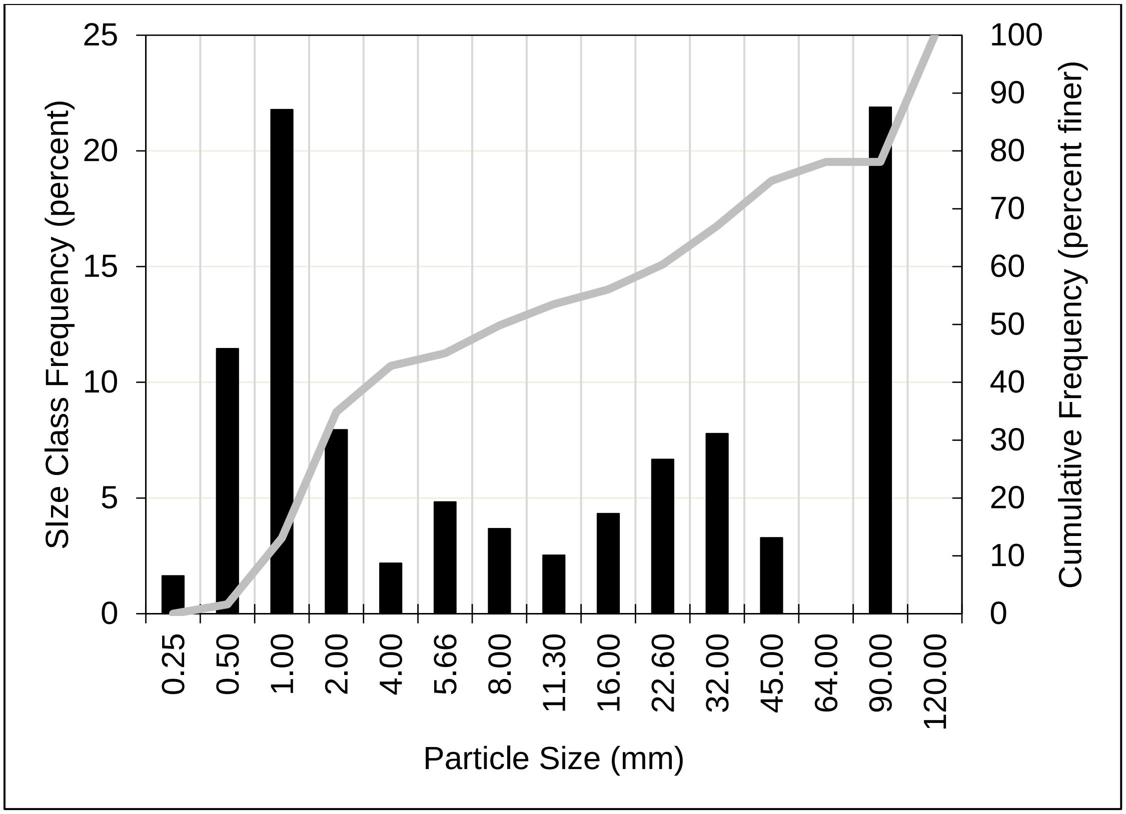

Figure A-11. Kaweah River Downstream of East Fork Kaweah Confluence and Upstream of Kaweah No. 1 Powerhouse: Histogram and Cumulative Particle Size Distribution, Sample 2 Subsample 1

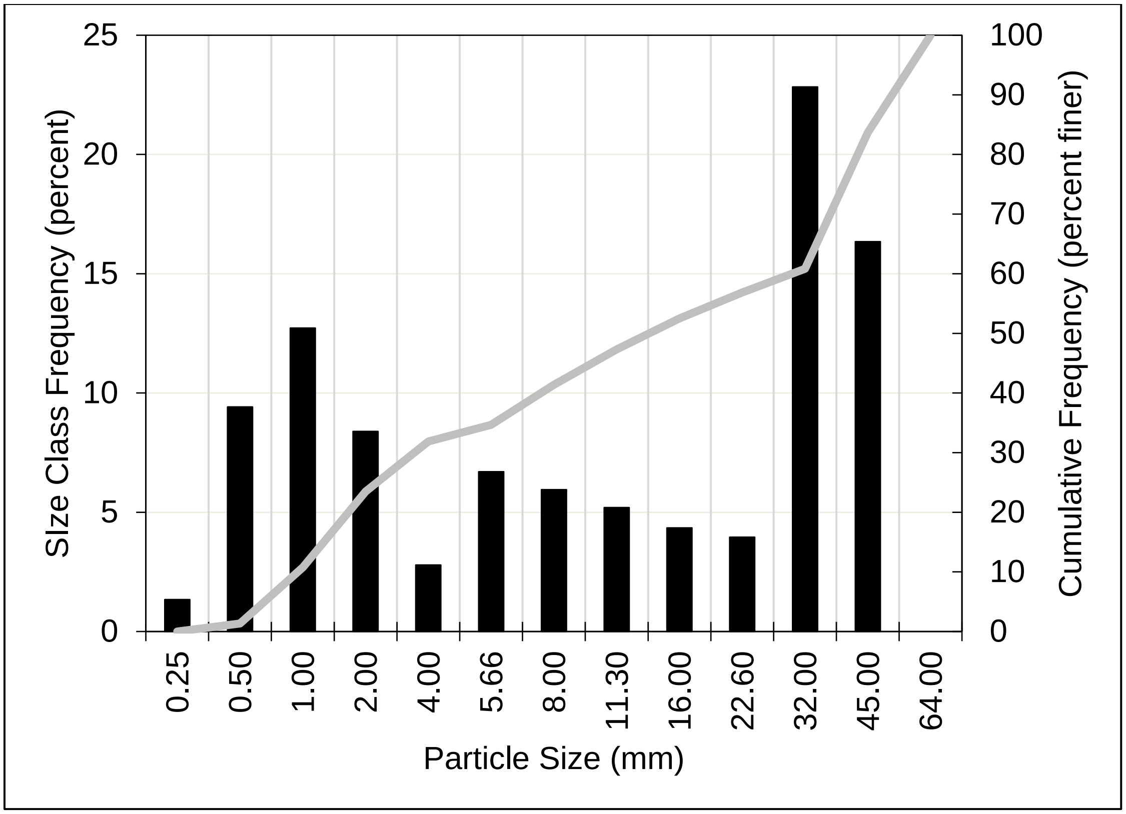

Figure A-12. Kaweah River Downstream of East Fork Kaweah Confluence and Upstream of Kaweah No. 1 Powerhouse: Histogram and Cumulative Particle Size Distribution, Sample 2 Subsample 2

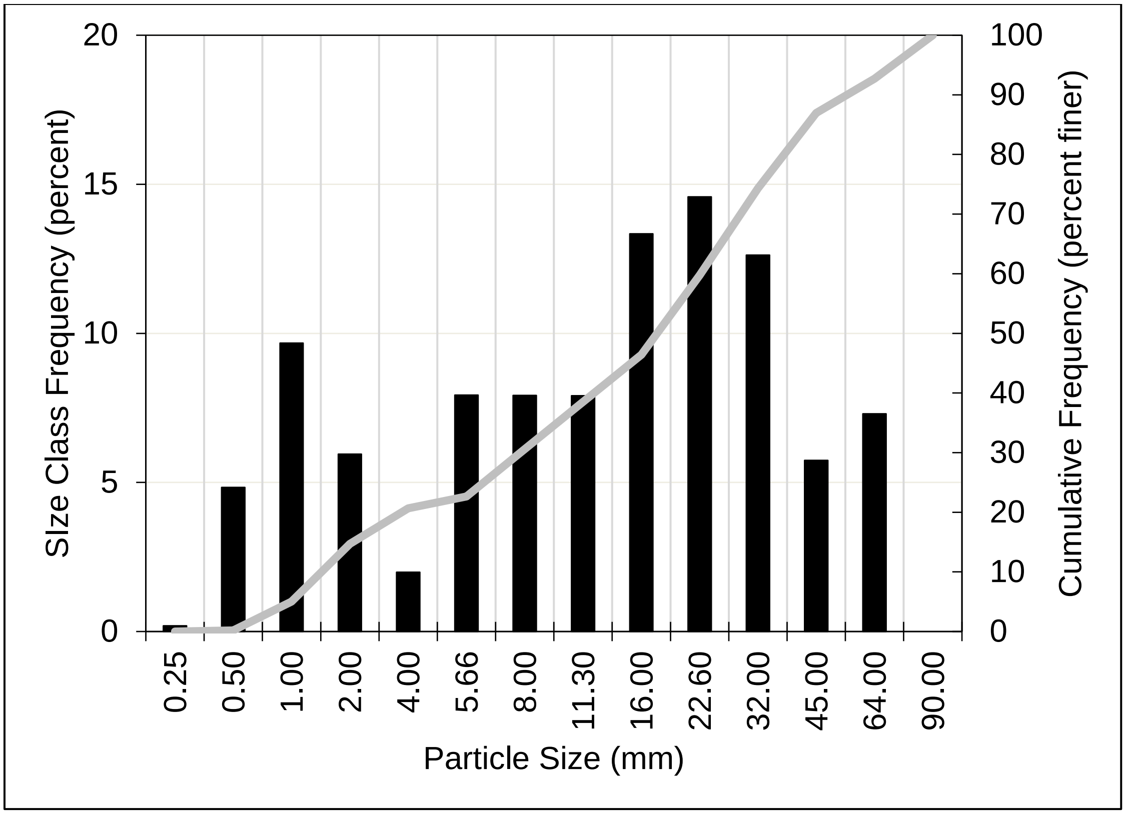

Figure A-13. Kaweah River Downstream of Kaweah No. 2 Powerhouse: Histogram and Cumulative Particle Size Distribution, Sample 1 Subsample 1

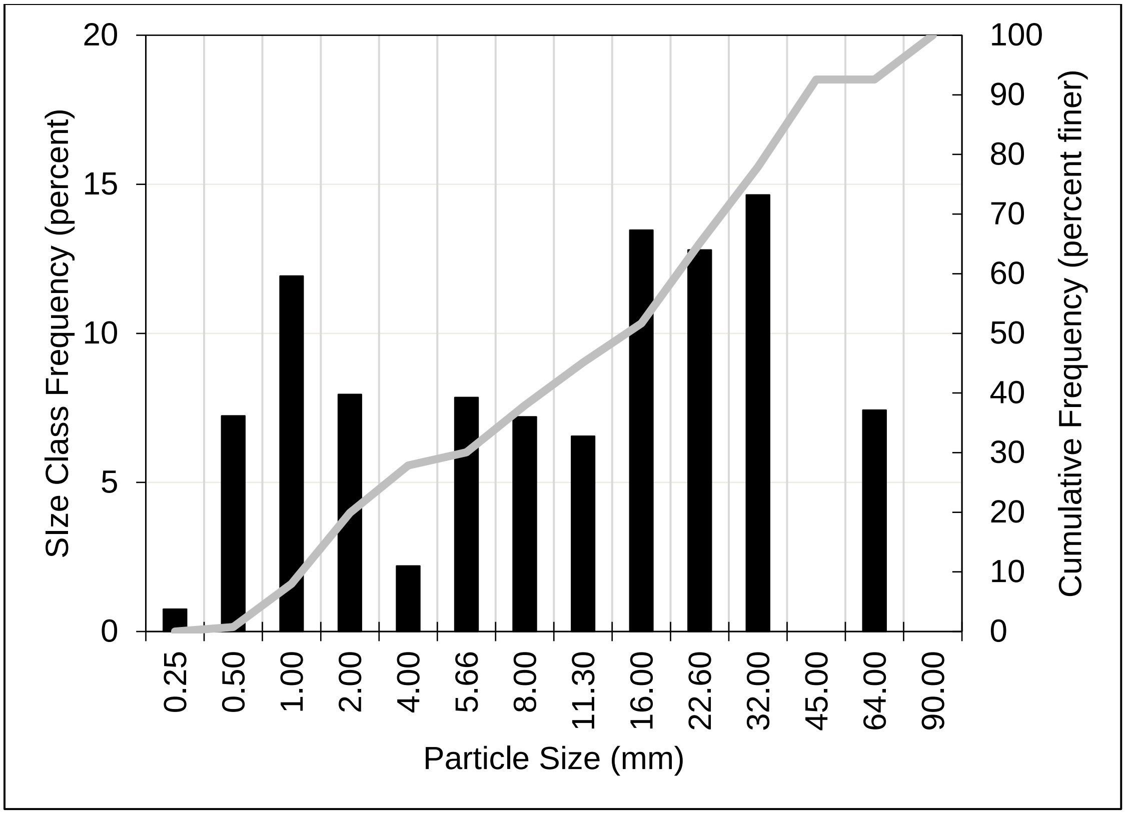

Figure A-14. Kaweah River Downstream of Kaweah No. 2 Powerhouse: Histogram and Cumulative Particle Size Distribution, Sample 1 Subsample 2

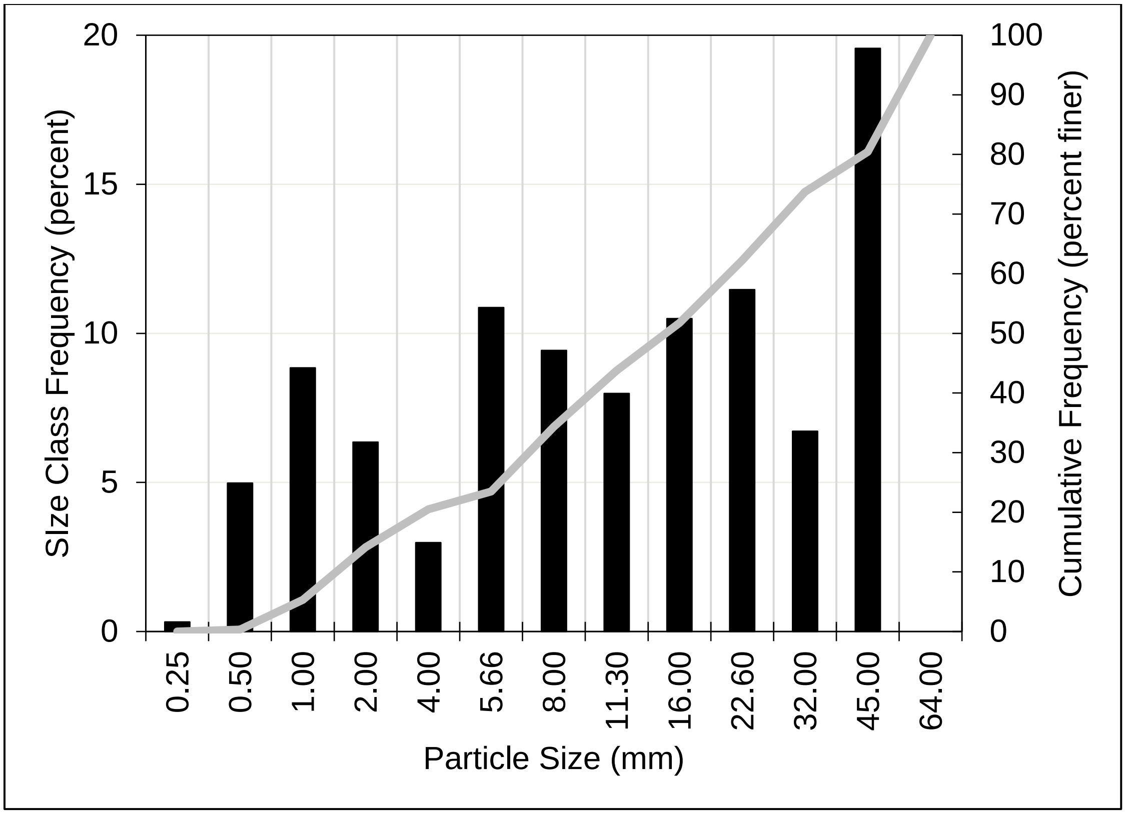

Figure A-15. Kaweah River Downstream of Kaweah No. 2 Powerhouse: Histogram and Cumulative Particle Size Distribution, Sample 2 Subsample 1

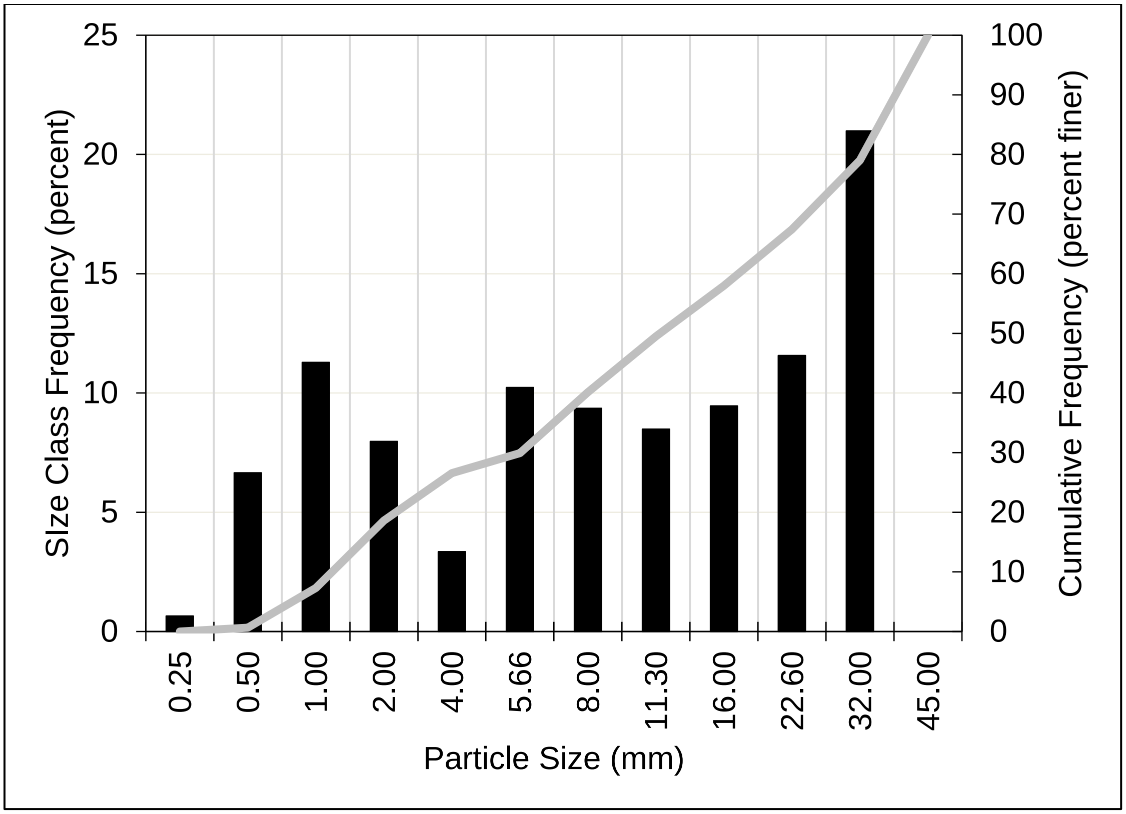

Figure A-16. Kaweah River Downstream of Kaweah No. 2 Powerhouse: Histogram and Cumulative Particle Size Distribution, Sample 2 Subsample 2

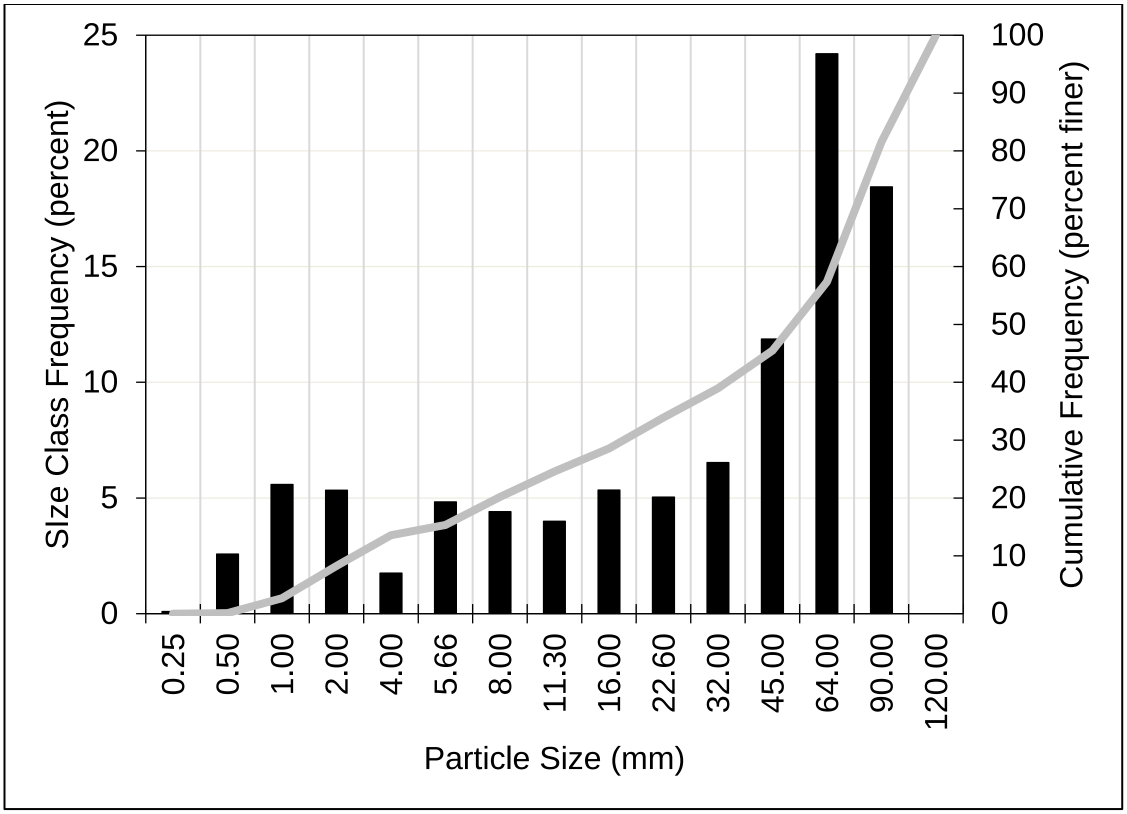

Figure A-17. East Fork Kaweah River Upstream of the Kaweah No. 1 Diversion: Histogram and Cumulative Particle Size Distribution, Sample 1 Subsample 1

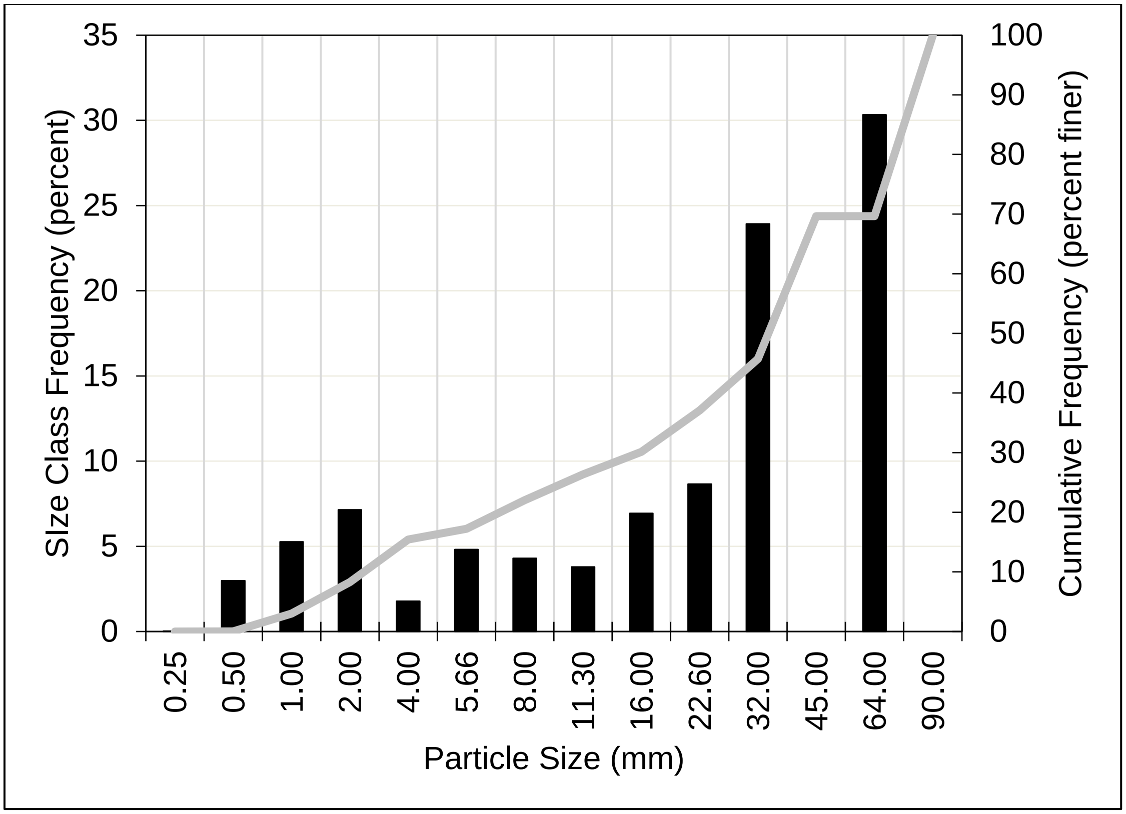

Figure A-18. East Fork Kaweah River Upstream of the Kaweah No. 1 Diversion: Histogram and Cumulative Particle Size Distribution, Sample 1 Subsample 2

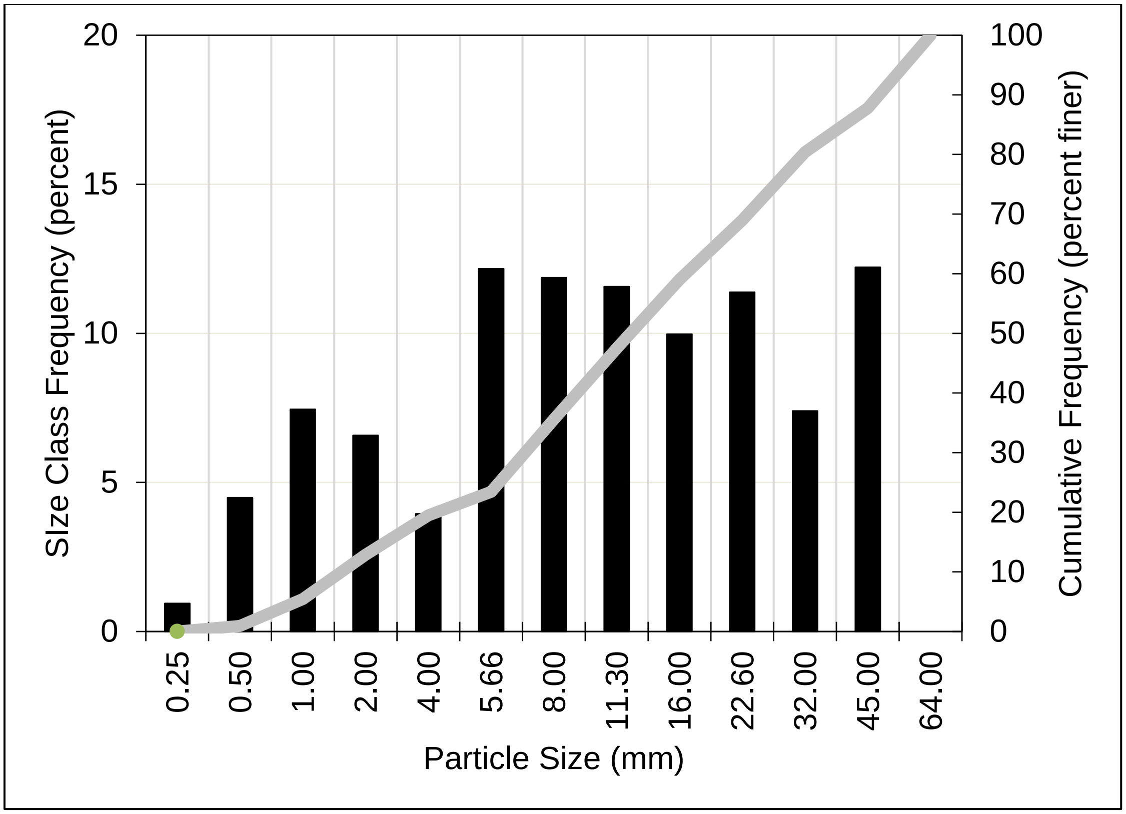

Figure A-19. East Fork Kaweah River Upstream of the Kaweah No. 1 Diversion: Histogram and Cumulative Particle Size Distribution, Sample 2 Subsample 1

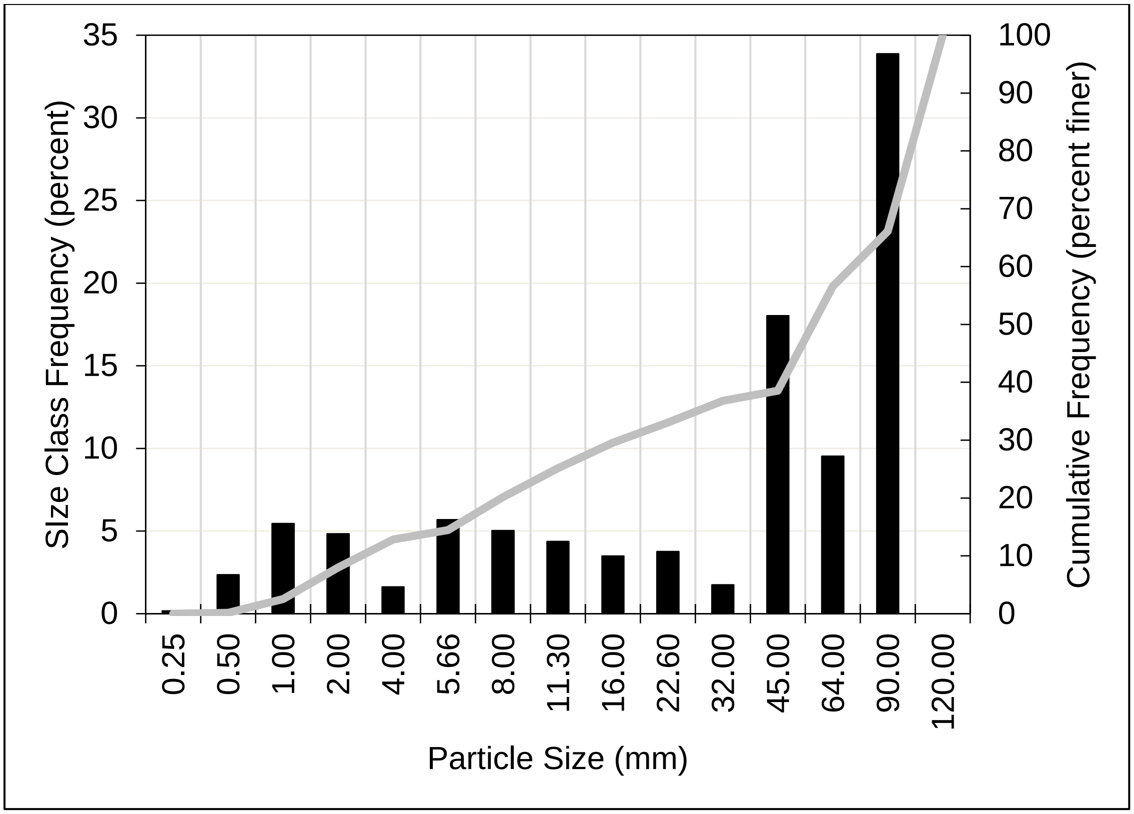

Figure A-20. **East Fork Kaweah River Upstream of the Kaweah No. 1 Diversion: Histogram and Cumulative Particle Size Distribution, Sample 2 Subsample 2**

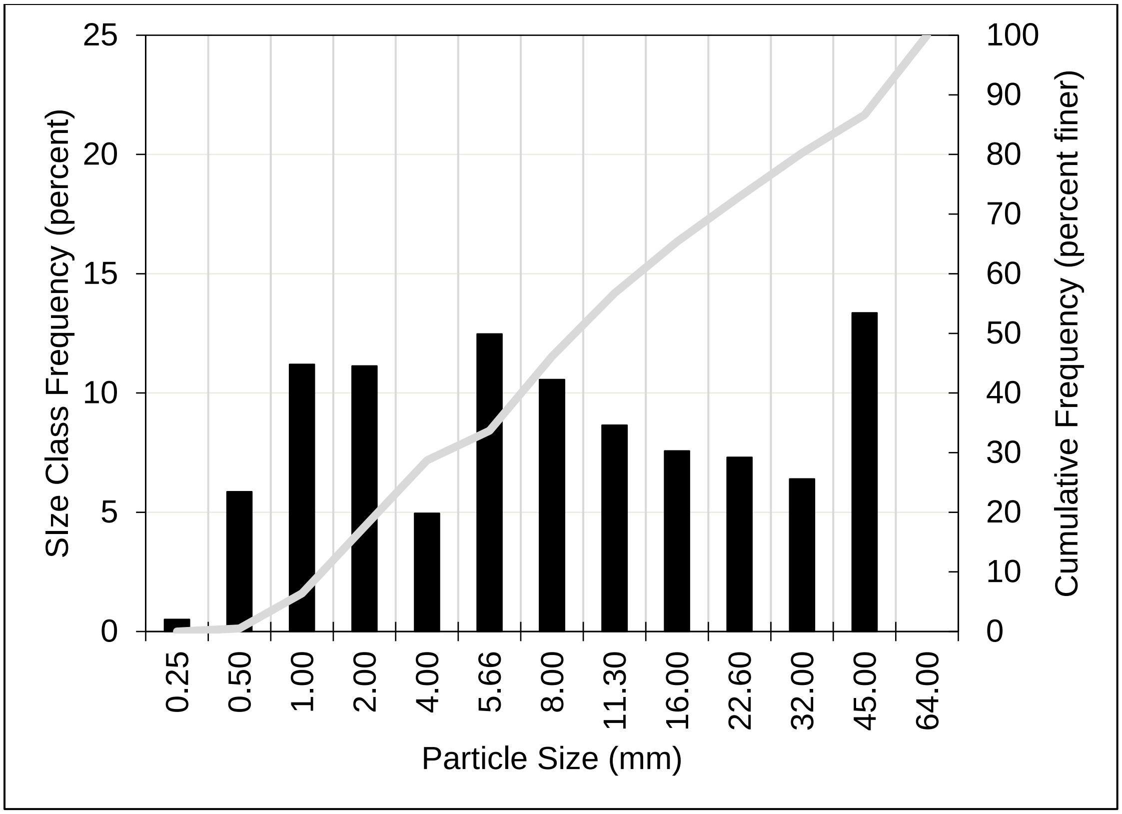

Figure A-21. **East Fork Kaweah River Downstream of the Kaweah No. 1 Diversion: Histogram and Cumulative Particle Size Distribution, Sample 1 Subsample 1**

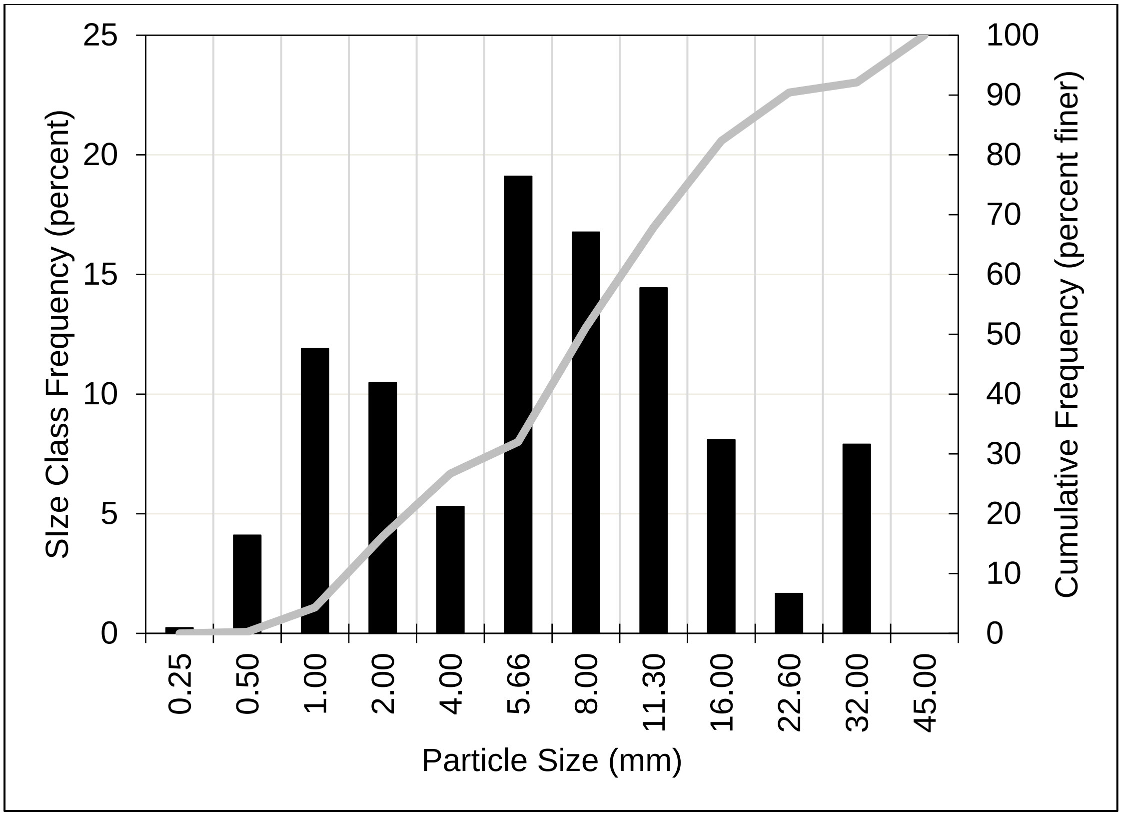

Figure A-22. East Fork Kaweah River Downstream of the Kaweah No. 1 Diversion: Histogram and Cumulative Particle Size Distribution, Sample 1 Subsample 2

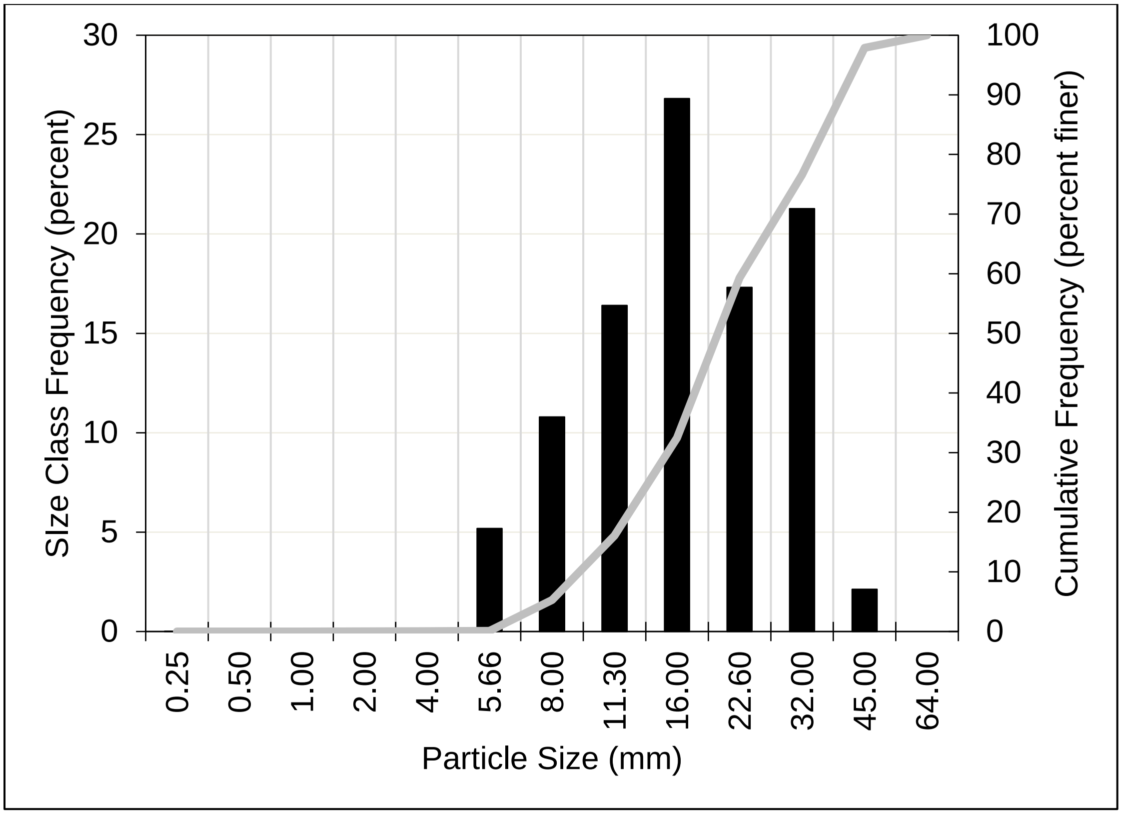

Figure A-23. East Fork Kaweah River Downstream of the Kaweah No. 1 Diversion: Histogram and Cumulative Particle Size Distribution, Sample 2 Subsample 1

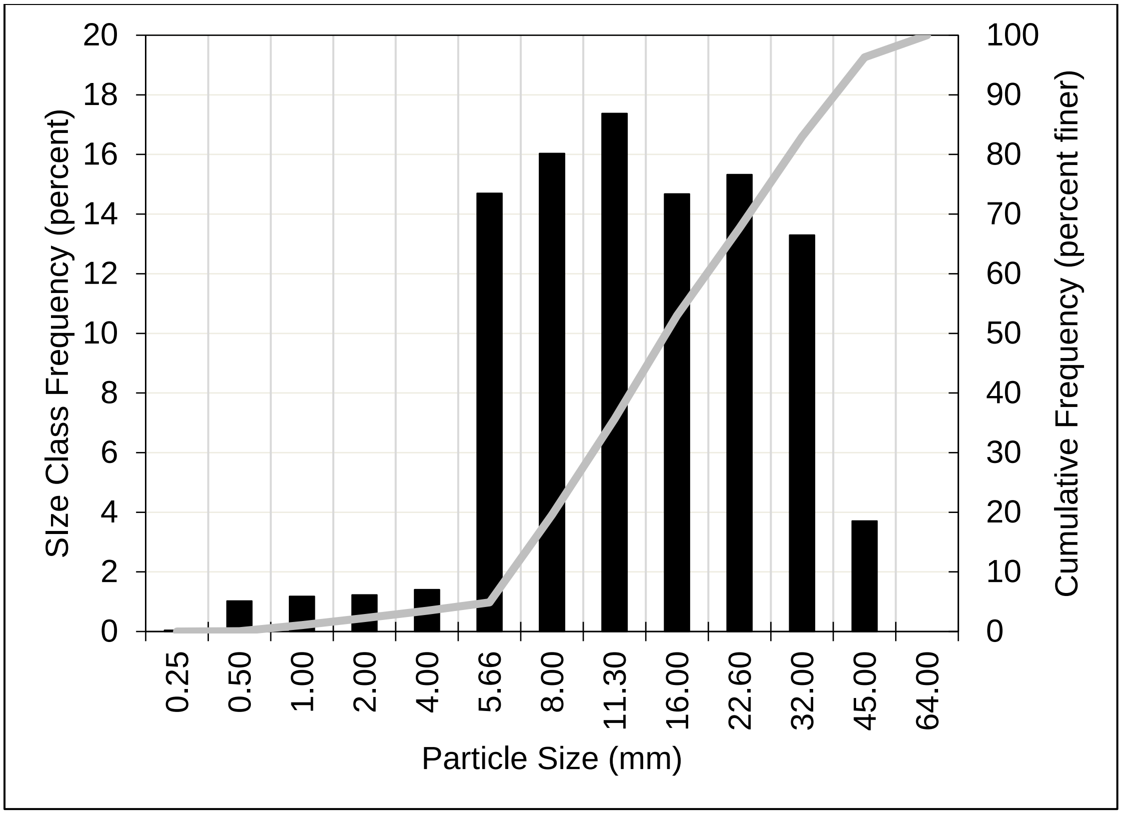

Figure A-24. East Fork Kaweah River Downstream of the Kaweah No. 1 Diversion: Histogram and Cumulative Particle Size Distribution, Sample 2 Subsample 2

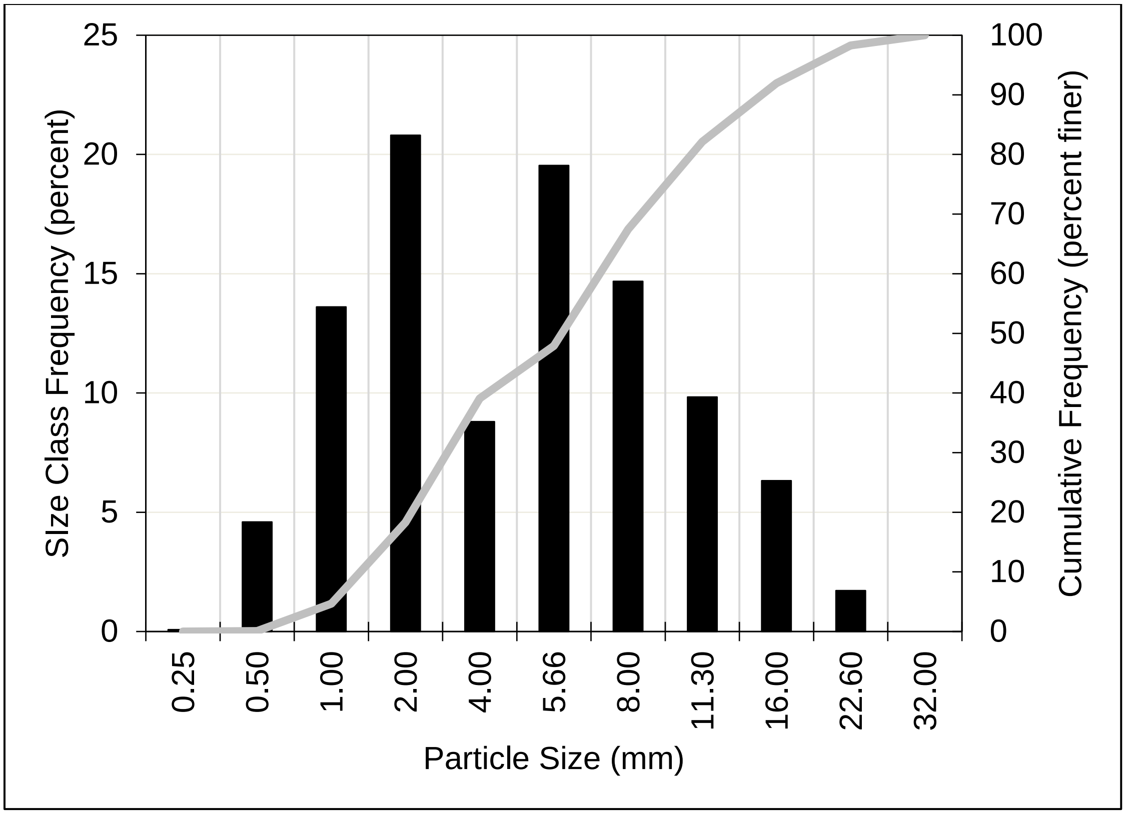

Figure A-25. **East Fork Kaweah River Upstream of Confluence with Kaweah River: Histogram and Cumulative Particle Size Distribution, Sample 1 Subsample 1**

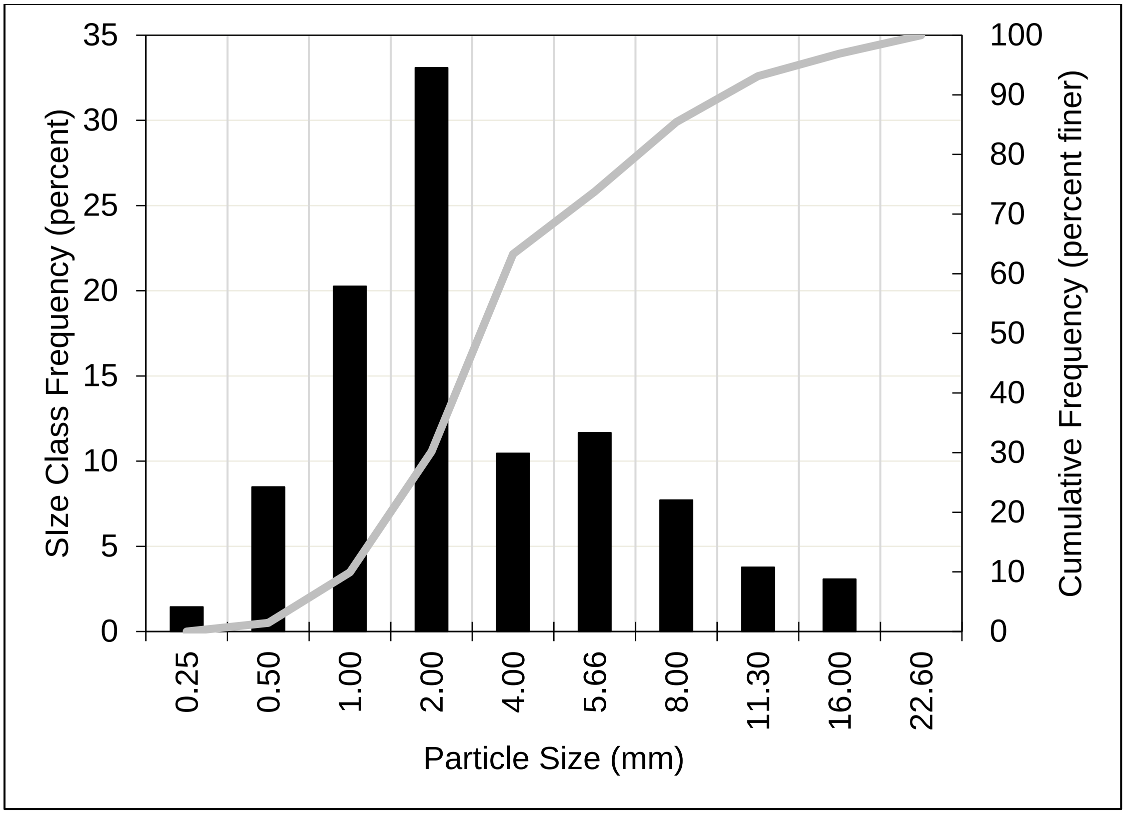

Figure A-26. East Fork Kaweah River Upstream of Confluence with Kaweah River: Histogram and Cumulative Particle Size Distribution, Sample 1 Subsample 2

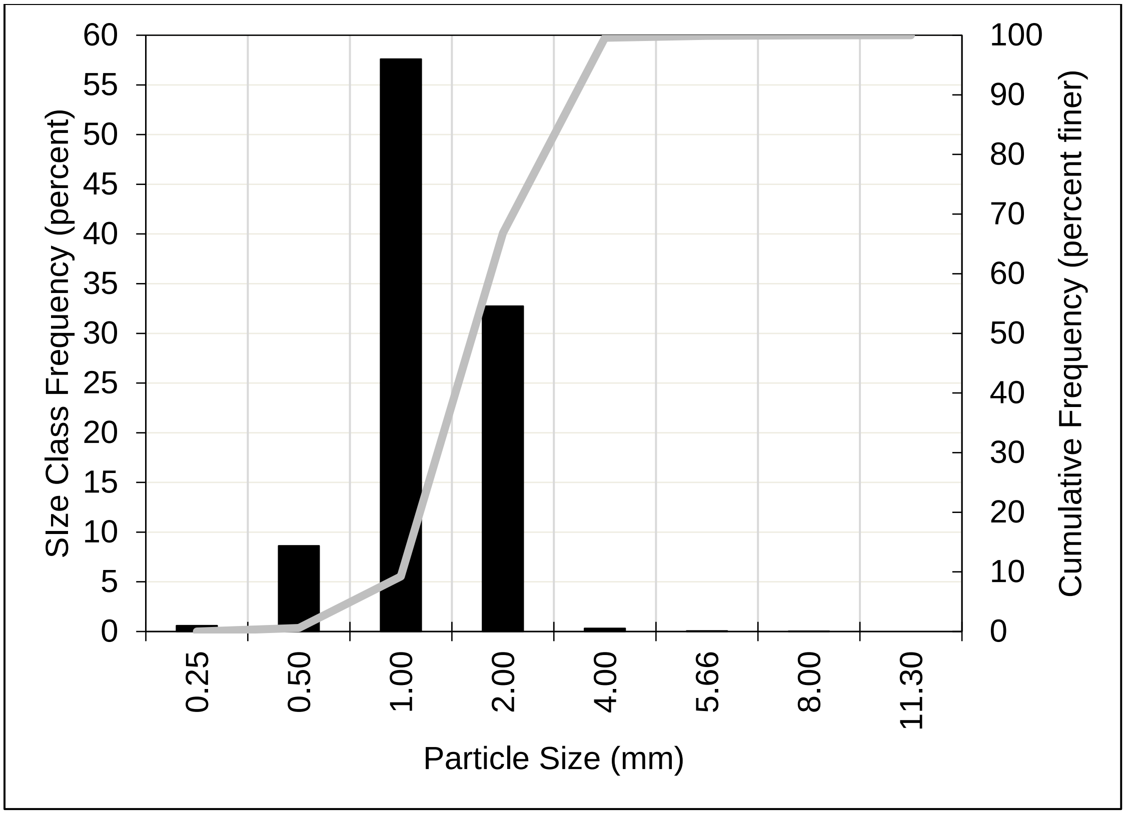

Figure A-27. East Fork Kaweah River Upstream of Confluence with Kaweah River: Histogram and Cumulative Particle Size Distribution, Sample 2 Subsample 1

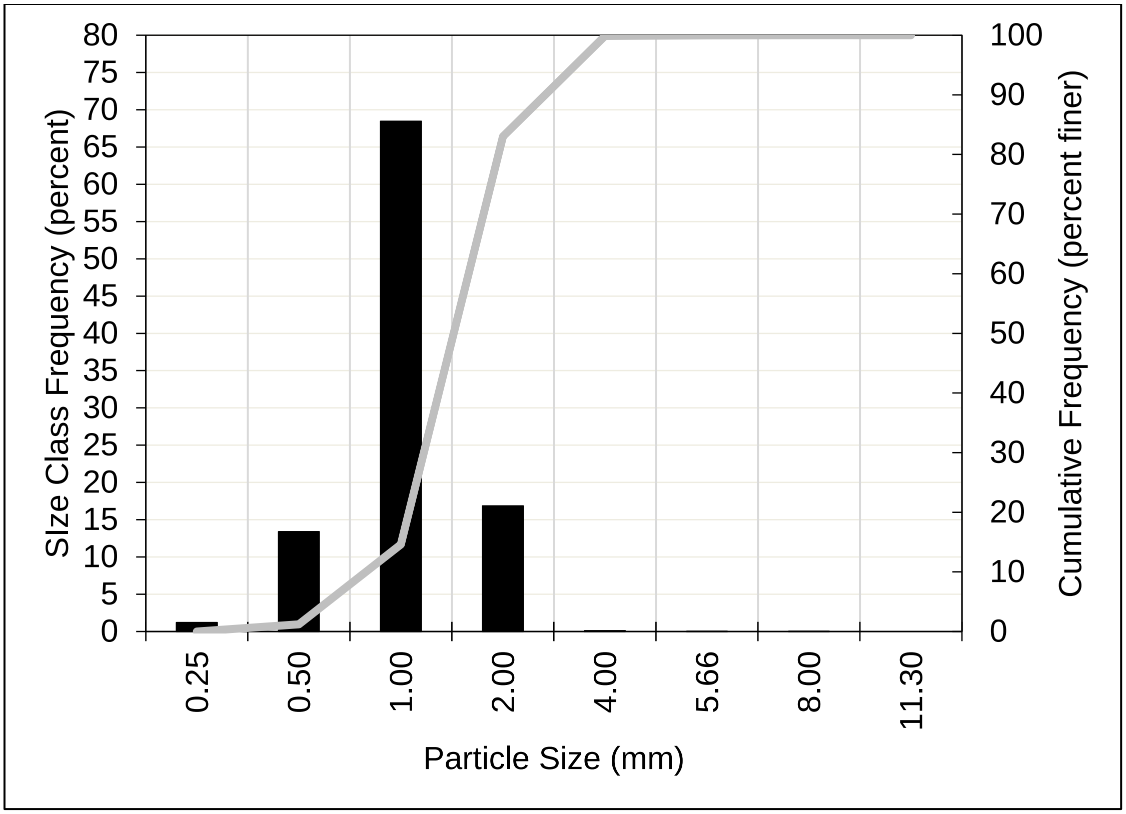

Figure A-28. **East Fork Kaweah River Upstream of Confluence with Kaweah River: Histogram and Cumulative Particle Size Distribution, Sample 2 Subsample 2**

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LIST OF ACRONYMS

BLM	Bureau of Land Management
MCV	Manual of California Vegetation
PAD	Pre-Application Document
SCE	Southern California Edison
USDA	U.S. Department of Agriculture
W&SR	Wild and Scenic River
WY	Water Year

7.8 RIPARIAN RESOURCES AFFECTED ENVIRONMENT

This section describes the riparian resources along the bypass reaches and around diversion pools, forebays, and flowlines associated with the Kaweah Project (Project). The bypass reaches associated with the Project include the Kaweah River from the Kaweah No. 2 Diversion to the Kaweah No. 2 Powerhouse Tailrace and the East Fork Kaweah River from the Kaweah No. 1 Diversion to the confluence with the Kaweah River.

Riparian and wetland habitats along the bypass reaches, diversion pools, and flowlines provide habitat for a variety of amphibians, wildlife, and avian species (BLM 2010; SCE 2019a; SCE 2019b; SCE 2019c; Tetra Tech 2010). Riparian corridors provide valuable habitat for many species, including nesting birds, and provide value as cover near water sources and travel corridors for a multitude of wildlife species. Special-status plants and wildlife that may occur in or use riparian areas are discussed in Section 7.5 – Botanical and Wildlife Resources. Amphibian and aquatic species that also use or are influenced by riparian and wetland habitats are described in Section 7.4 – Fish and Aquatic Resources.

Hydrology and geomorphology information pertinent to the discussion of riparian resources are summarized in this section. Detailed information on hydrology and geomorphology are discussed in Sections 7.2 – Water Use and Hydrology and 7.7 – Geomorphology, respectively.

7.8.1 Information Sources

The information presented in this section was developed using the following information sources:

- Environmental Assessment Number CA 160-07-032 Environmental consequences of managing vegetation for 3 year increments as proposed by Southern California Edison on Bureau of Land Management (BLM) property associated with the Southern California Edison - FERC 298 - Kaweah Hydroelectric Power Conduit Flowlines #1 and #3 (BLM 2010);
- A Manual of California Vegetation (MCV) (Sawyer et al. 2009);
- Wild and Scenic River (W&SR) Suitability Report for Bakersfield Field Office, California (Tetra Tech 2010);
- Riparian vegetation mapping in the Project vicinity by SCE in July 2015 included in SCE's Pre-Application Document for the Kaweah Project (SCE 2016);
- AQ 1 – Instream Flow Technical Study Report (AQ 1 – TSR) (SCE 2019a), which is included in Supporting Document A (SD A);
- TERR 1 – Botanical Resources Technical Study Report (TERR 1 – TSR) (SCE 2019b), which is included in SD A;

- TERR 2 – Wildlife Resources Technical Study Report (TERR 2 – TSR) (SCE 2019c), which is included in SD A; and
- AQ 5 – Geomorphology Technical Study Report (AQ 5 – TSR) (SCE 2019d), which is included in SD-A.

7.8.2 Riparian and Wetland Resources Associated with the Project

Riparian and wetland habitats along the bypass reaches and around the diversion pools, forebays, and flowlines associated with the Project were mapped from helicopter (in 2015) and/or field surveys (in 2018) (SCE 2016; SCE 2019a, SD A). Field surveys were conducted at selected representative riparian study sites within the bypass reaches to provide a more detailed assessment of the riparian communities in relation to flow and geomorphic conditions (SCE 2019a, SD A). Riparian mapping included in TERR 1 – TSR (SCE 2019b, SD A) supplemented the data collected as part of the riparian studies.

No wetlands and meadows occur in areas that would be hydrologically supported by the bypass reaches, forebays, or flowlines. Riparian vegetation associated with the bypass reaches, flowlines, and diversion pools are described below.

7.8.2.1 Riparian Vegetation along Bypass Reaches

The distribution and abundance of riparian resources along the bypass reaches associated with the Project were mapped from helicopter at a landscape-scale (SCE 2016). As part of the surveys, information on community composition and the distribution of dominant species was also collected. The mapping was focused on characterizing the distribution of woody riparian flow-dependent species that would be most sensitive to Project operations (e.g., cottonwoods [*Populus fremonii*], willows [*Salix* spp.], alders [*Alnus rhombifolia*], and sycamores [*Platanus racemosa*]). The distribution pattern of vegetation was mapped as polygons (wide corridors), continuous (long, narrow corridors), discontinuous (sporadic vegetation with a long reach), or sparse (no or only one or two individuals within a long reach). The general age classes of riparian trees and shrubs were also mapped during these surveys. Specifically, the presence of seedlings, young, medium-aged, or mature individuals[1] was mapped within each of the communities along the river reaches. The community composition and age structure data collected at the riparian study sites on the bypass reaches occurred at a finer scale and focused on assessing species distributions and characteristics in relation to the fluvial geomorphic regime (SCE 2019a, SD A). Observations of encroachment, riparian recruitment, unusual mortality, land use, and invasive species were made during the surveys at the study sites and during the helicopter survey. Additional information on the approaches for these surveys is provided in SCE (2016) and SCE (2019a, SD A).

[1] Age class structure was based on categories of shrub stem densities per individual and tree diameters, as follows: Seedlings (S); Young (Y): shrubs with less than 10 stems per individual or trees with diameters (diameter at breast height [DBH]) less than 3 inches; Medium-aged (M): shrubs with between 10 and 60 stems per individual or trees with DBHs between 3 and 9 inches; and Old/Mature (O): shrubs with more than 60 stems per individual or trees with DBHs greater than 9 inches.

A summary of riparian resources along each of the bypass reaches, including the distribution pattern of the dominant riparian species along the reaches; riparian corridor width and substrate; vegetation distribution and community composition; age class structure and regeneration; and riparian and inundation relationships is provided in Table 7.8-1. A list of all species identified during the riparian studies is available in the AQ 1 – TSR (SCE 2019a, SD A).

Distribution and Abundance

Riparian habitat occurred along approximately 3.5 linear miles or 51% of the total river miles along the bypass reaches, occurring primarily in discontinuous narrow corridors along the channel (2.7 miles) (Table 7.8-2). The remaining 49% of the bypass reaches were sparsely vegetated with scattered riparian trees and shrubs. The distribution and abundance of the riparian vegetation along the bypass reaches are shown on Map 7.8-1.

The confined valley walls and bedrock and/or coarse substrate characteristic of the East Fork Kaweah River and along the Kaweah Reach from river mile (RM) 9 to RM 6 limit the establishment of riparian vegetation in these reaches. The narrow valley bottom and steep side slopes also restrict the development of a riparian corridor adjacent the channel. Small alluvial and colluvial deposits that collect in low velocity areas behind boulders and near tributary confluences along these river segments are potential locations for riparian colonization, establishment, and development. Sparse or discontinuous narrow corridors of riparian vegetation were generally present within these reaches (Table 7.8-2; Map 7.8-1). Wide corridors of riparian vegetation were relatively uncommon upstream of RM 6. Downstream of RM 6, the valley bottom broadens, with wide or narrow corridors of riparian vegetation established along the channel and floodplain (Table 7.8-2; Map 7.8-1).

The riparian communities along the bypass reaches were primarily comprised of native species. The common woody riparian species included various willow species, white alder, cottonwoods, and California sycamores. Willows and alder were the dominant woody riparian species. Fremont cottonwood and California sycamore trees were common associates within the community. A diversity of understory species were identified within the riparian corridor and adjacent floodplain, including California mugwort (*Artemisia douglasiana*), tall flatsedge (*Cyperus eragrotis*), California brickelbush (*Brickellia californica*), smooth scouring rush (*Equisetum laevigatum*), deergrass (*Muhlenbergia rigens*), western panic grass (*Panicum acuminatum*), and California wild grape (*Vitis californica*). Spanish broom (*Spartium junceum*) and Himalayan blackberry (*Rubus armeniacus*) were observed along the Project bypass reaches (SCE 2019a, SD-A). The uplands bordering the riparian corridor were typically comprised of various oak species, often interspersed with California buckeye. The distribution and abundance patterns of the dominant species along the bypass reaches are summarized in Table 7.8-1. The majority of species encountered in the surveys were native species (SCE 2019a, SD A).

Age Structure and Regeneration

A diversity of age classes, including seedlings and young individuals, was present within the majority of the riparian communities along the bypass reaches. Based on the surveys, the communities along the bypass reaches were predominately comprised of mature individuals or mixed age classes (young, mature, and older individuals). Young individuals and seedlings were observed on the gravel and cobble deposits and among the boulders along the channel margins. Many of the bars along the Kaweah River are comprised of coarse material and are at elevations that are infrequently inundated and high above summer groundwater depths, and are not suitable to support riparian vegetation (discussed further in sub-section Riparian Resources and Hydrologic Regime Relationships below). Age class structure along the bypass reaches is summarized in Table 7.8-1.

Comparison Reaches

Riparian vegetation distribution and abundance and community composition and age structure on the bypass reaches were compared to the riparian vegetation on river segments upstream of Project diversions (East Fork Kaweah River and Kaweah River) and downstream of Project operations (Kaweah River below Kaweah Powerhouse No. 2). In general, riparian vegetation distribution and abundance along the channel, community composition and age structure were similar between the bypass reaches and the appropriate comparison reaches. Additional results of the comparison analyses are available in the AQ 1 – TSR (SCE 2019a, SD A).

Riparian Resources and Hydrologic Regime Relationships

The patterns of riparian vegetation establishment and distribution along a river are created by the interaction of physical processes (e.g., flows of varying magnitudes, timing of flows, flow recession rates, flow and depth to water table variability, and sediment deposition) and the different life history characteristics of the dominant species. The woody riparian species present along the bypass reaches have many life history adaptations that promote their success under dynamic and episodic, yet seasonally predictable, hydrologic conditions.

High magnitude, infrequent flow events (scouring flows) maintain the channel by scouring banks and the channel bed, and are important for maintaining channel complexity. These events create areas for new colonization by riparian species and maintain the compositional and structural diversity of the riparian community. The scouring flows also are important for limiting encroachment of riparian vegetation into the channel by scouring vegetation along the channel margins, which reduce the potential for berm development and channel narrowing. Riparian species can also readily reproduce vegetatively from downed or abraded limbs and trunks and root sprouts, as well as twig or root pieces deposited during a high flow event, which enables these species to rapidly re-establish following scouring flood events.

The magnitude, timing, and flow recession of spring flows (recruitment flows) are important determinants for successful regeneration and establishment of riparian species. For successful recruitment to occur, flows that coincide with the release of seeds with suitable recession rates are necessary to provide sufficient moisture to the seedlings and sprouts. This hydrology may occur in the same year as the scouring flow or may occur several years later (Mahoney and Rood 1998; Dixon 2003, Karrenberg 2002; Merritt et al. 2009; Stella et al. 2013). Willows and cottonwoods, dominant species along the bypass reaches, release seeds in the spring, timed with the natural snowmelt hydrograph. These seeds are only viable for a short period of time (weeks), requiring suitable moisture and soil conditions to be present at the time of seed release. For seedlings to survive, flow recession rates must be slow and groundwater must be available through the dry summer. Recession rates from the spring flows cannot exceed the root growth rates of the seedlings.

Results from studies from the literature indicate that seedlings typically survive down ramping rates that range from 0.4 to 1.6 inches per day. Seedlings can survive down ramping rates up to 3.9 inches per day, depending on various factors such as species, substrate characteristics, and other sources of water (e.g., seeps, hillslope runoff, precipitation) (Braatne et al. 1996; Amlin and Rood 2002; Shaforth et al. 2017). The maximum depth to groundwater is a strong determinant of riparian survival; with results of studies in the literature indicating maximum groundwater depths between 6.5 and 8.5 feet (Braatne et al. 1996; Uchytil 1989b; Shaforth et al. 2017). Seedlings that establish too close to the channel where late summer and fall water is available are more susceptible to scouring and uprooting by subsequent high winter or spring flows. As a result, riparian vegetation often establishes in elevation zones where water is available during the drier months, but not too close to the base flow (summer and fall) channel where it is susceptible to damage by higher flows.

A summary of the life history strategies of the dominant woody riparian species (Fremont and black cottonwoods, white alder, willows, and California sycamore) present along the bypass reaches is provided in Table 7.8-3. The timing of seed dispersal of these common species is summarized in Table 7.8-4.

The hydrology associated with riparian vegetation (scouring and recruitment flows and recession rates) and the position of vegetation along the channel (frequency, duration, and width and depth of inundation) were evaluated during studies conducted for the relicensing (AQ 1 – TSR [SCE 2019a, SD A]). As discussed earlier, riparian trees and shrubs of various ages (young, medium-aged, mature) were present along all the bypass reaches, indicating the flows that promote successful establishment and survival have occurred along these reaches. Scouring flows, recruitment flows, and recession rates under existing conditions in the bypass reaches are described below.

SCOURING FLOWS

The results of the geomorphology and riparian studies (AQ 5 – TSR [SCE 2019d, SD A] and AQ 1 – TSR [SCE 2019a, SD A]) indicated that sediment/channel conditions and the riparian community in the bypass reaches were being maintained by the high flow regime under existing conditions. Although young woody riparian was established among the boulders along the margins of the channel, neither encroachment of mature woody tree nor berm development were observed along the bypass reaches, which can occur if the magnitude and frequency of high flow events that are capable of mobilizing larger substrate and scouring riparian vegetation are reduced. To evaluate the potential effects of the existing Project on the magnitude of these events, the existing and unimpaired five-year recurrence interval flow (Q5)[2] during the period of record (water year [WY] 1994-2018) was compared for each of the reaches (Table 7.8-5). The Project has minimal effect on the magnitude of scouring flows - the difference between the unimpaired and existing Q5 flow at this magnitude in the bypass reaches was 1.2% or less.

RECRUITMENT FLOWS

Recruitment flows were evaluated for the spring/early summer (May–June; seed dispersal and setting period) time period. For this analysis, the recruitment flow for each reach was defined as the 1.5-year impaired recurrence interval flow (instantaneous peak flow basis; Q1.5). Table 7.8-6 identifies the number of days that the recruitment flows occurred in the bypass reaches in May and June[3] by WY type under existing and unimpaired flow conditions. Riparian recruitment may occur with lower magnitude flows, which would result in vegetation establishing closer to the low flow channel. The magnitude and frequency of flows that promote riparian recruitment were similar under existing and unimpaired flow conditions. In general, riparian recruitment flows in the bypass reaches occurred during normal WYs under both existing and unimpaired flow conditions. The Q1.5 flow was exceeded in May and June in about half of the normal WYs on the East Fork Kaweah River and in about one-third of the normal WYs in the bypass reaches on the Kaweah River. During May to June (months of seed setting for the dominant species), on average, the number of days the Q1.5 and Q2 flows were exceeded per year was two days or less on the Kaweah River and East Fork Kaweah rivers under existing and unimpaired flow conditions. The Q1.5 flow was exceeded for seven to eight days in May and 12 to 15 days in June, on average, in years in which the Q1.5 flow occurred under existing conditions and for eight to nine days in May and 13 to 15 days in June, on average, under unimpaired flow conditions. Seedlings and young woody riparian

[2] The 5-year recurrence interval flow (Q5), based on instantaneous peak flow data, was selected to represent a flow that would scour the channel. Based on the results of the relicensing studies (AQ 1 – TSR [SCE 2019a, SD A]; AQ 5 –TSR [SCE 2019d, SD A]), the Q5 flow for each reach is estimated to be able to mobilize the channel bed (McBain and Trush 1997; Schmidt and Potyondy 2004) and is within the range of high flows that are typically associated with large-scale cottonwood and willow regeneration in the literature (i.e., Mahoney and Rood 1998; Shafroth et al. 2017).

[3] The number of days that exceeded the Q1.5 flow (based on instantaneous flow data) was determined from average daily flows. This is a conservative estimate for the number of days that flows of this magnitude occur.

individuals were observed along all the bypass reaches, indicating that recruitment is occurring under the existing flow regime.

RECESSION RATES

Recession rates of spring/early summer flows during the time of spring seed release and seed setting (during the receding limb of the hydrograph) were evaluated for normal WYs at the riparian study sites. Details describing this analysis, including graphs showing the recession rates during normal WYs, are available in AQ 1 – TSR (SCE 2019a, SD A). Recession rates downstream from all the Project diversions were within the range identified in the literature for seedling survival success (less than 3.9 inches per day). Rates were typically one inch or slower per day during the spring snowmelt recession (Table 7.8-2 and 7.8-3 and Figure B2 AQ 1 – TSR; SCE 2019a, SD A).

7.8.2.2 Riparian Vegetation around Project Flowlines

The flowlines are comprised of elevated flume, concrete-lined ditch, or enclosed pipe sections that do not support riparian or wetland habitats. Riparian vegetation was present within many of the drainages that are crossed by the Kaweah No. 1 and No. 2 flowlines. This riparian vegetation is supported by natural runoff. Natural springs and seeps have also been identified along the flowlines that support riparian/wetland habitats (BLM 2010).

7.8.2.3 Riparian Vegetation around Project Diversion Pools

The Project includes two relatively small diversion pools behind the Kaweah No. 1 Diversion Dam and the Kaweah No. 2 Diversion Dam. The Kaweah No. 1 Diversion Pool has a design and current capacity of approximately 0.03 ac-ft. The Kaweah No. 2 Diversion Pool has a design capacity of approximately 1–2 ac-ft. Over time, this diversion pool has filled in with sediment and it currently has a capacity of approximately 0.2 ac-ft. The pools are approximately 0.1 mile in length. The channels at the diversion pools are comprised of bedrock and large boulders, similar to the channel downstream. Riparian vegetation was discontinuously distributed along the diversion pools, with a total 0.15 mile mapped along the banks of the diversion pools.

Discontinuous narrow patches of willows occurred along the Kaweah No. 1 Diversion Pool (Map 7.8-1). Along the Kaweah No. 2 Diversion Pool, the riparian vegetation was distributed in discontinuous narrow patches of willows and white alder, with scattered California sycamore and Fremont cottonwood (Table 7.8-7). The distribution and composition of the riparian vegetation in the vicinity of the Project, including around the diversion pools are shown on Map 7.8-1.

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TABLES

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Table 7.8-1. Summary of Riparian Vegetation Community Characteristics along the Bypass Reaches

Riparian Corridor Width[1]	Riparian Corridor Substrate[2]	Vegetation Distribution and Community Composition[3]	Age Structure and Regeneration[1]	Vegetation Position and Recession Rates[1]
Kaweah River Downstream of Kaweah No. 3 Powerhouse and Upstream of the East Fork Kaweah River Confluence				
Ranging from 25 to 80 feet, where vegetation was present.	Stream banks and adjacent areas: Bedrock and boulder, with small patches of cobbles and gravels.	Distribution: Discontinuous narrow corridor (0.6 mi, 100% of the reach). Dominant Species: White alder and willows commonly associated with California sycamore trees and scattered Fremont cottonwood trees. Percent cover (44%) is fairly low, with homogenous stands of vegetation within the study site. Other common species included buttonbush, California brickelbush, tall flatsedge, and western panic grass. Community Composition: 31 plant species identified. Percent Native Species: 81%; Spanish broom was observed within the study site.	Age Class Structure: Mix of older and mature willows, alders, and California sycamore shrubs and trees, with younger Fremont cottonwood individuals. Regeneration: Young willows, white alders, and Fremont cottonwoods were observed on small gravel pockets among boulders along the channel.	At the study site, willow-dominated communities occurred along the channel margins. Communities with white alder, cottonwood, and/or California sycamore trees were typically established on higher, less frequently inundated surfaces. Higher floodplain and bar surfaces and bedrock sections were sparsely vegetated. Recession rates during spring runoff were typically slower than 1.6 inches per day.
Kaweah River Downstream of East Fork Kaweah Confluence and Upstream of Kaweah No. 1 Powerhouse				
Ranging from 20 to 80 feet, where vegetation was present.	Stream banks and adjacent areas: Boulder-dominated, with small gravel and cobble deposits along the channel margins.	Distribution: Discontinuous narrow corridor (1.85 mi, 100% of the reach). Dominant Species: White alder and willows, interspersed with Fremont cottonwood, California sycamore, and Oregon ash trees, with approximately 71% cover where vegetation was present. Other species present included buttonbush, California brickelbush, common spikerush, and smooth scouring rush. Community Composition: 33 plant species identified. Percent Native Species: 76%; Spanish broom was observed within the study site.	Age Class Structure: Mix of older and mature willow shrubs and white alder and Fremont cottonwood trees, with older California sycamore trees in the canopy. Regeneration: Younger willow and cottonwood individuals and seedlings were observed among the boulders along the channel margins, and finer substrate deposits.	At the study site, willow-dominated communities occurred along the channel margins. Communities with white alder, cottonwood, and/or California sycamore trees were typically established on higher, less frequently inundated surfaces. Higher boulder-dominated floodplain and bar surfaces were sparsely vegetated. Recession rates during spring runoff were typically slower than 1.6 inches per day.
Kaweah River Downstream of Kaweah No. 1 Powerhouse and Upstream of Kaweah No. 2 Powerhouse				
Typically ranging from 40 to 80 feet, where vegetation was present; with wide corridors where the river bottom widens (greater than 250 feet in width).	Stream banks and adjacent areas: Gravel and cobble-dominated bars.	Distribution: Wide corridors (0.97 mi, 64% of the reach), with segments of narrow continuous (0.3 mi, 20% of the reach) and discontinuous (0.25 mi, 16% of the reach) corridors. Dominant Species: Willow and alder dominated, interspersed with cottonwood and California sycamore, with 56% cover where vegetation was present. Other common species observed included Oregon ash and buttonbush. Community Composition: 36 plant species identified. Percent Native Species: 70%.	Age Class Structure: Primarily mature willow, alder, and cottonwood trees, interspersed with older California sycamore trees. Regeneration: Younger willow and white alder individuals and seedlings were observed among the boulders along the channel margins, and finer substrate deposits.	At the study site, willow-dominated communities occurred along the active stream margins. Alder, cottonwood, and California sycamore communities, typically with willows, were established higher on the bank and bar surfaces. The high bar surfaces were sparsely vegetated. Recession rates during spring runoff were typically slower than 1.6 inches per day.

Riparian Corridor Width[1]	Riparian Corridor Substrate[2]	Vegetation Distribution and Community Composition[3]	Age Structure and Regeneration[1]	Vegetation Position and Recession Rates[1]
East Fork Kaweah River Downstream of the Kaweah No. 1 Diversion				
Ranging from 25 to 75 feet, where vegetation was present.	Stream banks and adjacent areas: Primarily boulder and bedrock, with small deposits of cobbles and gravels.	Distribution: Sparsely distributed (3.3 mi, 70% of the reach), with shorter segments with wide continuous (0.1 mi, 3% of the reach) or narrow discontinuous (1.2 mi, 27% of the reach) corridors. Dominant Species: Primarily willows and white alder, interspersed with California sycamore and cottonwood trees with intermittent cover along the channel (with 43% cover where vegetation was present). Other common species present included buttonbush, white bark raspberry, and Himalayan blackberry. Community Composition: 26 plant species identified. Percent Native Species: 88%.	Age Class Structure: Primarily mature willows, alder and cottonwoods, interspersed with older willows, and alder and California sycamore trees. Regeneration: Young willow and alder individuals and seedlings were observed on the finer substrate deposits.	At the study sites, there was a relatively narrow transition zone between the areas that were infrequently and frequently inundated along the stream channel. The riparian community was laterally distributed from the stream banks to the edge of the hillslopes. Recession rates during spring runoff were typically slower than 1.6 inches per day.

Notes:

[1] At the study sites (AQ 1 - TSR) (SCE 2019a, SD A).

[2] Also summarized in AQ 1 - TSR (SCE 2019a, SD A); AQ 5 - TSR (SCE 2019d); and SCE (2016).

[3] Vegetation distribution information within the reach reported in SCE (2016) and dominant species, community composition, age class, and native species data at the study sites was reported in AQ 1 - TSR (SCE 2019a, SD A).

Table 7.8-2. Summary of Riparian Vegetation along the Bypass Reaches

Reach	Dominant and Associated Riparian Species	Distribution Percent Within Reach (miles)			
		Wide Corridor	Narrow Continuous Corridor	Narrow Discontinuous Corridor	Sparse
Kaweah River Downstream of Kaweah No. 3 Powerhouse					
Kaweah River Downstream of Kaweah No. 3 Powerhouse and Upstream of the East Fork Kaweah River Confluence	Alder/willow with associated sycamore and cottonwood	--	--	100% (0.6 mi)	--
Kaweah River Downstream of East Fork Kaweah Confluence and Upstream of Kaweah No. 1 Powerhouse	Alder/willow with associated sycamore and cottonwood	--	--	100% (1.85 mi)	--
Kaweah River Downstream of Kaweah No. 1 Powerhouse and Upstream of Kaweah No. 2 Powerhouse	Alder/willow with associated sycamore and cottonwood	64% (0.97 mi)	20% (0.3 mi)	16% (0.25 mi)	--
East Fork Kaweah River Downstream of the Kaweah No. 1 Diversion					
East Fork Kaweah River Downstream of the Kaweah No. 1 Diversion	Alder	--	--	--	3% (0.16 mi)
	Alder/willow with associated sycamore	3% (0.13 mi)	--	14% (0.64 mi)	21% (0.99 mi)
	Alder and willow	--	--	13% (0.6 mi)	46% (2.18 mi)

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Table 7.8-3. Life History Strategies of Dominant Woody Riparian Species Found in the Study Area

Attribute		Cottonwood Fremont	Willow	Alder White	California Sycamore
Initiation[1]					
Reproduction	Flowering Timing	March to June (Stella et al. 2006)	April to May; depends on location/ elevation and species (USDA-FS 2009; Zasada et al. 2009)	March (Harrington et al. 2009)	February to April (Baldwin et al. 2012)
	Seed Dispersal Timing	Seed Dispersal Timing is provided in Table 7.8-4			
	Seed Dispersal Agent[2]	Hydrochoric and anemochoric			Primarily anemochoric, also hydrochoric and zoochoric
	Asexual Traits	Crown breakage and flood-related disturbance (e.g. tree fall) (Braatne et al. 1996)	Root sprouts and sprouting of broken stem and root pieces transported during high flows, and layering of stems (Zasada et al. 2009)	Root or trunk resprouting; layering (Uchytil 1989a)	Can reproduce from root crown
Germination and Establishment[3]	Seed Viability (in natural conditions)	1 to 3 weeks (as cited in Braatne et al. 1996)	A few days to a week, no more than 3 weeks (Anderson 2006)	Not a limiting factor (e.g. many months) (Harrington et al. 2009)	Not a limiting factor
	Germination	24 hours in moist, bare soil (Braatne et al. 1996)	12 to 24 hours (USDA-FS 2009; Karrenberg et al. 2002)	Can germinate immediately in favorable conditions (Uchytil 1989a and 1989b)	Germinates quickly in moist conditions
	Seedling Root Growth Rate (and Recession Rate Associated with Establishment)	Seedling root growth rate: 4 to 12 mm/day (as cited in Braatne et al. 1996); can reach 40 cm length in 30 days (Braatne et al. 1996) Recession rate: 2.5 to 4 cm/day (up to 10 cm/day) (Mahoney and Rood 1998; Amlin and Rood 2002; Roberts et al. 2002; Stella et al. 2006)	Recession rate: 1 to 2.5 cm/day (Amlin and Rood 2002)	Rapid (similar to cottonwoods with water table declining rates of 1 to 3 cm/day); require continuously moist substrates to successfully establish (Uchytil 1989a and 1989b; USDA-NRCS 2009; as cited in Braatne et al. 1996)	Similar to cottonwoods
Dormant Season	Rooting Depth of Sapling, first growing season	75 to 150 cm (Braatne et al. 1996)	40 to 60 cm (Karrenberg et al. 2002)	Root growth rates similar to cottonwoods	Similar to cottonwoods
Maturation[4]					
	Age at Reproductive Maturity	5 to 10 years (as cited in Braatne et al. 1996)	5 to 10 years (Zasada et al. 2009)	10 years, can be earlier (Harrington et al. 2009)	6 to 7 years
	Rooting Depth of Mature Stands/ Depth to Groundwater	3 to 5+ m (as cited in Braatne et al. 1996)	Less than 3 m	1 m (Uchytil 1989b)	Less than 1 m (USDA-NRCS 2019)
	Lifespan	130+ years (as cited in Braatne et al. 1996)	Varies depending on species. Stems survive 10 to 20 years (USDA-FS 2009)	100 years	200+ years
	Tree Height (mature tree)	12 to 35 m (USDA-NRCS 2008)	Variable, depends on species	15 to 24 m (Uchytil 1989a)	20 to 35 m (CNPS 2019)
	Diameter at Breast Height (mature tree)	30 to 150 cm USDA-NRCS 2008)	Variable, depends on species	28 to 60 cm (Uchytil 1989a)	up to 1 m (CNPS 2019)
Germination/Recruitment Microsite Characteristics					
	Depth to Water Table or Elevation above Baseflow	Elevation above baseflow: 1 to 3 m (Mahoney and Rood 1998; Roberts et al. 2002)	Elevation above baseflow: 0.6 to 3 m (Mahoney and Rood 1998; Jamison and Braatne 2001)	Elevation above baseflow: 0.4 m above baseflow (Lisle 1989)	Maximum depth to water table, 1.5 to 4.5 m (TNC 1998)
	Substrate	Bare, moist sandy, humous, or gravelly soils - with silts and clays	Bare, moist sandy, humous, or gravelly soils - with silts and clays	Sunny, wet mineral sites exposed from receding flood waters; cobbles, gravels and sands (Uchytil 1989a and 1989b)	Sunny, coarse, medium textured substrate near water (USDA-NRCS 2019)
	Location on Floodplain	Point bars, cut off channels, lower terraces	Point bars and cut off channels; water's edge	Sandbars or other fresh alluvium exposed by receding flood waters (Uchytil 1989a and 1989b)	Sand and gravel bars, alluvial surfaces near rivers and streams (USDA-NRCS 2019)

[1] Initiation refers to seed dispersal, germination, and initial seedling growth.
[2] Hydrochoric: water-dispersed; Anemochoric: wind-dispersed; Zoochoric: animal-dispersed.
[3] Establishment refers to the continued survival and growth of seedlings and saplings over several years until the tree reaches maturity.
[4] Maturity (sexual) occurs once a tree begins to flower and produce seed.

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Table 7.8-4. Timing of Flowering and Seed Dispersal for Common Woody Riparian Species in the Study Area

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Seed Dispersal[1]												
COTTONWOODS												
Fremont Cottonwood (*Populus fremontii)*												
Lower Yuba River												
Sacramento River												
Sacramento River												
San Joaquin and Tuolumne Rivers												
Trinity River												
Black Cottonwood (*Populus balsamifera)*												
Trinity River												
SYCAMORES												
California sycamore (*Platanus racemosa*)												
Sacramento River												
ALDERS												
White Alder (*Alnus rhombifolia)*												
San Joaquin and Tuolumne Rivers												
Trinity River										peak		
Mountain Alder (*Alnus incana* ssp. *tenuifolia)*												
WILLOWS												
Arroyo Willow (*Salix lasiolepis)*												
San Joaquin and Tuolumne Rivers												
Trinity River												
Dusky Willow (*Salix melanopsis*)												
Lower Yuba River												
Gooding's Willow (*Salix gooddingii)*												
San Joaquin and Tuolumne Rivers												
San Joaquin and Tuolumne Rivers												
Lower Yuba River												
Red Willow (*Salix laevigata*)												
Lower Yuba River												
Shining Willow (*Salix lasiandra* var. *lasiandra)*												
Trinity River												
Narrowleaf Willow (*Salix exigua)*												
Trinity River												
San Joaquin and Tuolumne Rivers												
San Joaquin and Tuolumne Rivers												
Lower Yuba River												

[1] References and elevation data for the different studies are:

- Lower Yuba River (<300 feet elevation) (SYRCL 2016)
- Sacramento River (TNC 1998)
- San Joaquin River and Tuolumne River (< 650 feet elevation) (Stella et al 2006)
- Sacramento River (< 300 feet elevation) (CALFED 1999)
- San Joaquin River (< 600 feet elevation) (as reported in McBain and Trush 2002)
- Sacramento River (< 300 feet elevation) (Roberts et al. 2002 (TNC))
- Trinity River (< ~1500 feet elevation) (McBain and Trush 1997)
- General Source (Uchytil 1989b and as cited in Braatne et al 1996 for POBA)
- General Source for flowers present (Baldwin et al 2012)

Table 7.8-5. Comparison of Peak Scouring Flows[1] under Unimpaired and Existing Flow Conditions (WY 1994–2018)

Study Site	Flow (cfs)		Percent Difference
	Existing	Unimpaired	
Kaweah River Downstream of Kaweah No. 3 Powerhouse			
Kaweah River Downstream of Kaweah No. 3 Powerhouse and Upstream of the East Fork Kaweah River Confluence	5,287	5,352	1.2%
Kaweah River Downstream of East Fork Kaweah Confluence and Upstream of Kaweah No. 1 Powerhouse	7,643	7,712	0.9%
Kaweah River Downstream of Kaweah No. 1 Powerhouse and Upstream of Kaweah No. 2 Powerhouse	7,701	7,712	0.1%
East Fork Kaweah River Downstream of the Kaweah No. 1 Diversion			
East Fork Kaweah River Downstream of the Kaweah No. 1 Diversion	2,348	2,357	0.4%

[1] The 5-year recurrence interval flow (Q5), based on instantaneous peak flow data, was selected to represent a flow that would scour the channel and vegetation within and adjacent to the channel. See Section 7.8.2 for additional discussion.

Table 7.8-6. Total Number of Riparian Recruitment Days (May and June Only) and Average Number of Recruitment Days per Year by Water Year Type for Existing and Unimpaired Flow Conditions (WY 1994–2018)

Study Site	Flow Threshold (cfs)[1]	Water Year Type	Existing Conditions								Unimpaired Conditions							
			Total No. of Days		Average No. of Days[2]		Event Year Average No. of Days[3]		No. of Months with Events / No. Months in WY Type		Total No. of Days		Average No. of Days[2]		Event Year Average No. of Days[3]		No. of Months with Events / No. Months in WY Type	
			May	Jun	May	Jun	May	Jun	May	Jun	May	Jun	May	Jun	May	Jun	May	Jun
Kaweah River Downstream of Kaweah No. 3 Powerhouse																		
Kaweah River Downstream of Kaweah No. 3 Powerhouse and Upstream of the East Fork Kaweah River Confluence	1,632	Normal	27	73	2	4	7	15	4/18	5/17	35	90	2	5	9	15	4/18	6/17
		Dry	1	0	0.1	0	1	0	1/7	0/8	1	0	0.1	0	1	0	1/7	0/8
Kaweah River Downstream of East Fork Kaweah Confluence and Upstream of Kaweah No. 1 Powerhouse	2,365	Normal	39	90	2	5	8	13	5/18	7/17	47	99	3	6	9	14	1/7	0/8
		Dry	0	0	0	0	0	0	0/7	0/8	0	0	0	0	0	0	0/7	0/8
Kaweah River Downstream of Kaweah No. 1 Powerhouse and Upstream of Kaweah No. 2 Powerhouse	2,434	Normal	36	86	2	5	7	12	5/18	7/17	41	94	2	6	8	13	5/18	7/17
		Dry	0	0	0	0	0	0	0/7	0/8	0	0	0	0	0	0	0/7	0/8
East Fork Kaweah River Downstream of the Kaweah No. 1 Diversion																		
East Fork Kaweah River Downstream of the Kaweah No. 1 Diversion	717	Normal	52	112	3	7	7	14	7/18	8/17	58	119	3	7	8	15	7/18	8/17
		Dry	0	0	0	0	0	0	0/7	0/8	0	0	0	0	0	0	0/7	0/8

[1] Impaired Q1.5.

[2] Total number of event days/ number of months in water year type.

[3] Total number of event days/ number of months with events in water year type.

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Table 7.8-7. Summary of Riparian Vegetation around Project Diversion Pools

Location	Total Miles of Discontinuously Vegetated Bank	Total Miles of Bank
Kaweah No. 1 Diversion Pool	0.14	0.14
Kaweah No. 2 Diversion Pool	0.01	0.01

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MAPS

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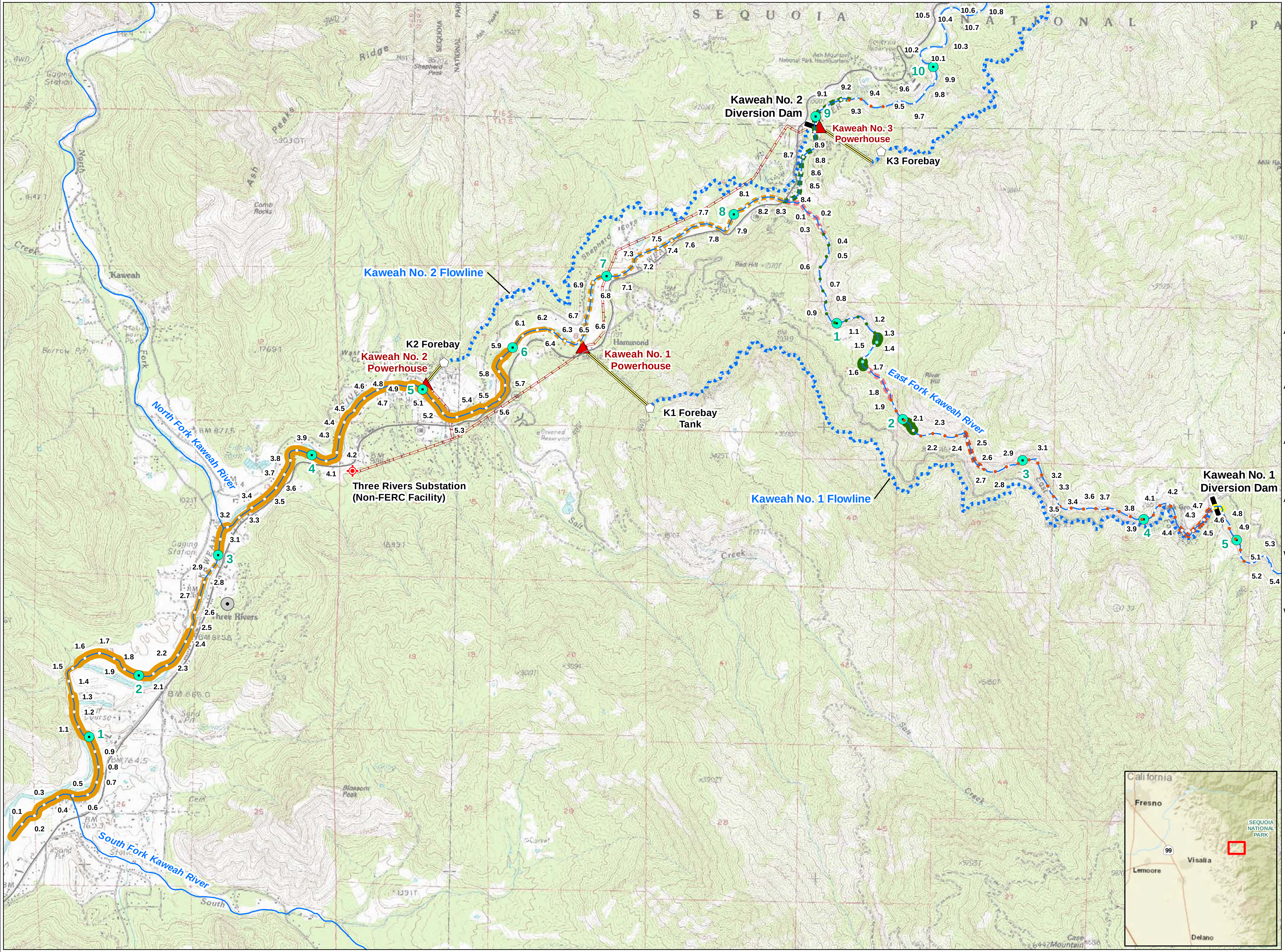

SCE Facilities

- Powerhouse
- Diversion
- Forebay
- Flowline
- Penstock
- Transmission Line

Other Features

- City/Town
- Highway/Road
- Watercourse
- Water Body
- River Mile
- River Mile (1/10th)

Riparian Community Types and Distribution Patterns

Alder
- Sparse
- Discontinuous Narrow Corridor
- Continuous Narrow Corridor
- Continuous Wide Corridor

Alder and Willow
- Sparse
- Discontinuous Narrow Corridor
- Continuous Narrow Corridor
- Continuous Wide Corridor

Alder and Willow with Sycamore
- Sparse
- Discontinuous Narrow Corridor
- Continuous Narrow Corridor
- Continuous Wide Corridor

Alder and Willow with Sycamore and Cottonwood
- Sparse
- Discontinuous Narrow Corridor
- Continuous Narrow Corridor
- Continuous Wide Corridor

Willow
- Sparse
- Discontinuous Narrow Corridor
- Continuous Narrow Corridor
- Continuous Wide Corridor

Willow with Alder, Sycamore and Cottonwood
- Sparse
- Discontinuous Narrow Corridor
- Continuous Narrow Corridor
- Continuous Wide Corridor

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Map 7.8-1

Distribution of Riparian Vegetation along the Bypass Reaches

Date: 5/13/2019

0 500 1,000 2,000 Feet

Projection: UTM Zone 11
Datum: NAD 83

C:\GIS\Cardno\30735240_SCE_EasternHydro\map\Kaweah\RiparianMaps\SCE_Eastern_KAWEAH_Riparian_Reaches_SpeciesDist_17i11i_01.mxd

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List of Acronyms

ACEC	Areas of Critical Environmental Concern
BLM	Bureau of Land Management, U.S. Department of the Interior
BMP	Best Management Practices
CDF	California Department of Forestry
CDFW	California Department of Fish and Wildlife (formerly known as CDFG)
CNDDB	California Natural Diversity Database
DOC	Department of Congress
ERMA	Extensive Recreation Management Area
FERC or Commission	Federal Energy Regulatory Commission
FRAP	Fire Resource and Assessment Program
IMP	Interim Management Policy
JK	John Krebs Wilderness Area
KCNP	Kings Canyon National Park
NPS	National Park Service
NRI	Nationwide Rivers Inventory
PAD	Pre-Application Document
PCT	Pacific Crest Trail
Project	Kaweah Project
RMP	Resource Management Plan
SCE	Southern California Edison Company
SD	Supporting Document
SKC	Sequoia Kings Canyon
SNP	Sequoia National Park
TSR	Technical Study Report
UDB	Urban Development Boundary
USACE	U.S. Army Corps of Engineers
W&SR	Wild and Scenic Rivers
WSA	Wilderness Study Area
WUI	Wildland Urban Interface

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7.9 LAND USE AFFECTED ENVIRONMENT

This section describes land use in the vicinity of the Kaweah Project (Project). The Federal Energy Regulatory Commission (FERC or Commission) regulations require the applicant to provide information regarding both land use and recreation. This section focuses on describing pertinent land management plans and policies that govern land uses within and adjacent to the FERC Project boundary. Recreation facilities, opportunities, and use are described in Section 7.10 – Recreation Resources.

7.9.1 Information Sources

This information presented in this section was developed using the following sources:

- Bureau of Land Management, U.S. Department of the Interior (BLM) Bakersfield Field Office Resource Management Plan (RMP) (BLM 2014);
- Tulare County General Plan 2030 (Tulare County 2012);
- Three Rivers Community Plan 2018 Update (Tulare County 2018);
- Final General Management Plan and Comprehensive River Management Plan, Sequoia and Kings Canyon National Parks, Middle and South Forks of the Kings River and North Fork of the Kern River (NPS 2006);
- Milk Ranch Case Mountain Wilderness Study Report (CA-010-023) (BLM no date);
- Nationwide Rivers Inventory (NRI) (NPS 2011);
- Omnibus Public Land Management Act of 2009 (Public Law 111-11);
- Wild and Scenic River (W&SR) Suitability Report for Bakersfield Field Office, California (Tetra Tech 2010);
- Various state and federal agency websites;
- Pre-Application Document (PAD) for the Kaweah Project (SCE 2016); and
- LAND 3 – Land Use Technical Study Report (TSR) (SCE 2019), which is included in Supporting Document (SD) A.

7.9.2 Setting

The Project is situated in the foothills and mountainous uplands of the western slope of the southern Sierra Nevada. All of the facilities under FERC jurisdiction are located along the Kaweah River upstream of the community of Three Rivers, and on the East Fork Kaweah River, a tributary to the Kaweah River, on private lands or on public lands administered by the BLM. Lake Kaweah, owned and operated by the U.S. Army Corps of Engineers (USACE), is located southwest of the Project, approximately five river miles downstream of the Kaweah No. 2 Powerhouse. The Sequoia National Park (SNP) and Sequoia Kings Canyon Wilderness Area are located immediately north and east of the Project, and the John Krebs Wilderness Area is located southeast of the Project. The primary Project facilities and land jurisdictions are shown on Map 7.9-1.

The Project facilities and bypass reaches associated with the Project are accessible via State Highway 198, which parallels the Kaweah River, and the Mineral King Road, which parallels the East Fork Kaweah River. These two roadways also serve as the primary access routes into the SNP and the Sequoia Kings Canyon and John Krebs Wilderness Areas, respectively (refer to Map 7.9-1).

The land encompassing the Project facilities is rural in nature and sparsely populated, especially along the East Fork Kaweah River. With approximately 2,200 people, the largest population center in the vicinity of the Project is the community of Three Rivers, which is located approximately 2 miles southwest of the Kaweah No. 2 Powerhouse (US DOC 2010). The community of Hammond is located near the confluence of the Kaweah River and the East Fork Kaweah River. The community of Oak Grove is located in the immediate vicinity of the Kaweah No. 1 Diversion and associated structures. Individual homes are scattered throughout the Kaweah River Valley, particularly in the lower foothills.

7.9.3 Land Management Within the FERC Project Boundary

The existing FERC Project boundary encompasses a total of approximately 321 acres of land, which is comprised of land owned by SCE, land owned by other private parties, and public lands managed by the BLM.

Public lands under BLM jurisdiction are subject to the goals, objectives, and management actions contained in the Bakersfield Field Office Resource Management Plan (Bakersfield RMP) (BLM 2014). Lands located on private property are subject to the provisions contained in the Tulare County General Plan (Tulare County 2012) and Three Rivers Community Plan 2018 Update (Tulare County 2018). These management plans are briefly described below.

7.9.3.1 BLM Bakersfield Field Office Resource Management Plan

In December 2014, the BLM approved the Bakersfield RMP and Record of Decision which provides direction for managing public lands under the administrative jurisdiction of the BLM’s Bakersfield Field Office in an eight-county region of central California, including the Project vicinity. The 2014 Bakersfield RMP revised the previous Caliente RMP (BLM 2007) that covered BLM lands in the vicinity of the Project. The Bakersfield RMP provides an updated assessment of resources; a review of land uses, conditions, and trends; a forum for enhanced public collaboration and involvement; and a comprehensive impact analysis of reasonable management alternatives and resulting land use decisions.

In addition, the Bakersfield RMP identifies Best Management Practices (BMPs) to be implemented for projects undertaken in the planning area. BMPs described in the RMP are a compilation of existing policies, guidelines, and commonly employed practices designed to assist in achieving the objectives for maintaining or minimizing water quality degradation from nonpoint sources; minimizing loss of soil productivity; providing guidelines for maintaining aesthetic conditions within watersheds; and mitigating impacts to soil, vegetation, or wildlife habitat from surface disturbing activities.

7.9.3.2 Tulare County General Plan

Activities on private land within Tulare County are subject to the provisions contained in the Tulare County General Plan 2030 Update (Tulare County 2012). The Tulare County General Plan 2030 Update provides a comprehensive, long-term plan for the future land use and physical development of the County through the year 2030. The Plan promotes healthy sustainable growth while protecting agricultural lands by directing growth to urban areas. The General Plan Update consists of policies that set forth objectives, principles, and standards that guide future land use decisions within the County.

Within the Tulare County General Plan there are three Area Plans for each of the major geographic areas in the county: Rural Valley Lands Plan; Foothill Growth Management Plan; and Mountain Framework Plan. The Project is located within the Foothill Growth Management Plan area which includes a statement of development policies and standards that prescribe land use and circulation patterns for the foothills of Tulare County, generally above 600 feet elevation.

7.9.3.3 Three Rivers Community Plan 2018 Update

Most of the Project facilities lie within a planning area referred to by Tulare County as the Three Rivers Urban Development Boundary (UDB). Land use within this UDB is managed according to provisions contained in the Three Rivers Community Plan 2018 Update (Tulare County 2018), which was adopted by the Tulare County Board of Supervisors on June 26, 2018. The Three Rivers Community Plan 2018 Update guides development within the Three Rivers UDB and includes specific provisions, goals, objectives, policies, and implementation measures for the physical development of the community of Three Rivers and the surrounding area through 2030. Land management associated with the Project, including for example, road maintenance and recreation facility development, must be consistent with the policies, goals, and objectives contained in the Three Rivers Community Plan 2018 Update.

7.9.4 Land Management Outside of the FERC Project Boundary

Land located outside of the FERC Project boundary primarily consists of private land or public land managed by the BLM or National Park Service (NPS). Plans that pertain to private land and public land under BLM jurisdiction are described above. Land in the vicinity of the Project within the SNP is managed by the NPS in accordance with the NPS Final General Management Plan, which is briefly described below.

7.9.4.1 NPS Final General Management Plan and Comprehensive River Management Plan

The purpose of the Final General Management Plan and Comprehensive River Management Plan (NPS 2006) is to provide management direction to establish and achieve a vision for what Sequoia and Kings Canyon National Parks should be, including desired future conditions for natural and cultural resources, as well as for visitor experiences. The purpose of the River Management Plan is to provide direction and overall guidance on the management of lands and uses within the river corridors. In accordance with the legislation, no development or use of park lands that is inconsistent with wild and scenic river designation may be undertaken.

7.9.5 Land Use Within the FERC Project Boundary

Land use within the FERC Project boundary primarily includes hydropower generation and a limited amount of dispersed recreation. The Project does not include any developed recreation facilities, but SCE allows the public to use a small parking area located adjacent to the Kaweah No. 2 Powerhouse to access a small beach on the Kaweah River, known locally as “Edison Beach”. The parking area is referred to as the Kaweah No. 2 Powerhouse River Access Parking Area.

7.9.5.1 Project Access Roads and Trails

The FERC Project boundary encompasses Project access roads and trails. Due to the prevalence of private property in the Project vicinity, some of the Project access roads are used by the general public to access private residences. In addition, some of the Project access roads and trails are used for dispersed recreation activities such as mountain biking, horseback riding, and hiking by local landowners. Public use of the Project access roads and trails is documented in the LAND 1 – Transportation System TSR provided in SD A (see Table LAND 1-6).

The Licensee is responsible for maintenance of the Project access roads and trails identified in Table 3-5. Accordingly, SCE regularly inspects Project access roads and trails during normal Project activities. Minor repairs are conducted on an as-needed basis and major repairs are implemented annually during late summer/fall. Vegetation management may be conducted concurrently with road and trail maintenance on an as-needed basis. Some of the Project access roads and trails cross land managed by the BLM. SCE’s road and trail management and maintenance practices and activities are described in detail in Section 3.0 – No-Action Alternative.

7.9.5.2 Safety Programs and Features

SCE maintains several programs and features that are specifically aimed at protecting public health and safety. In addition, SCE has installed a variety of features to help protect animals, including wildlife and livestock. SCE’s safety programs and features are described in Section 3.0 – No-Action Alternative.

At the request of the BLM, SCE inventoried and assessed the condition of the safety features that are present along the Kaweah No. 2 Flowline, the Kaweah No. 3 Flowline, the Kaweah No. 3 Forebay, and the Kaweah No. 1 Forebay Road. The results of this effort are provided in Appendix A of the LAND 3 – TSR, which is included in SD A. SCE inspects and maintains all of these features on a regular basis. Accordingly, as documented in Appendix A of the LAND 3 – TSR, almost all of these features are in good condition, meaning the feature is in new or like-new condition and functions as intended without signs of wear and/or deterioration.

7.9.5.3 Shoreline Management Plans

The Project does not include any reservoirs or impoundments. Therefore, a Shoreline Management Plan has not been developed or required for the Project.

7.9.6 Land Use Outside of the FERC Project Boundary

According the Three Rivers Management Plan 2018 Update, allowable land uses adjacent to the FERC Project boundary include: low, medium and high density residential; commercial recreation; resource conservation; and agricultural grazing. The entire Kaweah River corridor is designated floodway. Use of BLM land surrounding the Project facilities primarily includes dispersed recreation and livestock grazing, both of which must be conducted in accordance with the provisions outlined in the BLM Bakersfield RMP (BLM 2014).

7.9.6.1 Livestock Grazing

Livestock grazing is an authorized use of BLM-administered lands described in the RMP. Map 7.9-2 shows the grazing allotments present within the Watershed based on GIS data published by the BLM (BLM 2016). An allotment is a designated area of land available for livestock grazing.

SCE is not responsible for installing or maintaining fencing associated with BLM grazing allotments, referred to herein as cattle exclusion fencing. However, at the request of the BLM, SCE mapped the location and documented the condition of livestock exclusion fencing located in the vicinity of the Kaweah No. 2 and Kaweah No. 3 flowlines (including the associated forebays) and along an approximately 1.5-mile long segment of the Kaweah No. 1 Forebay Road (beginning at the locked gate on Craig Ranch Road). The results of this effort are depicted on Maps LAND 3-1a-j in the LAND 3 – TSR (SD A). As indicated on these maps, the existing livestock exclusion fencing that was mapped as part of the study effort is fragmented, discontinuous and generally in fair to poor condition. Note that fencing that may be present in the vicinity of the Kaweah No. 1 Flowline was not assessed because most of this flowline is elevated and is therefore not considered a hazard to cattle. In addition, the surrounding terrain is not conducive to cattle grazing.

Article 410 of the Kaweah Project License requires that SCE monitor livestock and wildlife mortality along the Kaweah No. 2 and Kaweah No. 3 flowlines. SCE is not required to monitor mortality along the Kaweah No. 1 Flowline because most of this flowline is elevated so the flowline is not considered a hazard to livestock and wildlife. As required, SCE has monitored and reported livestock and wildlife mortality on an annual basis since 1991. At the request of the BLM, these annual mortality reports were reviewed to identify any livestock mortality incidents that have occurred along the Kaweah No. 2 and Kaweah No. 3 flowlines since 1991, including date, species, locations, and other information, if available. In addition, SCE staff were interviewed to identify additional details.

A total of five livestock mortalities have occurred in the Kaweah No. 2 and Kaweah No. 3 flowlines since 1991, all of which were domestic cattle. Four of these mortalities occurred on the Kaweah No. 3 Flowline, and one on the Kaweah No. 2 Flowline. Table LAND 3-3 in the LAND 3 – TSR (SD A) provides additional information about each mortality including the date and animal size, based on records filed with the FERC. Wildlife mortality is addressed in Section 7.5 – Botanical and Wildlife Resources.

7.9.7 Specially Designated Areas

Several specially designated management areas are present in the Watershed. These specially designated areas are shown on Map 7.9-4 and are briefly described below

7.9.7.1 BLM Areas of Critical Environmental Concern

The BLM's Bakersfield RMP identifies areas requiring special management and protection as Areas of Critical Environmental Concern (ACEC). Portions of the Project are within and adjacent to the Kaweah ACEC (Map 7.9-3). In general, management policies in the Kaweah ACEC focus on: protection of natural resources, including habitat for sensitive species; and protection for various natural processes, geologic formations, and cultural resources. The goals, objectives, and policies for the Kaweah ACEC are identified below:

- **Goal:** Provide suitable habitat for sensitive species and protection for various natural processes, geologic formations, and cultural resources.

- **Objective:** Protect the Case Mountain giant sequoia groves, limestone caves and other karst features, riparian areas, and cultural resources. Manage habitat to support populations of California spotted owl, Pacific fisher, and Kaweah monkey flower.

7.9.7.2 BLM Extensive Recreation Management Area (ERMA)

The Bakersfield RMP designates portions of the area within the Kaweah ACEC in the vicinity of the Kaweah No. 1 Flowline as the Case Mountain Extensive Recreation Management Area (ERMA) (Map 7.9-3). The ERMA offers recreation opportunities in an unchanged middle country setting by allowing visitors to participate in non-motorized activities, including mountain biking, camping, hunting, wildlife and nature observation, photography, and picnicking.

A combination of topography of the region and surrounding private property has resulted in limited access to the Case Mountain ERMA. Three routes provide access, including off of Oak Grove Road (off Mineral King Highway), Craig Ranch Road/Salt Creek Road, and Skyline Drive. BLM recently improved public access to the Case Mountain ERMA by creating a new parking lot at the end of Skyline Drive. SCE utilizes Craig Ranch Road/Salt Creek Road to access the Kaweah No. 1 Forebay Tank and Flowline to conduct routine maintenance on a weekly basis.

7.9.7.3 National Wild and Scenic Rivers

The Kaweah River and its tributaries are not designated by Congress as Wild and Scenic Rivers in the W&SR System. However, the NPS and BLM determined that certain segments of the Kaweah River and its tributaries under their jurisdiction are eligible or suitable for inclusion in the National W&SR System (Map 7.9-4). None of the bypass reaches associated with the Project under FERC jurisdiction were found to be eligible or suitable for inclusion in the W&SR System.

The NPS found the following river segments eligible and suitable for inclusion in the National W&SR System (NPS 2006):

- Middle Fork Kaweah River from its headwaters to the confluence of the Marble Fork Kaweah River;[1]
- Marble Fork Kaweah River from its headwaters to the confluence of the Middle Fork Kaweah River;[2]
- Kaweah River from the confluence of the Middle and Marble forks of the Kaweah River to the SNP boundary;
- East Fork Kaweah River from its headwaters to the SNP boundary; and
- South Fork Kaweah River from its headwaters to the SNP boundary.

The BLM determined that a 2.5-mile long section of the North Fork Kaweah River outside of the SNP boundary is suitable for inclusion in the W&SR System (Tetra Tech 2010).

7.9.7.4 State Protected River Segments

The Kaweah River from the Kaweah No. 1 Powerhouse to Lake Kaweah is designated as a Central Valley drainage hardhead/pikeminnow stream and a California Natural Diversity Database (CNDDB) rare natural community (CDFW 2019). Although this segment has been designated as a rare natural community, it is still under review by the state to be assigned a rank (S1-S3). None of the rivers in the Watershed are designated as a Wild and Heritage Trout Water. In addition, none of the rivers in the Watershed are included in the California W&SR System.

[1] The Middle Fork Kaweah River is listed on the NRI.
[2] The Marble Fork Kaweah River is listed on the NRI.

7.9.7.5 National Trail System

The National Trails System is the network of scenic, historic, and recreation trails created by the National Trails System Act of 1968. The nearest national trail to the Project is the Pacific Crest Trail (PCT), which traverses the crest of the Sierra crossing through the SNP, east of the Project. At its closest point the PCT is located about 25 miles northeast of the Kaweah No. 2 Diversion Dam. With a few exceptions, the PCT is one continuous trail that extends more than 2,650 miles from Mexico to Canada.

7.9.7.6 National Parks

The nearest National Park to the Project is the SNP, which is located immediately north and east of the Project (Map 7.9-4). The SNP and adjacent Kings Canyon National Park (KCNP) are jointly administered by the NPS as the Sequoia and Kings Canyon National Park. The SNP is a popular recreation destination and visitation has steadily increased each year. The park is famous for its giant sequoia trees, one of which is the General Sherman tree, one of the largest trees on earth.

The SNP encompasses 404,064 acres of land, including the headwaters of the Kaweah River Watershed. The vast majority of the SNP is roadless wilderness. Most of the park is designated wilderness and is accessible only by foot or by horseback. No roads cross the Sierra Nevada within the park's boundaries.

7.9.7.7 Wilderness Areas

Two designated Wilderness Areas, the Sequoia Kings Canyon (SKC) Wilderness Area and the John Krebs (JK) Wilderness Area, are located in the vicinity of the Project. In addition, two BLM Wilderness Study Areas (WSA), the Milk Ranch/Case Mountain WSA and the Sheep Ranch WSA, are located in the vicinity of the Project. Each of these is briefly described in the following subsections. The location of these Wilderness Areas and WSAs are shown on Map 7.9-4.

Sequoia Kings Canyon Wilderness Area

The SKC Wilderness Area is located north and east of the Project within the SNP. The boundaries of this Wilderness Area are located near the Kaweah No. 1 Diversion and the Kaweah No. 2 Diversion (Map 7.9-4). The SKC Wilderness Area was originally established on September 28, 1984 as part of the California Wilderness Act of 1984 (Public Law 98-425) and was expanded in 2009 as part of the Omnibus Public Land Management Act of 2009 (Public Law 111-11) Combined, the SKC now includes 768,112 acres of land (UOM no date). Due to its location within the SNP, the SKC Wilderness Area is managed by the NPS.

John Krebs Wilderness Area

The JK Wilderness Area was established in 2009 as part of the Omnibus Public Land Management Act of 2009 (Public Law 111-11). The JK Wilderness Area includes 39,967 acres of land located within the SNP, bordered by the SKC Wilderness Area to the north and the Golden Trout Wilderness to the south east (UOM no date). The JK Wilderness Area is bisected by the East Fork Kaweah River but does not encompass any Project facilities. The nearest Project facility is the Kaweah No. 1 Diversion Dam, which is located approximately 2.3 river miles downstream of the JK Wilderness boundary (Map 7.9-4).

Milk Ranch/Case Mountain Wilderness Study Area

The BLM identified a WSA in the vicinity of the Kaweah No. 1 Diversion and the Kaweah No. 3 Flowline. This area is referred to as the Milk Ranch/Case Mountain WSA and encompasses 5,742 acres of land, divided across four parcels of land. The parcel closest to the Project facilities is called Milk Ranch and is bound by the Mineral King Road on the southwest and the SNP on the east. Located south of the Mineral King Road, the Kaweah No. 1 Flowline is within one-quarter mile of the WSA (Map 7.9-4). The BLM did not recommend that this WSA be designated a Wilderness Area under the Wilderness Act and has released the WSA for uses other than wilderness. The current status of the Milk Ranch/Case Mountain WSA is continued management in accordance with BLM Interim Management Policy (IMP) for Lands under Wilderness Review (BLM Handbook H-8550-1) until released from study status by Congress. If released, the Milk Ranch/Case Mountain area will be managed in accordance with the Kaweah ACEC, unless congressional release language provides other specific management guidelines.

Sheep Ranch Wilderness Study Area

The BLM Sheep Ranch WSA is located on the North Fork Kaweah River and encompasses 5,102 acres of land under BLM jurisdiction (BLM no date). As shown on Map 7.9-4, this WSA is not located in the immediate vicinity of any Project facilities. The BLM did not recommend that this WSA be designated a Wilderness Area under the Wilderness Act and has released the WSA for uses other than wilderness. The current status of the Sheep Ranch WSA is continued management in accordance with BLM IMP for Lands under Wilderness Review (BLM Handbook H-8550-1) until released from study status by Congress. If released, the Sheep Ranch area will be managed in accordance with the Kaweah ACEC, unless congressional release language provides other specific management guidelines.

7.9.8 Fire History and Fuels Management

Throughout California, communities are increasingly concerned about wildfire safety as increased development occurs in the foothills and mountain areas, and subsequent fire control measures have affected the natural cycle of the ecosystem. Suppression of natural fires allows the understory to become dense, creating the potential for larger and more intense wildland fires. Wind, steepness of terrain, and naturally volatile or hot-burning vegetation contribute to wildland fire hazard potential. The threat of wildland fires also increases as the terrain in Tulare County becomes increasingly steep in the foothills and mountains.

The Project facilities lie within the Kaweah Battalion of the California Department of Forestry's (CDF) Tulare Unit. According to the Tulare Unit Strategic Fire Plan (CDF 2018a), the Tulare Unit has a low frequency of large damaging fires and the Kaweah Battalion averages approximately 8 to 15 fire starts annually (CDF 2018a). Lightening tends to be a common fire cause in the higher elevations (CDF 2018a). Although rare, starts in the upper elevations pose a significant potential for large wildland fires due to the abundance of fuels and rugged terrain (CDF 2018a). Fires greater than 500 acres that have occurred in the Kaweah River Watershed during each decade since 1970, based on information in the Fire Resource and Assessment Program (FRAP) database (CDF 2018b) are shown on Map 7.9-5. The largest fires in the immediate vicinity of the Project since 1970 were the Case Fire which occurred in 1987 and consumed about 4,500 acres and the Kaweah Fire which occurred in 1996 and consumed about 4,650 acres (Map 7.9-5).

In Tulare County, fuels management in the vicinity of the Project is accomplished through vegetation management programs, including local landowner defensible space programs, public education, and reduction of overcrowded timber stands. The latter is being implemented by either Timber Harvest Plans or one of several timber exemptions. In addition, BLM's Bakersfield Field Office has an active fuels management program, supporting both prescribed fire and non-fire fuel treatments. Prescribed fire treatments are planned to break up continuous fuel beds and concentrations of dead or decadent fuels and are typically implemented in the Wildland Urban Interface (WUI). Non-fire fuel treatments are conducted in several areas, especially next to the WUI and within high visitor use areas, such as recreation areas and administrative sites. Treatments include mowing, cutting, and chipping vegetation, cutting and piling vegetation for future burning, and mechanically breaking down vegetation on-site.

To reduce fire hazards associated with Project facilities, SCE implements regular maintenance activities, including vegetation management and hazard tree removal. Vegetation management includes trimming by hand and with equipment, and herbicide use to provide adequate buffer around facilities. In addition, SCE removes trees posing a threat to facilities and which could become a fire hazard. A detailed description of Project facility maintenance activities and the locations and timing of their implementation is provided in Section 3.0 – No-Action Alternative.

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MAPS

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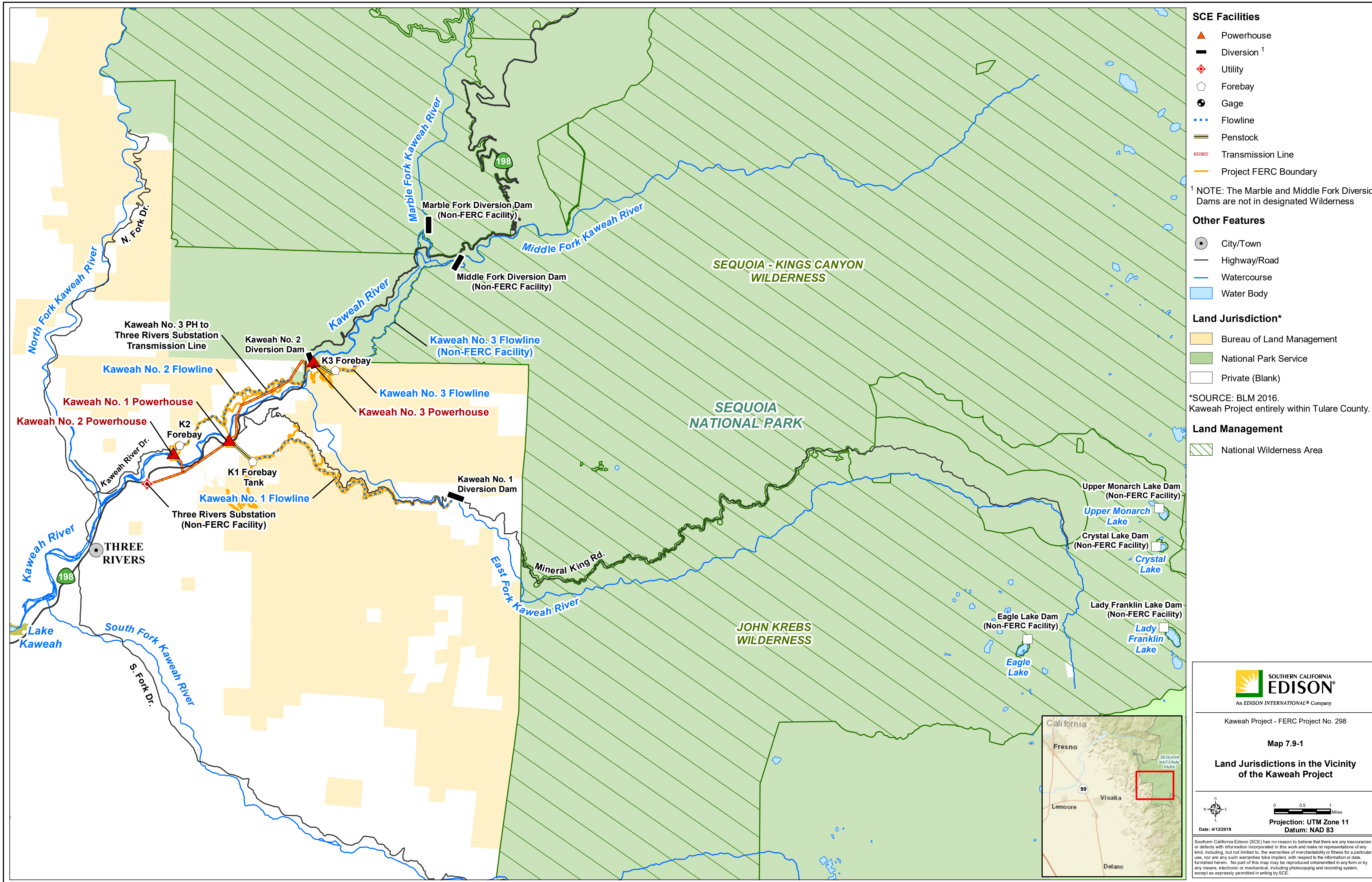

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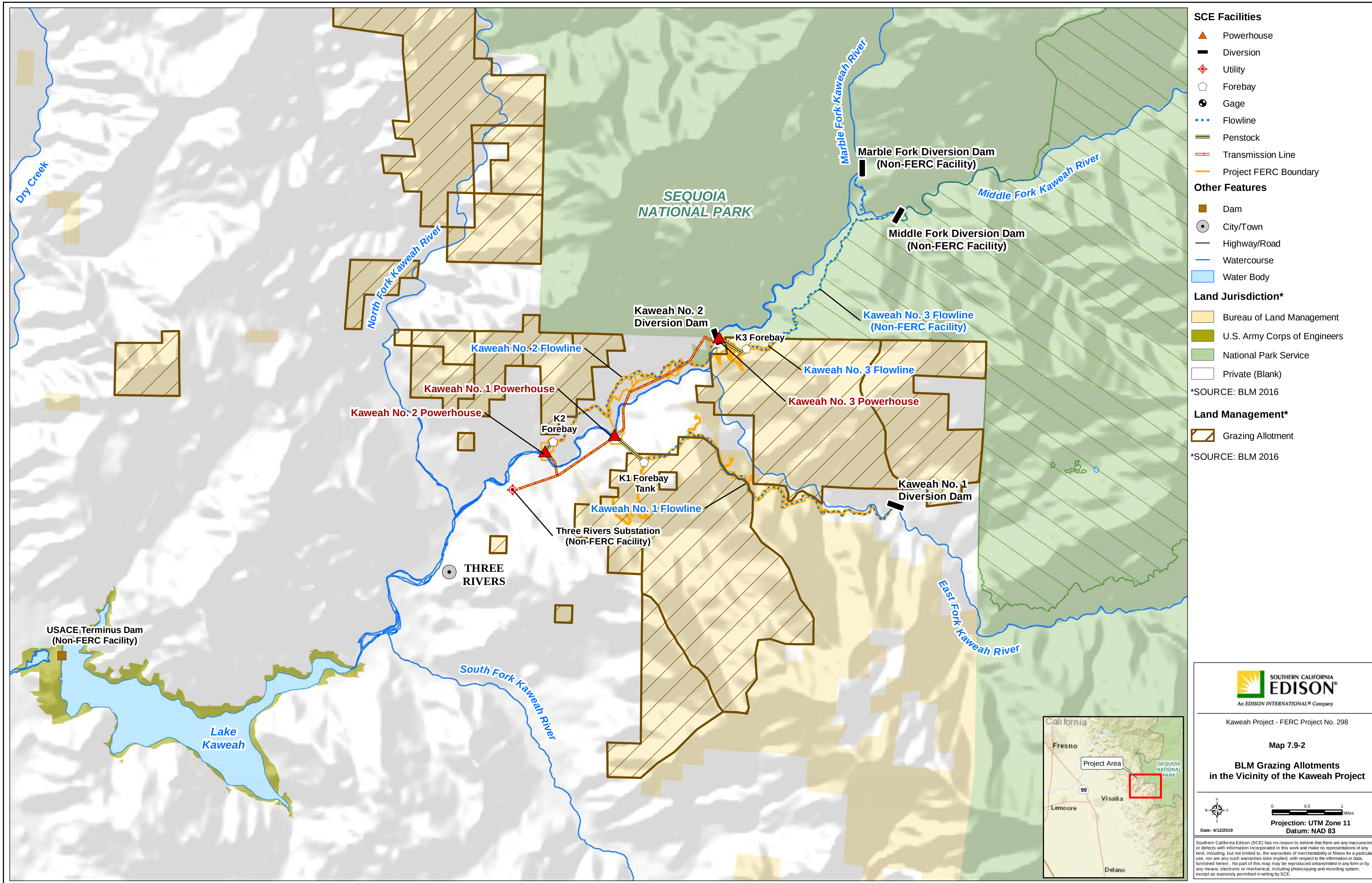

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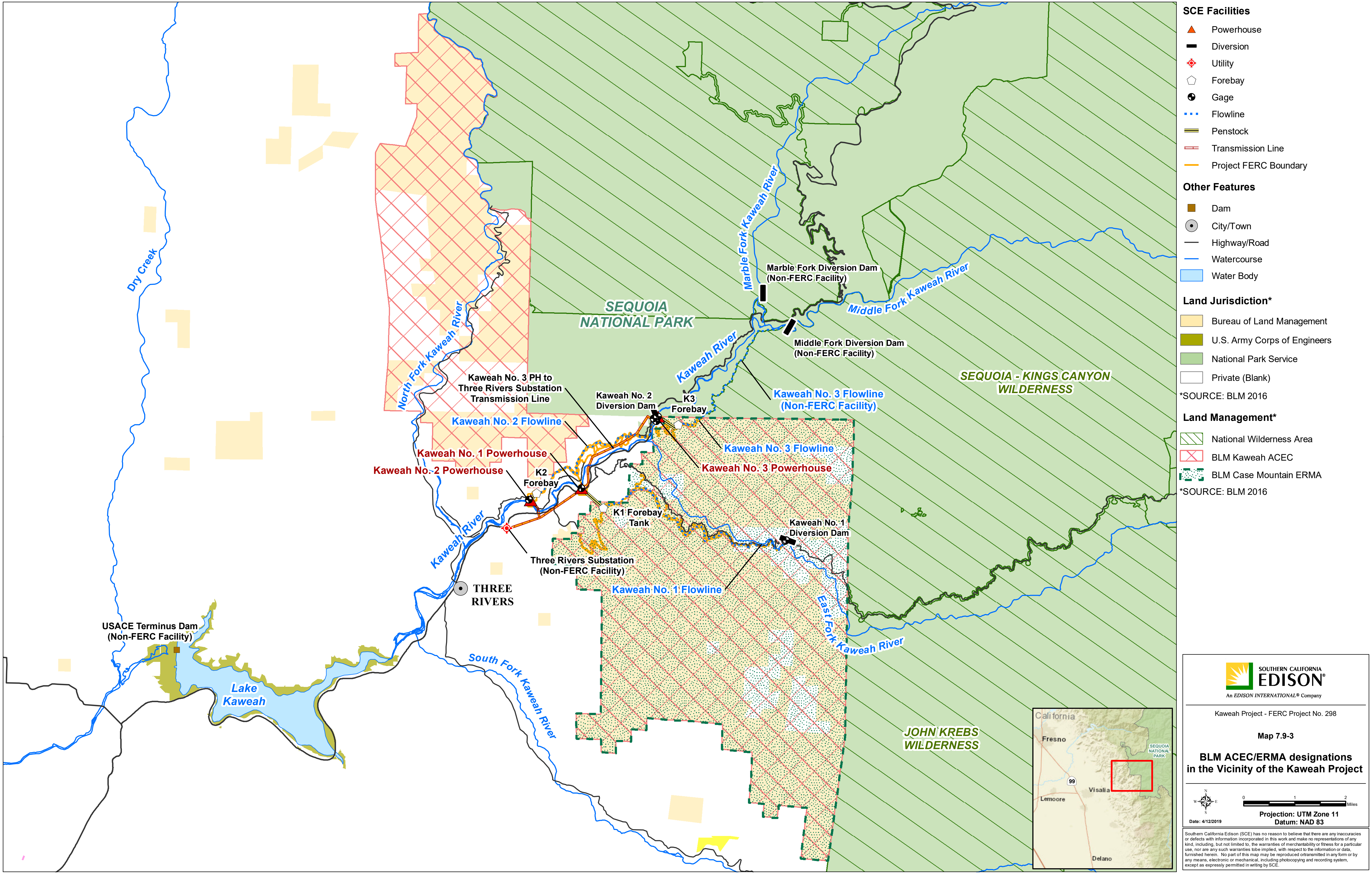

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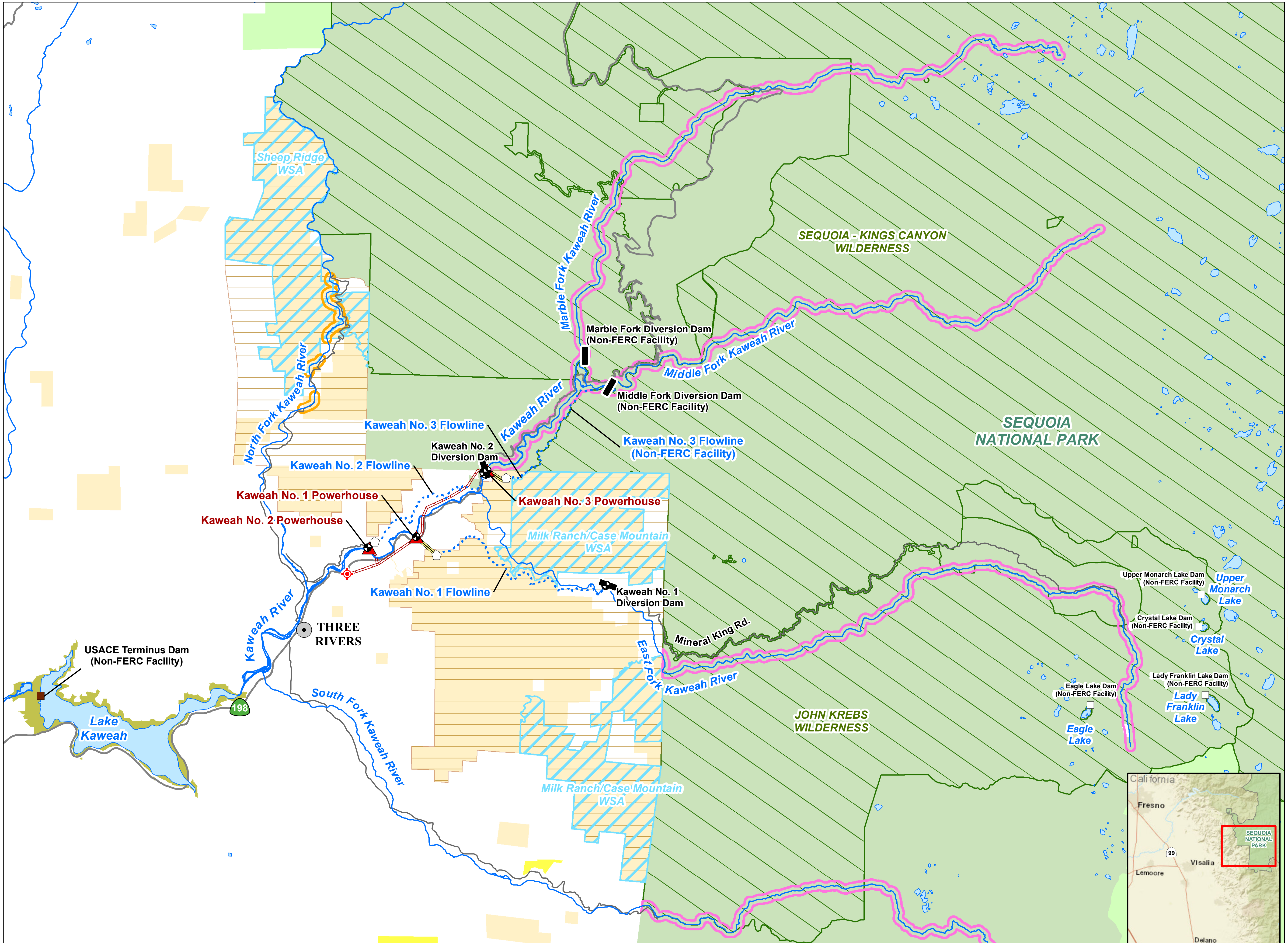

SCE Facilities

- Powerhouse
- Diversion
- Dam
- Utility
- Forebay
- Gage
- Flowline
- Penstock
- Transmission Line

Other Features

- Dam
- City/Town
- Highway/Road
- Watercourse
- Water Body

Land Jurisdiction*

- Bureau of Land Management
- U.S. Army Corps of Engineers
- National Park Service
- Private (Blank)

*SOURCE: BLM 2016

Land Management*

- National Wilderness Area
- BLM Wilderness Study Area (WSA)
- BLM Area of Critical Environmental Concern

*SOURCE: BLM 2016

Wild and Scenic Rivers

- NPS Study River found suitable for inclusion in the Wild and Scenic River System
- BLM Study River found suitable for inclusion in the Wild and Scenic River System

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Kaweah Project - FERC Project No. 298

Map 7.9-4

Specially Designated Management Areas in the Kaweah River Watershed

N W E S

0 0.5 1 2 Miles

Date: 4/12/2019

Projection: UTM Zone 11
Datum: NAD 83

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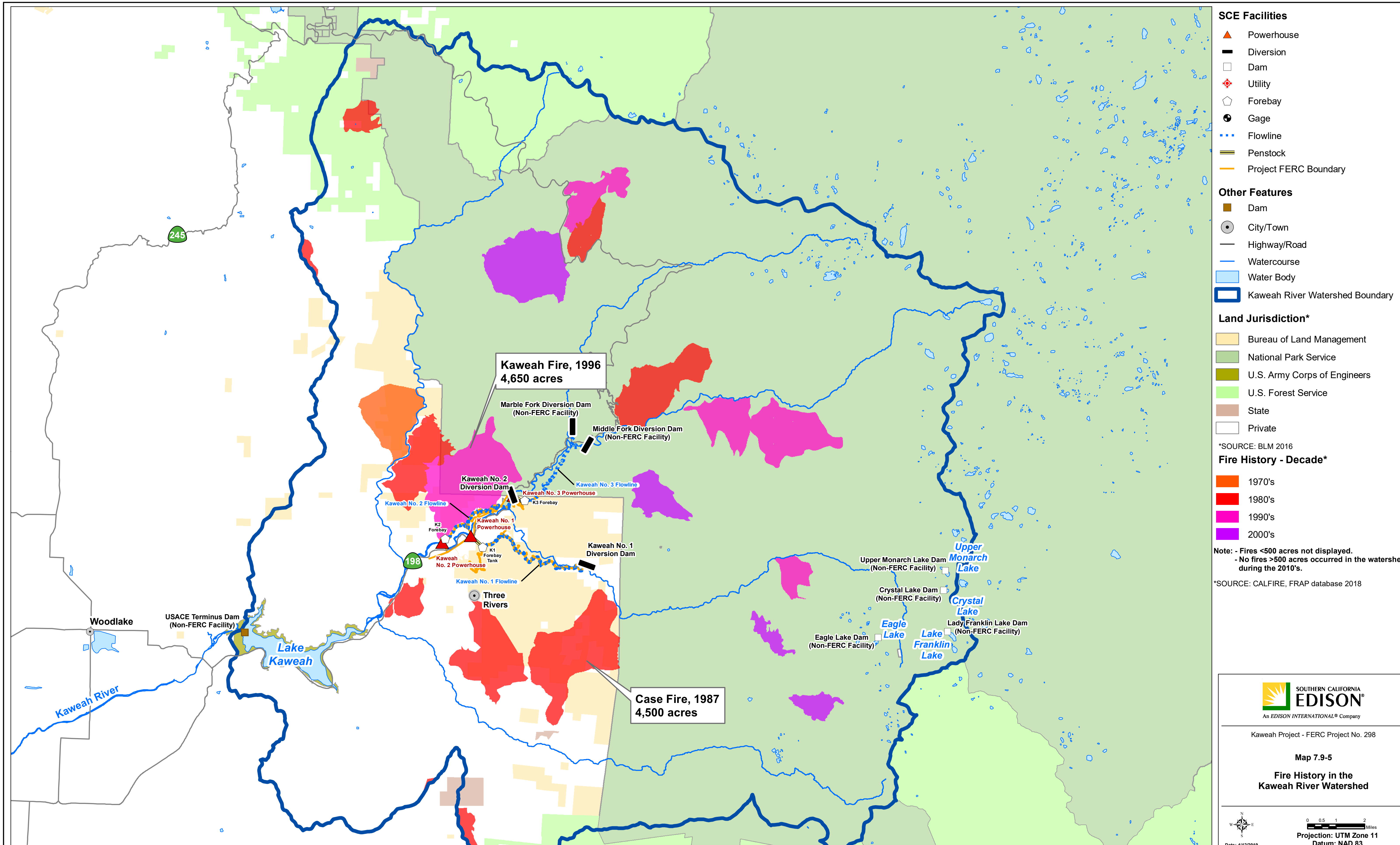

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List of Acronyms

BLM	Bureau of Land Management
CDFW	California Department of Fish and Wildlife
CFR	Code of Federal Regulations
cfs	cubic feet per second
ERMA	Extensive Recreation Management Area
FERC or Commission	Federal Energy Regulatory Commission
NPS	National Park Service
Project	Kaweah Project
RM	River Mile
RMP	Resource Management Plan
SCE	Southern California Edison Company
SNP	Sequoia National Park
TCRMA	Tulare County Resource Management Agency
TSP	Technical Study Plan
TSR	Technical Study Report
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey
WBFG	Whitewater Boating Focus Group

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7.10 RECREATION AFFECTED ENVIRONMENT

This section describes recreation resources in the vicinity of the Kaweah Project (Project). The Federal Energy Regulatory Commission (FERC or Commission) regulations require the applicant to provide information regarding both recreation and land use. This section provides information about the recreation resources in the Kaweah River Watershed (Watershed) and in the immediate vicinity of the Project. Information about land use within and outside of the FERC Project boundary, land management plans and policies, and specially designated areas (e.g., Wilderness Areas, Wild and Scenic Rivers, etc.) is provided in Section 7.9 – Land Use.

7.10.1 Information Sources

The information presented in this section was developed primarily using the following sources:

- REC 1 – Recreation Resources Technical Study Report (REC 1 – TSR) (SCE 2019a), which is included in Supporting Document A (SD A);
- REC 2 – Whitewater Boating TSR (REC 2 – TSR) (SCE 2019b), which is included in SD A;
- TERR 2 – Wildlife Resources TSR (TERR 2 – TSR) (SCE 2019c), which is included in SD A;
- LAND 3 – Land Use TSR (LAND 3 – TSR) (SCE 2019d), which is included in SD A;
- Bureau of Land Management (BLM) Bakersfield Field Office Resource Management Plan (RMP) (BLM 2014);
- California Freshwater Sport Fishing Regulations 2019–2020 (CDFW 2019); and
- Various state and federal agency websites.

7.10.2 Setting

The Project is located on the western slope of the Sierra Nevada in Tulare County, California. All of the facilities under FERC jurisdiction are located along the Kaweah River, upstream of the community of Three Rivers, and along the East Fork Kaweah River, a tributary to the Kaweah River, on private lands or on public lands administered by the BLM. Lake Kaweah, owned and operated by the U.S. Army Corps of Engineers (USACE), is located southwest of the Project, approximately five river miles downstream of the Kaweah No. 2 Powerhouse. The Sequoia National Park (SNP) is located immediately north and east of the Project and encompasses the Sequoia Kings Canyon and John Krebs Wilderness Areas. The primary Project facilities and land jurisdictions are shown on Map 7.10-1.

The Project facilities and bypass reaches associated with the Project are accessible via State Highway 198, which parallels the Kaweah River, and the Mineral King Road, which parallels the East Fork Kaweah River. These two roadways also serve as the primary access routes into the SNP and the Sequoia Kings Canyon and John Krebs Wilderness Areas, respectively (Map 7.10-1).

7.10.3 Existing Recreation Facilities in the Kaweah River Watershed

The nearest developed public recreation facilities (e.g., campgrounds, picnic areas, boat ramps, etc.) are located at Lake Kaweah and in the SNP (Map 7.10-2). Camping opportunities are also available at a private campground in Three Rivers. Historically, developed recreation facilities were also operated along the North Fork Kaweah River on land managed by the BLM. However, consistent with the BLM's approved RMP, public access to these facilities is prohibited due to public safety and resource concerns (BLM 2014).

A list of the developed recreation facilities (e.g., campgrounds, picnic areas, boat ramps, etc.) that are located within the Kaweah River Watershed is provided in Table 7.10-1, organized by jurisdiction and type of facility. The locations of the facilities that are identified on Table 7.10-1 are shown on Map 7.10-2. Note that much of the Watershed is designated as Wilderness Area, which by definition does not include developed recreation facilities. As such, for presentation purposes, Map 7.10-1 was scaled to exclude areas of the Watershed without developed recreation facilities. In addition, the BLM recreation facilities located on the North Fork Kaweah River (Cherry Falls, Advance, and Paradise Recreation Site) are not shown on the map because they are no longer open to public use.

As shown on Map 7.10-2, numerous developed campground, day use areas and trails are available in the Watershed, in the vicinity of the Project, concentrated around Lake Kaweah and in the SNP in areas that are not designated as Wilderness Areas. Most of the developed recreation facilities in the SNP occur along State Highway 198 but two campgrounds are located along the Mineral King Road, upstream of the Kaweah No. 1 Diversion Dam. Developed trails are available throughout the SNP and in the BLM's Case Mountain Extensive Recreation Management Area (ERMA).

7.10.4 Existing Project Recreation Facilities

Most of the land surrounding the Project facilities and bypass reaches is privately owned, which restricts public access and limits opportunities for recreational development. Therefore, there are no developed recreational facilities or trails associated with the Project. When the current FERC license was issued, the FERC required Southern California Edison Company (SCE) to construct a formal river access point at the Kaweah No. 3 Powerhouse with parking, sanitation, and improved trail facilities to enhance recreational use of the Project. However, this site was not constructed due primarily to opposition by adjacent landowners and concerns expressed by the National Park Service (NPS) law enforcement officials. The FERC formally deleted this requirement from the Kaweah License by order issued June 30, 1993.

7.10.5 Other Recreation-Related Facilities

Although the Project does not include any developed recreation facilities, SCE maintains a small parking area adjacent to the Kaweah No. 2 Powerhouse and allows the public to use this parking area on a limited basis. This parking area is typically used by recreation visitors who park in the lot then walk to a small beach known locally as “Edison Beach”, located approximately 400 feet southeast of the parking lot, on the northeast bank of the Kaweah River. The parking area and beach are shown on Map 7.10-3 relative to the Project facilities and FERC boundary, and are described in the following subsection. Additional, descriptive information about the parking area and beach is available in the REC 1 – TSR (SCE 2019a).

7.10.5.1 Kaweah No. 2 Powerhouse River Access Parking Area

The Kaweah No. 2 Powerhouse River Access Parking Area is located within the FERC Project boundary on land owned by SCE. The parking area is defined by large natural rock bollards which surround the perimeter. A cyclone fence covered in vines separates the parking area from the river, and Kaweah River Drive (a public road maintained by Tulare County) separates the parking area from the powerhouse. The parking area is paved and striped with six parking stalls, one of which is accessible. The pavement and existing striping is in good condition. In addition, the surface material and grade meets accessibility standards. Other than signage, the parking area does not include any amenities such as a bathroom or garbage receptacles.

The Kaweah No. 2 Powerhouse River Access Parking Area is typically used by recreation visitors who park in the lot then walk to a small beach known locally as “Edison Beach”. The route to the beach is along Kaweah River Drive, a paved road that is primarily used by local residents. The beach is accessed from the road via a sandy slope (i.e., the river bank). Edison Beach is not a formally developed recreation facility.

The Powerhouse No. 2 River Access Parking Area and Edison Beach are located on land owned by SCE. Due to concerns by local residents, SCE limits use of the parking area and beach to between the hours of 8:00 a.m. and 7:00 p.m. as specified on signage in the parking area and near the beach. In addition, between Memorial Day and Labor Day, use is limited to Monday through Thursday. During all other times of the year, SCE typically allows use of the parking area and Edison Beach seven days a week. However, SCE may sometimes close the parking area and beach due to complaints by local residents or to address safety or vandalism issues (graffiti), as was the case in late August/early September 2018.

When the parking area and beach are closed, SCE places a sign in the parking area notifying users that the area is temporarily closed and places barrier cord across the parking area to prevent parking. In addition, the sign posts located adjacent to the beach are turned to expose closure signage mounted on the back of the post and “Caution Do Not Enter” tape is placed between the road and beach.

7.10.6 Recreation Opportunities in the Project Vicinity

As discussed above, the Project does not include any developed Project recreation facilities. In addition, access to the bypass reaches associated with the Project is severely restricted by the presence of private property along nearly the entire length of the Kaweah River and portions of the East Fork Kaweah River. As such overall recreation use in the immediate vicinity of the Project is minimal and is generally confined to areas that are only accessible by local residents or lodges, cabins and resorts under private ownership.

As discussed below, fishing and whitewater boating opportunities are available on the Kaweah River and East Fork Kaweah River, and trail opportunities are available on the neighboring public lands. Although not formally developed for recreation purposes, the trails along the Kaweah No. 2 Flowline are also used by the general public. These opportunities are briefly discussed in the following subsections.

7.10.6.1 Fishing

The Kaweah River and its tributaries support rainbow trout, brown trout, and brook trout. In addition, smallmouth bass are present at lower elevations. Good fishing opportunities are available on all of the forks of the Kaweah River, but the best fishing reportedly occurs on the river segments located within the SNP.

According to the California Freshwater Sport Fishing Regulations 2019–2020 (CDFW 2019), the Kaweah River and its tributaries are open year round to angling with a daily limit of five fish, 10 in possession. Fishing on the segments of the Kaweah River and its tributaries located within the SNP are subject to SNP fishing regulations. Segments within the SNP, below 9,000 feet elevation are managed as a catch-and-release fishery and artificial flies and lures with barbless hooks are required. Above 9,000 feet elevation, state fishing regulations apply (36 CFR §2.3 – Fishing).

Recreational fishing in the bypass reaches associated with the Project is limited due to the rugged terrain, limited access, and low trout abundance. Historically, the California Department of Fish and Game (now the California Department of Fish and Wildlife [CDFW]) stocked the lower reaches of the Kaweah River (downstream of the SNP boundary) each spring and summer with about 4,000 catchable rainbow trout (FERC 1991). However, the CDFW discontinued this program because the river is naturally too warm to support a self-sustaining trout population. Trout may move downstream into the reach during the winter, but warm summer temperatures typically preclude full-time residency. Recent fish sampling data on the Kaweah River in the vicinity of the Project indicate that the current fish population is dominated by warm water fishes (SCE 2007).

7.10.6.2 Whitewater Boating

Whitewater boating opportunities are available on the Kaweah River and the East Fork Kaweah River. The Kaweah River is boated both commercially and privately. Commercial boating is strictly controlled through a permit system that is operated and maintained by the Tulare County Resource Management Agency (TCRMA). The East

Fork Kaweah River is characterized by extremely difficult rapids and is therefore only boatable by advanced/expert boaters. It is not boated commercially.

SCE developed information about the whitewater boating runs on the bypass reaches using information available in existing whitewater guidebooks augmented by information provided by knowledgeable whitewater boaters during a Whitewater Boating Focus Group (WBFG) meeting conducted in Three Rivers, California on April 3, 2018. Detailed information about the whitewater boating runs that are available in the vicinity of the Project is available in the REC 2 – TSR (SCE 2019b), and summarized below. For discussion purposes, the information is organized by three separate runs, the locations of which are shown on Map 7.10-4. These runs are sometimes combined differently to make shorter or longer runs at the discretion of the boater.

- **Park Boundary Run.** The 0.6-mile Park Boundary Run is located on the Kaweah River extending from the Kaweah No. 2 Diversion Dam to the East Fork Kaweah River Confluence. The run supports non-commercial rafting and kayaking, and is typically boated in the spring. This run is not considered a “stand-alone” run and is typically run as an extension of the upstream Ash Mountain Run or downstream Gateway Bridge Run (see Map 7.10-4). The put-in is located at the Indian Head River Trailhead (within SNP) or near SCE’s Kaweah No. 2 Diversion Dam (private property). The take-out is either at the Gateway Bridge (private property) located just downstream of the confluence of the Kaweah River and East Fork Kaweah River, or approximately 0.75 mile downstream of the Gateway Bridge (Pumpkin Hollow Condominiums; private property). The run is rated as Class IV+ to V (advanced/expert). A separate flow range was not established for the Park Boundary Run since the run is short and typically run in conjunction with upstream and/or downstream runs. The boatable flow range is assumed to be consistent with the downstream Gateway Bridge Run described below.
- **Gateway Bridge Run.** The 3.1-mile Gateway Bridge Run is located on the Kaweah River extending from the East Fork Kaweah River Confluence to Dinely Bridge. The run supports non-commercial rafting and kayaking, and commercial rafting. The Gateway Bridge Run is typically boated in the spring. When boated for commercial activities, the Gateway Bridge Run is most often boated in conjunction with downstream runs to extend the whitewater boating experience. The put-in is either at the Gateway Bridge (private property), or approximately 0.75 mile downstream of the Gateway Bridge (Pumpkin Hollow Condominiums; private property; designated commercial rafting put-in). The take-out is located at Dinely Bridge (private property), or at the Three Rivers Hideaway (private property) located 0.3 mile downstream of Dinely Bridge. The run is rated as Class IV to V (intermediate/advanced). Two boatable flow ranges were identified for the Gateway Bridge Run: a rafting flow range and a kayaking flow range. The rafting flow range was established as 500 cubic feet per second (cfs) to 3,000 cfs. The kayaking flow range was established as 300 cfs to 3,000 cfs.

- **Lower East Fork Run.** This 4.3-mile long Lower East Fork Run is located on the East Fork Kaweah River. The run is boated by non-commercial users (i.e. private boaters), generally in kayaks. The Lower East Fork Run is typically boated in the spring. The put-in for this run is located on private property just downstream of the Kaweah No. 1 Diversion Dam (left bank at approximately River Mile [RM] 4.1). The take-out is at either the Gateway Bridge (private property), or approximately 0.75 mile downstream of the Gateway Bridge (Pumpkin Hollow Condominiums; private property). This run is rated as Class V to V+ (expert) and is described as very difficult requiring expert technical river-running and portaging skills. Given its level of difficulty and remote location with limited access, this run is best suited to highly-skilled boaters that are capable of portaging across difficult terrain, potentially with ropes and other technical equipment. The boatable flow range identified for this run is 80 cfs to 400 cfs with a subset flow range of 160 cfs to 250 cfs considered the optimum. The run requires an average of 6 to 7 hours to complete; however experts with extensive knowledge of the run can complete it in 2.5 to 3 hours.

Most of the Project facilities located on the main stem of the Kaweah River are surrounded by private property. Due to the prevalence of private property in the vicinity of the Project, public access to the Kaweah River, and opportunities to develop public access, is extremely limited. Commercial outfitters have secured access to the river through agreements with private property landowners. However, as documented in the REC 2 –-SR (SCE 2019b), access for private boaters is limited primarily to public access points in the SNP (upstream of the Project), recreation facilities at Lake Kaweah (downstream of the Project), at the bridges that cross the Kaweah River, and at select private properties with permission. Boaters may also park at the Kaweah No. 2 Powerhouse River Access Parking Area and put-in or take-out at Edison Beach. However, no boaters were observed utilizing this area during the relicensing studies.

Real-Time Flow Information

Aside from access limitations, according to the WBFG participants, the primary constraint to non-commercial whitewater boating is the lack of real-time flow information. The only real-time flow information for the Kaweah River that is accessible to whitewater boaters is collected at a gage located on the Kaweah River, near Three Rivers (USGS Gage No. 11209900). This gage is maintained by the USACE and is referred to as the Kaweah River at Three Rivers Gage. This gage measures and records river stage on an hourly basis.

River stage data collected at the Three Rivers Gage is disseminated through the Dreamflows website, which is a website commonly used by whitewater boaters to obtain flow information on whitewater boating runs. Dreamflows collects the Three Rivers Gage data and converts the stage data to flow in cubic feet per second (cfs) using a stage-discharge relationship.

The WBFG participants indicated that providing additional real-time flow information on the bypass reaches would enhance the ability to take advantage of the existing whitewater boating opportunities within the bypass reaches, as well as other river reaches within the Kaweah River Watershed.

Hydrology Assessment

SCE utilized existing hydrologic information covering water years 1994 through 2017 (period of record = May 10, 1994 – May 9, 2018) to characterize the hydrology on the bypass reaches and to assess how current Project operations (impaired conditions) effect whitewater boating opportunities on the bypass reaches relative to unimpaired conditions. A complete description of the methods that were used to conduct this assessment and the associated results, including exceedance charts and hydrographs for various water-year types, are available in the REC 2 – TSR (SCE 2019b).

Boatable flow ranges for the Gateway Bridge Run and the Lower East Fork Run (described above) were identified in consultation with the WBFG participants. The boatable flow ranges were then used in conjunction with the hydrologic information to calculate the number of boating opportunity days on the bypass reaches under impaired and unimpaired conditions, for normal and dry water-year types. The boatable flow ranges for various watercraft and the results of this analysis are shown on Tables 7.10-2, 7.10-3, and 7.10-4. As indicated on these tables, the number of boating opportunities available under impaired conditions is lower than under unimpaired conditions during both normal and dry water-year types. The difference is more pronounced during dry water-year types.

7.10.6.3 Trail Opportunities

Recreation trails are present throughout the Watershed, on the neighboring public lands that are managed by the NPS, the USACE, and the BLM. Numerous developed trails are available to the east and west of the Project, in the SNP and at Lake Kaweah, respectively. In addition, various non-motorized trail opportunities (hiking, mountain biking, equestrian use) are available on the BLM land surrounding the Project.

All of the BLM land that surrounds the Kaweah No. 1 Project facilities is part of the Case Mountain ERMA, which the BLM manages to meet the following recreation objective:

- Offer recreation opportunities in an unchanged middle country setting, which facilitate the visitors freedom to participate in non-motorized activities that includes mountain bicycling, camping, hunting, wildlife and nature observation, photography and picnicking (BLM 2014).

Consistent with this objective, non-motorized trail use occurs along Salt Creek Road and Skyline Road starting at the BLM’s Skyline Drive Parking Area and Trailhead and along Craig Ranch Road. These three roads tie into SCE’s Kaweah No. 1 Forebay Road (Map 7.10-5). Additional trails are available within the Case Mountain ERMA along the South Fork of the Kaweah River.

The Project does not include any developed recreation trails. However, recreation visitors have been observed using the access trails that parallel both sides of the Kaweah No. 2 Flowline. The Kaweah No. 2 Flowline primarily crosses private land and is accessible via user created trails that extend from various roads and private parcels to the flowline. The access trails that parallel the flowline are not formally developed for recreation purposes. However, SCE does not prohibit the general public from walking along the trails.

7.10.7 Recreation Use

The Project does not include any developed Project recreation facilities. Therefore, SCE does not collect or maintain recreation use data for the Project. However, to characterize recreation use in the vicinity of the Project, SCE developed recreation use data in conjunction with the REC 1 – Recreation Resources Technical Study Plan (TSP) (SCE 2017) and the REC 2 – Whitewater Boating TSP (SCE 2017). The results of these efforts are described in detail in the REC 1 – TSR (SCE 2019a) and the REC 2 – TSR (SCE 2019b) and summarized below.

7.10.7.1 Recreation Use at the Kaweah No. 2 River Access Parking Area and Edison Beach

SCE conducted in-person vehicle and visitor counts at the Kaweah No. 2 Powerhouse River Access Parking Area on a total of 34 days over a one-year period extending from March 13, 2018, and March 19, 2019. During the peak season (Memorial Day through Labor Day), an average of two vehicles and six people were observed using the parking area at one time. During the non-peak season, the average number of vehicles and people observed was less than one in both cases. SCE also observed and recorded visitor activities at Edison Beach at the same time that the vehicle counts were conducted. Swimming/beach use accounted for 95% of all observed activity. All ‘other’ activity consisted of people walking and/or recreating with dogs. One fisherman was observed and no boaters were observed.

Although not required by the REC 1 – TSP, SCE also conducted camera counts at the Kaweah No. 2 Powerhouse River Access Parking Area. The photos captured using the video camera were used to validate the in-person vehicle and visitor count data. The comparison of the data collected by the camera and visitor survey data indicate that the camera data is a good indicator of both number of vehicles and visitors.

The camera data was also used to determine the total and average number of recreation vehicles and visitors over the entire year-long sampling period, which included a total of 314 days of data after accounting for closure days or days when the camera did not collect data. Based on the camera data, a total of 2,719 visitors and 1,268 vehicles and were counted during the 314 days the camera was operational, which equates to an average of 8.7 visitors per day, 4.0 vehicles per day, and an average of 2.14 people per vehicle. The latter can be used along with vehicle counts to determine recreation visitor use in the future, if needed.

7.10.7.2 Recreation Use Along Kaweah No. 1 Forebay Road

SCE documented recreation use along the Kaweah No. 1 Forebay Road near where it connects to Craig Ranch Road using data collected by a motion activated camera. A total of 326 days of data were collected (233 weekdays and 93 weekend days). A total of 3,836 people were counted using the road on the weekdays and a total of 3,746 people were counted using the road during the weekend days, for a combined total of 7,582 people. This equates to an average of 16.5 users per day during the weekdays and 40.3 users per day on the weekends. Accordingly, weekend use along Craig Ranch Road is about 2.4 times greater than weekday use.

The camera data were also sorted by month to assess how use varies by month. The monthly data indicates that use levels are the highest in March and April. Use levels decline during the summer months and increase again during the winter. This pattern is likely related to weather conditions.

Hiking was the most common recreation activity observed (59% of the total), followed by mountain biking (41% of the total). Equestrian use was also observed but represents a small fraction (0.38%) of total use. One hunter was observed during a weekday.

7.10.7.3 Recreation Use Along the Kaweah No. 2 Flowline

The Project does not include any developed recreation trails. However, recreation visitors have been observed using the trails that parallel the Kaweah No. 2 Flowline. Staff conducting cultural resource and biological studies along the flowline observed the general public walking, running and mountain biking along the trail (both as individuals and in groups) on numerous occasions in 2018 and 2019. Informal discussions with people encountered on the trail indicate that the trails are used by both local residents and by visitors staying in or near Three Rivers in conjunction with a trip to the SNP. The same people were observed on multiple occasions over the study period indicating local residents regularly utilize the trail along the Kaweah No. 2 Flowline to exercise and walk their dogs.

To further characterize use along the flowline, SCE reviewed photographs captured by six game cameras that were installed along the flowline to identify people (and domestic dogs) using the trail or trail crossings during the spring and fall of 2018 as part of the TERR 2 – TSR (SCE 2019c). During the spring (March 28 – May 3, 2018) a total 117 people were counted using the trail in the camera photos. During the fall (November 13 – December 19, 2018) a total of 101 people were counted using the trail.

Most of the people observed in the photographs were captured in the photographs taken by multiple game cameras on the same day, meaning they were walking along the flowline as opposed to crossing it. In addition, many of the people observed in the photos are present on multiple days, usually with dogs, confirming the trail is regularly used by local residents for exercise and dog walking.

7.10.7.4 Whitewater Boating Use

Flows on the Kaweah River and East Fork Kaweah River are primarily dependent on snowmelt. The Project has limited storage capacity and is operated in a "run-of-river" mode. As such, whitewater boating use (private and commercial) on both the Kaweah River and East Fork Kaweah River directly correlates to the water-year type and associated runoff.

Commercial boating use is strictly controlled through a permit system that is operated and maintained by the TCRMA, in accordance with the Kaweah River Management Plan (TCRMA 2005). The Kaweah River Management Plan allows for up to eight commercial licenses per year. Commercial outfitters are required to file a license application annually along with a Commercial River Plan and an application fee to obtain a permit from the TCRMA to operate commercial whitewater boating services on the Kaweah River.

In 2018, seven licenses were issued by the TCRMA to the following commercial outfitters: All-Outdoors California Whitewater Rafting; Kaweah Adventures; Adventure Connection; River Runners; Good Time Adventures; Kaweah Whitewater Adventures; and Sequoia Adventures. Information about these outfitters, including details about the runs they typically offer, is available in the REC 2 – TSR (SCE 2019b).

Based on information provided by the TCRMA, in 2017 (a "normal" water year), commercial whitewater use on the Kaweah River totaled 674 people. Commercial trips were run in April, May, and June, with May accounting for 65% (434 people) of the total use.

According to the TCRMA, there are no existing mechanisms to count private boating use on either the Kaweah River or the East Fork Kaweah River. As such, reliable estimates of private boating use on the bypass reaches are not available.

7.10.8 Public Safety Programs and Features

SCE maintains several programs and features that are specifically aimed at protecting public health and safety. SCE's safety programs and features are described in Section 3.0 – No-Action Alternative and also in the REC 1 – TSR (SCE 2019a).

At the request of the BLM, SCE inventoried and assessed the condition of the safety features that are present along the Kaweah No. 2 Flowline, the Kaweah No. 3 Flowline, the Kaweah No. 3 Forebay, and the Kaweah No. 1 Forebay Road. The results of this effort are provided in Appendix A of the LAND 3 – TSR (SCE 2019d). SCE inspects and maintains all of these features on a regular basis. Accordingly, as documented in Appendix A of the LAND 3 – TSR, almost all of these features are in good condition, meaning the feature is in new or like-new condition and functions as intended without signs of wear and/or deterioration.

7.10.9 Safety Incidents

The Title 18 of the Code of Federal Regulations (18 CFR) §12.10 requires a licensee to report safety-related incidents, including deaths and serious injuries, if applicable. These reports are available for review through the FERC's e-library. A search of the e-library was conducted covering the period of January 1, 2000, through May 27, 2019, to identify safety-related incident reports filed by SCE under 18 CFR §12.10. Since 2000, SCE filed seven incident reports, all relating to flume failures. None of these incidents resulted in injuries or deaths, nor did they cause serious damage to public or private property.

7.10.10 Literature Cited

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TABLES

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Table 7.10-1. Developed Recreation Facilities in the Kaweah River Watershed

Facility Name	Jurisdiction / Ownership	Facility Type	Number of Individual Campsites (if applicable)	Total Campsite Capacity (6 PAOT/site)	Number of Group Sites	Capacity of Group Sites	2019 Season Dates	Information Sources
Sequoia Kings Canyon National Park								
Foothills Visitor Center	NPS	Visitor Center	-	-	-	-	Year Round	https://www.nps.gov/seki/planyourvisit/visitorcenters.htm
Lodgepole Visitor Center	NPs	Visitor Center	-	-	-	-	Year Round	https://www.nps.gov/seki/planyourvisit/visitorcenters.htm
Moro Rock	NPS	Point of Interest	-	-	-	-	Year Round	https://www.nps.gov/seki/planyourvisit/gfdayhikesum.htm
Tunnel Log	NPS	Point of Interest	-	-	-	-	Year Round	https://www.nps.gov/seki/faqtunnel.htm
General Sherman Tree	NPS	Point of Interest	-	-	-	-	Year Round	https://www.nps.gov/seki/learn/nature/sherman.htm
Crescent Meadow (Chimney Tree and Tharp's Log)	NPS	Point of Interest	-	-	-	-	NA	https://www.hikespeak.com/trails/crescent-meadow-sequoia/
Timber Gap	NPS	Point of Interest	-	-	-	-	Year Round	https://www.nps.gov/seki/planyourvisit/mkdayhikesum.htm
Giant Forest Museum	NPS	Point of Interest	-	-	-	-	Year Round	https://www.nps.gov/seki/planyourvisit/visitorcenters.htm
Crystal Cave	NPS	Point of Interest	-	-	-	-	May 24 – Sept. 29	https://www.nps.gov/seki/planyourvisit/crystal-cave.htm
Atwell Mill Campground	NPS	Campground	21	126	0	-	June 21 – Oct. 30	https://home.nps.gov/seki/planyourvisit/atwell.htm
Buckeye Flat Campground	NPS	Campground	28	168	0	-	Mar 20 – Sept. 24	https://www.recreation.gov/camping/campgrounds/249982 https://www.nps.gov/seki/planyourvisit/buckeye.htm
Cold Springs Campground	NPS	Campground	40	240	0	-	June 21 – Oct. 31	https://www.nps.gov/seki/planyourvisit/cold_springs.htm
Dorst Creek Campground	NPS	Campground	218	1308	4	15-30 each	June 19 – Sept. 24	https://www.nps.gov/seki/planyourvisit/dorst.htm https://www.recreation.gov/camping/campgrounds/232460
Lodgepole Campground	NPS	Campground	214	1284	0	-	May 22 – Dec. 3	https://www.nps.gov/seki/planyourvisit/lodgepole.htm https://www.recreation.gov/camping/campgrounds/232461
Potwisha Campground	NPS	Campground	42	252	0	-	Year Round	https://www.nps.gov/seki/planyourvisit/potwisha.htm https://www.recreation.gov/camping/campgrounds/249979
Southfork Campground	NPS	Campground	10	60	0	-	Year Round	https://www.nps.gov/seki/planyourvisit/south_fork.htm

Facility Name	Jurisdiction / Ownership	Facility Type	Number of Individual Campsites (if applicable)	Total Campsite Capacity (6 PAOT/site)	Number of Group Sites	Capacity of Group Sites	2019 Season Dates	Information Sources
Lodgepole Picnic Area	NPS	Day Use Area	-	-	-	-	inaccessible when snow	https://www.nps.gov/seki/planyourvisit/picnic.htm
Hospital Rock	NPS	Day Use Area	-	-	-	-	NA	https://www.nps.gov/seki/planyourvisit/picnic.htm
Wolverton Ski Area	NPS	Day Use Area	-	-	-	-	Winter	https://www.nps.gov/seki/planyourvisit/snowplay.htm
Ladybug Trail	NPS	Trail/Trailhead	-	-	-	-	Year Round	https://www.nps.gov/seki/planyourvisit/ladybug-trail.htm
Garfield Grove Trail	NPS	Trail/Trailhead	-	-	-	-	Year Round	https://www.nps.gov/thingstodo/backpack-into-a-less-traveled-sequoia-grove.htm
Marble Falls Trail	NPS	Trail/Trailhead	-	-	-	-	Year Round	https://www.nps.gov/seki/planyourvisit/foothillhikessum.htm
Middle Fork Trail	NPS	Trail/Trailhead	-	-	-	-	Year Round	https://www.nps.gov/seki/planyourvisit/middle-fork-trail.htm
The Big Trees Trail	NPS	Trail/Trailhead	-	-	-	-	Year Round	https://www.nps.gov/seki/planyourvisit/gfdayhikesum.htm
Tokopah Falls Trail	NPS	Trail/Trailhead	-	-	-	-	Year Round	https://www.nps.gov/seki/planyourvisit/gfdayhikesum.htm
Twin Lakes Trail	NPS	Trail/Trailhead	-	-	-	-	Year Round	https://www.nps.gov/seki/planyourvisit/traildesc.htm
North Fork Trail	NPS	Trail/Trailhead	-	-	-	-	NA	https://www.nps.gov/seki/planyourvisit/foothillhikessum.htm
White Chief Trail	NPS	Trail/Trailhead	-	-	-	-	Year Round	https://www.nps.gov/seki/planyourvisit/traildesc.htm
Indian Head River Trailhead Parking Area	NPS	Trail/Trailhead	-	-	-	-	NA	https://www.nps.gov/seki/planyourvisit/upload/Foothills-Map-w-Descriptions-2012.pdf
Case Mountain Extensive Recreation Area								
Skyline Drive Parking Area and Trailhead	BLM	Trailhead	-	-	-	-	Year Round	https://www.blm.gov/visit/case-mountain
U.S. Army Corps of Engineers (Lake Kaweah)								
Horse Creek Campground	USACE	Campground	80	480	0	-	Year Round	https://www.spk.usace.army.mil/Locations/Sacramento-District-Parks/Lake-Kaweah/
Horse Creek Day Use Area	USACE	Day Use Area	-	-	-	-	Year Round	https://www.recreation.gov/camping/campgrounds/233692
Kaweah Recreation Area	USACE	Day Use Area, Boat Launch	-	-	-	-	Year Round	https://corpslakes.erdc.dren.mil/visitors/projects.cfm?ID=L218090 https://www.spk.usace.army.mil/Locations/Sacramento-District-Parks/Lake-Kaweah/

Facility Name	Jurisdiction / Ownership	Facility Type	Number of Individual Campsites (if applicable)	Total Campsite Capacity (6 PAOT/site)	Number of Group Sites	Capacity of Group Sites	2019 Season Dates	Information Sources
Lemon Hill Recreation Area	USACE	Day Use Area, Boat Launch	-	-	-	-	Year Round	https://corpslakes.erdc.dren.mil/visitors/projects.cfm?ID=L218090
Slick Rock Recreation Area	USACE	Day Use Area, Boat Launch	-	-	-	-	Year Round	https://corpslakes.erdc.dren.mil/visitors/projects.cfm?ID=L218090
Cobble Knoll	USACE	Recreation Area	-	-	-	-	Year Round	https://corpslakes.erdc.dren.mil/visitors/projects.cfm?ID=L218090
Private Recreation Facilities (Excludes Resorts, Cabins, Lodges, Hotels, Etc.)								
Sequoia Campground and Lodge	Private	Campground, lodging	51 tent sites 31 RV sites 10 cabins	492 *	0	-	Year round	https://www.sequoiacampground.com/

Notes:

* = Excludes cabin capacity

NA = not available.

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Table 7.10-2 Gateway Bridge Run, Average, Minimum, Maximum Boating Opportunity Days, 1994–2017

Water-year Type	Gateway Bridge Run					
	Rafting (500 to 3,000 cfs)			Kayaking (300 to 3,000 cfs)		
	Impaired	Unimpaired	Difference	Impaired	Unimpaired	Difference
Normal Year						
Average No. Days	90	103	-13	122	139	-18
Minimum No. Days	28	32	-4	52	76	-24
Maximum No. Days	157	181	-24	212	226	-14
Dry Year						
Average No. Days	41	54	-13	73	94	-21
Minimum No. Days	6	11	-5	19	28	-9
Maximum No. Days	86	101	-15	108	134	-26

Note: Based on data for water years 1994–2017 (period of record = May 10, 1994 – May 9, 2018)

Table 7.10-3. Lower East Fork Run, Average, Minimum, Maximum Boating Opportunity Days, 1994–2017

Water-year Type	Lower East Fork Run Kayaking (80 to 400 cfs)		
	Impaired	Unimpaired	Difference
Normal Year			
Average No. Days	104	115	-11
Minimum No. Days	37	39	-2
Maximum No. Days	183	186	-3
Dry Year			
Average No. Days	76	89	-13
Minimum No. Days	24	27	-3
Maximum No. Days	103	124	-21

Note: Based on data for water years 1994–2017 (period of record = May 10, 1994 – May 9, 2018)

Table 7.10-4. Annual Number of Boating Opportunity Days

Year	Water-year Type	Gateway Bridge Run				Lower East Fork Run	
		Rafting (500 to 3,000 cfs)		Kayaking (300 to 3,000 cfs)		Kayaking (80 to 400 cfs)	
		Impaired	Unimpaired	Impaired	Unimpaired	Impaired	Unimpaired
1994	Dry	86	101	108	134	99	124
1995	Normal	149	163	191	195	131	133
1996	Normal	148	181	212	226	183	186
1997	Normal	107	113	140	166	128	149
1998	Normal	75	85	103	113	75	86
1999	Dry	60	84	103	120	103	111
2000	Normal	62	78	85	100	78	91
2001	Normal	57	70	79	95	80	93
2002	Normal	52	84	105	113	112	118
2003	Normal	78	95	115	123	97	107
2004	Dry	54	77	92	118	98	115
2005	Normal	116	127	139	163	107	114
2006	Normal	72	87	106	138	75	94
2007	Dry	43	51	71	108	88	105
2008	Normal	69	79	103	126	99	112
2009	Normal	56	85	116	133	116	118
2010	Normal	133	140	159	205	145	185
2011	Normal	100	102	118	141	92	101
2012	Normal	28	32	52	76	58	78
2013	Dry	11	16	43	58	46	59
2014	Dry	6	11	19	28	24	27
2015	Dry	29	39	74	93	73	83
2016	Normal	157	163	170	175	147	147
2017	Normal	71	67	79	82	37	39

MAPS

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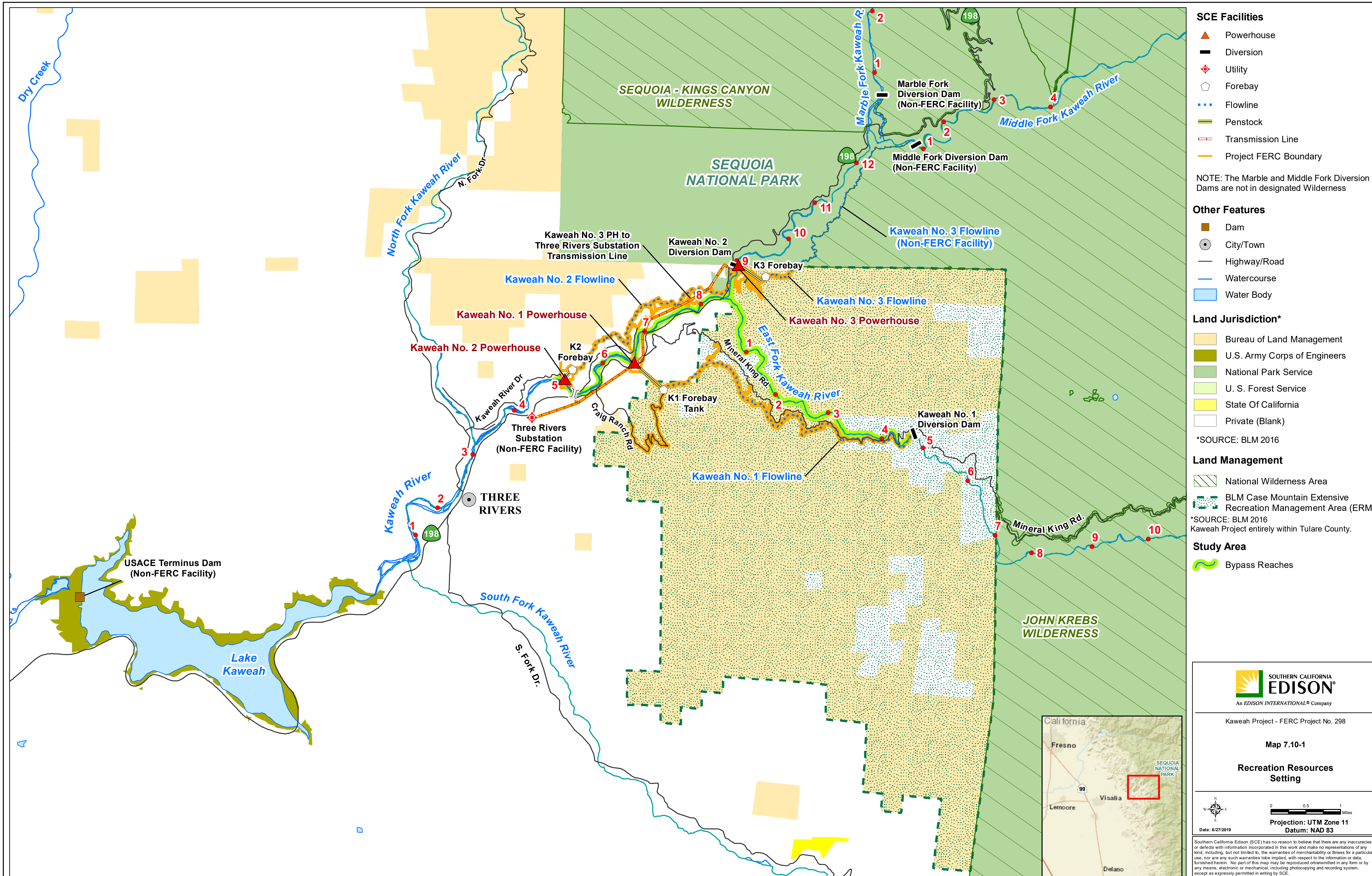

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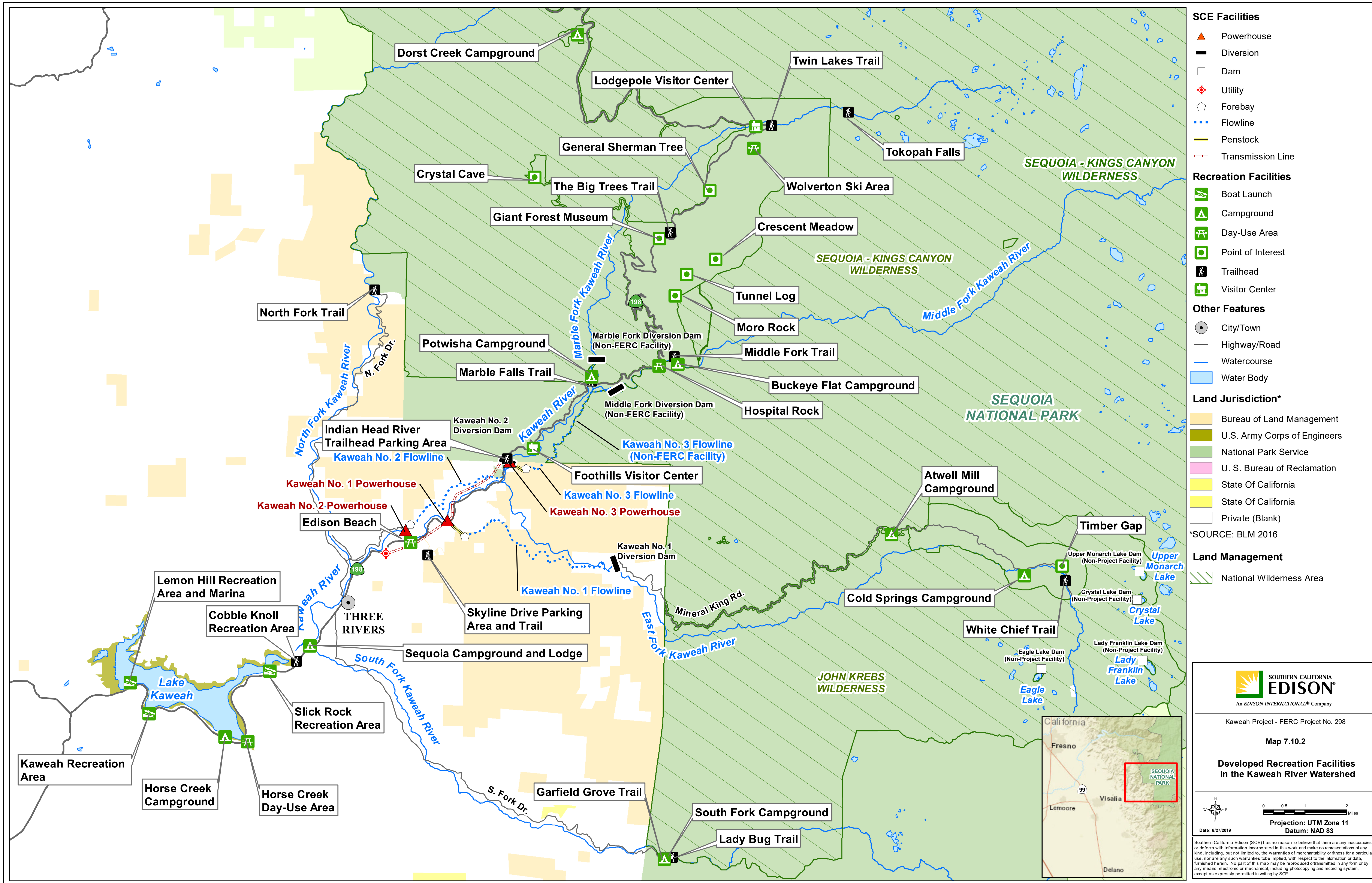

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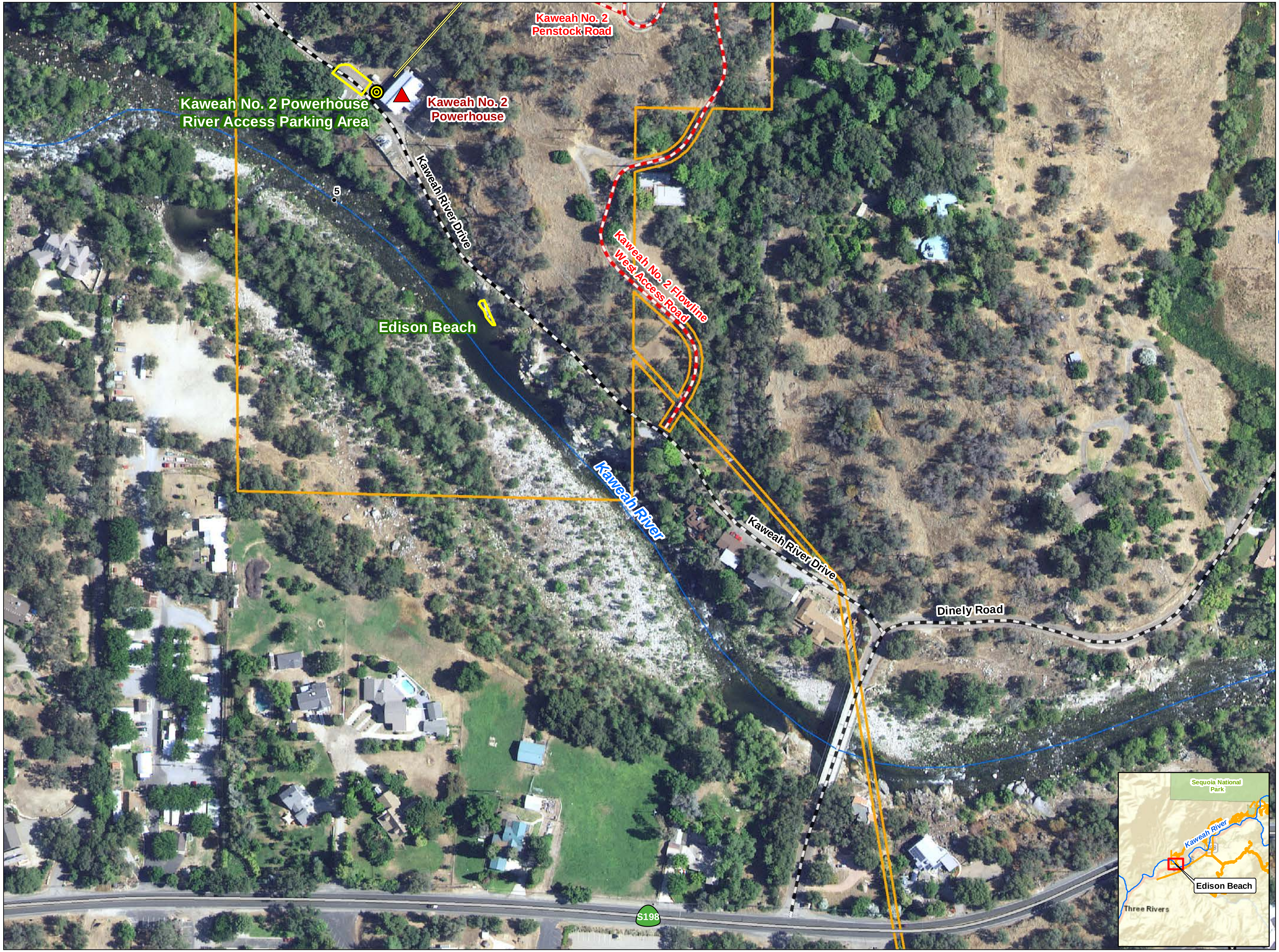

SCE Facilities

- Powerhouse
- Diversion
- Forebay
- Flowline
- Penstock
- FERC Boundary

Other Features

- City/Town
- Highway/Road
- Watercourse
- Water Body
- River Mile

Transportation

- Project Road
- Non-Project General Access Road
- Gate

Recreation Use Study

- Camera Location

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Kaweah Project - FERC Project No. 298

Map 7.10-3

Kaweah No. 2 Powerhouse River Access Parking Area and Edison Beach Location Map

N S E W

0 50 100 200 Feet

Date: 6/27/2019

Projection: UTM Zone 11
Datum: NAD 83

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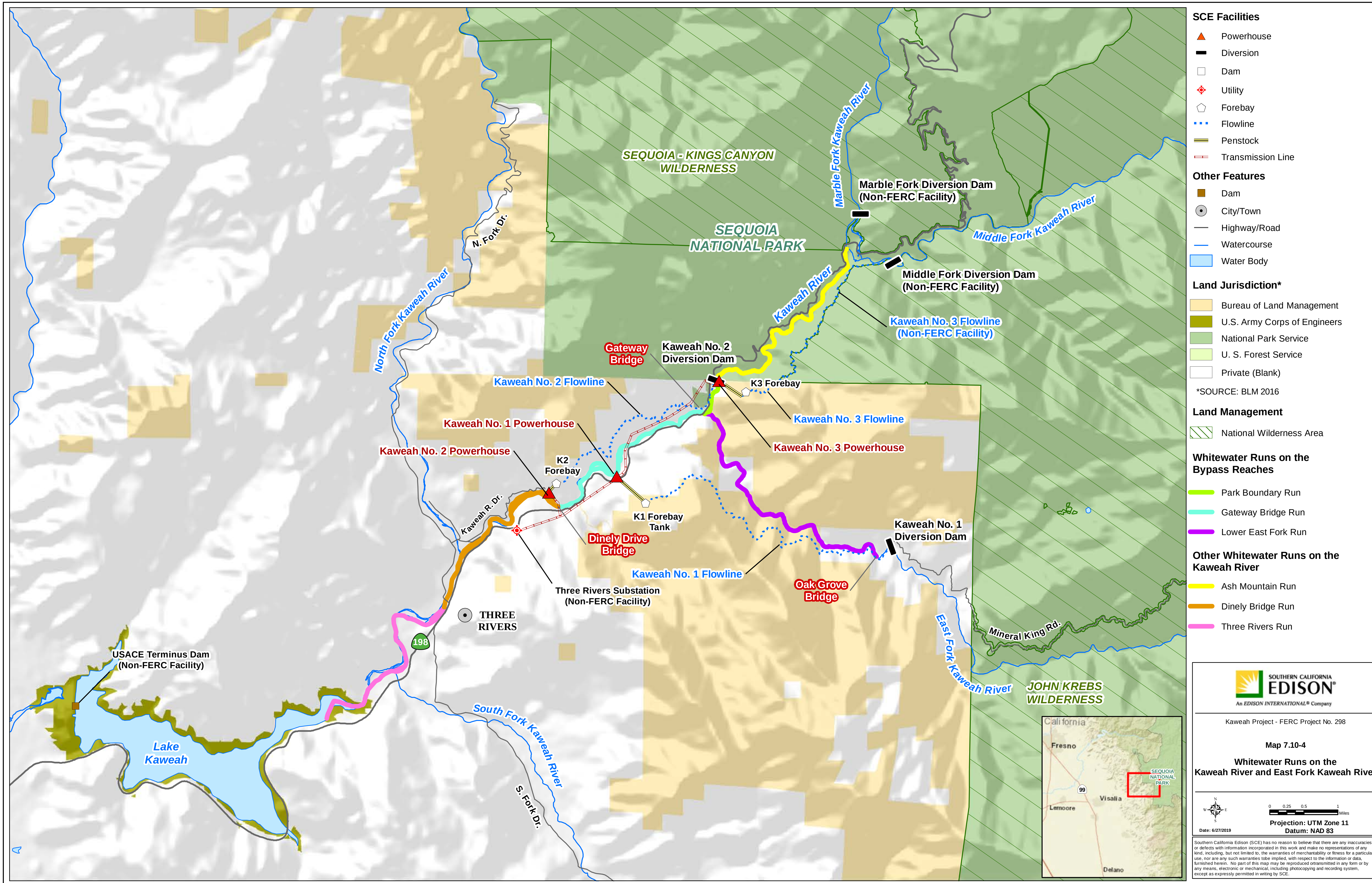

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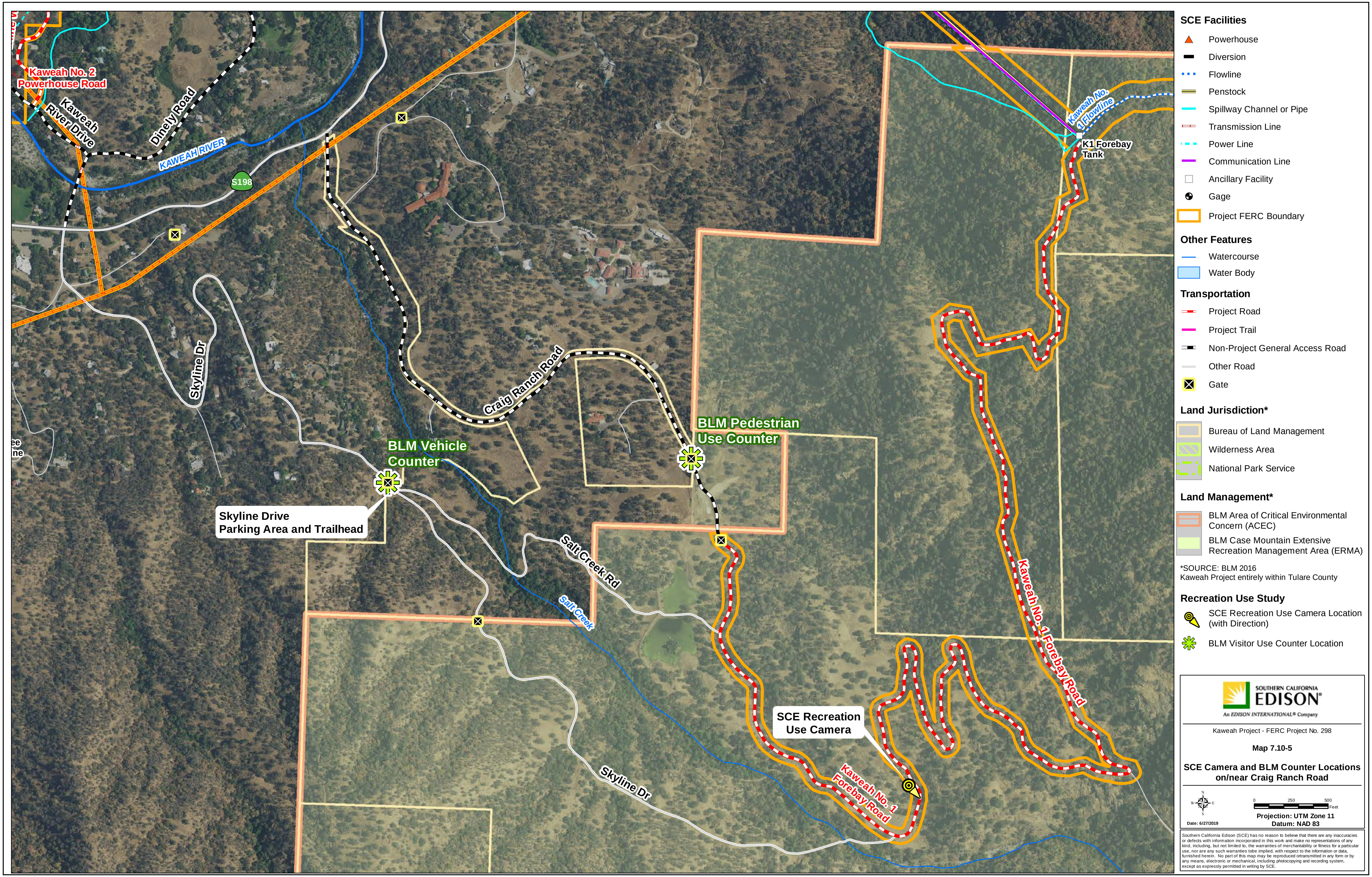

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LIST OF ACRONYMS

ac-ft	acre-foot/feet
BLM	U.S. Bureau of Land Management
CFS	Cubic Feet per Second
FERC or Commission	Federal Energy Regulatory Commission
KOP	Key Observation Point
MSL	Mean Sea Level
NPS	National Park Service
Project	Kaweah Project
RMP	Resource Management Plan
SCE	Southern California Edison Company
SD	Supporting Document
SNP	Sequoia National Park
TSP	Technical Study Plan
USACE	U.S. Army Corps of Engineers
VRM	Visual Resource Management

7.11 AESTHETIC RESOURCES AFFECTED ENVIRONMENT

This section describes the aesthetic resources in the vicinity of Southern California Edison Company's (SCE) Kaweah Project (Project), and includes: (1) an overview of the setting; (2) a summary of the management direction that pertains to the Project; (3) a description of the existing visual conditions in the Project vicinity; and (4) information about noise that was developed per the request of the National Park Service (NPS). The information presented in this section focuses on the Project facilities that are visible to the general public from primary travel corridors or developed recreation facilities, and helicopter and spillway noise that can be heard from two developed recreation facilities within the Sequoia National Park (SNP).

7.11.1 Information Sources

The information presented in this section was developed using the following sources:

- Pre-Application Document (PAD) for the Kaweah Project (SCE 2016);
- Kaweah Hydroelectric Project Visual Resources Report prepared by Keller Environmental Associates (KEA) (KEA 1989);
- LAND 2 – Aesthetic Resources Technical Study Report (LAND 2 – TSR) (SCE 2019), which is included in Supporting Document A (SD A);
- U.S. Bureau of Land Management (BLM) Bakersfield Field Office Approved Resource Management Plan (BLM 2014);
- Tulare County General Plan 2030 Update (Tulare County 2012);
- Three Rivers Community Plan 2018 Update (Tulare County 2018);
- Final General Management Plan and Comprehensive River Management Plan, Sequoia and Kings Canyon National Parks (SKCNP), Middle and South Forks of the Kings River and North Fork of the Kern River (NPS 2006); and
- Environmental Assessment, Kaweah Project Federal Energy Regulatory Commission (FERC or Commission) Project No. 298-000 (FERC 1991).

7.11.2 Setting

The Project is situated in the foothills and mountainous uplands of the western slope of the southern Sierra Nevada. All of the facilities under FERC jurisdiction are located along the Kaweah River upstream of the community of Three Rivers, and on the East Fork Kaweah River, a tributary to the Kaweah River, on private lands or on public lands administered by the BLM. Lake Kaweah, owned and operated by the U.S. Army Corps of Engineers (USACE), is located southwest of the Project, approximately five river miles downstream of the Kaweah No. 2 Powerhouse. The SNP and Sequoia-Kings Canyon (SKC) Wilderness Area are located immediately north and east of the Project, and the

John Krebs Wilderness Area is located southeast of the Project. The primary Project facilities and land jurisdictions are shown in Section 7.9 – Land Use, Map 7.9-1.

The Project facilities and bypass reaches associated with the Project are accessible via State Highway 198, which parallels the Kaweah River, and the Mineral King Road, which parallels the East Fork Kaweah River. These two roadways also serve as the primary access routes into the SNP and the SKC and John Krebs Wilderness areas, respectively (refer to Map 7.9-1). State Highway 198 is not currently identified as a State Scenic Highway as defined by the California Department of Transportation (Caltrans 2019). However, designating State Highway 198 as a State Scenic Highway is a priority project for Tulare County (Tulare County 2018).

The land encompassing the Project facilities is rural in nature and sparsely populated, especially along the East Fork Kaweah River. With approximately 2,200 people, the largest population center in the vicinity of the Project is the community of Three Rivers located approximately four miles west of the Kaweah No. 2 Powerhouse (US BOC 2010). The community of Hammond is located near the confluence of the Kaweah River and the East Fork Kaweah River. The community of Oak Grove is located in the immediate vicinity of the Kaweah No. 1 Diversion and associated structures. Individual homes are scattered throughout the Kaweah River Valley, particularly in the lower foothills.

The landscape is dominated by the Kaweah River and its tributaries. At lower elevations, near Lake Kaweah, the landscape is a relatively level floodplain with well-defined stream terraces, typical of the Sierra Nevada foothills. Vegetation consists primarily of oak and grass communities. Oak species vary from evergreen to deciduous, and on the drier slopes, chamise evergreen shrub dominates. Eastward, the landscape transitions to narrow drainages flanked by steeply sloping hillsides. Granite outcrops are common. At higher elevations the landscape is characterized by steep canyons and rugged terrain with dense forests and woodlands. A representative photograph of the Kaweah River Valley as seen from the Kaweah No. 2 Forebay is provided in Appendix A, Photo A-1.

The Kaweah River and its tributaries flow continuously throughout the year and support a wide diversity of riparian vegetation. The scenic quality in the Project vicinity is enhanced with flowing water and wetland vegetation, and in areas where the high snow-capped mountains of the Sierra Nevada are visible. However, aside from rapids and granite outcrops, there are no significant natural features or other scenic attractions in the immediate vicinity of the Project. A typical view of the Kaweah River is provided in Appendix A, Photo A-2.

7.11.3 Management Direction Pertaining to Visual Resources

The Project facilities are located in Tulare County on private lands and public lands administered by the BLM. Although none of the Project facilities are located within the boundaries of the SNP, some are visible from select locations within the SNP. Specifically: the Kaweah No. 2 Diversion Dam/Intake and the Kaweah No. 3 Powerhouse switchyard are visible from pullouts located on Highway 198, near the SNP boundary; and the edge of the Kaweah No. 3 Forebay and the slope below the forebay are visible from the Indian Head River Trailhead Parking Area and the Foothill Visitor Center, both developed recreation facilities located within the SNP. The following summarizes relevant visual resource direction contained in the BLM, Tulare County, and NPS management plans that pertain to the Project.

7.11.3.1 BLM Bakersfield Office RMP

The BLM's Bakersfield Office Approved Resource Management Plan (RMP) (BLM 2014) provides broad-scale direction for the future management of BLM-administered public lands and resources located in an eight county region of southern-central California, including the Project area. The Visual Resources section of the RMP contains the following goal, objective, and direction regarding administrative actions that pertain to the Project area:

- **Goal VR-G-1**. Public lands demonstrate a range of visual resource values that allow for development and provide opportunities for scenic appreciation.
- **Objective VR-O-1**. Utilize visual resource management classes for all public lands within the decision area to preserve and enhance scenic quality for present and future generations.
- **Administrative Actions**. For all surface-disturbing projects or activities, regardless of size of potential impact, incorporate visual design considerations, consistent with the Visual Resource Contrast Rating Manual H-8431-1, to meet Visual Resource Management (VRM) class objectives of the area.

As shown on Map 7.9-1, most of the Project facilities are located on private land that is surrounded by public land managed by the BLM. Most of the BLM land surrounding the Project facilities is designated Class II. The exceptions are the Kaweah No. 2 Diversion Dam and the Kaweah No. 3 Powerhouse, which are located in an area with a Class III VRM designation. The visual management objectives associated with these two BLM classifications are summarized below.

- **Class II Objective**. The objective of this class is to retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.
- **Class III Objective**. The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

The Project facilities were mapped relative to the BLM's VRM classifications using GIS data provided by the BLM on July 11, 2018. The resulting map is included in the LAND 2 – TSR, which is available in SD A (see Map LAND 2-4). Note that most of the Project facilities are located on private land. Therefore, Map LAND 2-4 is a generalized depiction of the BLM classifications. Table LAND 2-1 included in the LAND 2 – TSR provides similar information in a tabular format, and identifies which of the Project facilities are located on private or BLM land.

7.11.3.2 Tulare County Plans

The Tulare County General Plan (Tulare County 2012) includes two sections containing visual resource direction relevant the Project: Watercourses and Gateway to the Sequoias. In the Watercourses section, the plan specifies the importance of, "maintaining the rural and natural character of landscape viewed from trails and watercourses used for public recreation". In the Gateways to the Sequoias section, which includes State Highway 198, the plan states the importance of, "protecting primary viewsheds from development" (Tulare County 2012).

The Project is located in an area that is managed in accordance with the direction contained in the Three Rivers Community Plan 2018 Update (Tulare County 2018). The Community Plan, also referred to as a Policy Plan, "is a programmatic document that includes policies and diagrams to implement the goals and objectives of the community." (Tulare County 2018). Overall, the draft plan highlights the importance of maintaining the visual quality of the view along State Highway 198 and designing structures and developments with an emphasis on preserving the scenic panorama.

The Community Plan contains 22 "Vision Statements" that reflect the community's vision for the planning area as determined through years of public meetings and review and revision of draft documents. The Community Plan contains policies that are intended to guide how development and other activities should be implemented to achieve the community's vision for the planning area. One Vision Statement pertains directly to aesthetic resources: "preserve visual resources including viewsheds and ridgelines." The Community Plan contains 30 different policies that relate to this Vision Statement. Of these, 16 policies may be applicable to existing and/or future Project activities.

According to the Community Plan, designating State Highway 198 as a State Scenic Highway is a priority project for Tulare County. As such, the Community Plan provides a detailed inventory of the scenic resources and conditions along State Highway 198 as background information to facilitate the process of nominating State Highway 198 as a State Scenic Highway. The inventory begins downstream of Lake Kaweah and ends near the SNP boundary, just upstream of the East Fork Kaweah River confluence. The inventory is divided into three distinct segments, with the Project facilities falling within Segments 2 and 3. The inventory does not identify the Project facilities by name but mentions a "power generating facility" near the upper end of Segment 2 and "historic power station water flumes" "clinging to the hillside" and two power plants in Segment 3. Overall, the inventory depicts the Project facilities as historically important features in the Kaweah River landscape.

7.11.3.3 Sequoia & Kings Canyon General Management Plan

The SKC General Management Plan (NPS 2006) does not contain specific visual resource management objectives that pertain to the Project. In general, the plan emphasizes protection of natural resources and scenic river corridors.

7.11.4 Management Direction Pertaining to Noise

The following summarizes relevant noise-related direction contained in the BLM, Tulare County, and NPS management plans that pertain to the Project.

7.11.4.1 BLM Bakersfield Office RMP

The BLM Bakersfield Field Office RMP (BLM 2014) does not contain specific decibel (dB) level criteria for noise. In addition, a specific noise criteria was not identified in consultation with BLM.

7.11.4.2 Tulare County Plans

The Tulare County General Plan establishes noise level criteria in terms of the Day-Night Average Level (L_{dn}) metric (Tulare County 2012). The L_{dn} is the time-weighted energy average noise level for a 24-hour day, with a 10 dB penalty added to noise levels occurring during the nighttime hours (10:00 p.m. to 7:00 a.m.). The L_{dn} represents cumulative exposure to noise over an extended period of time and is calculated based on annual average conditions. The Three Rivers Community Plan Update (Tulare County 2018) refers to the standards identified the Tulare County General Plan (Tulare County 2009) and states that 60 dB L_{dn} is considered to be the maximum normally acceptable noise level for single family residential areas. Also, according to the Three Rivers Community Plan Update (2018), "the most significant mobile source of noise in the Three Rivers Community is SR-198."

7.11.4.3 NPS SKC General Management Plan

The SKC General Management Plan does not contain specific noise level criteria. However, the Projection of Natural Sounds section of the plan includes the following general discussion related to noise in the park: "Protection of Natural Sounds Opportunities in the parks are preserved for visitors to enjoy natural sounds, including quiet. Visitors to the parks often seek escape from the sights and sounds of urban life. As visitors move away from developed areas and park features, they are more able to enjoy the natural sounds of water, wind, and wildlife. The parks continue to limit low-flying aircraft to avoid disturbing the natural setting. Additionally, all visitors are reminded that their actions can disturb others. Sounds caused by visitors can destroy the tranquility that other visitors often seek."

7.11.5 Existing Visual Conditions

This section briefly describes the visual conditions of the Project facilities, focusing on those facilities that are visible to the general public from primary travel corridors or developed recreation facilities. Representative photographs of the Project facilities and surrounding landscape discussed in this section are provided in Appendix A, Photos A-3 through A-16.

All of the Project facilities that are readily visible from public viewing locations were systematically evaluated in 1989 as part of the previous relicensing effort. The results of that study are documented in the Kaweah Hydroelectric Project Visual Resources Report (KEA 1989), which is provided in Appendix B for reference. The Project has not been substantially altered since the 1989 assessment. Therefore, the Project facilities and features that were assessed in 1989 were not reassessed as part of the current relicensing effort. Instead, as specified in the LAND 2 – Aesthetic Resources Technical Study Plan (LAND 2 – TSP), the studies that were completed for the current relicensing effort focused on the following:

- Assessing a new maintenance building that was erected at the Kaweah No. 1 Powerhouse Campus in 2012;
- Assessing the Kaweah No. 2 Diversion Dam intake structure, which was substantially modified in 2012;
- Documenting visual conditions of the hillside located immediately below the Kaweah No. 3 Forebay, as requested by the NPS; and
- Documenting visual conditions during a spill event from Kaweah No. 3 Forebay, as requested by the NPS.

The EVC and visual compatibility of the Project facilities as documented by KEA in 1989 is discussed below by development. New information that was developed as part of the current relicensing effort is integrated into each development, as appropriate. Note that KEA assessed the visual compatibility of the Project facilities using the BLM's Visual Resources Management (VRM) System. Accordingly, for consistency, the assessments that were conducted for the current relicensing effort were also completed using the BLM's VRM. A description of the VRM and definitions of the terminology used herein are available in KEA's 1989 report (Appendix B).

7.11.5.1 Kaweah No. 1 Development

The Kaweah No. 1 Development under FERC jurisdiction primarily consists of a diversion dam and intake structure, an elevated flowline, a forebay tank, a penstock, a powerhouse, and the Kaweah No. 1 Powerhouse Campus. These facilities are briefly described below in the context of aesthetic resources. Detailed descriptions of these facilities are available in Section 3.0 – No-Action Alternative.

The Kaweah No. 1 Diversion Dam is located on the East Fork Kaweah River, approximately 4.6 miles upstream of the Kaweah River confluence, near the small community of Oak Grove. The diversion structure is a 6-foot high overflow concrete gravity dam, with a crest length of 20 feet at an elevation of approximately 2,583 feet above mean sea level (msl). The dam forms a small pool with a current capacity of approximately 0.03 acre-foot (ac-ft). Water is diverted through an intake into an unlined tunnel and empties into a sandbox (sediment trap) at the downstream end. Although located near Oak Grove, the diversion dam, intake structure and sandbox cannot be seen from public roadways or residences. Therefore, since they are not visible to the general public, KEA did not assess these facilities in detail. The Kaweah No. 1 Diversion Dam and associated structures as seen from below Mineral King Road is shown in Appendix A-3 in Appendix A. Note that the diversion and sandbox are not visible when driving along the Mineral King Road.

Water leaving the sandbox flows into the Kaweah No. 1 Flowline. The Kaweah No. 1 Flowline is approximately 30,723 feet long and consists of an elevated steel flume supported by a wooden support structure. The flowline traverses along the south side of East Fork Kaweah River Canyon and generally parallels Mineral King Road (Appendix A, Photo A-3). The flume is visible from Mineral King Road for approximately 5.5 miles. The flume is openly visible along most of this section, although vegetation screening and topography reduces the visibility of the flume in some areas. KEA rated the visual contrast of the Kaweah No. 1 flume as “weak” to “moderate” due primarily to its proximity (within 0.5 mile) to the Mineral King Road for over five miles. A photograph of the Kaweah No. 1 Flowline as seen from Mineral King Road is provided in Appendix A, Photo A-4.

The flowline terminates at the Kaweah No. 1 Forebay Tank, a 24-foot diameter tan-colored tank located at the terminus of the Kaweah No. 1 Flowline, at the upper end of the Kaweah No. 1 Penstock. The forebay tank is located approximately 0.5 mile southeast of State Highway 198 and can be seen from the highway, Dinely Road, and from dispersed residences within the 0.5-mile viewing distance. However, although visible, the forebay tank’s elevated position, and poor line of site from public viewing areas significantly reduces the number of viewers affected. Therefore, KEA rated the visual contrast of the forebay tank as “weak.” Photo A-5 in Appendix A shows the forebay as viewed from Dinely Road. As indicated, it is not readily noticeable due to the small size of the forebay relative to the viewing distance.

The penstock is buried and therefore is not visible to the public. However, the penstock alignment is noticeable due to the difference in vegetation patterns that exist along and adjacent to the penstock. KEA rated the visual contrast of the penstock alignment as “weak”. The penstock alignment is visible in Photo A-5 in Appendix A.

Kaweah No. 1 Powerhouse is situated on the Kaweah River, below Highway 198. The Kaweah No. 1 Powerhouse is a beige color reinforced concrete structure, measuring approximately 22.5-feet by 26.3-feet by 25 feet in height. The powerhouse is partially visible from several dispersed residences located on the northwest banks of the Kaweah River (KEA 1989). However, views of the powerhouse from these residences are totally or severely restricted most times of the year by dense riparian vegetation along the river banks (KEA 1989). The powerhouse is not visible from State Highway 198 because it is situated at a lower elevation than the highway, below a natural terrace, adjacent to the river. Since this facility is not generally visible by the public, KEA did not assess this facility in detail.

The Kaweah No. 1 Powerhouse sits immediately below an assemblage of administrative and maintenance buildings referred to as the Kaweah No. 1 Powerhouse Campus. All of the primary buildings located within the campus boundaries are single-story structures, painted white or off-white, with natural color, low-angle roofs. Natural vegetation is dispersed throughout the campus, partially screening some of the structures from view. However, since the vegetation is generally sparse in this part of the Kaweah River canyon, and because the campus is located immediately adjacent to State Highway 198, the entire campus is visible in the foreground when travelling past it on Highway 198. Photo A-6 in Appendix A shows the campus as viewed from a turnout on the highway. KEA assessed the visual contrast of the campus maintenance buildings as “moderate” because the site as a whole exhibits industrial characteristics relative to the surrounding landscape and is openly viewed from the highway (KEA 1989).

A new maintenance building was added to the complex in 2012 and was not assessed by KEA as part of the previous relicensing effort. Therefore, the maintenance building was assessed in 2018 as part of the LAND 2 – TSP. The assessment results are summarized in the LAND 2 – TSR, which is included in SD A. As documented in the LAND 2 – TSR, the maintenance building is a modern, prefabricated structure measuring approximately 50 feet wide by 100 feet long by 20 feet high. The exterior is clad with metal siding and has a low-angle metal roof, all painted white, or off-white to match the other buildings on the campus. No vegetation is present between the building and the highway. Therefore, the building is readily visible in the foreground from State Highway 198. Visual contrast of the building was rated as “moderate”. Photo A-7 in Appendix A shows the new maintenance building as seen from a turn-out on Highway 198. This turn-out was used as the Key Observation Point (KOP) for the current assessment.

7.11.5.2 Kaweah No. 2 Development

The Kaweah No. 2 Development primarily consists of a diversion dam and intake structure, a flowline, a forebay, a penstock, and a powerhouse. These facilities are briefly described below in the context of aesthetic resources. Detailed descriptions of these facilities are available in Section 3.0 – No-Action Alternative.

The Kaweah No. 2 Diversion Dam is located on the Kaweah River, just below the Kaweah No. 3 Powerhouse tailrace and approximately one-mile upstream of the confluence of the East Fork Kaweah River. The diversion is comprised of a 7-foot high granite masonry overflow gravity dam with a crest length of 161 feet. Water impounded by the dam is diverted into the Kaweah No. 2 Flowline at an intake structure located on the northwest end of the dam (i.e., river right, looking downstream). The diversion dam and intake structure are not readily visible from a primary travel corridor (e.g., Highway 198). As such, KEA did not assess these structures in detail in 1989.

The Kaweah No. 2 Intake Structure was reconstructed in 2012. As such, consistent with the LAND 2 – TSP, the intake structure was assessed as part of the current relicensing effort. The assessment methods and results are available in the LAND 2 – TSR, which is included in SD A. The assessment was conducted from the river trail that begins at the Indian Head River Trailhead Parking Area, which is the first pullout along Highway 198 in the SNP in the vicinity of the Project (see Map LAND 2-2 in the LAND 2 – TSR). Photo A-8 in Appendix A shows Kaweah No. 2 Diversion Dam and intake structure as viewed from the Indian Head Trailhead Parking Area trail. As shown in the photograph, the dam and intake structure are not readily noticeably from this vantage point due to viewing distance, dense riparian vegetation, and because the concrete intake structure blends with the nearby bedrock. As such, visual contrast was rated as “weak”.

Water diverted at the Kaweah No. 2 Diversion Dam enters the Kaweah No. 2 Flowline, which is approximately 21,607 feet in length, consisting of 16,738 feet of concrete ditch, 3,822 feet of steel flume comprised of 19 segments, and 1,047 feet of 50-inch diameter steel pipe. The flowline generally parallels the northwest side of the Kaweah River and State Highway 198. The top of the concrete ditch section is essentially flush with the ground surface and is therefore not visible from public viewing areas. The steel flume section is elevated and supported primarily on a steel structure, although some short flume sections are supported by wood framing. Portions of the elevated flume are visible from State Highway 198 and from rural residential areas, with the most visible section being a one-mile section just east of the Kaweah No. 2 Forebay (Appendix A, Photo A-9). KEA assessed the flowline in 1989 from one KOP located along State Highway 198. KEA rated the visual contrast of the visible section of flume as “moderate to strong” due to the contrast between the reflective steel flume and surrounding hillside (KEA 1989).

The flowline terminates at the Kaweah No. 2 Forebay, a small concrete lined structure that is an enlargement of the Kaweah No. 2 Flowline. The forebay is approximately 180 feet long, with a cross section 13-feet wide by 14-feet deep, and a capacity of 0.75 ac-ft. Except for minor structures located at the terminus of the forebay, the top of the forebay is essentially flush with the ground surface and is therefore not readily visible from State Highway 198, but according to KEA (1989) can be seen from a limited number of local residences. Photo A-10 in Appendix A shows the forebay as viewed from Highway 198.

From the forebay, flow is conveyed to the Kaweah No. 2 Powerhouse through the Kaweah No. 2 Penstock. The Kaweah No. 2 Penstock is buried and therefore is not visible to the public. Furthermore, the penstock alignment is not readily noticeable because the alignment and adjacent landscape are similarly sparsely vegetated.

The Kaweah No. 2 Powerhouse is located on the northwest bank of the Kaweah River, approximately 1.5 miles north of the community of Hammond. The above-grade portion of the powerhouse is a rectangular building approximately 34-foot by 62-foot wide and 25-feet high. The structure is a wood frame building clad in corrugated steel, painted a matte tan color. The Kaweah No. 2 Switchyard, enclosed in green coated cyclone fencing, is located between the powerhouse and the Kaweah River. The powerhouse and switchyard cannot be seen from Highway 198, but can be seen from Kaweah River Drive, a non-Project general access road that bisects the area between the powerhouse and the switchyard. Photo A-11 in Appendix A shows the Kaweah No. 2 Powerhouse as seen from Kaweah River Drive. Because the powerhouse and switchyard are not visible from Highway 198, KEA rated visual contrast as “none”.

7.11.5.3 Kaweah No. 3 Development

The portions of the Kaweah No. 3 development that are under FERC jurisdiction include a short segment of the Kaweah No. 3 Flowline, the Kaweah No. 3 Forebay and the Kaweah No. 3 Powerhouse. These facilities are briefly described below in the context of aesthetic resources. Detailed descriptions of these facilities are available in Section 3.0 – No-Action Alternative.

The short segment of the Kaweah No. 3 Flowline under FERC jurisdiction consists of a 2,975-foot long concrete box flume that conveys water to the Kaweah No. 3 Forebay. The flume is set into the steep hillside and the downstream side of the flume is screened by dense vegetation. Therefore, the linear form of the flume on the hillside is generally not noticeable from public viewing locations. KEA rated the visual contrast of the entire flowline (including sections located within the SNP) as “weak” to “moderate”.

The flume terminates at the Kaweah No. 3 Forebay, which is an embankment forebay with a capacity of approximately 11 ac-ft. The forebay is open and concrete lined, with the top of the concrete essentially flush with the ground surface. The Kaweah No. 3 Forebay is not visible from public viewing locations. Therefore, KEA did not assess the forebay in detail.

Although the Kaweah No. 3 Forebay itself is not noticeable, the vegetation on the hillside below the forebay is sometimes noticeable due to seasonal changes in vegetation. Specifically, grape vines growing on the hillside are noticeable during the spring and summer due to their bright green color relative to the surrounding native vegetation. Conversely, the hillside appears barren and brown during the fall and winter when the grapes have dropped their leaves exposing the hillside and dead vegetation beneath. Photographs of the hillside below the Kaweah No. 3 Forebay as viewed from the Foothill Visitor Center on May 31, 2018 and December 4, 2018 are included in Appendix A as Photos A-12 and A-13, respectively.

Overflow from the Kaweah No. 3 Forebay enters an approximately 75-foot long concrete-lined spillway chute that begins at the upstream end of the forebay. The spillway chute discharges into an adjacent natural drainage channel that flows approximately 0.3 mile downslope to the Kaweah River (within the SNP).

Per the request of the SNP, SCE documented visual conditions of the natural drainage channel under “no-spill” and “maximum spill” scenarios (about 92 cubic feet per second [cfs]) as viewed from the Foothill Visitor Center Picnic Area (KOP 4) on May 31, 2018 (Appendix A, Photo A-14). The study methods and results are documented in the LAND 2 – TSR, which is available in SD A. As documented in the report, the natural drainage channel (referred to as the East Spillway Channel in the LAND 2 – TSR) is not discernable from the Foothill Visitor Center Picnic Area under the no-spill condition, mainly due to the viewing angle, and the long viewing distance between the visitor center and the natural drainage channel. Conversely, the natural drainage channel is visible from the Foothill Visitor Center Picnic Area under the maximum spill scenario due to the contrast between the white color of the aerated water relative to the adjacent vegetation and the linear nature of the natural drainage channel. However, overall the contrast rating is considered “weak” due to the long viewing distance between the natural drainage channel and the KOP, and because the vegetation along the channel disrupts the linear nature of the channel, thereby reducing overall visual contrast. In general, with a flow of 92 cfs, the channel appears as a natural waterfall. Lower flows would be less discernable.

Water from the forebay is conveyed to the Kaweah No. 3 Powerhouse via the Kaweah No. 3 Penstock. The Kaweah No. 3 Penstock is a 3,151-foot long buried steel pipe varying in diameter from 42–36 inches. The penstock conveys water to the Kaweah No. 3 Powerhouse. The penstock is buried and therefore is not visible to the public. However, the penstock alignment is distinguishable by the differences in vegetation patterns along and adjacent to the penstock, as well as the presence of a telephone line that parallels the penstock (KEA 1989). Accordingly, KEA rated visual contrast of the penstock alignment as “weak”.

The Kaweah No. 3 Powerhouse is located on the east bank of the Kaweah River near the SNP boundary. The powerhouse is a concrete building measuring approximately 52-feet-by-52-feet and is approximately 25 feet high. The building is painted light brown. A switchyard is located adjacent to the powerhouse. The Kaweah No. 3 Powerhouse can be seen from several turnouts along State Highway 198 within the SNP, including the parking area at the SNP boundary. However, visibility is partially obscured from these viewing locations by the surrounding vegetation along the Kaweah River (KEA 1989). Kaweah Powerhouse No. 3 may also be seen from a few residences located immediately south and outside of the SNP (KEA 1989). KEA rated visual contrast of the powerhouse as “weak”.

7.11.5.4 Transmission, Power, and Communication Lines

There are three transmission lines associated with the Project—the primary transmission line and two tap lines. The primary Project transmission line extends approximately 4.09 miles from the Kaweah No. 3 Powerhouse to the Three Rivers Substation.[1] The line is a 66 kV, 3-phase, single circuit line construction on a combination of wooden and steel poles with suspension-type insulators. The primary transmission line connects to the Kaweah No. 1 Switchyard via a 66 kV, 120-foot long tap line, and to the Kaweah No. 2 Switchyard via a 66 kV, 0.4-mile long tap line. The transmission lines generally parallel the Kaweah River and State Highway 198. The 66 kV transmission line can be seen from State Highway 198 and from dispersed residences in the Kaweah River Valley. The transmission line was assessed by KEA in 1989. As documented by KEA, while the transmission line can be seen from Highway 198, the contrast of the transmission line within the landscape

[1] The Three Rivers Substation is not part of the Kaweah Project.

is very weak, mainly due to the visual absorption capacity of the surrounding landscape (KEA 1989). Photo A-16 in Appendix A shows a typical view of the transmission line.

The Project also includes various overhead power and communication lines. A complete list of the power and communication lines that are associated with the Project is provided in Table 3-4 along with descriptive information such as length, voltage, and purpose. As indicated on Table 3-4, these lines extend between Project facilities and are used to operate equipment and allow communication between facilities. In general, the Project power and communication lines are situated in the immediate vicinity of other Project facilities or local commercial buildings. Therefore, although the power and communication lines are visible, they are not visually obtrusive because they blend with the surrounding built environment.

7.11.6 Noise

At the request of the NPS, SCE conducted noise studies to: (1) assess helicopter noise associated with routine operation and maintenance of the Project; and (2) assess noise associated with spills from the Kaweah No. 3 Forebay. A detailed discussion of the methods and results of the noise studies are provided in the LAND 2 – TSR, which is included in SD A. The study methods and results are summarized below.

7.11.6.1 Helicopter Noise

According to the NPS, helicopter noise can be heard at the Indian Head River Trailhead Parking Area and at the Foothill Visitor Center Picnic Area when the nearby Ash Mountain Heliport is used as a staging area/landing zone. Therefore, the NPS requested that SCE document Project-related helicopter use and conduct a noise study from these two recreation areas. These two recreation areas, and the Ash Mountain Heliport, are shown on Map LAND 2-2 included in the LAND 2 – TSR in SD A.

As documented in the LAND 2 – TSR, operation and maintenance of the components of the Kaweah Project that are under FERC jurisdiction does not require the routine use of helicopters. Therefore, any helicopter noise that may be heard at the Indian Head River Trailhead Parking Area and the Foothill Visitor Center Picnic Area is not associated with routine operation and maintenance of the Project. Helicopters have been used in the past related to non-routine capital projects related to replacement of Project penstocks or flowlines.

Since SCE does not use helicopters for routine operation and maintenance of the Project, the study was conducted when SCE used helicopters to perform a non-routine repair/replacement of the penstock at the Kaweah No. 3 Forebay. On the day the noise assessment was conducted, SCE used a Bell 205 helicopter to transport pipes from a staging area located approximately 500 feet east of Highway 198 to the Kaweah No. 3 Forebay (refer to Map LAND 2-2). During the study, SCE conducted a total of 18 round trip flights between the staging area and the forebay plus three flights to and from the Ash Mountain Heliport to refuel the helicopter.

Noise levels were measured using Larson-Davis Laboratories Model LDL-820 sound level analyzers equipped with a B&K Type 4176 1/2” microphones. Noise level measurements were taken at the Indian Head River Trailhead Parking Area and the Foothill Visitor Center Picnic Area simultaneously before, during and after helicopter operations. Noise levels were measured continuously and as individual events and the results were used to calculate the L_{eq} (hourly average), L_{max} (maximum noise level) and L_{dn} (day-night average).

Indian Head River Trailhead Parking Area

Prior to the commencement of helicopter operations, noise levels at the Indian Head River Trailhead Parking Area were generally dominated by the flow of the nearby Kaweah River; traffic noise associated with vehicles on Highway 198; and human voices and vehicle activities within the parking area and nearby trail.

Helicopter operations associated with the Kaweah No. 3 Forebay maintenance activities resulted in an increase of approximately 15.4 dB in the hourly average (L_{eq}) and an increase of approximately 13 dB in the hourly maximum (Lmax) compared to ambient noise levels measured at the Indian Head River Trailhead Parking Area. Overall, helicopter noise exposure as defined by the L_{dn} metric was calculated to be 58.7 dB. Accordingly, the L_{dn} noise exposure at the Indian Head River Trailhead Parking Area was below the 60 dB L_{dn} noise standard provided in the Tulare County General Plan.

Foothill Visitor Center Picnic Area

Prior to the commencement of helicopter operations, noise levels at the Foothill Visitor Center Picnic Area were generally dominated by traffic noise associated with vehicles on Highway 198 as well as human voices and vehicle activities at the parking area.

Helicopter operations associated with the Kaweah No. 3 Forebay maintenance activities resulted in an increase of approximately 9.5 dB in the hourly average (L_{eq}) and an increase of approximately 4.8 dB in the hourly maximum (Lmax) compared to ambient noise levels measured at the Foothill Visitor Center Picnic Area. Overall helicopter noise exposure as defined by the L_{dn} metric was calculated to be 49.1 dB. Accordingly, the L_{dn} noise exposure at the Foothill Visitor Center Picnic Area was below the 60 dB L_{dn} noise standard provided in the Tulare County General Plan.

7.11.6.2 Kaweah No. 3 Forebay Spill Noise

According to the NPS, noise can be heard at the Indian Head River Trailhead Parking Area and at the Foothill Visitor Center Picnic Area when spills occur from the Kaweah No. 3 Forebay. Therefore, the NPS requested that SCE conduct a noise study from these two recreation areas during a spill event. These two recreation areas, the Kaweah No. 3 Forebay, and the natural drainage channel (referred to as East Spillway Channel in the LAND 2 – TSR) associated with the forebay are shown on Map LAND 2-2 included in the LAND 2 – TSR in SD A.

The noise study was conducted on May 31, 2018, and timed to occur on a day when SCE could provide a controlled spill event in the 80–90 cfs range, which represents a maximum spill event scenario. The spill event lasted a total of 1.5 hours, including a 15-minute ramp up and a 15-minute ramp down. Noise level measurements were taken at Indian Head River Trailhead Parking Area and the Foothill Visitor Center Picnic Area simultaneously before, during and after the spill event using a LDL-820 sound level analyzer equipped with B&K Type 4176 ½" microphones. To obtain a statistically valid sample size, and to avoid loud single events unrelated to the spill event that would dominate or contaminate noise samples, noise level measurements were broken into time synced 5-minute intervals.

Noise levels were used to calculate the L_{eq} (hourly average), L_{max} (maximum noise level) and L_{90}. While all three metrics are provided in the LAND 2 – TSR, the L_{90} descriptor is considered the parameter most representative of noise levels associated with a spill event because the noise produced by flowing water remains relatively constant over time. The L_{90} metric can be used to assess the noise level associated with flow by separating out noise levels associated with individual events such as vehicles, aircraft, and human voices.

Indian Head River Trailhead Parking Area

The controlled spill/release was neither visible nor audible at the Indian Head River Trailhead Parking Area. Noise levels at the Indian Head River Trailhead Parking Area were generally dominated by noise associated with the flow of the Kaweah River. Other sources of noise observed during the measurement period including traffic noise associated with vehicles on Highway 198, as well as human voices and vehicle activities within the parking area and nearby trailhead.

Residual background noise levels, as defined by the L_{90} statistical descriptor were 0.4 dB higher during the period the spill event was occurring. This is likely due to the temporal increase in flow in the Kaweah River during the spill event. Changes in noise levels less than 1 dB are below the general threshold of perception by the human ear.

Foothill Visitor Center Picnic Area

The controlled spill/release was both visible and audible at the Foothill Visitor Center Picnic Area. Noise levels at the Foothill Visitor Center Picnic Area were generally dominated by noise associated vehicle traffic on Highway 198 and the nearby parking area. Other sources of noise observed during the measurement period included aircraft and human voices. Residual background noise levels, as defined by the L_{90} statistical descriptor were 4.8 dB higher during the period the spill event was occurring. This change is generally perceivable by the human ear. However, noise associated with the spill event only increased overall noise levels (as defined by the L_{eq}) by approximately 2.5 dB during the period the spill event was occurring.

7.11.7 Literature Cited

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APPENDIX 7.11-A

Representative Photographs of the Kaweah Project Facilities

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Photo A-1. View of Kaweah River Valley looking southwest from the Kaweah No. 2 Forebay. 2018.

Photo A-2. Typical view of the Kaweah River, looking downstream in the vicinity of the Kaweah No. 2 Powerhouse. Camera facing southwest. October 6, 2018.

Photo A-3. Kaweah No. 1 Diversion Dam, sandbox, and flowline on the East Fork Kaweah River as viewed from <u>below</u> Mineral King Road. Camera facing southwest. April 17, 2018.

Photo A-4. **Kaweah No. 1 Flowline, typical elevated steel flume section along the East Fork Kaweah River as seen from Mineral King Road. Camera facing southeast. April 17, 2018.**

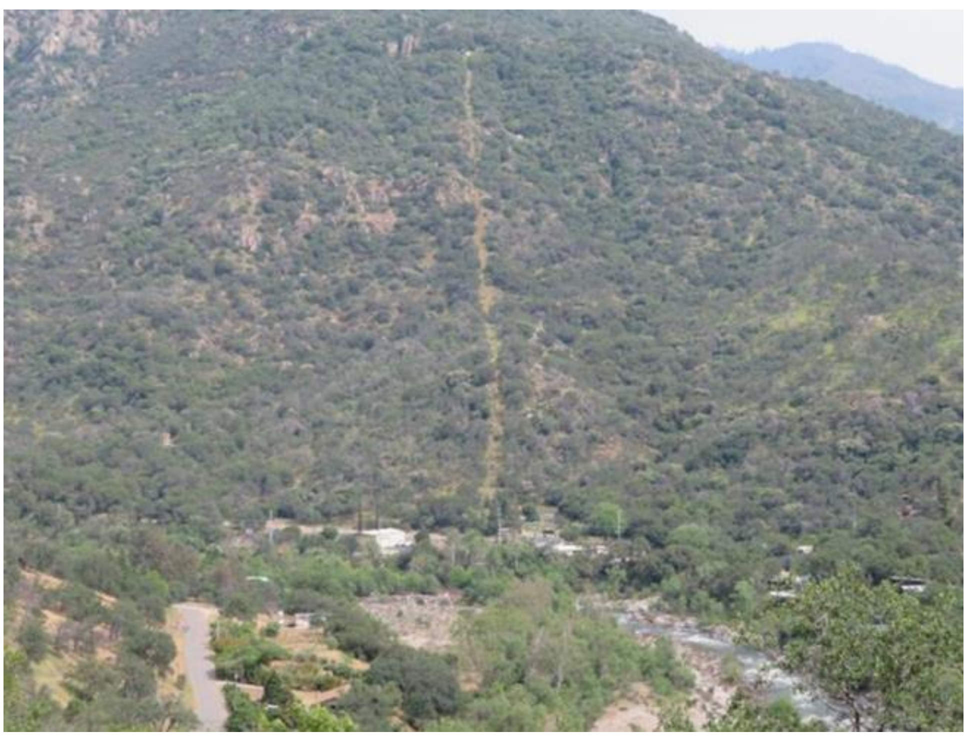

Photo A-5. **Kaweah No. 1 forebay, penstock alignment and powerhouse as viewed from Dinely Road. The Kaweah River is in the foreground. Camera facing southeast. May 8, 2018.**

Photo A-6. **Kaweah No. 1 Powerhouse Campus as seen travelling east on Highway 198. Camera facing northeast. April 18, 2018.**

Photo A-7. **New maintenance building at the Kaweah No. 1 Powerhouse Campus as seen from Highway 198. Camera facing northeast. May 9, 2018.**

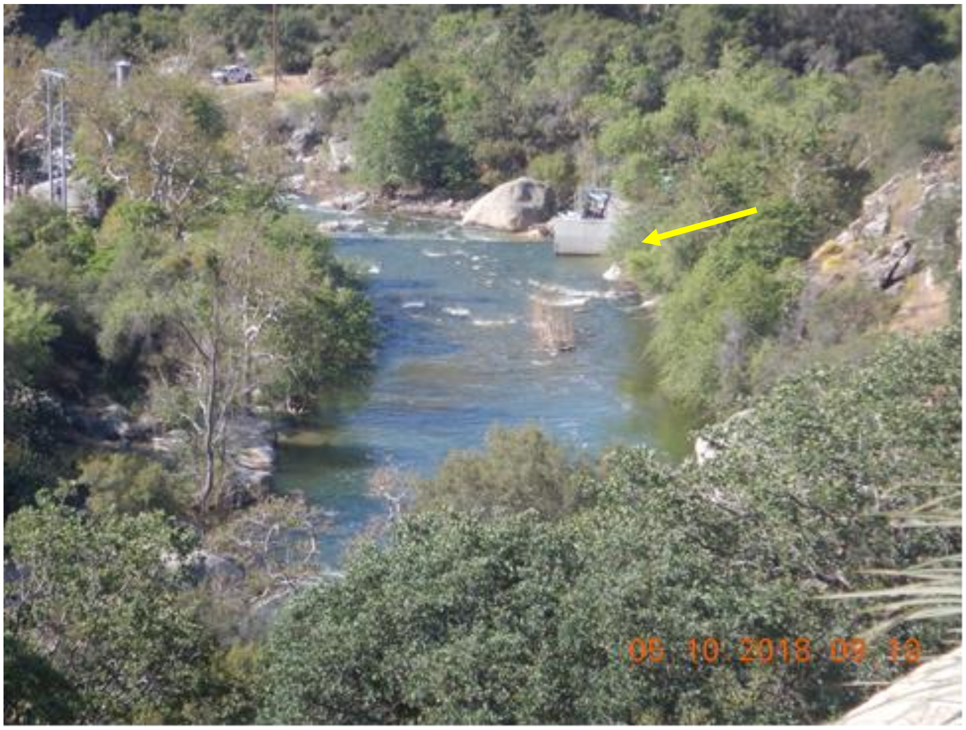

Photo A-8. **Kaweah No. 2 Diversion Dam and intake structure on the Kaweah River as seen from the Indian Head Trailhead Parking Area. Camera facing southwest. May 10, 2018.**

Photo A-9. **Kaweah No. 2 Flowline as seen from Highway 198. Camera facing northwest. May 16, 2019.**

Photo A-10. Kaweah No. 2 Forebay (and access roads) as seen from Highway 198. Camera facing north. May 16, 2019.

Photo A-11. Kaweah No. 2 Powerhouse as seen driving east on Kaweah River Drive. May 16, 2019.

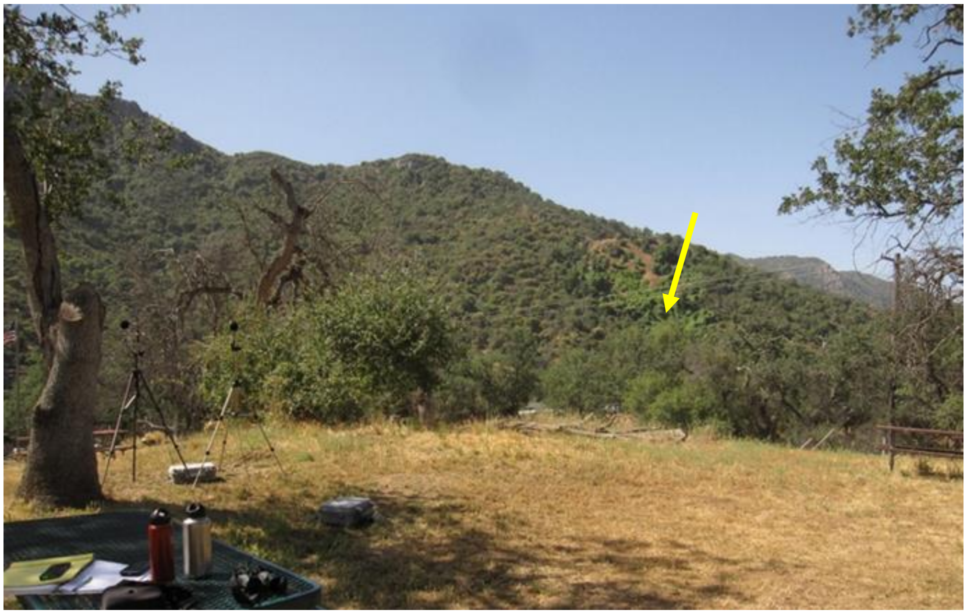

Photo A-12. Hillside below Kaweah No. 3 Forebay as seen from the Foothill Visitor Center Picnic Area during the spring. May 31, 2018.

Photo A-13. Hillside below Kaweah No. 3 Forebay as seen from as seen from the Foothill Visitor Center Picnic Area during the winter. December 4, 2018.

Photo A-14. **Spillway below Kaweah No. 3 Forebay during maximum spill event (92 cfs) as viewed from the Foothill Visitor Center Picnic Area on May 31, 2018.**

Photo A-15. **Kaweah No. 3 Powerhouse and penstock alignment as seen from the parking area at the SNP boundary. Camera facing southeast. May 16, 2019.**

Photo A-16. Kaweah No. 3 Powerhouse to Three Rivers Substation 66 kV Transmission Line as seen from the intersection of Alta Acres and Skline Drive. Camera facing north east. April 19, 2018.

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APPENDIX 7.11-B

Kaweah Hydroelectric Project Visual Resources Report Prepared by Keller Environmental Associates

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KAWEAH HYDROELECTRIC PROJECT

VISUAL RESOURCES REPORT

Prepared for:

Southern California
Edison Company
Environmental Operations
2244 Walnut Grove Avenue
Rosemead, CA 91770

Prepared by:

Keller Environmental
Associates, Inc.
964 Fifth Avenue
Suite 535
San Diego, CA 92101

November 1989

KAWEAH HYDROELECTRIC PROJECT

VISUAL RESOURCES REPORT

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LIST OF FIGURES AND PLATES

LIST OF TABLES

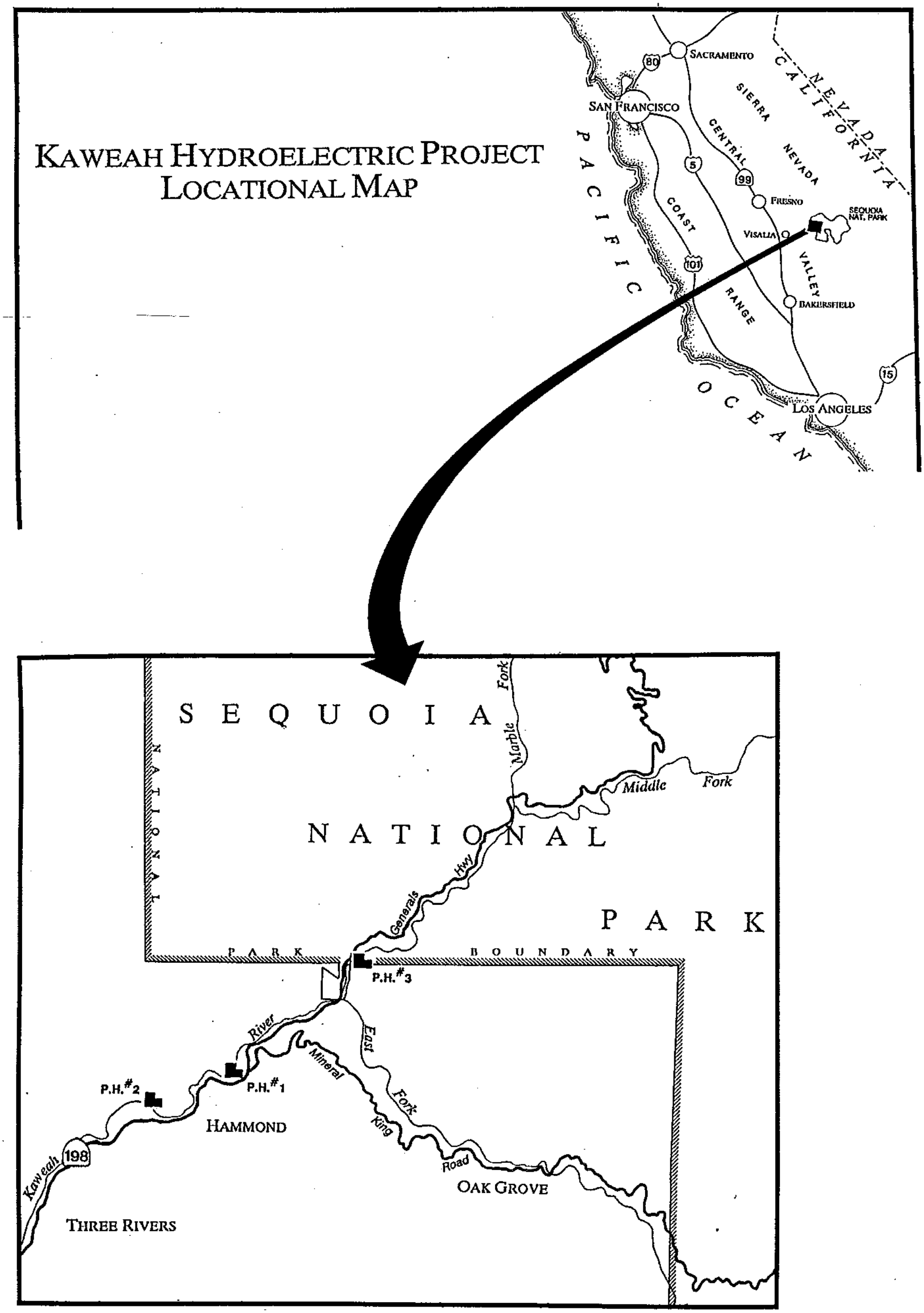
I. INTRODUCTION

The Visual Resources Study for the Kaweah Hydroelectric Relicensing Project was conducted by Keller Environmental Associates from April through August 1989. The study was structured and designed to answer data requests set forth in the Federal Energy Regulatory Commission's (FERC's) letter to Edison dated October 24, 1988. Specifically, the following general visual issues are evaluated in response to FERC's data request Number 10:

- **The Visual Compatibility of the Project Facilities Within the Landscape.** Located within and near the Sequoia National Park on the western foothills of the Southern Sierra Nevada Mountains, the project facilities are recognized as being located in a scenic and visually sensitive area. The study evaluates the degree to which the project imposes visual effects and is based upon the Bureau of Land Management's Visual Resource Management (VRM) System. Comments received by the National Park Service are incorporated into the study findings. Figure 1 shows the location of the Kaweah Hydroelectric Facilities and the study area consideration for the visual assessment.

- **The Average Monthly Stream Flows in Bypassed Reaches.** The Kaweah Hydroelectric Powerhouses intake structures are located on the Marble Fork, Middle Fork, and East Fork of the Kaweah River. The visual report provides historical data on the stream flows in these bypassed reaches of the Kaweah River over the past ten years. The visual impact implications of these operations are discussed.

In addition, FERC has requested a discussion of alternative ways to enhance the visual quality of the project facilities as well as the construction, operation and maintenance costs and their effects on project economics. Edison is responsible for providing this information, and it is therefore not addressed herein.



KAWEAH HYDROELECTRIC PROJECT
LOCATIONAL MAP
SACRAMENTO
80
SAN FRANCISCO
NEVADA
CALIFORNIA
SIERRA
NEVADA
CENTRAL
VALLEY
5
99
FRESNO
SEQUOIA NAT. PARK
VISALIA
COAST
RANGE
101
BAKERSFIELD
PACIFIC
OCEAN
15
LOS ANGELES
SEQUOIA
NATIONAL
PARK
NATIONAL
Marble
Fork
Middle
Fork
Generals
Hwy
PARK
BOUNDARY
P.H.#3
River
East
Fork
Mineral
King
Road
P.H.#1
P.H.#2
HAMMOND
Kaweah
198
OAK GROVE
THREE RIVERS

Figure 1

II. VISUAL COMPATIBILITY ASSESSMENT

The visual compatibility assessment for the Kaweah Project is discussed in the following two subsections: Methods and Findings. The Methods section is intended for technical reviewers interested in the BLM's VRM system and its application to the project. The Findings section is written primarily for general audiences interested in the project's visual characteristics and compatibility with the project area. Terms used in the Findings section are defined under Methods.

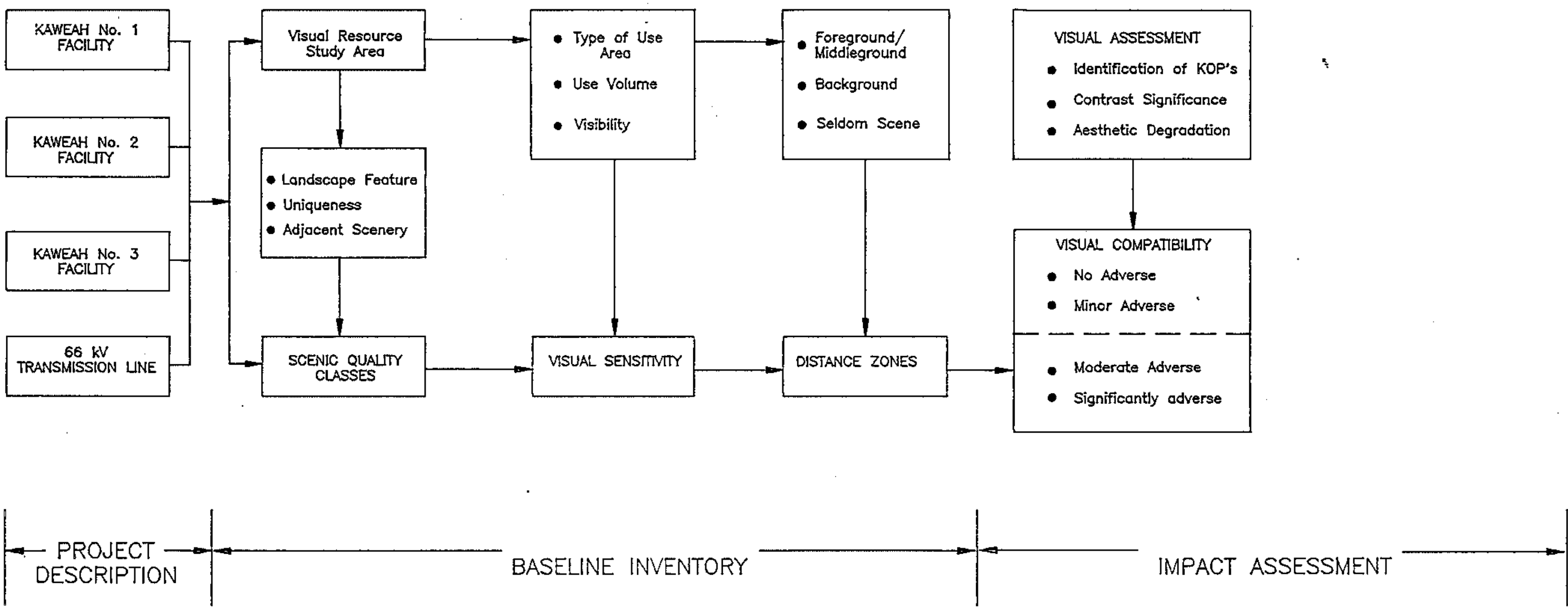
A. METHODS

The assessment of the visual compatibility of the Kaweah Hydroelectric Facilities with the surrounding landscape is based upon the Bureau of Land Management's Visual Resources Management (VRM) System. The VRM system provides a mechanism for systematically evaluating scenic resources, visual sensitivity, distance zones and the visual contrast level that project facilities create in the environment. Figure 2 shows the overall VRM methodology and its application to the Kaweah Hydroelectric Project.

Lands within the project vicinity consist of both privately-owned lands and public lands, including those administered by the National Park Service and the Bureau of Land Management. Consequently, minor modifications were made to incorporate private land values and land uses into the visual study methodology since system methodology is specifically tailored to federal land management actions and objectives. The following sections provide a brief overview of the steps followed for this evaluation.

1. Preparation of Baseline Inventories

Baseline inventory components of the VRM system include scenic quality, sensitivity levels and distance zones. Existing information on these factors was collected from the BLM Bakersfield District Office and Caliente Resource Area Office. The existing data base was verified and supplemented in the field for private lands and lands not previously studied through field reconnaissance and evaluations. The methodology for baseline data collection followed the VRM guidelines established by BLM in BLM Manual Handbook 8410-1. Fieldwork was conducted for two weeks, from April 10 through April 17, and May 20 through May 25, 1989. A description of the inventory tasks is presented below.



VISUAL ASSESSMENT METHODOLOGY

Figure 2

a. Scenic Quality

Through an analysis of resource data (i.e., aerial photography, topography, vegetation, geomorphology, and other resource maps, photographs, and Nevin M. Fenneman's description of physiographic provinces), landscape character types had been previously delineated and mapped by the BLM for portions of the study region. The study area is located in the western portion of the Southern Sierra Nevada foothills physiographic province (Fenneman, 1931). The predominant landscape character type for this region consists of rolling to steep-sloped hills (averaging 2,000 to 3,500 feet above MSL), steep canyons cut by rivers and streams, as well as granite rock outcroppings and higher mountain peaks scattered throughout the character type.

The criteria used in the VRM system to distinguish distinctive from common and minimal landscape types are those used to establish scenic quality levels (e.g., Classes A, B and C). General definitions for these levels are:

- **Class A - Areas of High Scenic Quality.** Landscapes exhibiting greater visual diversity or composition than the typical landscape. Class A also applies to regionally unique landscapes having scenic/visual values.

- **Class B - Areas of Representative Scenic Quality.** Landscapes that are characteristic of the region. These landscapes are typically seen throughout the region.

- **Class C - Areas of Minimal Scenic Quality.** Landscapes exhibiting less variety in line, form, color, and texture than the characteristic landscape are assigned. Class C Scenic Quality areas disturbed or significantly degraded by man's activities are also classified as "C" Scenic Quality.

The physical description of key factors, including the landscape features of rockforms, landforms, vegetation, water, color, adjacent scenery scarcity (uniqueness), and cultural modifications are the criteria by which scenic quality levels are delineated. As a step toward refining scenic quality levels, existing cultural modifications (i.e., structures, roads, etc.) were examined to determine their visual significance in the landscape. Consideration of cultural modifications are identified by the extent of their visual influence to the adjacent landscape. It should be stressed that not all cultural modifications are intrusive nor considered adverse. The characteristics of the feature are carefully reviewed to determine whether they are beneficial, adverse or neutral to the visual quality of an area. For example, the conditions and visual setting of an abandoned ranch or farm house, or an historical hydroelectric flume may enhance the variety, diversity and the scenic quality of a landscape. Scenic quality assessments were made in the field according to the evaluation criteria shown on Table 1. The result of this evaluation are contained on Table 2 and shown on Figure 3.

b. Visual Sensitivity

Visual Sensitivity Levels indicate the relative degree of user interest and concern for visual changes in the landscape. The purpose of this inventory component is to consider types of uses based upon (places where people travel to or reside, or recreate, etc.) user volumes and user attitudes toward visual change. Information on visual sensitivity was available for BLM lands and supplemented for other public National Park lands and private lands. Within the Kaweah Project Study Area, the following uses were identified and evaluated:

- National Park and Recreation Areas - Sequoia National Park, the Generals Highway, hiking trails, scenic pulloffs, and campgrounds;

- Major Travel Routes - State Highway 198 and Mineral King Road; and

- Residential Areas - dispersed residences at Hammond, Oak Grove, and scattered along the Kaweah River Valley.

Table 3 shows the use areas identified for study for each of the Kaweah Hydroelectric Facilities. Table 4 indicates the amount of use documented for each area and the overall sensitivity level assigned to the use area. Three levels of sensitivity are used for this evaluation: high, medium and low. The assignment of sensitivity levels takes into consideration the type of users, amount of use, public interest, and adjacent land uses. Figure 4 shows the locations of use areas considered in this study.

c. Distance Zones

The final inventory component is the compilation of visual distance zones. Distance zones are those areas, or distances, that define the foreground, middleground, background and seldom seen areas from viewer locations. Within the Kaweah Project area, foreground distances extend up to 0.5 mile from key observer locations; middleground areas extend up

TABLE 1
SCENIC QUALITY INVENTORY AND EVALUATION CHART

SCENIC QUALITY
INVENTORY AND EVALUATION CHART

key factors	rating criteria and score		
landform	High vertical relief as expressed in prominent cliffs, spires, or massive rock outcrops; or severe surface variation or highly eroded formations including major badlands or dune systems; or detail features dominant and exceptionally striking and intriguing such as glaciers. 5	Steep canyons, mesas, buttes, cinder cones, and drumlins; or interesting erosional patterns or variety in size and shape of landforms; or detail features which are interesting though not dominant or exceptional. 3	Low rolling hills, foothills, or flat valley bottoms; or few or no interesting landscape features. 1
vegetation	A variety of vegetative types as expressed in interesting forms, textures, and patterns. 5	Some variety of vegetation, but only one or two major types. 3	Little or no variety or contrast in vegetation. 1
water	Clear and clean appearing, still, or cascading white water, any of which are a dominant factor in the landscape. 5	Flowing, or still, but not dominant in the landscape. 3	Absent, or present, but not noticeable. 0
color	Rich color combinations, variety or vivid color; or pleasing contrasts in the soil, rock, vegetation, water or snow fields. 5	Some intensity or variety in colors and contrast of the soil, rock, and vegetation, but not a dominant scenic element. 3	Some color variations, contrast, or interest; generally mute tones. 1
influence of adjacent scenery	Adjacent scenery greatly enhances visual quality. 5	Adjacent scenery moderately enhances overall visual quality. 3	Adjacent scenery has little or no influence on overall visual quality. 0
scarcity	One of a kind; or unusually memorable, or very rare within region. Consistent chance for exceptional wildlife or wildflower viewing, etc. 1/ 5+	Distinctive, though somewhat similar to others within the region. 3	Interesting within its setting, but fairly common within the region. 1
cultural modifications	Modifications add favorably to visual variety while promoting visual harmony. 2	Modifications add little or no visual variety to the area, and introduce no discordant elements. 0	Modifications add variety but are very discordant and promote strong disharmony. -4

1/ A rating of greater than 5 can be given but must be supported by written justification.

INSTRUCTIONS

Purpose: To rate the visual quality of the scenic resources on all BLM managed lands.

How to Identify Scenic Values: All Bureau lands have scenic value.

How to Determine Minimum Suitability: All BLM lands are rated for scenic values. Also rate adjacent or intermingling non-BLM lands within the planning unit.

When to Evaluate Scenic Quality: Rate for scenery under the most critical conditions (i.e., highest user period or season of use, sidelight, proper atmospheric conditions, etc.).

How to Delineate Rating Areas: Consider the following factors when delineating rating areas.

1. Like physiographic characteristics (i.e., land form, vegetation, etc.).
2. Similar visual patterns, texture, color, variety, etc.
3. Areas which have a similar impact from cultural modifications (i.e., roads, historical and other structures, mining operations, or other surface disturbances).

Explanation of Criteria:

Note: Values for each rating criteria are maximum and minimum scores only. It is also possible to assign scores within these ranges.

SCENIC QUALITY

A = 19 or more
B = 12 - 18
C = 11 or less

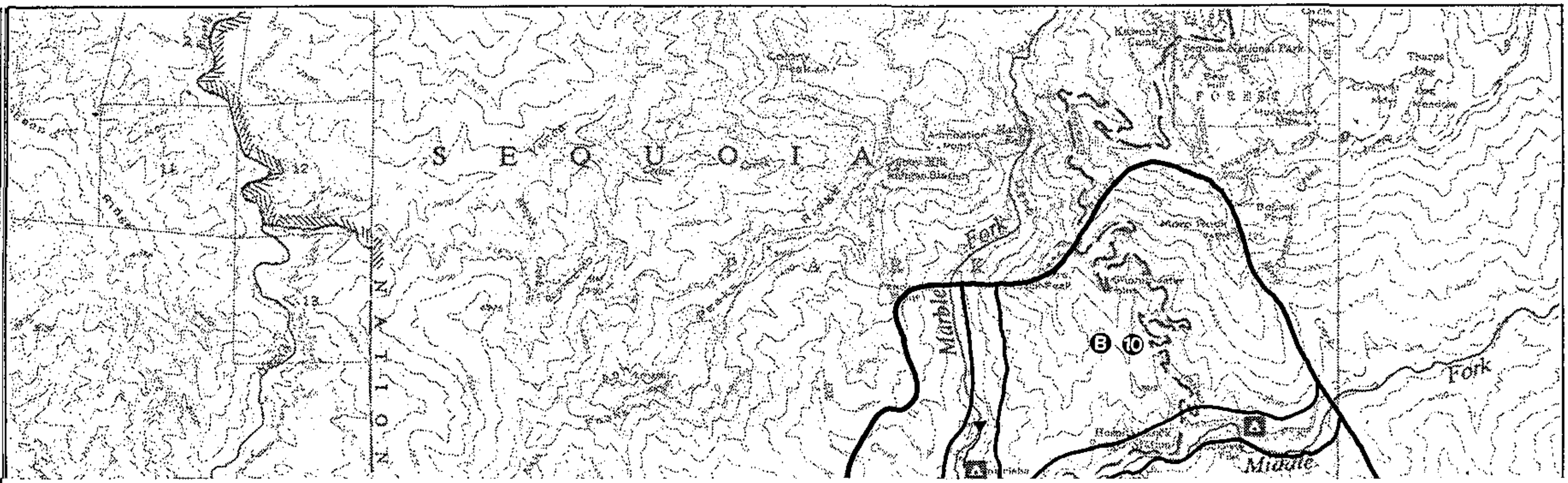
Source: Adopted from BLM Manual Handbook 8410-1

Table 2
Kaweah Scenic Quality Evaluations

Unit #	1	2	3	4	5	6	7	8	9	10
a. Landform	L(1)	M(3)	M(3)	M(3)	M(3)	M(3)	M(3)	M(3)	M(3)	M(3)
b. Vegetation	M(3)	H(5)	H(4)	M(3)	M(3)	M(3)	H(4)	M(3)	H(4)	H(4)
c. Water	L(0)	H(5)	H(4)	L(0)	L(0)	L(0)	H(4)	L(0)	H(4)	L(0)
d. Color	M(3)	M(3)	H(4)	M(3)	M(3)	M(3)	H(4)	M(3)	H(4)	M(4)
e. Adjacent Scenery	H(4)	H(4)	H(5)	H(5)	H(5)	M(3)	M(3)	M(3)	H(4)	H(4)
f. Scarcity	L(1)	M(3)	M(3)	L(2)	L(2)	L(1)	M(3)	L(1)	M(3)	M(3)
g. Cultural Modif.	M(0)	L(-1)	M(0)	M(0)	M(0)	M(0)	M(0)	M(0)	M(0)	M(0)
S.Q. Class	B(12)	A(22)	A(23)	B(16)	B(16)	B(13)	A(21)	B(13)	A(22)	B(18)

H - High
M - Medium
L - Low

(no.) - numerical weight



KAWEAH HYDROELECTRIC FACILITIES

- POWERHOUSE
- PENSTOCK
- FOREBAY
- FLUME/FLOWLINE
- HEADWORKS
- 66kV TRANSMISSION LINE
- THREE RIVERS SUBSTATION

MILES 1 2 3

NORTH

LANDSCAPE SCENIC QUALITY

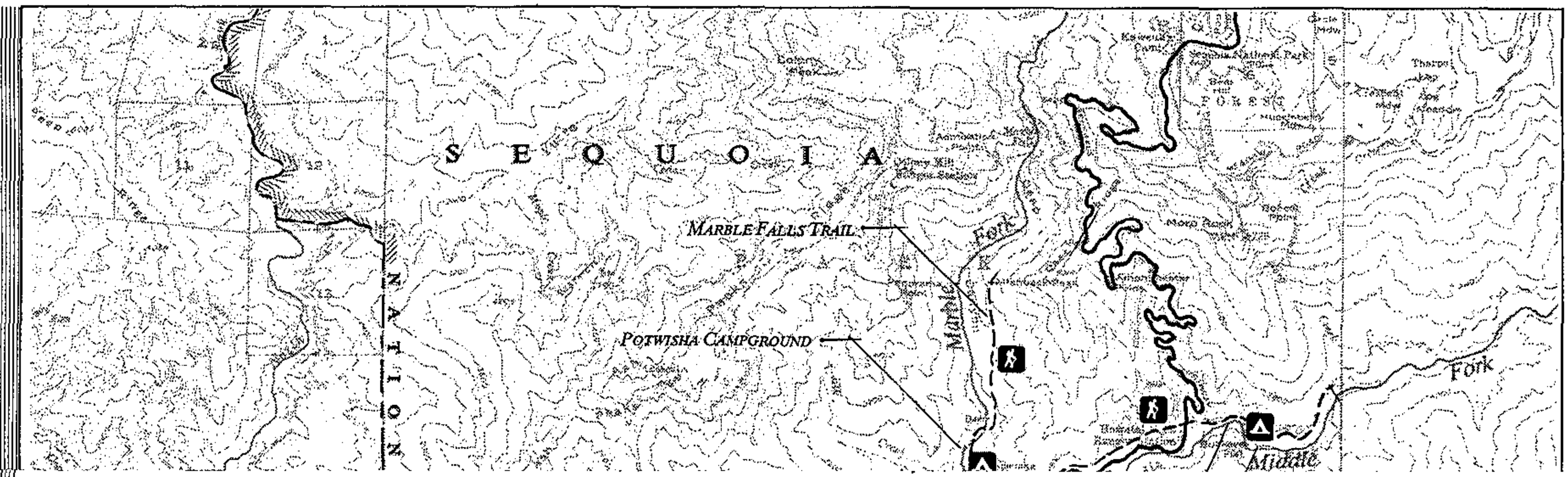
Figure 3

Table 3
Kaweah Hydroelectric Facilities and Associated Use Areas

	Powerhouse 1						Powerhouse 2					Powerhouse 3					
Use Areas	Powerhouse	Maintenance	Penstock	Forebay	Flume	Intake	Powerhouse	Penstock	Forebay	Flume	Intake	Powerhouse	Penstock	Forebay	Flume	Intake #1	Intake #2
Sequoia National Park																	
Generals Highways												●	●		●		
Scenic Pulloff No. 1												●	●		●		
Scenic Pulloff No. 2												●			●		
Scenic Pulloff No. 3												●			●		
Scenic Pulloff No. 4															●		●
Potwisha Campground/ Marble Falls Trail															●	●	
Hiking Trail to Powerhouse 3											●		●		●		
Hiking Trail - Elk Creek/ Middle Fork															●		●
State Highway 198		●	●	●	●			●		●							
Mineral King Road					●	●											
Hammond/Washburn Cove Residents	●	●	●	●				●	●	●							
Oak Grove Residents					●												
Rural Residents - Kaweah River Valley											●						

Table 4
Visual Sensitivity Levels

Use Area	Type of Use	Amount of Use	Public Interest Level	Sensitivity Level
Sequoia National Park	Recreational	High	National	High
Generals Highway	Recreational	High	National	High
Scenic Pulloff #1	Recreational	High	National	High
Scenic Pulloff #2	Recreational	High	National	High
Scenic Pulloff #3	Recreational	High	National	High
Scenic Pulloff #4	Recreational	High	National	High
Potwisha Campground/ Marble Falls Trail	Recreational	High-Moderate	National/Regional	High
Elk Creek/Middle Fork Trail	Recreational	High-Moderate	National/Regional	High
Hiking Trail to Powerhouse 3	Recreational	High-Moderate	National/Regional	High
State Highway 198	Travel/ Recreational	High	National/Regional	High
Mineral King Road	Recreational/ Local Residential	Moderate	National/Regional	Moderate
Hammond/Washburn Cove	Local Residential	Low	Local	Moderate
Oak Grove	Local Residential	Low	Local	Moderate
Kaweah River Valley	Local Residential	Low	Local	Moderate



SCENIC HIGHWAY PULLOFFS

USE AREAS - TRANSPORTATION

198 STATE HIGHWAY 198

GENERALS HIGHWAY

MINERAL KING ROAD

USE AREAS - RESIDENTIAL COMMMUNITIES

HAMMOND

OAK GROVE

DISPERSED RESIDENTIAL

MILES 1 2 3

NORTH

VISUAL SENSITIVITY - PUBLIC USE AREAS

Figure 4

to 3 miles to 5 miles, and background areas up to 15 miles. Seldom seen areas are identified as unseen or beyond a fifteen mile limit from an observation point.

2. Assessment of Visual Contrasts and Project Compatibility

Visual contrast effects are typically long-term since visual changes usually last for the life of a project. Construction and operation activities typically result in visual contrast affecting:

- The quality of any aesthetic resource;
- Scenic resources having rare or unique value;
- The view from or the visual setting of any designated or planned park, wilderness, or natural area, or other visually sensitive land use;
- The view from or the visual setting of any travel route; and
- The view from, or the visual setting of, any established, designated, or planned recreation, education, preservation, or scientific facility, use area activity, view point or vista.

The degree to which the Kaweah project has affected the aesthetic quality of the landscape depends upon the amount of visual and aesthetic contrast that the project has created in relation to the existing landscape character. The amount of contrast between the project and the existing landscape character can be measured by separating the landscape into its major features (landform, vegetation, and structures), and then documenting the magnitude of change in contrast of each of the basic visual elements (form, line, color, and texture) that has occurred due to each project feature.

Two issues were addressed in determining the level of visual contrast: the type and extent of actual physical contrast or aesthetic degradation, and the degree of visibility caused by site location, structures and activities within the 'seen area' or viewshed. The type of actual physical contrast was examined by evaluating the following criteria: landforms, diversity, soil color and erosion, vegetative patterns, and structure compatibility. At least eight variables were considered in establishing overall visibility levels: view orientation, lighting conditions, seasonal effects, view distance, duration of view, visibility, viewer numbers, and use association. Degrees of visual contrast were assigned as strong, moderate, weak or none.

a. **Key Observation Points**

Site visits and preliminary assessments were made for all the Kaweah Project facilities from those viewer locations where the project could conceivably be seen. Based upon this preliminary overview, seven KOPs were selected for detailed assessments. KOPs are defined as project viewing locations that show two types of conditions: 1) views that are representative of the viewing experiences to project facilities; and 2) those viewing locations where the worst-case visual impacts occur.

It should be noted that KOPs were not selected in areas where the visibility of project facilities is extremely low or non-existent. Contrasts documented for KOPs are used to evaluate visual impacts for project viewing locations. The seven KOPs are shown on Figure 5 and include the following areas:

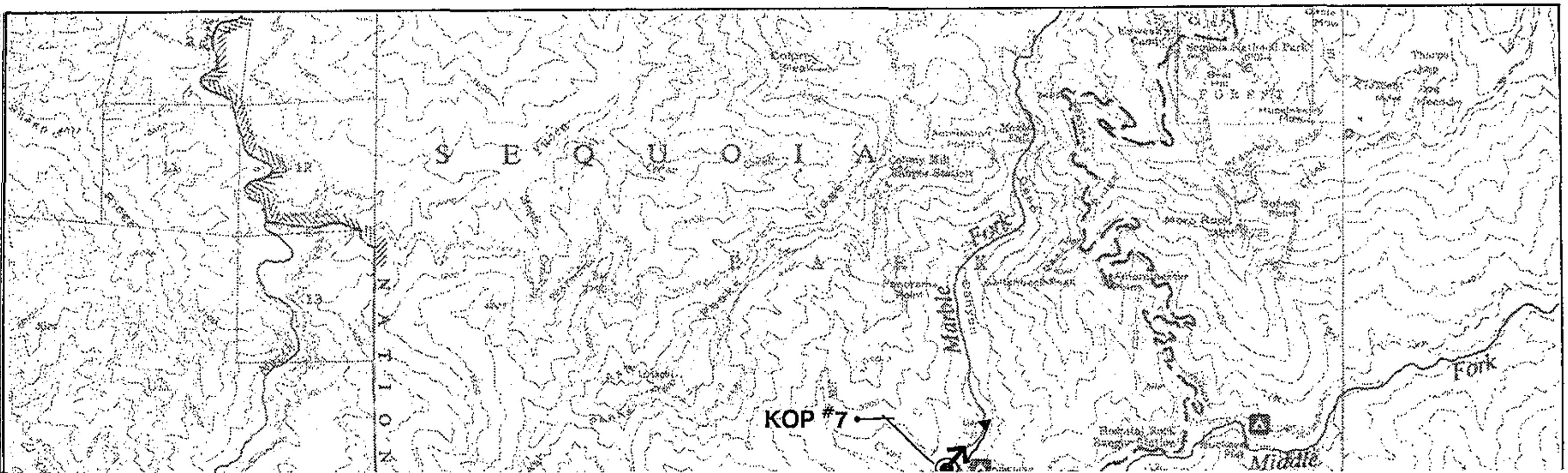
- **KOP 1** - Located approximately 0.2 mile west of Powerhouse No. 1 on State Highway 198. Direction of view is uphill to southeast centering on penstock supplying Powerhouse No. 1.

- **KOP 2** - Located approximately 0.3 mile west of Powerhouse No. 1 on State Highway 198. The first direction of view is across the river uphill to the northeast centering on the flume supplying Powerhouse No. 2. The second direction of view is to the southwest centering on the transmission line.

- **KOP 3** - Located directly across State Highway 198 from Powerhouse No. 1. Direction of view is directly at Powerhouse No. 1.

- **KOP 4** - Located approximately 0.4 mile northeast of Powerhouse No. 3 on "the Generals Highway" (State Highway 198) in Sequoia National Park. Direction of view is south, centering on Powerhouse No. 3. A second view centers on the penstock supplying Powerhouse No. 3.

- **KOP 5** - Located approximately 3 miles southeast of State Highway 198 on Mineral King Road. Direction of view is south centering on the flume supplying Powerhouse No. 1.



KAWEAH HYDROELECTRIC FACILITIES

- POWERHOUSE
- PENSTOCK
- FOREBAY
- FLUME/FLOWLINE
- HEADWORKS
- 66kV TRANSMISSION LINE
- THREE RIVERS SUBSTATION

MILES 1 2 3

NORTH

KEY OBSERVATION POINTS

Figure 5

- **KOP 6** - Located at a scenic pulloff on Generals Highway overlooking the Kaweah Powerhouse No. 3 intake structure and flume on the Middle Fork of the Kaweah River.

- **KOP 7** - Located along the Marble Falls Trail in Sequoia National Park, at the Powerhouse No. 3 intake structure and flume on the Marble Fork of the Kaweah River.

b. Visual Contrast Rating

The visual contrast ratings were based upon the guidelines and procedures outlined for the Kaweah Project in the BLM's Visual Resource Contrast Rating Manual H-8431-1 (January 1986). Four levels of contrast were considered:

- **None** - The element contrast is not visible or perceived.

- **Weak** - The element contrast can be seen but does not attract attention.

- **Moderate** - The element contrast begins to attract attention and is not easily overlooked.

- **Strong** - The element contrast attracts attention and will not be overlooked.

Visual contrasts in line, form, color and texture were rated. Project elements were divided into landform/vegetation changes and structure changes. Table 5 shows the visual contrast ratings for the project facilities.

c. Visual Compatibility Evaluation

For the purposes of this study, visual impacts were identified according to four potential levels of significance: No Adverse Effect, Minor Adverse Effect, Moderate Adverse Effect, and Significant Adverse Effects. The assignment of impact levels was based upon: 1) existing visual resource values including scenic quality, visual sensitivity and distance zones from KOPs; and 2) the visual contrast level assigned. These levels are defined below:

- **No Adverse Effects** - No Adverse Effects were identified for those Kaweah Project Facilities that would not be perceived from public viewing locations, or only visible during certain seasons of the year from a limited number (less than 5) of residences.

Table 5
Summary of Visual Contrast Ratings

Kaweah Hydroelectric Facility	KOP No.	Landform/Vegetation Line	Landform/Vegetation Form	Landform/Vegetation Color	Landform/Vegetation Texture	Structures Line	Structures Form	Structures Color	Structures Texture	Composite Contrast Rating
Powerhouse 1 Facilities										
Powerhouse	None*									
Maintenance Facility Administration	3	M	M	M	M	M	S	S	M	M
Penstock	1	W	N	W	W	W	N	W	W	W
Forebay	1	N	N	N	N	N	W	W	W	W
Flume	5	W	W	N	N	M	M	W	W	W-M
Intake Structure	None*									
Powerhouse 2 Facilities										
Powerhouse	None*									
Penstock	None*									
Forebay	None*									
Flume	2	N	N	N	N	M	M	S	S	M-S
Intake Structure	None*									

Table 5 (cont.)

Kaweah Hydroelectric Facility	KOP No.	Landform/Vegetation				Structures				Composite Contrast Rating
		Line	Form	Color	Texture	Line	Form	Color	Texture	
Powerhouse 3 Facilities										
Powerhouse	4	W	W	W	W	W	M	W	W	W
Penstock	4	W	N	W	W	M	W	W	W	W
Forebay	None*									
Flowline										
-Middle Fork	6	M	N	N	N	M	M	W	W	W-M
-Marble Fork	7	N	N	N	N	M	M	W	W	W-M
Intake Structure										
-Middle Fork	6	W	M	N	N	W	M	N	N	W
-Marble Fork	7	N	N	N	N	M	M	W	W	W-M
66 kV Transmission Line	2	N	N	N	N	W	W	N	N	N-W

Contrast Rankings

N - None
W - Weak
M - Moderate
S - Strong

*Structures that are not easily visible from public viewing locations were not evaluated in detail. No identifiable adverse visual impacts are assessed for these facilities.

Facilities assigned no adverse effect are visually mitigated by vegetation and topography. Kaweah facilities assigned this level include Powerhouse No. 1, Powerhouse No. 2, Powerhouse No. 2 Penstock, Powerhouse No. 3 Forebay and Powerhouse Nos. 1 and 2 intake structures.

No Adverse Effect was also assigned to those Kaweah Facilities that are visible from public viewing locations, but do not detract from the natural landscape due to their historical and architectural qualities. The Kaweah No. 1 flume and intake, Kaweah No. 2 intake and the Kaweah No. 3 flowlines and intake structures were assessed this level of impact for visual resources.

- **Minor Adverse Effects** - Minor adverse effects were assigned to Kaweah Project Facilities that are visible from highly sensitive public viewing locations but are minimally perceived due to the revegetation that has occurred over the past 50 to 80 years. Kaweah facilities assigned this level of impact include: Kaweah No. 1 penstock, forebay and flume; Kaweah No. 2 forebay; Kaweah No. 3 penstock; and the 66 kV transmission line.

- **Moderate Adverse Effects** - This level of effect is assigned to those facilities that are moderately visible from highly sensitive public viewing locations and may attract attention due to their industrial character and proximity to viewers. While the visual contrast of these facilities is moderate, the overall sensitivity of the area is high, thus these impacts may be potentially significant, depending upon viewer attitudes. Kaweah facilities assessed this level of effect include: Kaweah No. 1 maintenance yard and facilities and Kaweah No. 2 flume.

- **Significant Adverse Effects** - This level of impact pertains to facilities within view of highly sensitive use areas that would attract attention and degrade the visual quality of the landscape due to their visual contrasts and industrial character. No Significant Adverse Effects were identified for the Kaweah Hydroelectric facilities.

Table 6 summarizes the results of this evaluation for the Kaweah No. 1, 2 and 3 facilities and the 66 kV transmission line.

Table 6
Visual Compatibility Assessment Summary
Kaweah Hydroelectric Project

	KOP Use Area Evaluated	KOP Visual Sensitivity	Scenic Quality	Distance Zone	Visual Contrast	Significance and Recommendations
Kaweah No. 1 Facilities						
Powerhouse No. 1	*	*	*	*	*	No Adverse Effect
Maintenance and Administration	St. Highway 198	H	A/B	Foreground	Moderate	Moderate Adverse Effect
Penstock	St. Highway 198	H	B	Foreground	None to Weak	Minor Adverse Effect
Forebay	St. Highway 198	H	B	Foreground/ Middleground	None to Weak	Minor Adverse Effect
Flume+	Mineral King Road	M	B	Foreground	Weak to Moderate	No Adverse Effect
Intake Structure	*	*	*	*	*	No Adverse Effect
Kaweah No. 2 Facilities						
Powerhouse No. 2	*	*	*	*	*	No Adverse Effect
Penstock	*	*	*	*	*	No Adverse Effect
Forebay	*	*	*	*	*	No Adverse Effect
Flume	State Highway 198	High	B	Foreground	Moderate	Moderate Adverse Effect
Intake Structure	*	*	*	*	*	No Adverse Effect

Table 6 (cont.)

Powerhouse 3 Facilities	KOP Use Area Evaluated	KOP Visual Sensitivity	Scenic Quality	Distance Zone	Visual Contrast	Significance and Recommendations
Powerhouse 3+	Generals Highway/ Sequoia National Park	High	A	Foreground	Weak	No Adverse Effect
Penstock	Generals Highway/ Sequoia National Park	High	A/B	Foreground	Weak	Minor Adverse Effect
Forebay	*	*	*	*	*	No Adverse Effect
Flowline+						
- Middle Fork	Generals Highway/ Sequoia National Park	High	B	Middleground	Weak to Moderate	No Adverse Effect
- Marble Fork	Potwisha Cmpgrnd./ Marble/Falls Trail Sequoia National Park	High	B	Foreground	Weak to Moderate	No Adverse Effect
Intake Structures+						
- Middle Fork	Generals Highway/ Sequoia National Park	High	A	Middleground	Weak	No Adverse Effect
- Marble Fork	Potwisha Cmpgrnd./ Marble Falls Trail	High	A	Foreground	Weak to Moderate	No Adverse Effect
Transmission Line	State Highway 198	High	A/B	Foreground/ Middleground	None to Weak	Minor Adverse Effect

*Structures that are not easily visible from public viewing locations were not evaluated in detail. No identifiable adverse visual impacts are assessed for these facilities.
+Structures that are visible from public viewing locations were assessed as 'No Adverse Effect' if their visual character does not detract from natural landscape scenic values.

B. FINDINGS

1. Description of the Existing Environment

a. Regional Setting

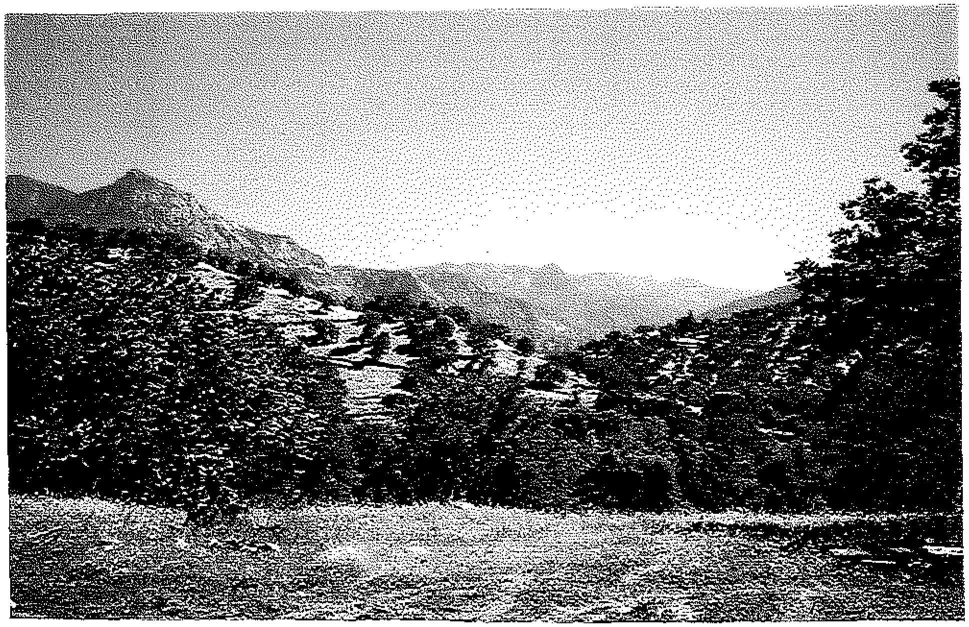
The Kaweah Hydroelectric Power Plants are located in Tulare County, California, along the Marble, Middle and East Forks of the Kaweah River. State Highway 198 passes through the project vicinity, generally paralleling the Middle Fork of the Kaweah River to the south, and provides the major access to Sequoia National Park. Within the Park, State Highway 198 becomes the "Generals Highway". The only other major travel route in the project area is Mineral King Road, which intersects with State Highway 198 near Hammond and provides access to the Mineral King area of Sequoia National Park. Residential communities within the project area include Three Rivers and Hammond along State Highway 198 and the community of Oak Grove, along the Mineral King Road.

Figure 1 shows the regional location of the Kaweah Project and the project vicinity.

b. Description of Landscape Character and Scenic Quality

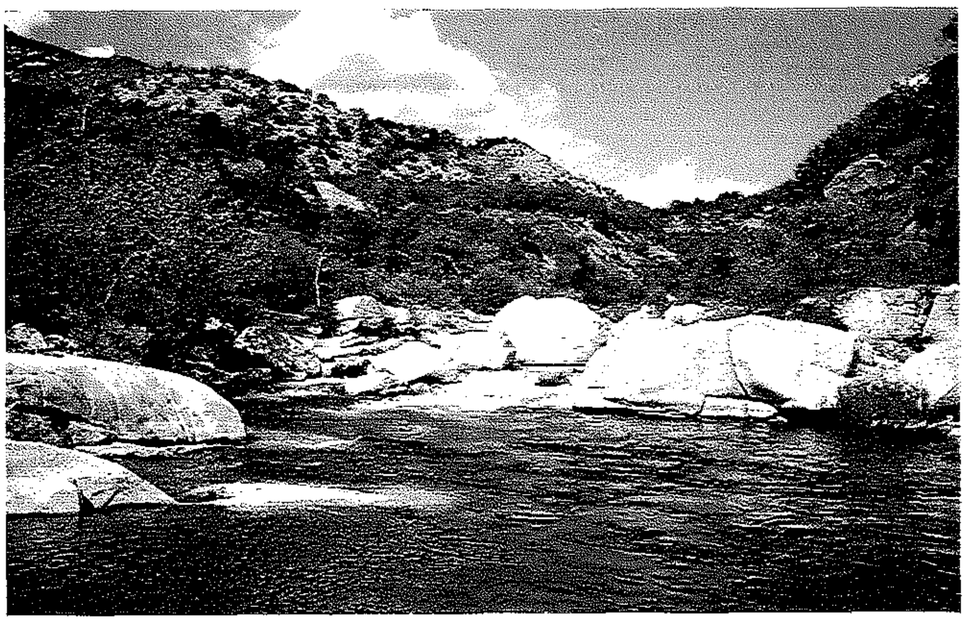
The Kaweah Hydroelectric Project is sited in the Sierra Nevada Physiographic Province. The Kaweah project facilities are located on the western slopes of the south Sierra Nevada foothills. The foothills lie between the high Sierra Nevada Mountains to the east and northeast and the central California Valley to the west. Within the project vicinity, the landscapes are characteristically rolling foothills and mountains that range in elevation from 1,500 feet near the community of Hammond to over 3,000 feet in Sequoia National Park. Vegetation in the foothills primarily consists of oak and grass communities. Oak specimens vary from evergreen to deciduous, and on the drier slopes, the chamise evergreen shrub predominates. Interspersed with the vegetation on the southwestern Sierra foothills are granite rock outcroppings. These grey/tan outcroppings vary in size from small boulders to dramatic vertical cliffs. Representative (Class B) foothill landscapes are shown on Plate 1.

The visual character of the western Sierra Nevada foothills varies dramatically between the wet season, that extends from November through April, and the dry season that occurs between May and October. During the winter wet season, the region's precipitation turns the grassland hills and slopes to a mantle of green. By early April, open grassy slopes are

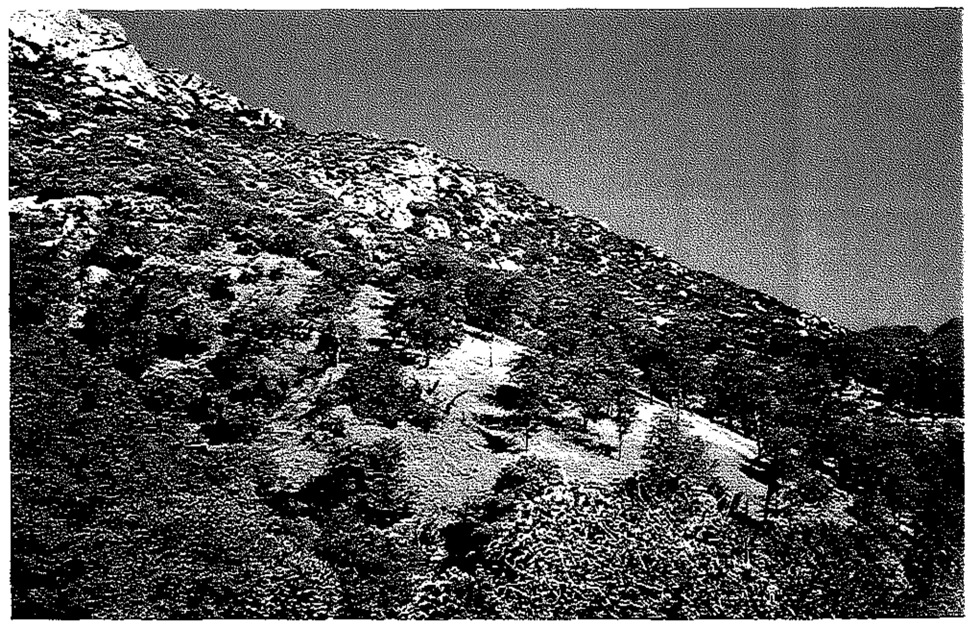


Class A

Class B



Class A



Class B

PLATE 1 - EXAMPLES OF LANDSCAPE SCENIC QUALITY CLASSE

covered with wildflowers. The predominant visual character of the landscape emerges during the dry season, however. By the end of May, the grass hillsides and flowers have died off and created a golden wheat color and texture. The stunted oak species and evergreen chamise are characteristically an olive-green that contrasts sharply with the hillside grasses. During this season, the intense green vegetation following the waterways also strongly contrasts with the surrounding landscape.

The scenic quality of the project vicinity is enhanced in localities with flowing water and wetlands vegetation, and in areas where views to the high snow-capped Sierras and canyons are afforded. Perennial streams, including portions of the Middle, North, East and Marble Forks of the Kaweah River flow continuously throughout the year and support a wide diversity of water species including horsetails, willows, broad-leaved alders and sycamores. Landscapes significantly enhanced by the presence of water are classified as High, or Class A, Scenic Quality. In addition, landscapes notably enhanced by the presence of snowcapped Mt. Alta in the background and those characterized by deep vertical canyons are classified as landscapes with high scenic quality. Plate 1 shows selected Class A areas within the project vicinity.

c. Visual Sensitivity

Visual sensitivity is a measure of the degree and type of use an area receives and viewer attitudes towards the maintenance of landscape aesthetics. It is recognized that the Kaweah Project is located in an area of high visual sensitivity. The area receives a significant degree of national, as well as regional visitation, due to the proximity of project lands to Sequoia National Park and State Highway 198.

The types of viewers frequenting this area include visitors to the Sequoia and Kings Canyon National Parks; recreationalists utilizing the national parks and other BLM public lands for passive recreational uses; highway travelers and local residents. Table 4 summarizes the types of viewers potentially affected by the Kaweah hydroelectric facilities and their associated visual sensitivity levels.

Travelers and Transportation Routes

Visitors to Sequoia National Park arrive via State Highway 198, or through Kings Canyon National Park, along State Highways 180 or 245. State Highway 198 is the primary route to Sequoia National Park and provides access to the main park entrance station at Ash

Mountain. Annual average daily traffic volumes along sections of State Highway 198 in the project area were estimated by the California Department of Transportation to be 2,500 to 3,000 vehicles per day (VPD) in 1987. Peak month averages in 1987 were 5,600 VPD. As shown on Figure 4, State Highway 198 passes near a number of the Kaweah Nos. 1 and 2 Hydroelectric facilities. Within the National Park, State Highway 198 becomes the Generals Highway. The southern extent of Generals Highway and four scenic pulloffs are within view of Kaweah No. 3 facilities.

Mineral King Road, a Tulare County Road, intersects with State Highway 198 near Hammond. This road provides access to the high sierra Mineral King Area of the National Park. The daily traffic volume along the road was estimated by the Tulare County Public Works Department in 1982 to be 40. The Kaweah Powerhouse No. 1 flume and intake structures are sited near this roadway.

Recreationalists and Visitors to the National Parks

Sequoia and National Park received approximately 1,031,129 visits in 1988. Average monthly visits in 1988 were 85,927 while peak month visitations was 181,437 visits.

A number of developed recreational facilities to accommodate visitors to the National Park are within close proximity to the Kaweah No. 3 facilities. These developed recreational sites include the Potwisha and Buckeye Flat campgrounds, several hiking trails and the Generals Highway and four scenic pulloffs. The Potwisha Campground located at 2,100 feet elevation is open year round. The campground contains 44 campsites. Buckeye Flat is at 2,800 feet elevation and closed in winter. At the Buckeye Flat Campground, 28 campsites are provided. Both campgrounds have trails leading from the campground to the Kaweah No. 3 flowlines.

The Marble Falls hiking trail starts at the Potwisha Campground and passes next to the Kaweah Powerhouse No. 3 intake structure and flowline canal on the Marble Fork of the Kaweah River. A hiking trail from the Buckeye Flat Campground generally follows along the Middle Fork of the Kaweah River and passes by the intake structure and flume for Powerhouse No. 3. A third hiking trail is in close proximity to the Kaweah Powerhouse No. 3 facilities and consists of a short trail (approximately 0.3 mile) that originates near the Ash Mountain Entrance Station and leads hikers to the Kaweah River.

Local Residents

Local residents within the project area live in the community of Hammond, along State Highway 198; at Oak Grove, situated along Mineral King Road; and in dispersed locations in the Kaweah River Valley, particularly in the vicinity of Washburn Cove and on the lower foothills. The community of Three Rivers is centered approximately 2 miles south of project facilities. In total, the estimated population of the Three Rivers area was 1,645 in 1980. County population for the area projections are approximately 2,340 in 1990, and 3,445 in the year 2000.

2. Visual Compatibility of the Kaweah Hydroelectric Facilities

The visual compatibility of the Kaweah Hydroelectric Facilities depends upon a number of interrelated functions: 1) the existing visual characteristics for the project facilities; 2) the scenic quality and character of the landscape; 3) the number and types of viewers exposed to the project and their viewing distances from the facilities; and 4) the degree of visual contrast that the Kaweah facilities create in the seen environment.

a. Kaweah No. 1

Description of Project Facilities

The Kaweah No. 1 headworks include a small dam along the East Fork of the Kaweah River which diverts water through the intake head gate into a 50 foot long unlined tunnel. A sandbox equipped with sluice gates and trash rack, and stream gaging stations are located at the entrance of the flow line. These intake structures are located just east of the community of Oak Grove and mark the easternmost facilities visible to the public. The flume is approximately 30,723 feet long and constructed of steel. The steel flume is supported on a wooden frame structure, and generally parallels Mineral King Road to the south. A tan forebay tank 24 feet in diameter is at the upper end of the penstock and connects to the flume. The Kaweah No. 1 penstock is 3,340 feet long and underground, the penstock is aligned vertically on foothill slopes adjacent and west of the highway.

Powerhouse No. 1 is situated along the Middle Fork of the Kaweah River, approximately two miles south of Sequoia National Park, near the community of Hammond. The Powerhouse No. 1 site encompasses the 22-1/2 feet by 26-1/3 feet powerhouse building along the east river bank of the Kaweah River. The powerhouse is grey-tan in color and approximately 25 feet in height. Adjacent to the powerhouse are Edison maintenance facilities, an administration building and one employee housing structure that is vacant. These adjacent facilities are located on the west side of State Highway 198, and are at a raised elevation compared to the powerhouse. Plate 2 shows photographs of Kaweah No. 1 facilities.

Scenic Quality

The majority of the Kaweah No. 1 facilities, including the flume, forebay, penstock, maintenance and administration buildings, are located in Class B landscapes. Class A scenery is found in the immediate vicinity of the Kaweah No. 1 headworks and powerhouse, along the East and Middle forks of the Kaweah River, respectively.

Visual Sensitivity

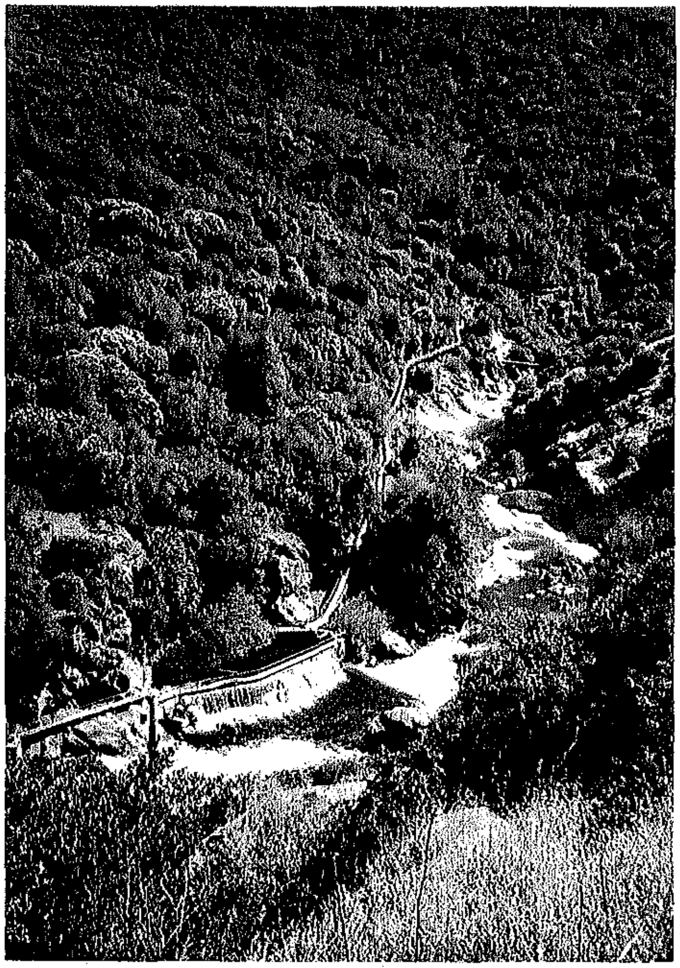
Viewers. Kaweah No. 1 facilities can be seen within the foreground distance zone of State Highway 198, Mineral King Road and from dispersed residences at Oak Grove and Hammond. (See Figure 6).

- Powerhouse No. 1 is partially visible from several dispersed residences located on the northwest banks of the Kaweah River. Visibility to powerhouse No. 1 is totally or severely restricted most times of the year by dense riparian vegetation that lines the river banks. Although the powerhouse is located within 0.1 mile of State Highway 198, the powerhouse's location on the lower river bank restricts its visibility from the roadway.

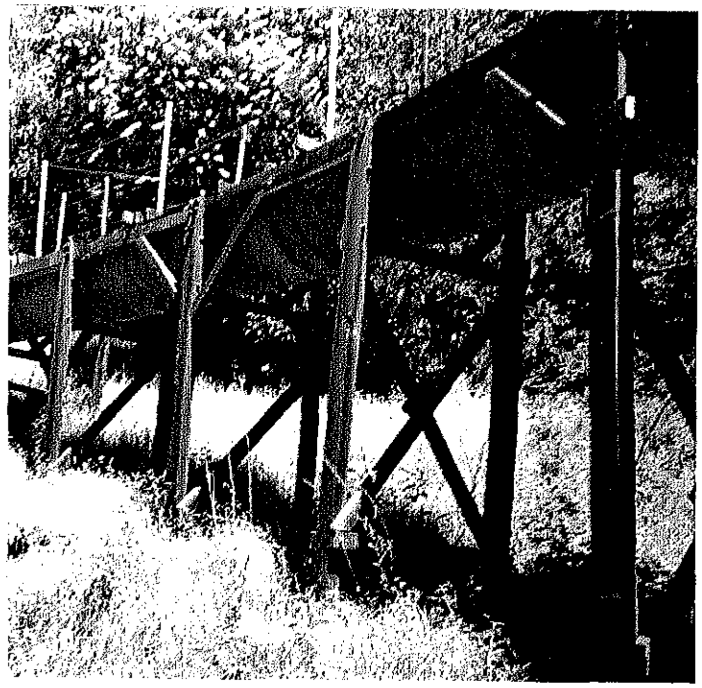
- The maintenance and administration buildings are openly visible from State Highway 198, for approximately 0.2 mile. These facilities are adjacent to the highway.

- The penstock and forebay can be seen from State Highway 198 and from dispersed residences within 0.5 mile viewing distance. Although the penstock is underground, the penstock alignment is evidenced by the differences in vegetation patterns that exist along and adjacent to the penstock.

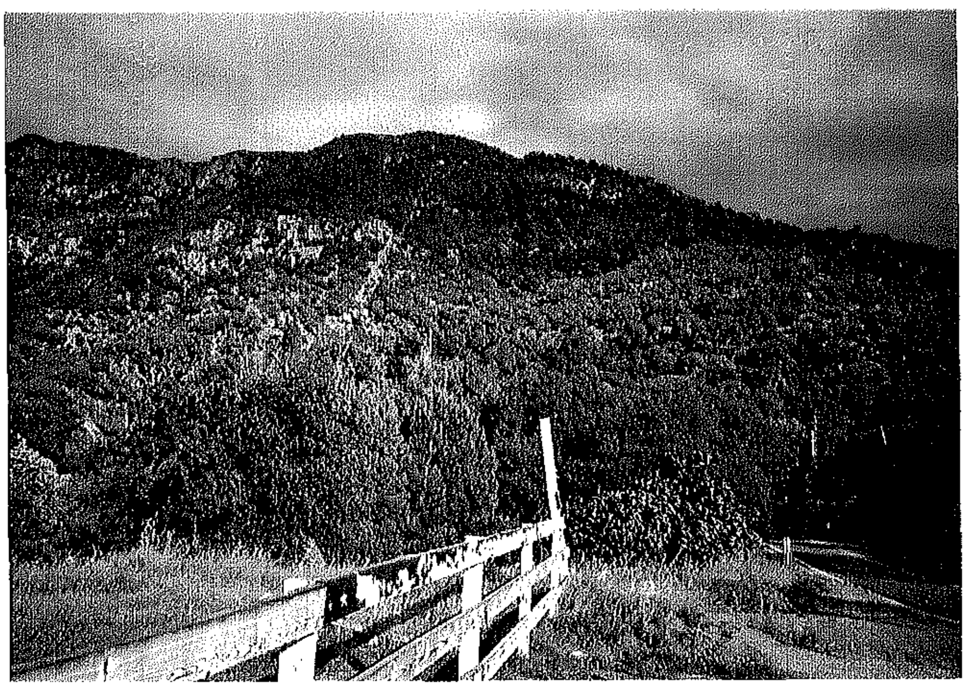
- The forebay is located approximately 0.5 mile southeast of State Highway 198. Although openly visible from the roadway, the forebay's elevated position and poor line of site from the roadway significantly reduces the number of viewers affected.



2A - East Fork Intake and Flume

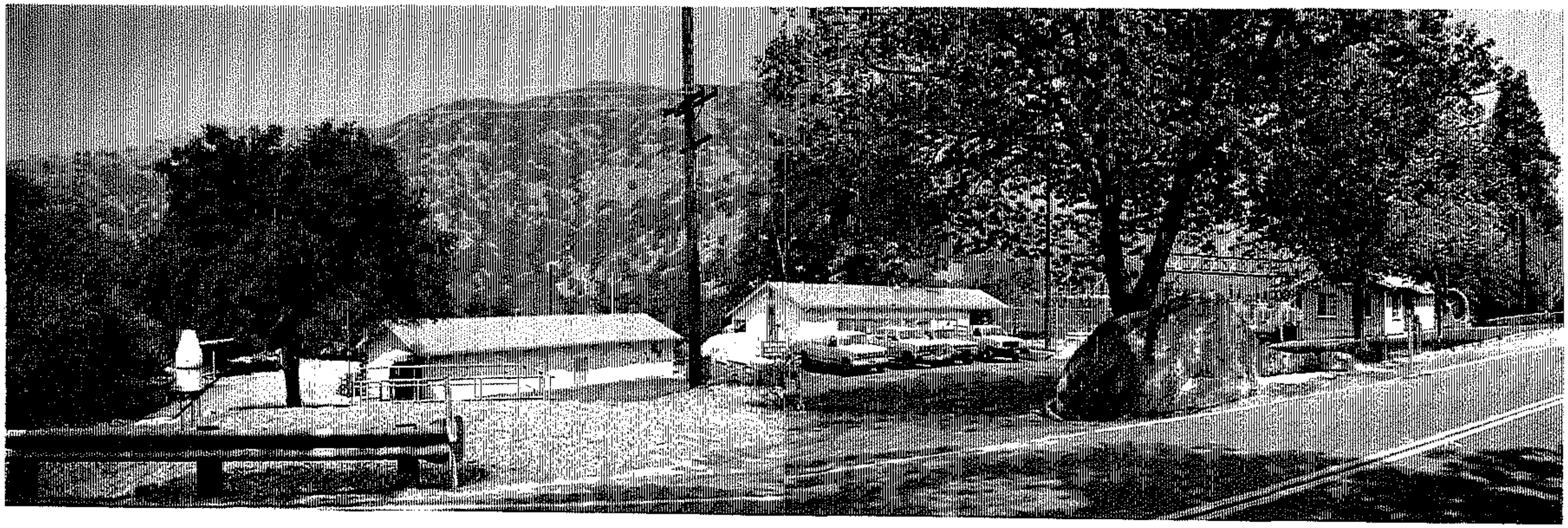


2B - Steel Flume with Wooden Support Structure



2C - Penstock and Forebay

PLATE 2 - KAWEAH NO. 1 FACILITIES

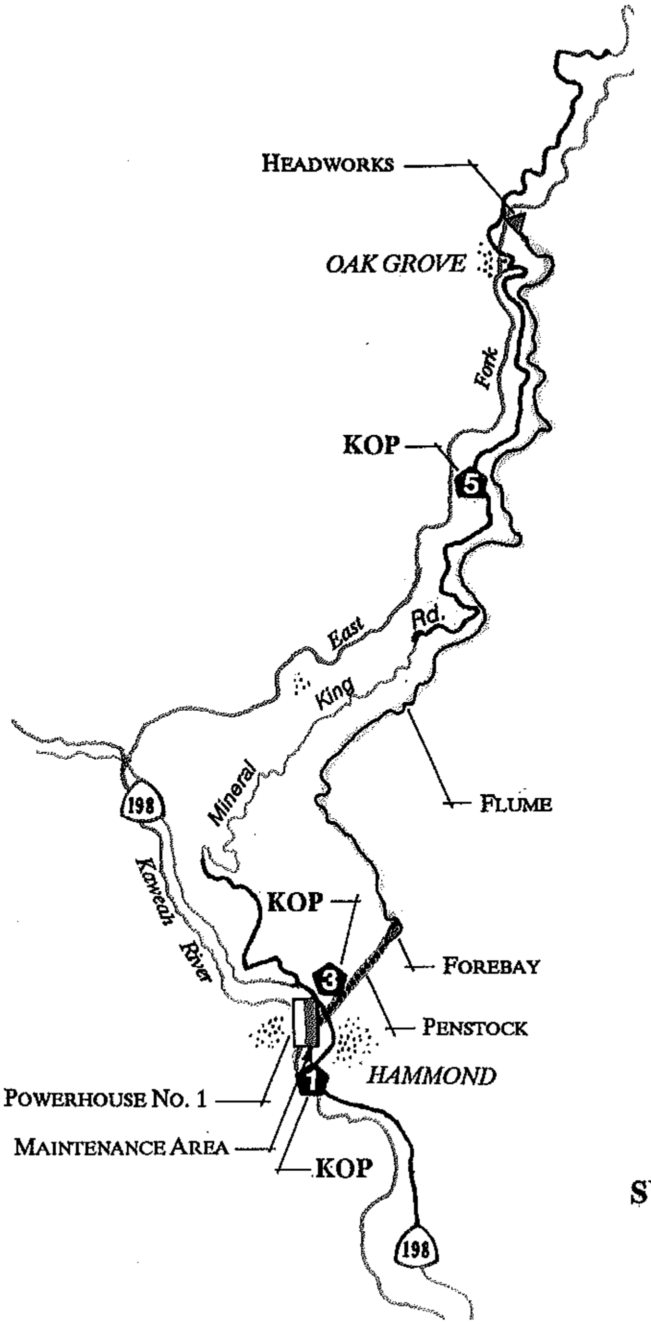


2D - Maintenance and Administration Facilities

2E - Powerhouse No. 1

Kaweah #1
maintenance yard

PLATE 2 (CONT.) - KAWEAH NO. 1 FACILITIES



VISUAL CONDITIONS

- LANDSCAPE SCENIC QUALITY

  High Scenic Quality (Class A)
  Along The Kaweah River

  Representative Scenic Quality (Class B)
  Surrounding Foothills

- TYPES OF VIEWERS/VISUAL SENSITIVITY

  State Hwy 198 & Mineral King Rd. Viewers (High)

  Dispersed Residential (Moderate)

- VISUAL CONTRAST

  None

  Weak

  Weak to Moderate

  Moderate to Strong

SUMMARY OF VISUAL IMPACT SIGNIFICANCE

FACILITIES	State Highway 198	Mineral King Road	Dispersed Residential
P.H.#1	○	○	○
Maintenance Area	●	○	○
Penstock	◒	○	○
Forebay	◒	○	◒
Flume	○	○	○
Headworks	○	○	○

○ No Adverse Effect ◒ Minor Adverse Effect ● Moderate Adverse Effect

Figure 6

- The flume is visible from Mineral King Road, for approximately 5.5 miles and is within the foreground viewing distance for most of this distance. The flume is openly visible along most roadway sections, although vegetation screening and topography reduces the visibility of the flume in some areas.

- The headworks and intake structure cannot be seen from public roadways or residences, however, public access is provided to the headworks. Local recreationalists using public lands in the project area will see these facilities.

Key Observation Points. Three observation points were used to evaluate the visual contrast of the Kaweah No. 1 facilities:

- KOP 1 - Along State Highway 198, where views to the penstock and forebay occur.

- KOP 3 - Along State Highway 198, where the administration and maintenance facilities are visible.

- KOP 5 - Along Mineral King Road, where the Kaweah No. 1 flume is visible.

Visual Contrasts and Impacts

Although the Kaweah No. 1 facilities are seen in the foreground distance zone of visually sensitive public use areas, the visual contrasts of most of these facilities is extremely low due to the revegetation that has occurred over the past 80 years. Figure 6 summarizes the results of the visual contrast and compatibility assessment. Visual contrasts, ranging from none to weak were identified for Powerhouse No. 1, the penstock, forebay and intake structure. The visual contrast of the Kaweah No. 1 maintenance facilities is assessed as moderate since the project site exhibits industrial characteristics and is openly viewed from State Highway 198 which is located immediately adjacent to the facility. The visual contrasts of the Kaweah No. 1 flume are also assessed to be moderate, due primarily to this facilities proximity (within 0.5 mile) to Mineral King Road for over five miles. The visual contrasts of the Kaweah No. 1 flume are not assessed as adverse, however, since the flume generally blends well with the natural soils and vegetation colors and may provide historical and architectural interest to roadway travelers.

b. Kaweah No. 2

Description of Project Facilities

The headworks for Kaweah No. 2 consist of a diversion dam located just below the Kaweah No. 3 trailrace and is of masonry construction. The dam has an average height of seven feet and is 161 feet long. The intake is a reinforced concrete structure with a spillway. The upper end of the intake is provided with a trash rack and two head gates to regulate diversions to the flowline. One wooden by-pass gate is at the lower end of the intake structure.

The flume is 21,607 feet in length and is constructed of steel. The flume is supported primarily on a steel structure, although some short flume sections are constructed of wood.

The Kaweah No. 2 penstock is 1,012 feet long and is sited northwest of the powerhouse. The forebay is a tan colored concrete lined enlargement of the flume, and is approximately 180 feet long, 13 feet wide and 14 feet deep.

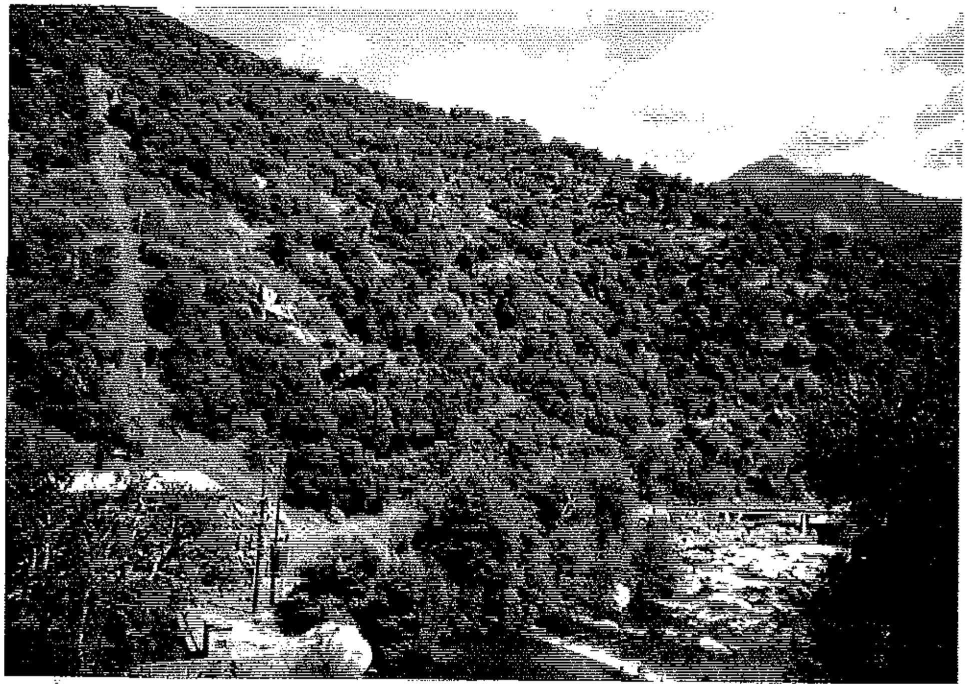
Powerhouse No. 2 is located on the northwest banks of the Middle Fork of the Kaweah River, approximately 2.5 miles south of Sequoia National Park and 1.5 miles north of the community of Hammond. The powerhouse No. 2 site consists of a small parking lot and the 34 foot by 62 foot powerhouse. The Kaweah No. 2 powerhouse is a grey structure, approximately 25 feet in height, that was constructed in 1904. Plate 3 shows the Kaweah No. 2 powerhouse and related facilities.

Scenic Quality

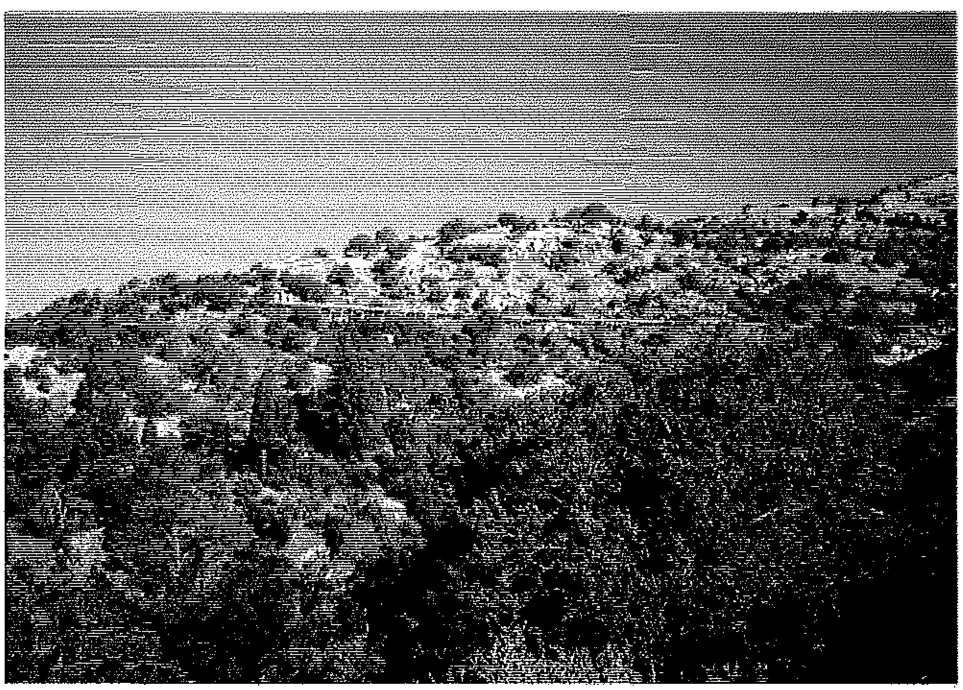
The majority of the Kaweah No. 2 facilities are located in Class B scenic quality landscapes. This includes the Kaweah No. 2 penstock, forebay and flume. Class A scenery is found in the immediate vicinity of Kaweah No. 2 powerhouse and at the headworks, both of which are located along the Middle Fork of the Kaweah River.

Visual Sensitivity

Viewers. Due to dense vegetation screening Powerhouse No. 2 is not considered to be noticeably visible from public viewing locations. During the winter months, Kaweah No. 2 may be seen from a few dispersed residences. Kaweah No. 2 facilities that can be seen



3A - Kaweah No. 2 Intake Vicinity (Downstream of Kaweah No. 3)

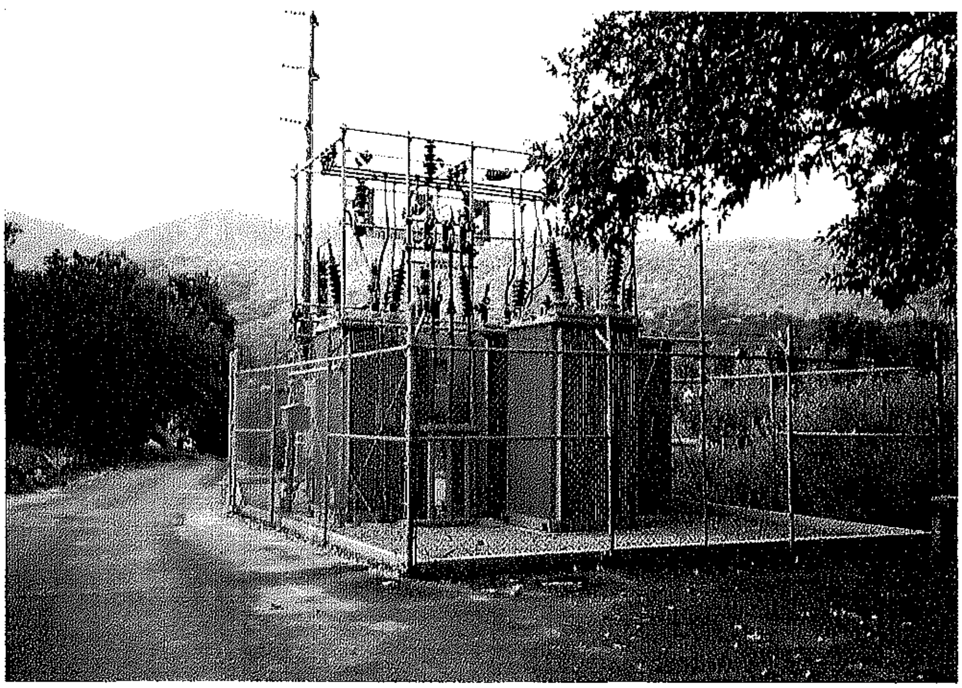


3B - Kaweah No. 2 Flume

Kaweah 2 Flume

PLATE 3 - KAWEAH NO. 2 FACILITIES

3C - Kaweah No. 2 Powerhouse



3D - Kaweah No. 2 Transformer

PLATE 3 (CONT.) - KAWEAH NO. 2 FACILITIES

from public locations include the forebay and flume and portions of the headworks. (See Figure 7).

- o The forebay can be seen from a limited number of local residences and from short roadway sections (less than 0.2 mile) of State Highway 198. The visibility of the forebay is significantly reduced, however, by the tan tank color of the tank that blends well with the surrounding hillside soils, as well as the poor line of sight that exists between the roadway and forebay.

- o The Kaweah No. 2 flume is visible along 1.4 miles of State Highway 198 and from rural residential areas. The visibility of the flume varies from none, along approximately three miles of State Highway 198, to open along one mile closest to the forebay.

- o Headworks - The Kaweah No. 2 intake structure and dam are partially visible from the first hiking trail and scenic road pulloff along Generals Highway in Sequoia National Park.

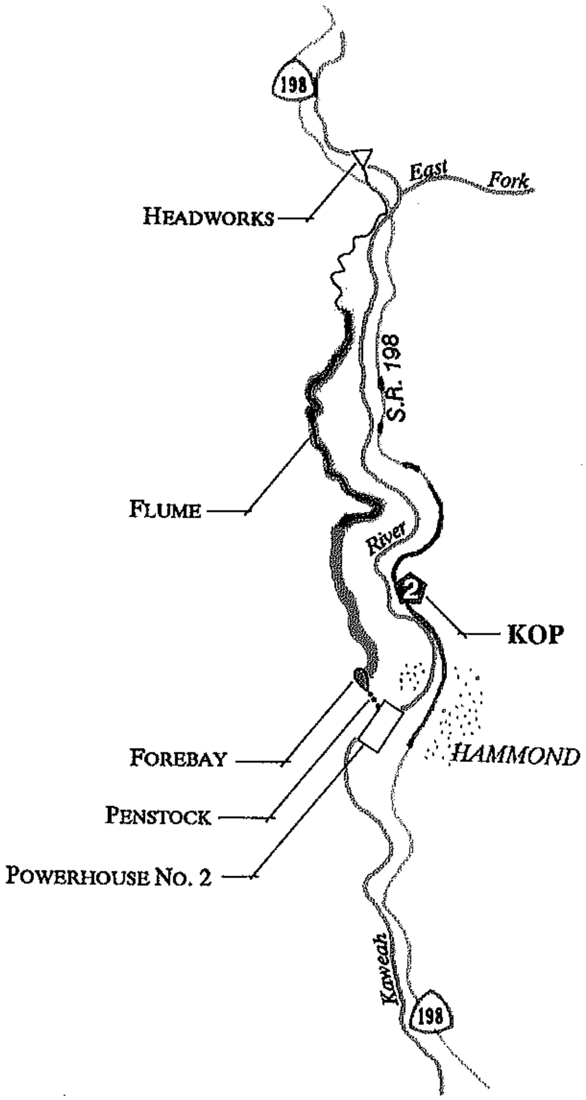
<u>Key Observation Points</u>. One KOP was used to evaluate the Kaweah No. 2 facilities. Additional KOPs were not selected due to the minimal visibility of the facilities from public viewing locations.

- o KOP 2 - Along State Highway 198, where views to the flume occur.

<u>Visual Contrasts and Impact Significance</u>

The Kaweah No. 2 powerhouse, forebay, penstock and headworks structures do not create an adverse visual impact in the landscape due to the lack of public viewing locations to these facilities, as well as the mitigating influence that vegetation regrowth has created over the past 75 to 80 years. Figure 7 shows the results of the visual contrast and compatibility assessment.

The only facility that is openly visible from a public viewing location is the Kaweah No. 2 flume. The visibility of this flume is effectively concealed by vegetation along most of its length. However, the last mile of the flume connecting to the forebay is openly visible along the foothills for more than one mile along State Highway 198. A moderate to strong visual contrast between the reflective steel flume and surrounding hillside landscape



VISUAL CONDITIONS

- LANDSCAPE SCENIC QUALITY

  High Scenic Quality (Class A)
  Along The Kaweah River

  Representative Scenic Quality (Class B)
  Surrounding Foothills

- TYPES OF VIEWERS/VISUAL SENSITIVITY

  State Hwy 198 Viewers (High)

  Dispersed Residential (Moderate)

- VISUAL CONTRAST

  None

  Weak

  Weak to Moderate

  Moderate to Strong

SUMMARY OF VISUAL IMPACT SIGNIFICANCE

FACILITIES	State Highway 198	Dispersed Residential
P.H.#2	○	○
Penstock	○	○
Forebay	○	◒
Flume	●	●
Headworks	○	○

○ No Adverse Effect ◒ Minor Adverse Effect ● Moderate Adverse Effect

Figure 7

occurs. Consequently, the flume is assessed as creating a moderate adverse visual effect in the seen landscape.

c. Kaweah No. 3

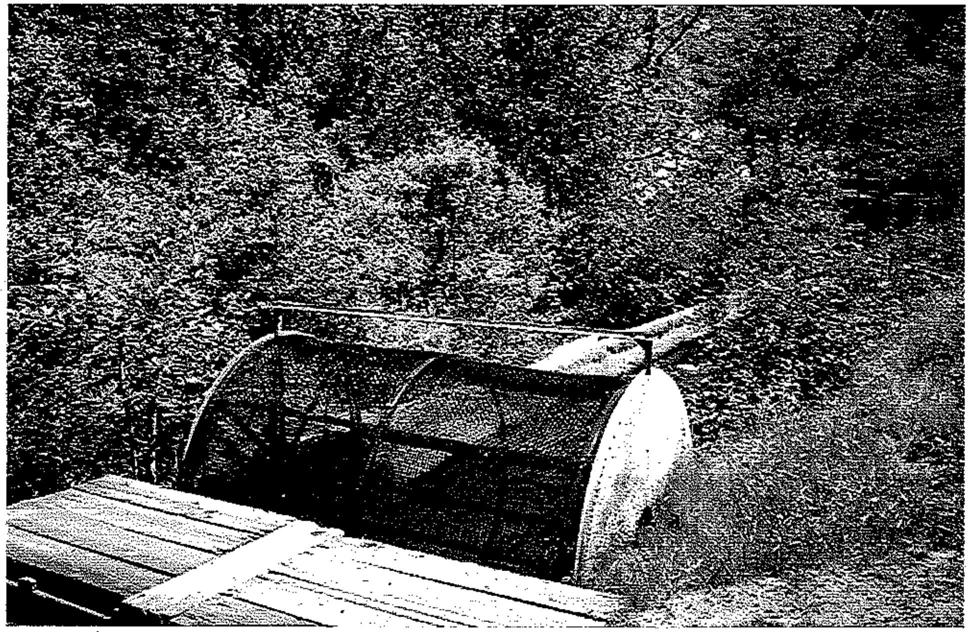
Description of Project Facilities

The headworks for Kaweah No. 3 consist of an intake located on the Marble Fork of the Kaweah River, and an intake on the Middle Fork of the Kaweah River, approximately 3,300 feet upstream from the confluence of the Marble and Middle Forks. Both intakes are concrete dams that divert water from the main stream canals. Headgates are at the downstream ends of the structures.

The flowlines for Kaweah No. 3 consist of canals, tunnels and flumes that total 25,000 feet in length. Except for the last few hundred feet, the flow lines lie within the Sequoia National Park. Marble Fork water is carried in a concrete canal to the siphon which transports the water under the Middle Fork stream bed, which then joins the Middle Fork conduit. From the intersection of the Middle Fork and Marble Fork conduit to the forebay, the flowline consists of concrete lined, and slab bench constructed canal. To bridge flume sections damaged by flood water, three short wooden flumes have been constructed since the original flowline was completed.

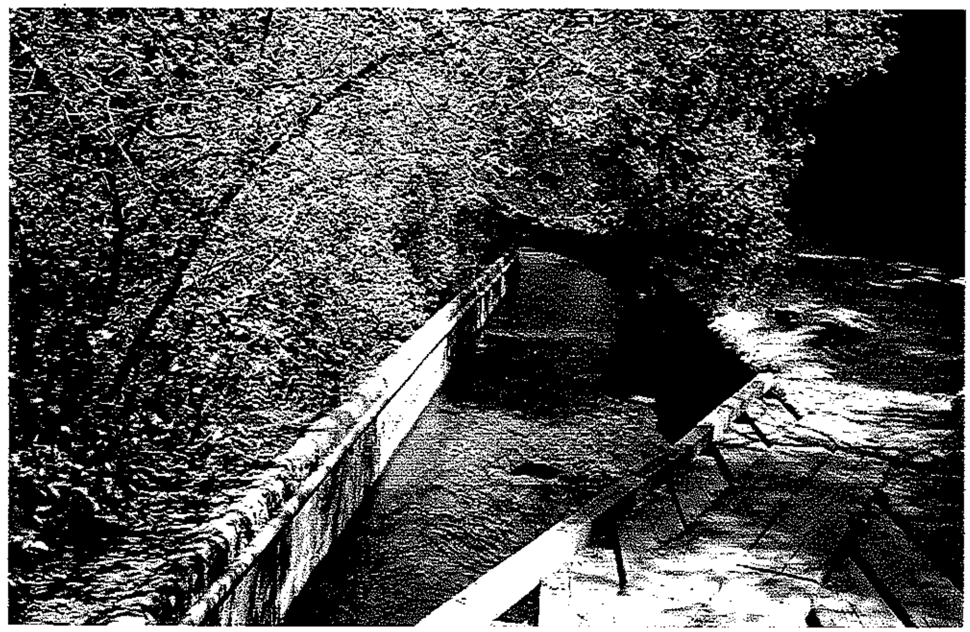
The forebay for Kaweah No. 3 is a regulating reservoir, 315 feet in length, which varies from 15 to 70 feet wide and 7 to 22 feet deep. In total, the forebay has a capacity of approximately 5 acre-feet. The Kaweah No. 3 penstock is 3,151 feet in length. The penstock is partially visible and partially buried.

Powerhouse No. 3 is situated along the Middle Fork of the Kaweah River, near the entrance to Sequoia National Park. Powerhouse No. 3 is located within the National Park boundaries, and is a 50 foot by 34 foot building that is approximately 25 feet in height. This powerhouse was constructed in 1913. Adjacent to the powerhouse are the headworks for Kaweah No. 2 and the Kaweah No. 3 penstock and forebay. Two Edison employee cottages are also in the vicinity of the powerhouse. Plate 4 shows the Kaweah No. 3 facilities.



4A - Fish Release on the Marble Fork

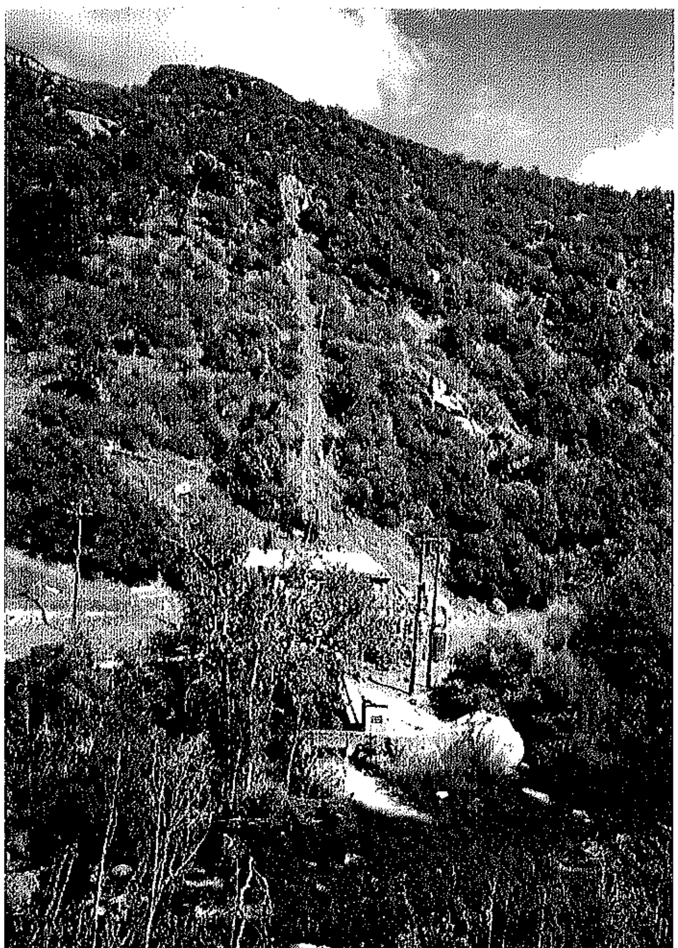
4B - Intake on the Marble Fork



4C - Flowline along Marble Fork

PLATE 4 - KAWEAH NO. 3 FACILITIES

4D - Intake and Flowline along the Middle Fork



4E - Kaweah No. 3 Powerhouse, Penstock and Transformer

PLATE 4 (CONT.) - KAWEAH NO. 3 FACILITIES

Scenic Quality

The Kaweah No. 3 facilities are sited in areas of Class B and Class A Scenic Quality. The landscapes where the flowlines, forebay and penstock structures are sited are classified as B Scenic Quality. The headworks for Powerhouse No. 3 are located on the Middle and Marble Forks of the Kaweah River, where Class A Scenic Quality is assessed. In addition, the scenic quality of the project area is enhanced by Class A scenic views to Mt. Alta in the background.

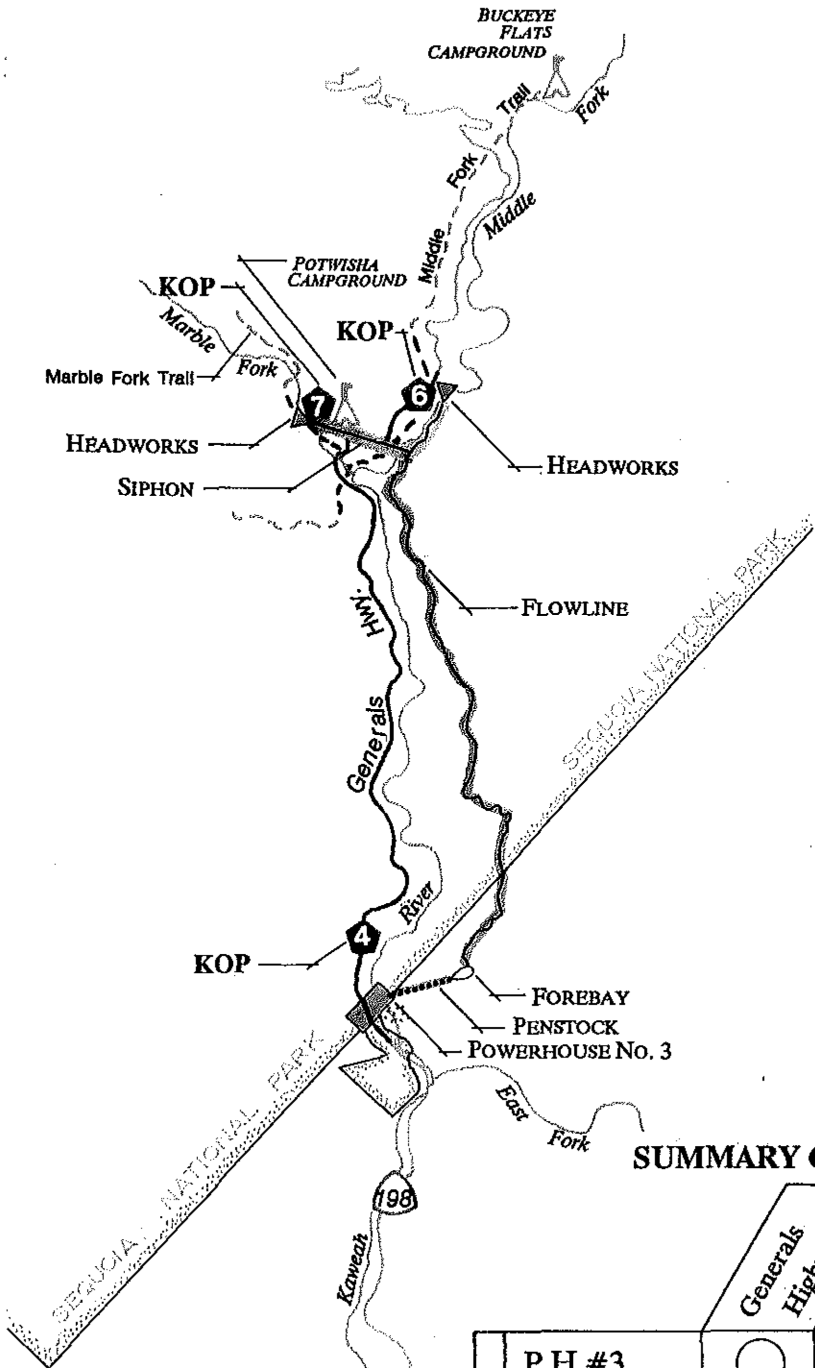
Visual Sensitivity

Viewers. Kaweah No. 3 facilities can be viewed within the foreground to middleground distance zones from Generals Highway and four scenic pulloffs, from hiking trails to Marble Falls and along the Middle Fork of the Kaweah River, and from dispersed residences located immediately south of the National Park. The Kaweah No. 3 forebay is not visible from public viewing locations. (See Figure 8.)

- Powerhouse No. 3 is partially visible from three scenic pulloffs along the Generals Highway and from a hiking trail near Ash Mountain Entrance Station that leads from a scenic pulloff to the Kaweah River. Visibility to Powerhouse No. 3 is partially obscured from these viewing locations by surrounding vegetation along the Kaweah River. Powerhouse No. 3 may also be seen by a few residences located immediately south and outside the Park.

- The penstock is visible from the Generals Highway, the first scenic pulloff near Ash Mountain Entrance Station and from the hiking trail leading to the Kaweah River in the vicinity of Powerhouse No. 3. Although the penstock is partially underground, its alignment is distinguishable by the differences in vegetation patterns along and adjacent to the penstock, as well as the presence of a small telephone line that parallels the penstock.

- The Marble Fork intake structure and canal are directly adjacent to a hiking trail that leads from the Potwisha Campground to Marble Falls. The Marble Falls Trail parallels the Kaweah No. 3 canal for approximately 0.2 mile. The Kaweah No. 3 facilities are not visible from the campground itself which is located approximately 0.2 mile to the south.



VISUAL CONDITIONS

- LANDSCAPE SCENIC QUALITY

  High Scenic Quality (Class A)
  The Kaweah River Along
  Middle and Marble Forks

  Representative Scenic Quality (Class B)
  Surrounding Foothills

- TYPES OF VIEWERS/VISUAL SENSITIVITY

  Generals Highway Viewers (High)
  Sequoia National Park

  National Park Trial Viewers (Moderate)
  Sequoia National Park

- VISUAL CONTRAST

  None
  Weak
  Weak to Moderate
  Moderate to Strong

SUMMARY OF VISUAL IMPACT SIGNIFICANCE

FACILITIES	Generals Highway	Powerhouse #3 Trail	Marble Falls Trail	Middle Fork Trail	Dispersed Residential
P.H.#3	○	○	○	○	○
Penstock	○	◒	○	○	○
Forebay	○	○	○	○	○
Flowline Marble Fork	○	○	○	○	○
Flowline Middle Fork	○	○	○	○	○
Headworks Marble Fork	○	○	○	○	○
Headworks Middle Fork	○	○	○	○	○

○ No Adverse Effect ◒ Minor Adverse Effect ● Moderate Adverse Effect

Figure 8

- The Middle Fork intake structure and canal are visible from a scenic pulloff along Generals Highway and along intermittent stretches of the highway. From the scenic pulloff, the headworks and canal provide a focal point for viewers overlooking the Kaweah River. Views from the pulloff are also directed towards Mt. Alta to the northeast. Along other stretches of the Generals Highway, the canal is barely distinguishable due to the vegetation regrowth that has occurred over the decades.

Key Observation Points. Three KOPs were evaluated to assess the visual impacts of the Kaweah No. 3 facilities.

- KOP 4 - Located at the second scenic pulloff along Generals Highway. Views from this KOP were to the powerhouse.
- KOP 6 - Located at the fourth scenic pulloff along Generals Highway, where views are afforded to the Middle Fork intake structure and canal.
- KOP 7 - Located along the Marble Falls hiking trail, adjacent to the Marble Fork headworks and canal.

Visual Contrasts and Impact Significance

Located within and adjacent to the Sequoia National Park, the Kaweah No. 3 facilities are situated in the area of highest visual sensitivity. Figure 8 summarizes the visual compatibility evaluation results. The scenic quality of the Park is generally high due to the views to Mt. Alta and the Kaweah River that are afforded from most viewing locations. In addition, visitors and travelers to the National Park are encouraged to stop and look at the landscapes, some of which present views to the Kaweah No. 3 facilities.

The Kaweah facilities impose few adverse effects on Park lands however, due largely to the visual mitigation that vegetation regrowth has created over the years, as well as the historical and architectural interest that the facilities provide. Views expressed by the National Park personnel are that the facilities have largely regrown into the natural landscape and create little or no problem with respect to visual values (Tweed, May 23, 1989). In addition, the NPS summer program includes a daily guided hike to educate visitors of the California foothills environment and the historic Kaweah No. 3 flume.

d. Kaweah 66 kV Transmission Line

Description of Project Facilities

The 66 kV transmission line originates at Kaweah No. 3 Powerhouse and transmits power to the Kaweah Substation. Between Kaweah No. 3 and the first point of system interconnection, the 66 kV transmission line is approximately 4.3 miles in length and is supported on wood pole "H" frame structures that are approximately 40 feet in height. The 66 kV transmission line, shown on Figure 3, generally parallels the Kaweah River and State Highway 198.

Scenic Quality

The scenic quality of the landscapes crossed by the 66 kV transmission line are predominantly Class B. Class A landscapes are associated with the Kaweah River and from valley areas where background views to Mt. Alta are dominant.

Visual Sensitivity

Viewers. The 66 kV transmission line can be seen in the foreground to middleground distance zone of State Highway 198 and from dispersed residences in the Kaweah River Valley.

Key Observation Points. One KOP was evaluated with respect to the visual contrast of the 66 kV transmission line:

o **KOP 2** - Along State Highway 198, where long views of the transmission line are provided.

Visual Contrasts and Impacts

The 66 kV transmission line, as reviewed from KOP 2, is shown in Plate 5. While the transmission line can be seen from Highway 198 (particularly by southbound travelers), the contrast of the transmission line within the landscape is very weak. The H frame wood towers blend effectively in the valley landscape with respect to line, color and scale. A number of other similar pole structures are present in the valley. In addition, the landscape has a very good visual absorption capability due to the camouflaging affect of vegetation patterns, background topography and similar wood structures. As such, the transmission line is assessed to have a minor adverse effect.

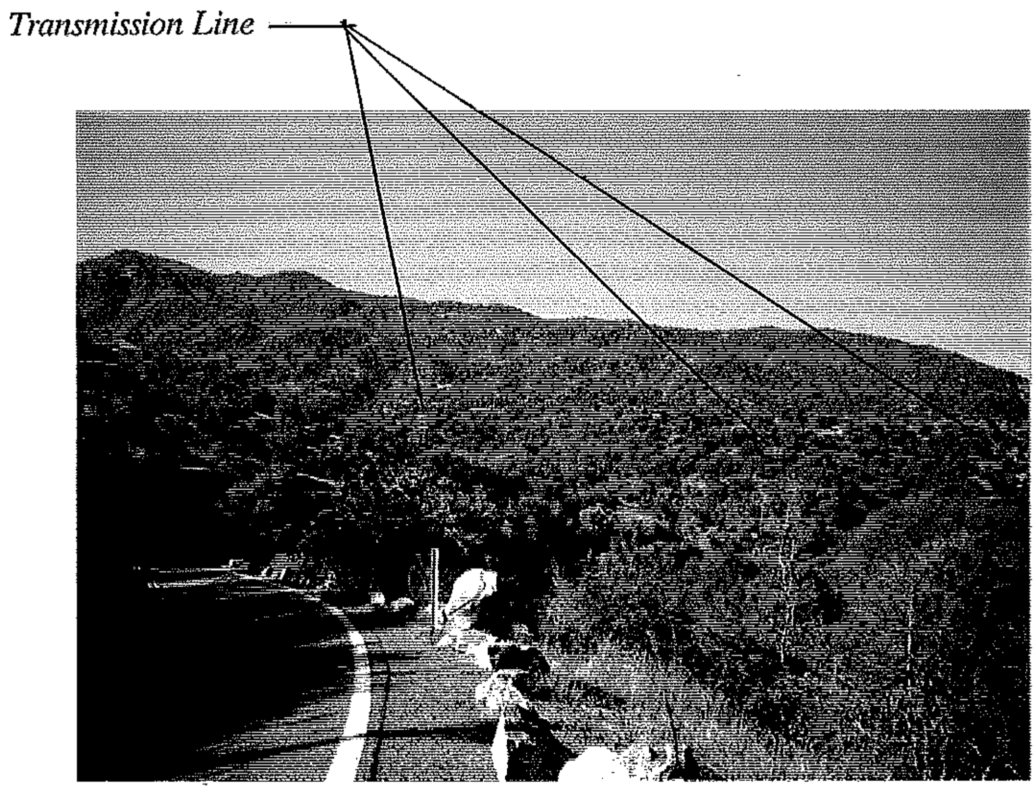


PLATE 5 - 66 KV TRANSMISSION LINE

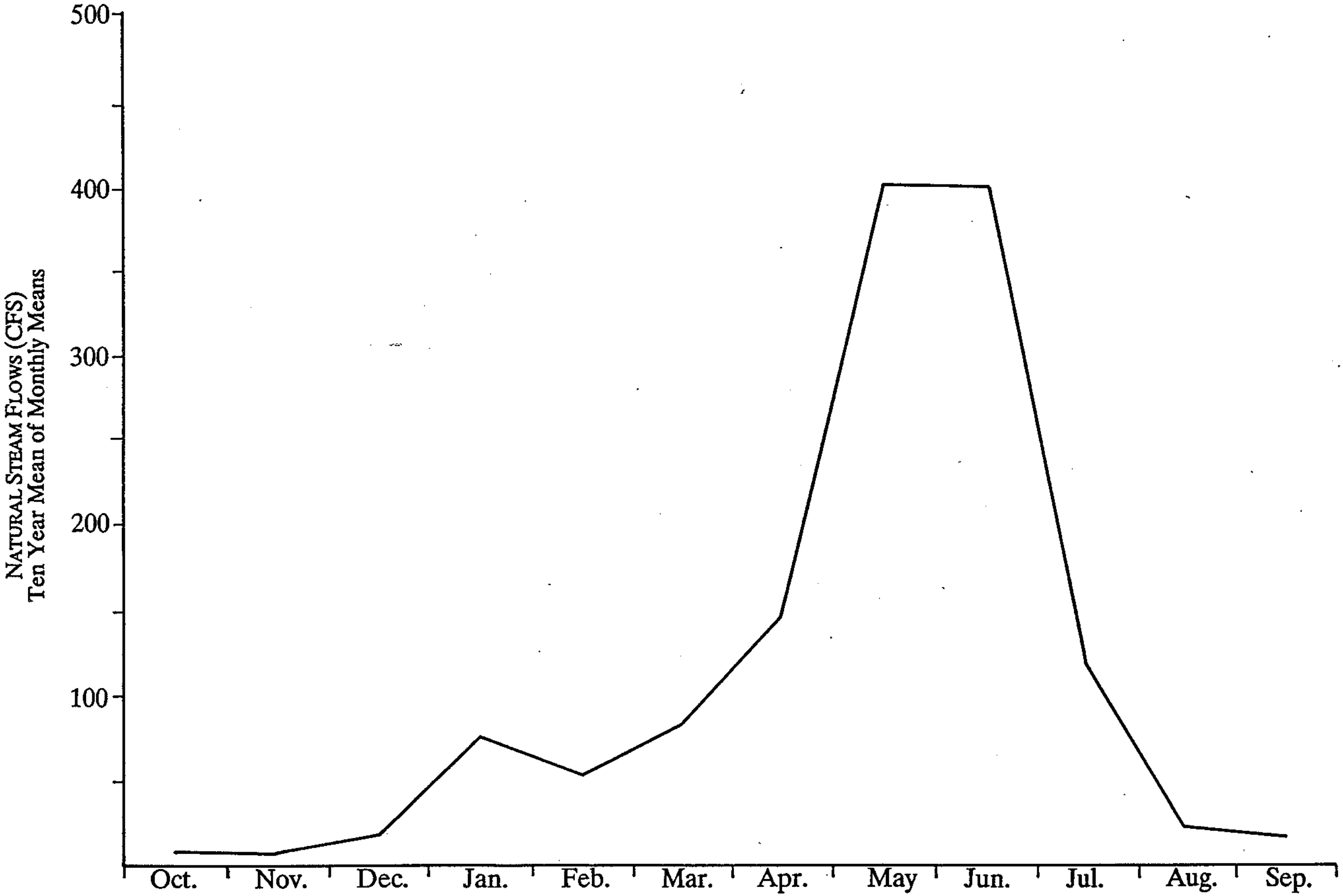
III. AVERAGE MONTHLY STREAM FLOWS IN BYPASSED REACHES

The monthly mean stream flows in the bypassed reaches of the East Fork, Marble Fork, and Middle Fork of the Kaweah River are shown on Figure 9 for the time period 1969 through 1978. The U.S. Geological Survey does not require a fish-water release at the Kaweah No. 2 intake below Powerhouse No. 3, consequently, flow records have not been maintained for this site. Similarly, records for the flows below intake No. 1 on the East Fork of the Kaweah River are available up to 1979, at which time Edison was no longer required by U.S.G.S. to keep records. The time period of 1969 through 1978 consequently represents the last ten year time period for which comparable information is available for three of the four bypassed reaches of the Kaweah River. Supporting Figures 9, 10 and 11 are Tables 7, 8 and 9.

- o Table 7 shows the monthly mean natural stream flows in cubic feet per second (CFS) along the East Fork of the Kaweah River below the Kaweah No. 1 intake.

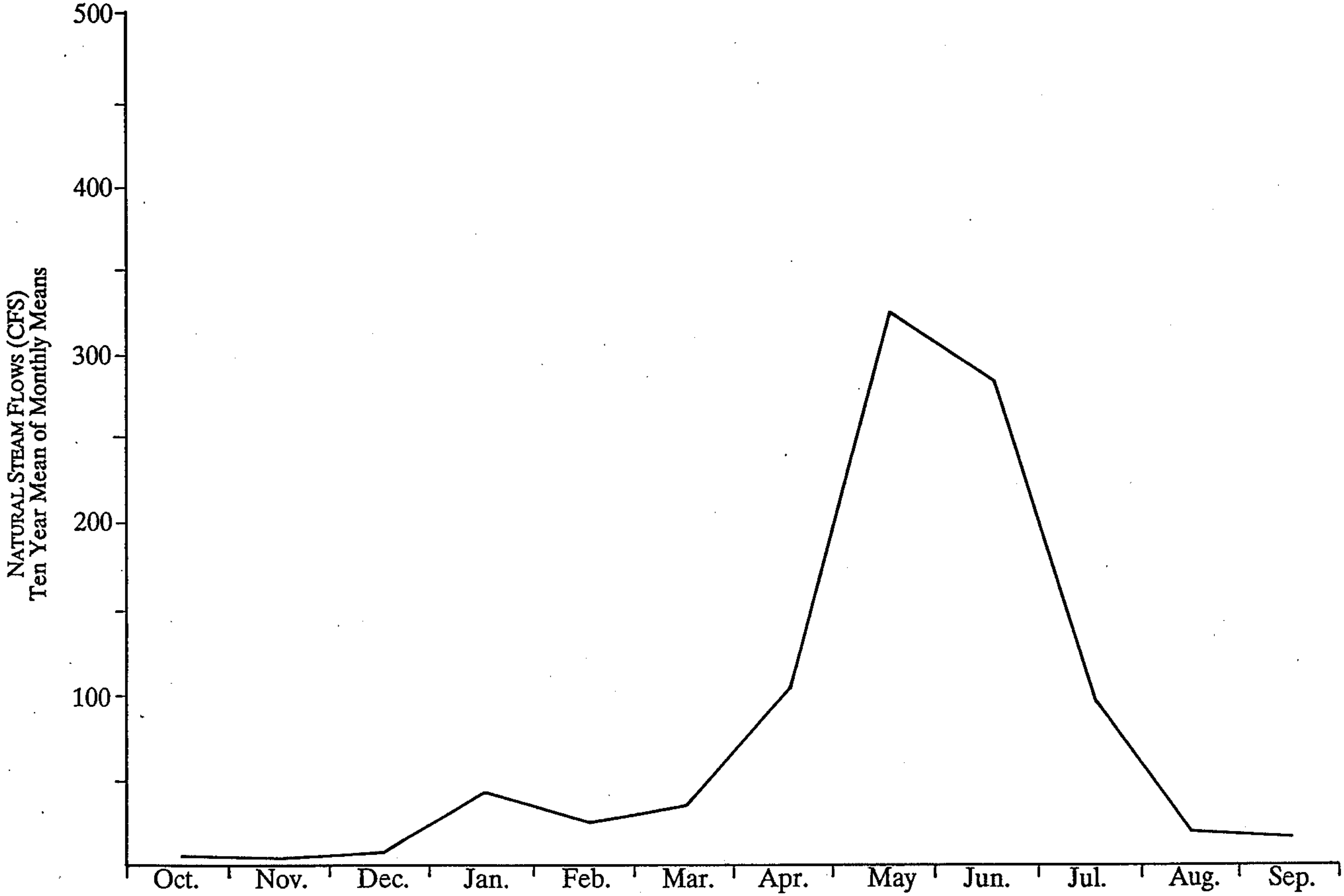
- o Table 8 illustrates the monthly mean natural stream flows (CFS) along the marble Fork of the Kaweah River below Kaweah No. 3 intake.

- o Table 9 summarizes the monthly mean natural stream flows (CFS) along the Middle Fork of the Kaweah River, below the Kaweah No. 3 intake.

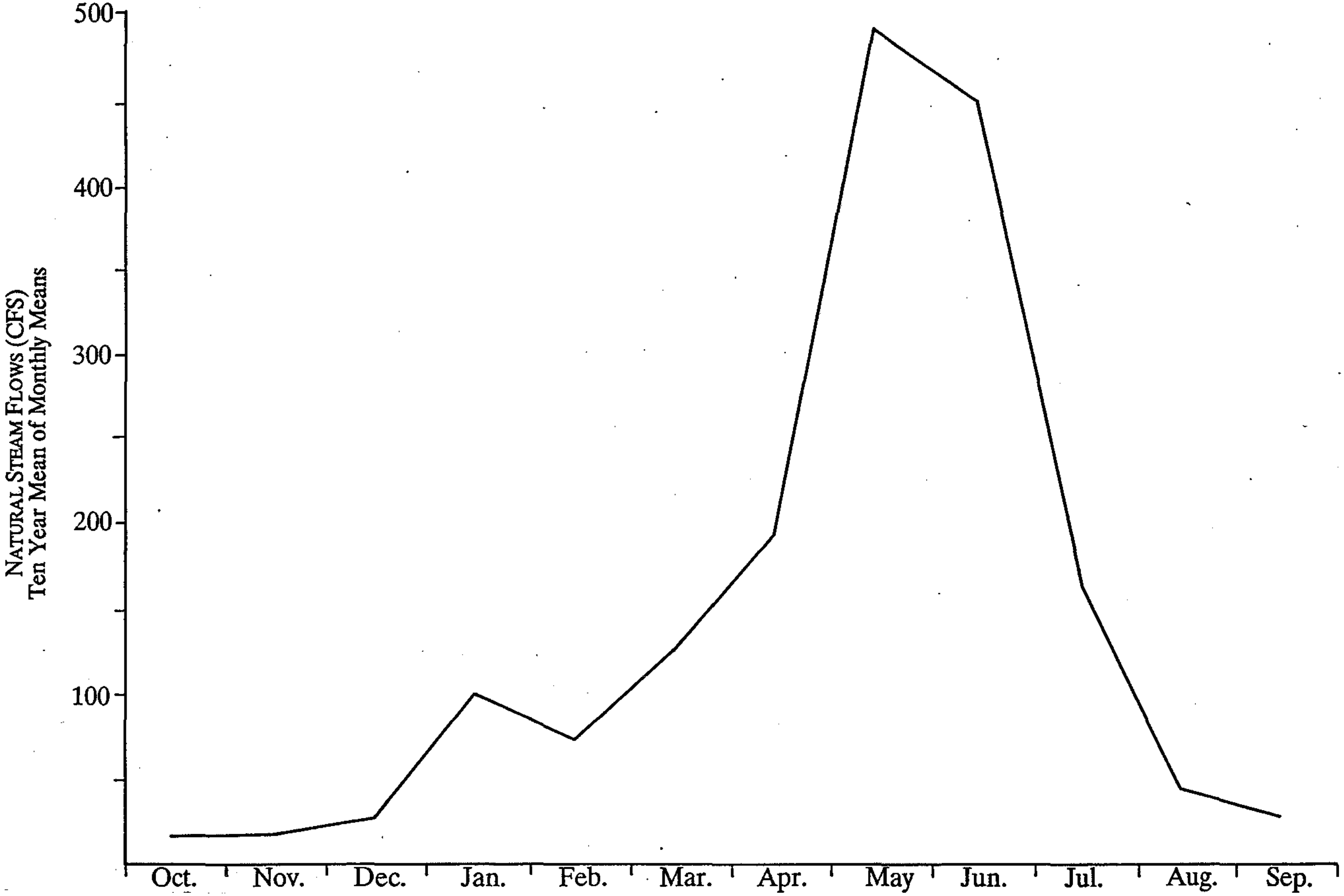


EAST FORK KAWEAH NO. 1 INTAKE - TEN YEAR MEAN OF MONTHLY MEAN FLOWS

Figure 9



MARBLE FORK KAWEAH NO. 3 INTAKE - TEN YEAR MEAN OF MONTHLY MEAN FLOWS
Figure 10



MIDDLE FORK KAWEAH NO. 3 INTAKE - TEN YEAR MEAN OF MONTHLY MEAN FLOWS
Figure 11

Table 7
SCE Hydro Division
Natural Stream Flows (CFS)
Ten Year Mean of Monthly Flows
East Fork Kaweah No. 1 Intake

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1969	2.9	5.2	20.0	358.6	219.1	160.4	350.1	943.8	965.7	451.3	96.5	22.8
1970	22.4	10.2	30.8	137.5	51.5	85.3	127.5	451.2	279.0	45.3	3.7	1.1
1971	1.0	12.7	17.4	30.1	31.6	54.8	120.1	255.6	338.0	64.7	8.4	2.5
1972	1.2	3.6	13.2	12.8	10.6	58.4	55.1	130.3	77.7	2.4	1.9	2.9
1973	0.8	4.6	17.6	80.9	50.4	78.7	181.5	662.9	654.1	138.6	25.0	1.9
1974	10.1	12.3	20.8	73.4	37.9	113.1	200.7	494.8	430.6	87.9	15.1	4.5
1975	2.3	2.6	8.6	7.0	22.9	52.0	72.9	404.3	472.2	80.3	7.1	3.2
1976	12.6	5.5	6.9	4.3	4.1	24.2	67.7	166.2	21.3	1.8	1.4	26.1
1977	12.6	4.0	1.3	1.9	2.1	2.3	45.2	54.8	60.9	2.0	2.1	2.0
1978	3.5	1.3	29.7	38.5	103.3	191.2	222.9	466.5	713.8	306.6	63.3	73.9
Mean Flow	6.9	6.2	16.6	74.5	53.4	82.0	144.4	403.0	401.3	118.1	22.5	14.1

Table 8
SCE Hydro Division
Natural Stream Flows (CFS)
Ten Year Mean of Monthly Flows
Marble Fork Kaweah No. 3 Intake

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1969	6.4	3.6	4.9	235.1	96.0	110.6	293.3	812.5	724.4	441.0	75.7	1.4
1970	7.3	1.7	8.6	59.9	6.0	42.0	67.9	241.4	105.5	8.0	5.7	1.6
1971	2.2	6.9	2.3	16.4	21.0	42.9	90.2	156.3	187.9	29.0	7.1	3.2
1972	1.6	3.2	3.7	6.1	8.9	63.1	68.3	119.0	41.1	4.8	3.9	3.9
1973	6.7	3.2	3.8	18.5	9.3	19.0	131.4	554.9	411.4	58.3	13.2	9.1
1974	12.3	16.1	8.9	29.4	8.4	82.4	144.1	396.6	324.7	48.6	11.3	3.4
1975	3.5	3.6	4.9	6.0	8.1	27.9	32.7	346.1	367.7	52.6	13.8	1.9
1976	17.8	2.7	4.5	6.3	8.4	17.6	39.1	99.5	9.6	6.5	6.9	31.0
1977	6.0	1.6	2.4	6.4	9.0	11.6	39.1	46.5	49.9	6.4	2.4	1.4
1978	2.5	2.9	36.0	31.4	67.1	128.9	163.9	498.5	646.6	312.7	59.5	103.5
Mean Flow	6.6	4.6	8.0	41.6	24.2	54.6	107.0	327.1	286.9	96.8	20.0	16.0

Table 9
SCE Hydro Division
Natural Stream Flows (CFS)
Ten Year Mean of Monthly Flows
Middle Fork Kaweah No. 3 Intake

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1969	26.8	15.3	23.0	462.2	274.0	294.3	545.5	1177.8	1087.2	672.2	183.4	22.0
1970	20.8	13.6	27.3	168.0	62.5	103.3	151.3	449.9	269.1	47.8	17.4	11.6
1971	11.4	30.2	25.4	39.5	32.9	73.9	130.7	243.4	302.0	66.1	18.0	12.3
1972	12.5	14.9	20.5	17.5	18.9	83.1	91.7	156.9	76.6	15.6	11.4	14.8
1973	17.6	12.5	17.7	69.7	59.1	93.8	245.0	858.1	714.8	160.7	22.8	13.2
1974	12.4	30.8	24.9	98.4	41.9	180.7	257.1	572.0	509.2	101.3	22.7	13.6
1975	14.0	17.7	15.4	18.2	29.6	71.3	80.3	544.7	549.9	95.9	16.8	11.4
1976	30.2	12.2	16.4	15.1	16.9	33.2	64.3	170.9	27.1	18.4	17.4	44.7
1977	13.8	11.9	10.0	14.2	16.5	22.3	68.4	78.6	97.9	17.0	16.8	9.4
1978	11.7	11.1	71.9	80.0	157.8	272.0	283.3	665.5	868.8	425.9	93.8	123.4
Mean Flow	17.1	17.0	25.3	98.5	71.0	122.8	191.8	491.8	450.3	162.1	42.1	27.6

IV. CONCLUSION

In conclusion, the Kaweah Hydroelectric Project has a very minor effect on the visual quality of the surrounding landscape. Only two Kaweah facilities were identified as moderately adverse: the Kaweah No. 1 maintenance and administration facility, adjacent to State Highway 198 and the Kaweah No. 2 flume, also located parallel to State Highway 198. As presented in Section II.B, Visual Compatibility Assessment Findings, most of the project facilities are either not seen from public viewing locations due to the vegetation regrowth that has occurred over the past 50 to 80 years or create only a very weak visual contrast in the seen environment. Furthermore, several of the facilities that are visible from public viewing locations (including the Kaweah Nos. 1 and 3 flumes and headwork structures), may add, rather than detract, from the visual interest to the landscape.

Conclusion

United States Department of the Interior

NATIONAL PARK SERVICE
SEQUOIA AND KINGS CANYON NATIONAL PARKS
THREE RIVERS, CALIFORNIA 93271

California's First National P

IN REPLY REFER TO:
L3031

March 2, 1989

RECEIVED
MAR 06 1989
B.J. MOUNT

Mr. B. J. Mount
Manager of Hydro Generation
Southern California Edison Company
Post Office Box 800
Rosemead, California 91770

Dear Mr. Mount:

The purpose of this letter is to confirm in writing several recent telephone conversations between Jan Knox and Wm. Tweed of my staff and Ron Schroeder with Southern California Edison. These conversations relate to your company's current dealings with the Federal Energy Regulatory Commission (FERC) with regard to the relicensing of the Kaweah Hydro-electric Project. You will recall that you first shared these issues with us in your letter to these Parks of November 2, 1988.

The interests of the National Park Service in the relicensing of the Kaweah Project relate primarily to the following items and then only to lands within Sequoia National Park. The items are titled and numbered as they were in the attachment to the letter from Dean L. Shumway of FERC to John R. Bury of SCE and dated October 24, 1988.

3. Erosion and Slope Stability
4. Deer
5. Right-of-way Clearing/Vegetation Management
10. Scenic Quality
11. Cultural Resources

As you prepare final recommendations to FERC regarding future handling of these items, we would like to have the opportunity to review your recommendations. Again, we would like to emphasize that our concerns relate only to those portions of the Kaweah Project within Sequoia National Park.

Additionally, we do not think it necessary for SCE to conduct specific resource studies within the boundaries of the National Park. Previous work undertaken here under contract to this Service has given us a good understanding of the natural resources involved. We do have reason to suspect, however, that your facilities themselves may have reached an age where they have possible significance as cultural resources. Certainly, the Kaweah Number 3 flume and associated development represent a classic example of early hydro-electric engineering.

If you have additional questions, our contact on this affair is Management Assistant Wm. Tweed. He may be reached at (209) 565-3341.

Sincerely,

J. Thomas Ritter
Superintendent

STATE OF CALIFORNIA—THE RESOURCES AGENCY

GEORGE DEUKMEJIAN, *Governor*

DEPARTMENT OF PARKS AND RECREATION
P.O. BOX 942896
SACRAMENTO 94296-0001
(916) 324-6415

March 29, 1989

Ms. Christine A. Keller
Keller Environmental Associates, Inc.
964 Fifth Avenue, Suite 535
San Diego, CA 92101

Dear Ms. Keller:

In response to your March 10, 1989 letter, we have reviewed the copies of Exhibit W and the Scope of Work - Visual Resources Report for the relicensing of the Kaweah Project (FERC No. 298) by Southern California Edison Company. The proposed project does not appear to affect any existing or proposed State Park System unit or statewide recreation opportunities. Therefore, we have no comments.

Sincerely,

James M. Doyle

James M. Doyle, Supervisor
Environmental Review Section

United States Department of the Interior

NATIONAL PARK SERVICE

SEQUOIA AND KINGS CANYON NATIONAL PARKS
THREE RIVERS, CALIFORNIA 93271

Sequoia National Park Centennial 1890-1990

California's First National Park

IN REPLY REFER TO:
L3031

November 1, 1989

Ms. Christine A. Keller, President
Keller Environmental Associates Incorporated
964 Fifth Avenue, Suite 535
San Diego, California 92101

Dear Ms. Keller:

As you requested in your letter of October 4th, we have reviewed the "Visual Resources Report" and the "Recreation Resources Report" prepared by Keller Environmental Associates for the Southern California Edison Company with respect to the resources of Sequoia National Park.

We have only limited comments on the substantive content of the two reports. We agree with your conclusion that the Kaweah Number Three has very little visual impact on Sequoia National Park. We suggest, however, that you have missed one significant impact of the 66kV line which begins at the Number Three Power Plant. This line passes directly over the Sequoia National Park entrance station plaza. We believe that this represents a significant visual intrusion which affects visitor perceptions as they enter the National Park. We are not in a position to suggest a mitigation for this situation, but we suggest that you consider the question.

We have no comments of substance regarding the contents of the Recreation Report, except to suggest that all lands used by SCE should be open to public access to the maximum degree that safety considerations allow.

For the sake of accuracy, we will share some detail comments. As a matter of style "Sierra Nevada" should always stand alone. "Sierra Nevada" means "snowy mountains" so there is no reason to use "Sierra Nevada mountains." The U. S. Postal Service estimates that approximately 4,000 persons live in the foothill regions of the Kaweah River; this is considerably higher than your estimates on page 11 of the Visual Resources Report. On page 17 of the same document you should delete mention of the two employee cottages at Kaweah Number Three since they have been razed.

In the Recreation Report, you should note that the Middle Fork Trail connects Potwisha Campground with Hospital Rock Picnic Area. The trail does not connect with Buckeye Flat Campground. Mount Alta is properly "Alta Peak." The "Mount Alta Pulloff" which you refer to on page 7 is actually the "Mt. Stewart Pulloff."

We appreciate the opportunity to comment on these documents.

Sincerely,

Wm Tweed

Wm. Tweed
Management Assistant

AUG 28 1989

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
CALIENTE RESOURCE AREA
4301 Rosedale Highway
Bakersfield, California 93308
Phone: (805) 861-4236
Office Hours: 7:30 a.m. to 4:00 p.m. weekdays

TAKE PRIDE IN AMERICA

IN REPLY REFER TO:

2100
(CA-016.5)

AUG 22 1989

Ms. Lisa Capper
Keller Environmental Associates, Inc.
964 Fifth Avenue, Suite 535
San Diego, CA 92101

Dear Ms. Capper:

This letter is being sent as a follow-up to our meeting with Christine Keller in our office on April 13, 1989. As discussed with Christine, we feel the area surrounding the Kaweah Hydroelectric Project is very important to the public and the community in terms of recreational opportunities and visual quality. Our resource inventory information supporting this assessment was provided to Christine at this meeting.

Thank you for the opportunity to comment on the relicensing effort.

Sincerely,

Glenn A Carpenter

Glenn A. Carpenter
Resource Area Manager

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LIST OF TABLES

LIST OF MAPS

LIST OF ACRONYMS

AGOL	Archaeology Geographic Information System Data Viewer
APE	Area of Potential Effects
BLM	Bureau of Land Management
CFR	Code of Federal Regulations
CRMP	Cultural Resource Management Plan
DPR	Department of Parks and Recreation
FERC	Federal Energy Regulatory Commission
NHPA	National Historic Preservation Act
NPS	National Park Service
NRHP	National Register of Historic Places
OHP	Office of Historic Preservation
Project	Kaweah Project
SCE	Southern California Edison Company
SD	Supporting Document
SHPO	State Historic Preservation Officer
SNP	Sequoia National Park
SOI PQS	Secretary of the Interior’s Professional Qualification Standards
SUP	Special Use Permit
TSR	Technical Study Report

7.12 CULTURAL RESOURCES AFFECTED ENVIRONMENT

This section describes cultural resources in the vicinity of the Kaweah Project (Project). The section includes information documenting: (1) prehistoric and historic period archaeological resources; and (2) historic period built environment resources. Tribal Resources are described in Section 7.13.

In addition, this section summarizes existing cultural resources management guidance that Southern California Edison Company (SCE) undertakes to avoid adverse impacts to National Register of Historic Places (NRHP) eligible properties.

7.12.1 Information Sources

The information presented in this section was developed using the following sources:

- CUL 1 – Cultural Resources Archaeology Technical Study Report (CUL 1 – Archaeology TSR) (SCE 2019a), which is included in Supporting Document (SD) A;
- CUL 1 – Cultural Resources Built Environment Technical Study Report (CUL 1 – Built Environment TSR) (SCE 2019b), which is included in SD A;
- CUL 1 – Cultural Resources NRHP Evaluation Plan (SCE 2019c), which is included in SD A;
- Pre-Application Document for the Kaweah Project (SCE 2016); and
- Cultural Resources Management Plan for SCE's Kaweah Hydroelectric Project, Tulare County, California, FERC Project No. 298 (SCE 1992).

7.12.2 Setting

This subsection provides an overview of the prehistoric and historic period setting related to cultural resources. For more detailed discussion of the setting and associated historic context related to prehistoric and historic period archaeological resources and historic period built environment resources, refer to the CUL 1 – Archaeology TSR and CUL 1 – Built Environment TSR, included in SD A. These documents provide a comprehensive discussion of cultural resources identification and evaluation efforts that were undertaken as part of the relicensing technical studies. The following subsections are excerpted from these supporting technical studies.

7.12.2.1 Prehistoric Setting

The Project occupies an area that lies within the westernmost traditional territory of Western Mono or Monache ethnolinguistic group, and near the traditional territory of the Foothill Yokuts ethnolinguistic group. Two separate Mono-speaking groups, the Patwisha (also Padwishe) on the Middle Fork of the Kaweah River and the Waksachi on the North Fork into Eshom Valley occupied the areas in the vicinity of the Project (Gayton 1948; Golla 2011:151).

Despite speaking languages from different families, the Monache and the Foothill Yokuts had a close, although not always friendly, relationship. Generally, the boundary between the two ethnolinguistic groups along the Kaweah River is placed around the confluence with the South Fork Kaweah River, where the mixed Wukchumni-Patwisha village of hotnu'nyu was located. However, boundaries such as this were not firm, and there was apparently freedom of movement both within and across customary tribal boundaries without it being a major offense, and hunting and seed gathering activities were conducted across them. The Wukchumni traveled into Patwisha territory to hunt wild pigeons and sold the Patwisha the tule house mats that they brought with them (Gayton 1948:55-59, 74; Golla 2011:151).

Subsistence activities of both the Foothill Yokuts and Monache included hunting, fishing, and collection of plant resources, particularly acorns. A variety of flaked and ground stone tools (e.g., knives, arrow and spear points, and shaped pestles), the plain and sinew-backed bow, and baskets were commonly used. This area was an important link in a trade network that extended from the Pacific Ocean over the Sierra into the Great Basin. Within the Sierra Nevada, the Monache were important traders, acting as the intermediaries between the Yokuts and the Owens Valley Paiute (Eastern Mono). Obsidian, sinew-backed bows, moccasins, rock salt, pine nuts, and pinewood hot-rock lifters traveled west, while shell-bead money and finely made baskets traveled east (Gayton 1948:2.56).

Euro-American contact with Native American groups living in the California Central Valley began during the last half of the eighteenth century. At this time, the attention of Spanish missionaries shifted away from the coast, and its dwindling Native American population, to the missionization of interior populations, including the Yokuts. The efforts of the Spanish to missionize the Native American population began a history of destructive Euro-American interactions with Native Americans that eventually led to the loss of traditional Native American culture. Around 1830, American trappers from the north brought an epidemic, likely malaria, which killed over 75 percent of the natives of the San Joaquin Valley over a span of three years. One result was that Coastal and Central Valley populations fled into the foothills, only to be caught in a new Euro-American influx during the Gold Rush (Cook 1976).

Additional detailed information about the prehistoric and historic period archaeological setting and historic context in the vicinity of the Project is documented in CUL 1 – Archaeology TSR, included in SD A.

7.12.2.2 Historic-Era Setting

Beginning in the late 1850s, logging, mineral exploration, farming, and ranching activities became increasingly widespread in the Kaweah River Watershed. Logging and ranching, especially the grazing of sheep, resulted in extensive environmental degradation. Between 1873 and 1882, galena and silver were mined in the Mineral King area, along the East Fork Kaweah River. These mining operations ceased when the silver ore was found to be difficult to smelt profitably. However, the residents soon focused their attention on the ideal agricultural lands of the lower Tulare County region in the San Joaquin Valley (Berryman and Elasser 1966).

The growth of the San Joaquin Valley agricultural sector was predicated on the development of an economical source of electricity to operate wells for irrigation purposes. To satisfy the burgeoning demand for power, the Kaweah Hydroelectric Project was constructed by the Mount Whitney Power Company, with construction beginning in 1898. The Kaweah No. 1 Development was completed in 1899, the Kaweah No. 2 Development was completed in 1905, and the Kaweah No. 3 Development was completed in 1913. Additionally, Mount Whitney Power Company constructed small masonry dams on four high Sierra lakes in the Mineral King area between 1903 and 1905 to help regulate late-summer and early-fall flows on the East Fork Kaweah River, stabilizing flows for the Kaweah No. 1 Development. The Mount Whitney Power Company operated the Project until 1916, at which time it was purchased by Henry Huntington's Pacific Light and Power Company, which merged with SCE in 1917.

Additional detailed information about the historic period built environment setting and historic context in the vicinity of the Project is documented in CUL 1 – Built Environment TSR, included in SD A.

7.12.3 Identified Cultural Resources

The following subsection describes the cultural resources that have been identified in the vicinity of the Project. The subsection is organized by cultural resource type, with discussion of prehistoric and historic period archaeological cultural resources followed by discussion of historic period built environment cultural resources.

All cultural resource identification was undertaken in accordance with the requirements of Section 106 of the National Historic Preservation Act (NHPA), as codified in 36 Code of Federal Regulations (CFR) Part 800, as described in detail below and in the CUL 1 – Archaeology and Built Environment TSRs included in SD A.

7.12.3.1 Development of Area of Potential Effects

Section 106 of the NHPA requires that FERC develop an Area of Potential Effects (APE) to guide identification efforts for the Project. Under 36 CFR Part 800, the APE is defined as “the geographic area or areas within which an undertaking may cause changes in the character or use of historic properties” (36 CFR 800.16[d]).

In compliance with this requirement of Section 106 and as delegated by FERC, qualified personnel under the Secretary of the Interior’s Professional Qualification Standards (SOI PQS) established an APE for prehistoric and historic period archaeological resources and historic period built environment resources in consultation with the California State Historic Preservation Officer (SHPO) and Project stakeholders. The APE for prehistoric and historic period archaeological resources and historic period built environment resources consists of the FERC boundary and any associated Project facilities outside the FERC boundary surrounded by a defined buffer area, depending upon facility type, as detailed in Table 7.12-1.[1]

While the APE for the Project is limited to the areas described above, cultural resources identification for historic period built environment resources also included documentation of SCE Kaweah hydroelectric facilities that are located outside of the FERC Project boundary on lands located within the Sequoia National Park (SNP) and operated under a Special Use Permit (SUP) issued by the National Park Service (NPS). Although these historic period built environment facilities are not under FERC jurisdiction and are instead managed under an NPS SUP, because the facilities are physically and contextually associated with hydroelectric facilities in the FERC Project boundary, built environment cultural resource identification included inventory and NRHP evaluation of the built environment facilities to provide contextual information for management of historic properties in the APE. This built environment study area is referred to as the SNP Study Area. This built environment documentation approach was developed in collaboration with SHPO and Project stakeholders. Archaeological inventory conducted under CUL 1 – Archaeology TSR did not include survey of lands in the SNP, as the lands are outside of FERC jurisdiction and outside of the APE.[2]

The APE for prehistoric and historic period archaeological resources is depicted in Map 7.12-1 and the APE and SNP Study Area for historic period built environment resources is depicted in Maps 7.12-2 (a–c).

7.12.3.2 Prehistoric and Historic Period Archaeological Resources

Formal record searches utilizing SCE's Archaeology Geographic Information System Data Viewer (AGOL), California Office of Historic Preservation (OHP) Information Center record repositories, and Bureau of Land Management (BLM) records identified 42 previously documented prehistoric and historic period archaeological resources in or immediately adjacent to the APE prior to the current survey efforts. Of the 42 previously identified sites, 35 of these sites were relocated and revisited as part of resource identification undertaken during the archaeological field survey. The remaining seven resources were not relocated. Of these seven, four sites were recorded in 1961 and were mapped within the APE; however, upon further investigation were found to be located outside of the APE. Three isolates were not revisited because they are not classified as sites under the guidance of the NRHP and California OHP.

The 42 previously identified prehistoric and historic period archaeological resources in the APE are listed in Table 7.12-2, which includes overview characteristics of each site.

[1] SHPO approved the Study Area and proposed APE in a letter dated May 3, 2018, Reference Number: FERC_2018_0309_001. In addition, the proposed APE was presented to stakeholders for discussion and comment at a Kaweah Project Cultural Resources Technical Working Group (TWG) Meeting on March 20, 2018. No comments were received on the APE from any member of the TWG.

[2] See Footnote 1.

In addition to the 42 previously identified sites in the APE, eight new archaeological sites were identified during the archaeological field survey. Seven are historic-era age, with the majority associated with the construction and operation of the Project. One site is a bedrock milling station assumed to be used during the prehistoric or protohistoric period. The newly identified archaeological sites are listed in Table 7.12-3.

For additional detailed information and California Department of Parks and Recreation (DPR) 523 Site Records documenting the prehistoric and historic period archaeological resources identified in the APE, refer to the CUL 1 – Archaeology TSR, included in SD A. Please note, portions of this TSR are withheld from public disclosure in accordance with 36 CFR Section 800.11(c)(1) as the information contains details on the locations of sensitive cultural resources and disclosure of such information could be harmful to these resources.

While the CUL 1 – Archaeology TSR included identification of all prehistoric and historic-era archaeological resources in the APE, the documentation did not include new or updated NRHP evaluation of archaeological resources. Such evaluation is being addressed in the Cultural Resources NRHP Evaluation Plan (SCE 2019c), which will guide cultural resource management of unevaluated cultural resources in the APE that may be affected by the Project.

7.12.3.3 Historic Period Built Environment Cultural Resources

All built environment resources (buildings, structures, objects) that were determined to be over 45 years of age were subject to field inventory and NRHP evaluation by SOI PQS Architectural Historians as part of the relicensing study The inventory consisted of comprehensive written and photographic documentation of all historic period built environment resources located within the APE and SNP Study Area. For those properties that had been previously inventoried and evaluated and had formal NRHP status, the survey effort focused on assessing each property relative to the previous documentation and recording any changes that may have occurred.

The APE and SNP Study Area includes 18 historic period built environment resources associated with hydroelectric development. Historic period built environment resources identified in the APE are listed in Table 7.12-4 and historic period built environment resources identified in the SNP Study Area are listed in Table 7.12-5. The tables include information regarding age of the resource, any previous NRHP evaluation status prior to this current study, and an updated NRHP status based on the results of the built environment study.

As detailed in Tables 7.12-4 and 7.12-5, the majority of historic period built environment resources identified in the APE and SNP Study Area were previously inventoried and evaluated for the NRHP. This previous inventory and evaluation was conducted in association with the previous Kaweah Project relicensing effort (Lehman et al 1989). Because of the length of time that has passed since the previous recordation and the fact that the previous recordation did not formally inventory and evaluate some components of the Project because at the time the facilities were not yet 50 years of age, the current study provides an updated inventory and NRHP evaluation to account for all historic period built environment resources.

As documented in Tables 7.12-4 and 7.12-5, the updated NRHP evaluation generally concurs with the previous findings that the Kaweah No. 3 Project facilities comprise an NRHP Historic District, the Kaweah No. 3 Hydroelectric System Historic District. The District is eligible under Criterion A for its association with the broad and significant pattern of agricultural expansion and development in Tulare County and the surrounding region. The District is also eligible under Criterion C, as the development of the Kaweah No. 3 facilities reflect a significant type, period, and method of construction as an early twentieth century hydroelectric system. The period of significance of the Kaweah No. 3 Hydroelectric System Historic District spans from construction in 1913 to sale of the company in 1916 to Pacific Light and Power Company. The District has a regional level of significance, reflecting its Tulare County and San Joaquin Valley development associations.

While the updated study generally concurs with the previous evaluation efforts undertaken for Project facilities in the APE and SNP Study Area, the current analysis augments the earlier NRHP findings in several key areas, as detailed below.

- While the previous evaluation found that the Marble and Middle Fork Diversion Dams did not contribute to the Kaweah No. 3 Hydroelectric System NRHP Historic District and as such were ineligible for listing in the NRHP, the current analysis finds that they do contribute to the established historic district because of their contextual, functional, and operational associations and as such recommends that the resources be included as contributors to the Kaweah No. 3 Hydroelectric System Historic District.

- While the previous evaluation found that the Kaweah No. 3 Powerhouse appeared individually eligible for the NRHP as well as eligible as a contributor to the Kaweah Hydroelectric System NRHP Historic District, the current evaluation finds that the powerhouse does not appear to be individually eligible for listing. Rather the NRHP significance of the resource is embodied in its functional, operational, and contextual relationship to the Kaweah No. 3 Hydroelectric System as a whole, and as such appears eligible for the NRHP as a contributor to the District under Criteria A and C and not additionally as an individual historic property.

- The current evaluation provides NRHP analysis for Project facilities that were not formally addressed under the previous evaluation, finding that the Project's stream gages and transmission, distribution, and communication lines appear ineligible for listing in the NRHP as either components of the Kaweah No. 3 Hydroelectric System Historic District or as individual properties.

For additional detailed information about historic period built environment resources in the APE, including DPR 523 Site Records, refer to the CUL 1 – Built Environment TSR, included in SD A.

7.12.4 Current Cultural Resource Management

SCE prepared a Cultural Resource Management Plan (CRMP) for the Project in 1992. The CRMP identifies specific measures that SCE undertakes to avoid adverse impacts to the NRHP-eligible properties located within the FERC Project boundary. The CRMP identifies various programmatic measures that SCE is required to implement, as well as resource monitoring and recordation, to ensure that any adverse impacts are accounted for and addressed in accordance with Section 106 of the NHPA as codified by 36 CFR Part 800. The CRMP states that if impacts to NRHP-eligible properties cannot be avoided with implementation of protective and avoidance measures, SCE, in consultation with SHPO and FERC, shall develop a site-specific treatment plan in accordance with 36 CFR Part 800.4-800.6. Resource monitoring and recordation is required to occur in three-year increments to determine the success of current measures and to evaluate the need for additional treatment.

7.12.5 Literature Cited

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SCE. 2019a. CUL 1 – Cultural Resources Archaeology Technical Study Report. Available in SD A.

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SCE. 2019c. CUL 1 – Cultural Resources NRHP Evaluation Plan. Available in SD A.

TABLES

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Table 7.12-1. Cultural Resources Survey Area for Facilities that Lie Outside of the Existing FERC Project Boundary

Project Facility	Survey Area
Diversion Dams and Pools	15 feet around the perimeter
Flowlines[1]	20 feet on either side
Forebays/Forebay Tank	20 feet around the perimeter
Penstocks	15 feet on either side
Powerhouses and Switchyards	Within and up to 15 feet around the perimeter fence
Transmission, Power, and Communication Lines	25 feet on either side
Gages	10 feet around gages
Project Access Roads	20 feet on either side
Project Trails	15 feet on either side
Ancillary and Support Facilities	
Kaweah No. 1 Powerhouse Campus	Within the developed campus
Repeaters and Solar Panels	15 feet around the perimeter
River Access Parking	10 feet around parking area and beach

Notes:
[1] Footbridges, wildlife bridges, and wildlife escape ramps are located on Project flowlines and will be surveyed concurrently with the flowlines.

Table 7.12-2. Previously Identified Archaeological Resources within the APE

P-Number/ Identifier	Site Type	Relocated	Site Record Update	Site Condition	FERC Facility	Land Owner	Previous Eligibility Status Prior to Study[1]
P-54-000232	Prehistoric: AP02 (Lithic scatter); AP03 (Ceramic scatter); AP04 (Bedrock milling feature); AP07 (Architectural feature)	Yes	Yes	Good	Transmission line	Private	Eligible for the NRHP
P-54-000258	Prehistoric AP02 (Lithic scatter); AP04 (Bedrock milling feature)	Yes	No	Good	Transmission line	Private	Unevaluated for the NRHP
P-54-000261	Prehistoric AP04 (Bedrock milling feature)	No	Yes	--	--	--	Unevaluated for the NRHP. Attempted to relocate, incorrect site location.
P-54-000266	Prehistoric AP04 (Bedrock milling feature)	No	Yes	--	--	--	Unevaluated for the NRHP. Attempted to relocate, incorrect site location.
P-54-000271	Prehistoric AP02 (Lithic scatter); AP14 (Rock shelter/cave)	No	Yes	--	--	--	Unevaluated for the NRHP. Attempted to relocate, incorrect site location.
P-54-000278	Prehistoric AP02 (Lithic scatter); AP03 (Ceramic scatter) - potsherds; AP04 (Bedrock milling feature); AP15 (Habitation debris) - midden	Yes	Yes	Fair	Kaweah No. 3 Powerhouse access road	SCE	Unevaluated for the NRHP
P-54-000290	Prehistoric AP04 (Bedrock milling feature)	No	Yes	--	--	--	Unevaluated for the NRHP. Attempted to relocate, incorrect site location.[2]
P-54-001478	Prehistoric AP04 (Bedrock milling feature)	Yes	Yes	Good	Kaweah No. 2 Flowline access road	Private	Eligible for the NRHP

P-Number/ Identifier	Site Type	Relocated	Site Record Update	Site Condition	FERC Facility	Land Owner	Previous Eligibility Status Prior to Study[1]
P-54-001479/H	Prehistoric, Historic-era AP04 (Bedrock milling feature); Historic-era HP29 (Landscape architecture); HP30(Trees); AH2 Foundations/structure pads; AH4 Trash scatters;	Yes	Yes	Poor	Kaweah No. 1	SCE	Unevaluated for the NRHP
P-54-001480/H	Prehistoric, Historic-era AH11 (Walls/fences); AH16 (Other) - Historic-era rock lined hearth; AP04 (Bedrock milling feature)	Yes	Yes	Good	Transmission line	Private	Eligible for the NRHP
P-54-003332	Historic General's Highway	Yes	No	Good	Kaweah No. 3 Powerhouse and access road	SCE and Sequoia National Park	Eligible for the NRHP
P-54-004342	Prehistoric AP04 (Bedrock milling feature)	Yes	Yes	Good	Transmission line	Private	Unevaluated for the NRHP. May connect or include site P-54-000258.
P-54-004595	Historic-era AH02 (Foundations/structure pads); AH04 (Privies/dumps/trash scatters); AH06 (Water conveyance system); AH11 (Walls/fences)	Yes	No	Fair to good	Kaweah No. 1 Powerhouse	SCE	Unevaluated for the NRHP
P-54-004596	Prehistoric AP04 (Bedrock milling feature)	Yes	Yes	Fair to good	Kaweah No. 1 Powerhouse	SCE	Unevaluated for the NRHP. Site is part of P-54-001479 (Feature A).
P-54-004616	Historic-era HP11 (Engineering structure)	Yes	No	Good	Kaweah No. 2 Flowline	SNP	Unevaluated for the NRHP
P-54-004693	Historic-era AH04 (Privies/dumps/trash scatters)	Yes	No	Good	Kaweah No. 2 Intake Road	SCE	Unevaluated for the NRHP

P-Number/ Identifier	Site Type	Relocated	Site Record Update	Site Condition	FERC Facility	Land Owner	Previous Eligibility Status Prior to Study[1]
P-54-004694	Historic-era AH02 (Foundations/structure pads); AH11 (Walls/fences)	Yes	Yes	Good	Kaweah No. 2 Intake Road	SCE	Unevaluated for the NRHP
P-54-004695	Historic-era AH05 (Wells/cisterns); AH16 (Other)	Yes	Yes	Good	Kaweah No. 2 Flowline	Private	Unevaluated for the NRHP
P-54-004696	Historic-era AH04 (Privies/dumps/trash scatters)	Yes	No	Good	Kaweah No. 2 Flowline	Private	Unevaluated for the NRHP
P-54-004697	Historic-era AH02 (Foundations/structure pads)	Yes	Yes	Poor	Kaweah No. 2 Flowline	Private	Unevaluated for the NRHP
P-54-004698	Historic-era AH04 (Privies/dumps/trash scatters)	Yes	No	Good	Kaweah No. 2 Flowline	Private	Unevaluated for the NRHP
P-54-004739	Historic-era AH02 (Foundations/structure pads)	Yes	Yes	Good	Kaweah No. 2 Powerhouse	SCE	Unevaluated for the NRHP. Site combined with P-54-004756.
P-54-004749	Historic-era Isolate	Yes	No	Good	Kaweah No. 2 Flowline	SNP	Ineligible for the NRHP
P-54-004750	Historic-era Isolate	Yes	No	Good	Transmission line	Private	Ineligible for the NRHP
P-54-004751	Historic-era Isolate	Yes	No	Good	Kaweah No. 2 Flowline	Private	Ineligible for the NRHP
P-54-004752	Historic-era Isolate	No	No	--	Kaweah No. 2 Flowline	Private	Ineligible for the NRHP
P-54-004754	Historic-era AH11 (Walls/fences); AH16 (Other)	Yes	Yes	Fair	Kaweah No. 2 Flowline access road	Private	Unevaluated for the NRHP
P-54-004755	Historic-era AH05 (Wells/cisterns)	Yes	No	Good	Kaweah No. 2 Flowline	Private	Unevaluated for the NRHP

P-Number/ Identifier	Site Type	Relocated	Site Record Update	Site Condition	FERC Facility	Land Owner	Previous Eligibility Status Prior to Study[1]
P-54-004756	Historic-era AH02 (Foundations/structure pads); AH04 (Privies/dumps/trash scatters); AH11 (Walls/fences)	Yes	Yes	Good	Kaweah No. 2 Powerhouse	SCE	Unevaluated for the NRHP. Site P-54-004739 was combined in this site record as Feature A.
P-54-004757	Historic-era AH04 (Privies/dumps/trash scatters); AH11 (Walls/fences)	Yes	Yes	Fair	Kaweah No. 2 Powerhouse	SCE	Unevaluated for the NRHP
P-54-004758	Prehistoric AP04 (Bedrock milling feature)	Yes	No	Good	Kaweah No. 2 Powerhouse	SCE	Unevaluated for the NRHP
P-54-004759	Historic-era Isolate	No	No	--	Kaweah No. 2 Flowline	--	Ineligible for the NRHP
P-54-004761	Historic-era AH02 (Foundations/structure pads)	Yes	No	Good	Kaweah No. 1 Flowline	Private	Unevaluated for the NRHP
P-54-004762	Historic-era AH16 (Other)	Yes	No	Good	Kaweah No. 1 Flowline	BLM	Unevaluated for the NRHP
P-54-004763	Historic-era AH04 (Privies/dumps/trash scatters)	Yes	No	Good	Kaweah No. 1 Flowline	Private	Unevaluated for the NRHP
P-54-004764	Historic-era AH11 (Walls/fences)	Yes	No	Good	Mineral King Road	Private	Unevaluated for the NRHP
P-54-004765	Historic-era AH11 (Walls/fences)	Yes	No	Good	Kaweah No. 1 Flowline	Private	Unevaluated for the NRHP
P-54-004766	Historic-era Isolate	No	No	--	Kaweah No. 1 Flowline	Private	Ineligible for the NRHP
P-54-004797	Historic-era Isolate	Yes	No	Good	Mineral King Road	BLM	Ineligible for the NRHP
P-54-005300	Historic-era HP39 (Other) - bridge abutment remains	Yes	No	Good	Mineral King Road	Private	Unevaluated for the NRHP

P-Number/ Identifier	Site Type	Relocated	Site Record Update	Site Condition	FERC Facility	Land Owner	Previous Eligibility Status Prior to Study[1]
CM-SSDV-2016-01	Prehistoric AP04 (Bedrock milling feature)	Yes	Yes	Good	Kaweah No. 1 Forebay Road	BLM	Unevaluated for the NRHP
CM-SSDV-2016-02	Prehistoric AP04 (Bedrock milling feature)	Yes	Yes	Good	Kaweah No. 1 Forebay Road	BLM	Unevaluated for the NRHP

1. Information regarding existing NRHP status of archaeological resources that were inventoried as part of the Archaeology TSR was obtained from review of SCE's AGOL and BLM cultural resource records. No NRHP evaluation of archaeological resources has been conducted as part of the Archaeology TSR.

Table 7.12-3. Newly Identified Archaeological Resources within the APE

Field Identifier	Site Type	Site Condition	Facility	Land Owner	Description
K-ALK-001	Historic-era: AH16. Other – telegraph/early telephone line remains	Good	Kaweah No.1 Flowline/Forebay	BLM	A decomposing wood post and ceramic insulators with wiring on top of large granite boulders above forebay, likely associated with hydroelectric project.
K-ALK-002	Historic-era: AH4. Dumps/trash scatters; AH7. Roads; AH9. Quarries; AH11. Fences	Good	Kaweah No. 1 Forebay Road	BLM	Appears to be a historic-era road cut, pad, and refuse dump from a 1960s cabin or house. Not likely associated with hydroelectric project.
K-ALK-003	Historic-era: AH2. Foundations/structure pads	Good	Kaweah No. 1 Forebay Road	BLM	A large board-form concrete retaining wall likely associated with ranching or settlement.
K-ETE-002	Historic-era: AH4. Privies/dumps/trash scatters, AH6. Water conveyance system - unused penstock pipe	Good	Kaweah No. 3 Forebay	BLM	This site consists of discarded penstock sections that are likely associated with early construction of the forebay and horizontal penstock.
K-ETE-003	Historic-era: AH2. Foundations/structure pads; AH7. Roads/trails/railroad grades	Fair to Good	Kaweah No. 3 Penstock	BLM	Likely represents the remains of a Mt. Whitney Power Co. construction camp or tramway system that was used for construction per SCE historic drawings.
K-ETE-007	Historic-era: AH2. Foundations/structure pads, Historic-era: AH16 (Other) - Survey Marker	Good	Kaweah No. 3 Powerhouse	SCE	Likely represents remains of the Kaweah No. 3 Powerhouse cottages and associated buildings per historic photos.
K-ETE-011	Historic-era: AH16. (Other) – Rock Art and Modern Graffiti	Good	Kaweah No. 2 Diversion Dam	SCE	May be associated with worker housing and workers at Kaweah No. 2 Diversion and No. 3 Powerhouse.
K-MMR-006	Prehistoric: AP4: Bedrock Milling Feature	Good	Kaweah No. 2 Flowline Access Road	Private	Bedrock milling feature assumed to be used during the prehistoric or protohistoric period.

Table 7.12-4. Historic Period Built Environment Resources within the APE

Resource Name	Construction Date	Previous NRHP Evaluation Status[1]	Updated NRHP Evaluation Status
Kaweah No. 1 Facilities			
Kaweah No. 1 Powerhouse and Penstock	1898; 1928-1929	Ineligible for the NRHP	Ineligible for the NRHP
Kaweah No. 1 Diversion Dam	1898; 1940	Ineligible for the NRHP	Ineligible for the NRHP
Kaweah No. 1 Flowline	1947 (reconstruction from original 1899 flowline)	Ineligible for the NRHP	Ineligible for the NRHP
Kaweah No. 1 Forebay Tank	1947 (reconstruction from original 1899 forebay)	Ineligible for the NRHP	Ineligible for the NRHP
Kaweah No. 1 Powerhouse Campus	1927; circa 1950; 1990	Ineligible for the NRHP	Ineligible for the NRHP
Kaweah No. 2 Facilities			
Kaweah No. 2 Powerhouse and Penstock	1905	Ineligible for the NRHP	Ineligible for the NRHP
Kaweah No. 2 Diversion Dam	1905; 1938; 2012-2013	Ineligible for the NRHP	Ineligible for the NRHP
Kaweah No. 2 Flowline	1905; 1948; 1984	Ineligible for the NRHP	Ineligible for the NRHP
Kaweah No. 2 Forebay	1905; 1946	Ineligible for the NRHP	Ineligible for the NRHP
Kaweah No. 3 Facilities			
Kaweah No. 3 Powerhouse and Penstock	1913	Eligible for the NRHP as a Contributor to a Historic District; Eligible for the NRHP as an Individual property	Eligible for the NRHP as a Contributor to a Historic District
Middle Fork / Kaweah No. 3 Flowline (partially in APE)	1913; 1946	Eligible for the NRHP as a Contributor to a Historic District	Eligible for the NRHP as a Contributor to a Historic District
Kaweah No. 3 Forebay	1913; 2012	Eligible for the NRHP as a Contributor to a Historic District	Eligible for the NRHP as a Contributor to a Historic District

Resource Name	Construction Date	Previous NRHP Evaluation Status[1]	Updated NRHP Evaluation Status
Project Support Facilities			
Kaweah Hydroelectric Project Stream Gages	1952-2005	Unevaluated	Ineligible for the NRHP
Kaweah Transmission Lines: • Kaweah No. 3 Powerhouse to Three Rivers Substation • Kaweah No. 1 Tap Line • Kaweah No. 2 Tap Line • Kaweah Distribution and Fiber Lines	1913; replacement ongoing with most recent transmission structures added circa 2012	Unevaluated	Ineligible for the NRHP

1. Previous NRHP evaluation of built environment resources in the APE was conducted on behalf of SCE in 1989 and documented in comprehensive single report: *A History and Significance Evaluation of the Kaweah Hydroelectric System, Tulare County, California* (Lehman et al 1989). SHPO concurred with the findings in in a letter dated March 21, 1990 (Reference: FERC890210A).

Table 7.12-5. Historic Period Built Environment Resources within SNP Study Area

Resource Name	Construction Date	Previous NRHP Evaluation Status[1]	Updated NRHP Evaluation Status
Kaweah No. 1 Facilities			
Mineral King Dams	1903-1905	Ineligible for the NRHP	Ineligible for the NRHP
Kaweah No. 3 Facilities			
Marble Fork Diversion Dam	1913	Ineligible for the NRHP as a Contributor to a Historic District	Eligible for the NRHP as a Contributor to a Historic District
Marble Fork Flowline and Siphon	1913	Eligible for the NRHP as a Contributor to a Historic District	Eligible for the NRHP as a Contributor to a Historic District
Middle Fork Diversion Dam	1913	Ineligible for the NRHP as a Contributor to a Historic District	Eligible for the NRHP as a Contributor to a Historic District
Middle Fork / Kaweah No. 3 Flowline (partially in SNP Study Area)	1913; 1946	Eligible for the NRHP as a Contributor to a Historic District	Eligible for the NRHP as a Contributor to a Historic District

1. Previous NRHP evaluation of built environment resources in the APE was conducted on behalf of SCE in 1989 and documented in comprehensive single report: *A History and Significance Evaluation of the Kaweah Hydroelectric System, Tulare County, California* (Lehman et al 1989). SHPO concurred with the findings in in a letter dated March 21, 1990 (Reference: FERC890210A).

MAPS

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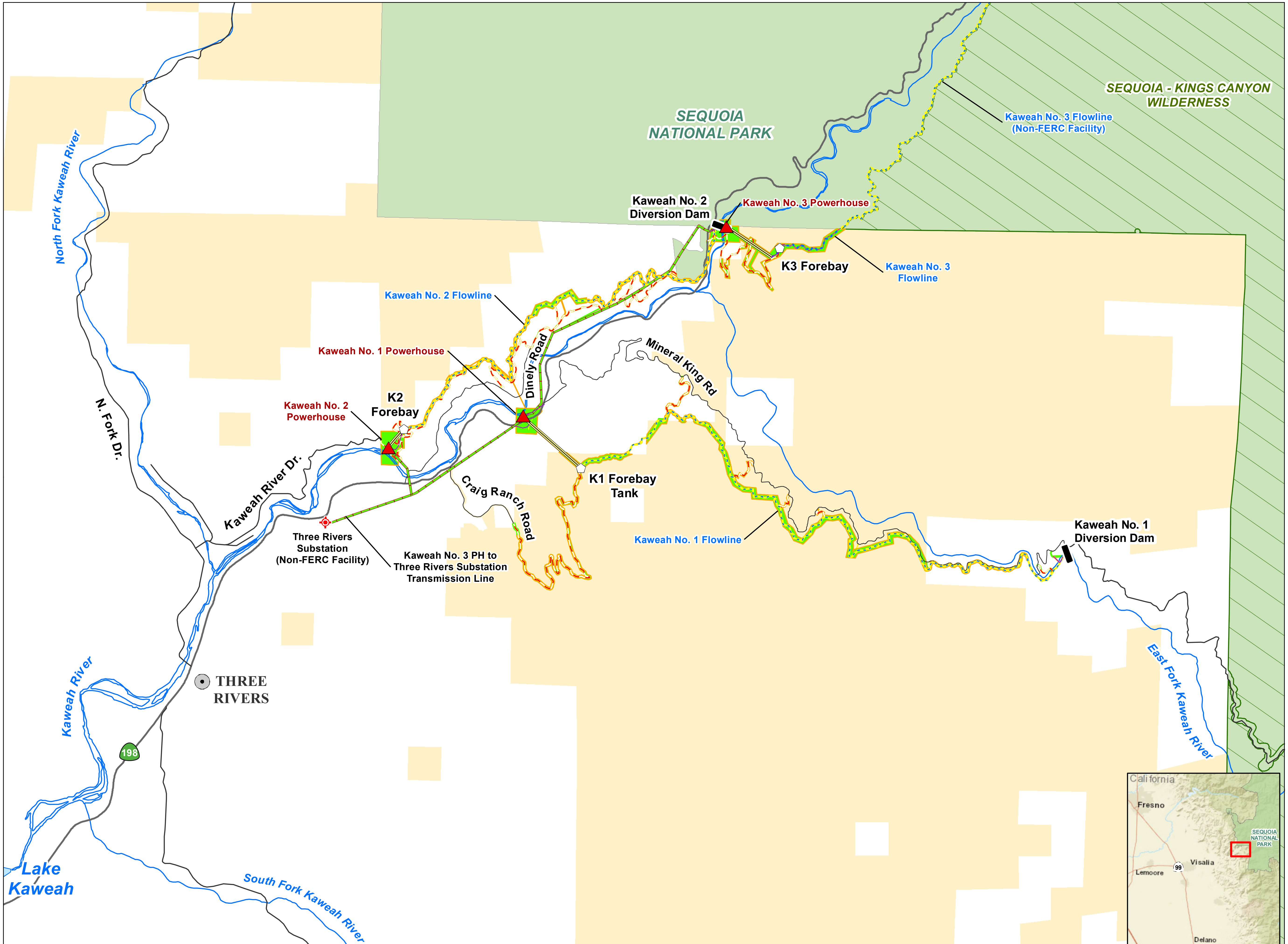

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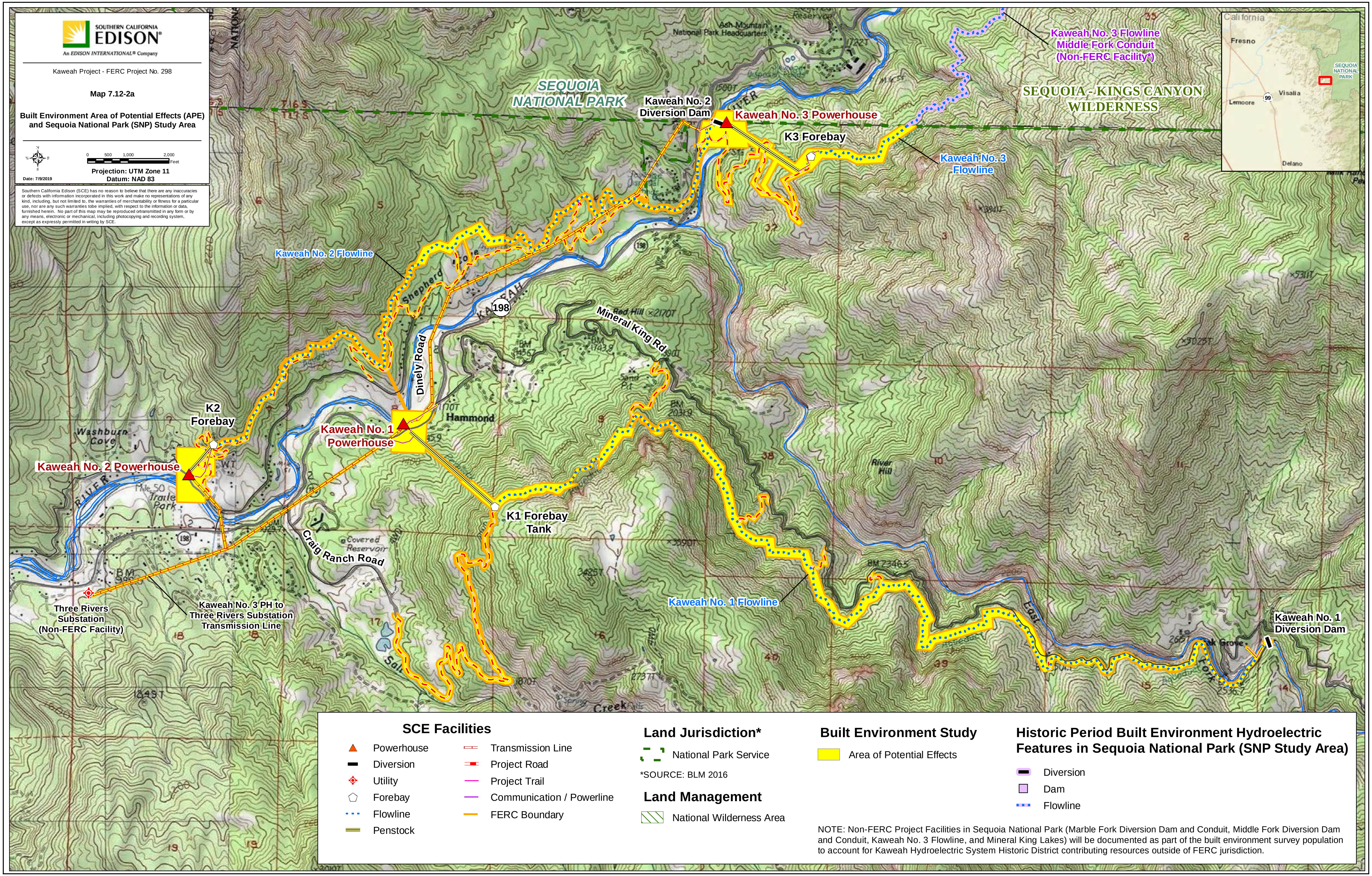

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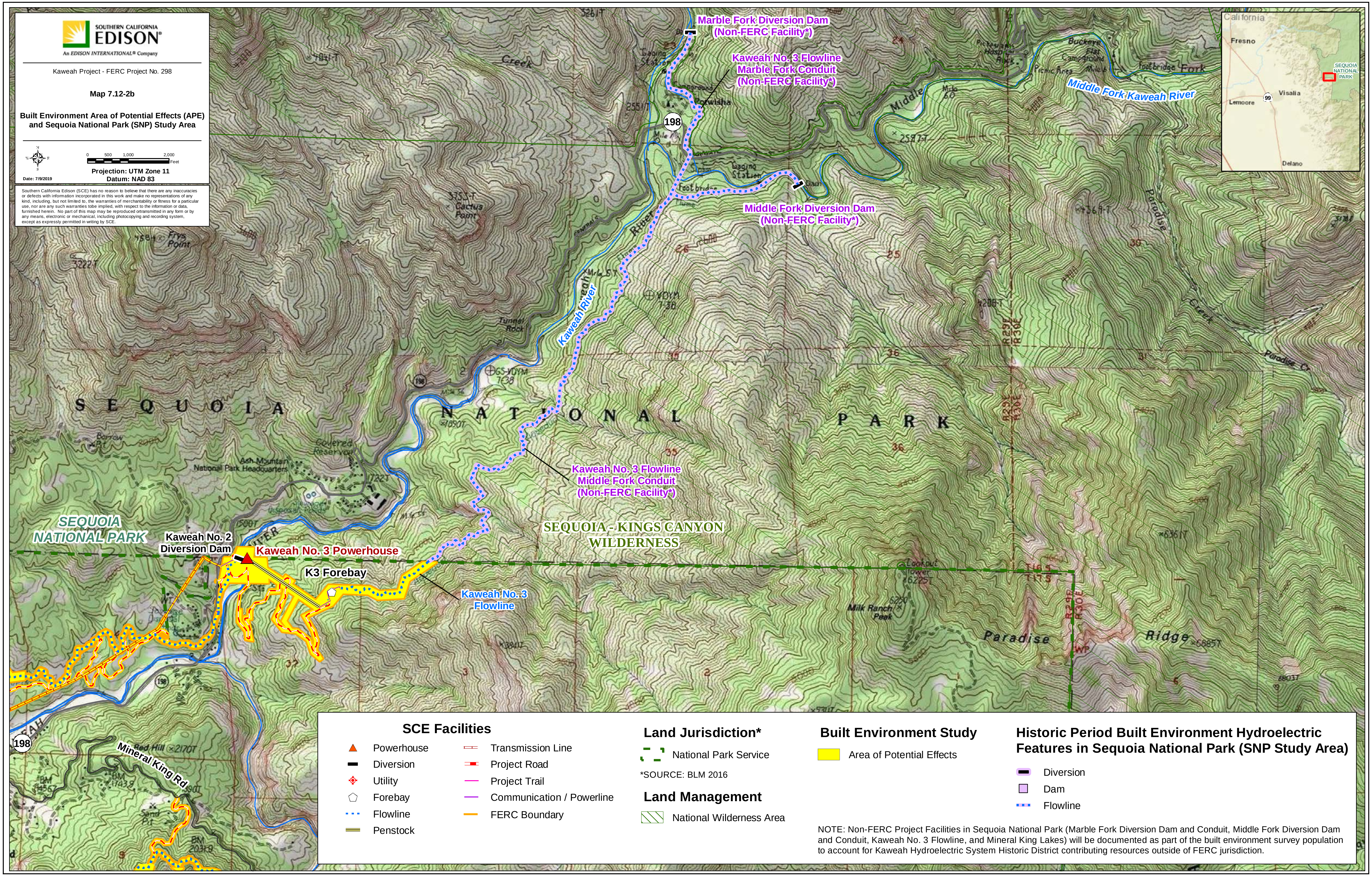

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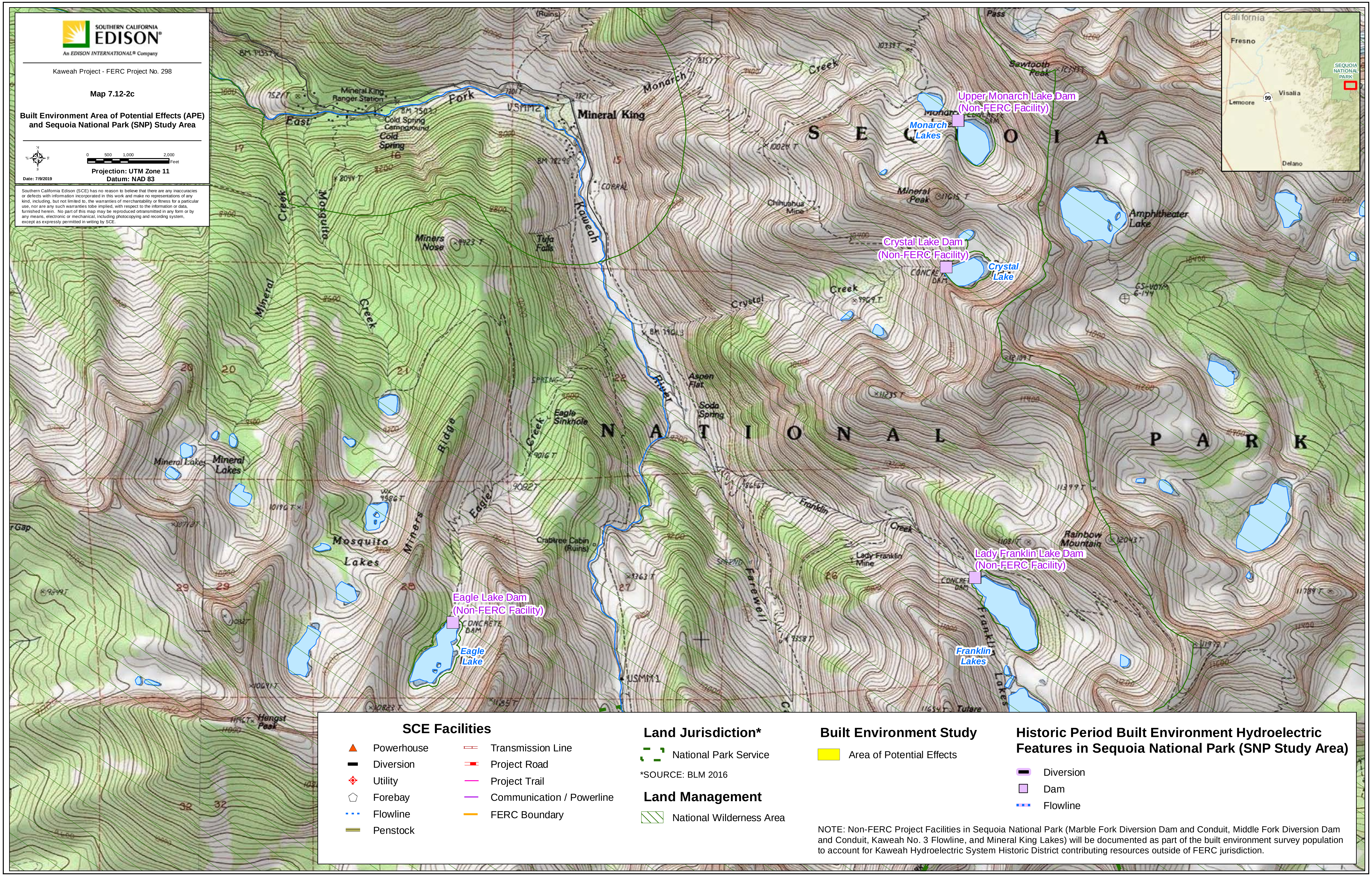

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LIST OF ACRONYMS

AGOL	Archaeology Geographic Information System Data Viewer
APE	Area of Potential Effects
BIA	U.S. Bureau of Indian Affairs
BLM	U.S. Bureau of Land Management
CFR	Code of Federal Regulations
FERC	Federal Energy Regulatory Commission
NAHC	Native American Heritage Commission
NHPA	National Historic Preservation Act
OHP	Office of Historic Preservation
PAD	Pre-Application Document
Project	Kaweah Project
SCE	Southern California Edison Company
SD	Supporting Document
SHPO	State Historic Preservation Officer
SNP	Sequoia National Park
SOI PQS	Secretary of the Interior's Professional Qualification Standards
TCP	Traditional Cultural Property
TSP	Technical Study Plan
TWG	Technical Working Group

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7.13 TRIBAL RESOURCES AFFECTED ENVIRONMENT

This section describes tribal resources in the vicinity of the Kaweah Project (Project). The section identifies Indian Tribes that are known to have cultural ties or other tribal interests in the vicinity of the Project and details documentation undertaken to identify any tribal resources or Traditional Cultural Properties (TCPs) in the vicinity of the Project. Cultural Resources, including prehistoric and historic period archaeological resources, are described in Section 7.12.

7.13.1 Information Sources

This section was prepared utilizing the following information sources:

- CUL 1 – Cultural Resources Ethnographic Technical Study Report (CUL 1 – Ethnographic TSR) (SCE 2019a), which is included in Supporting Document (SD) A;
- Pre-Application Document for the Kaweah Project (SCE 2016); and
- Consultation with Native American Tribes identified as potentially interested in the Project.

7.13.2 Native American Tribes

A "federally recognized tribe" is any tribe, band, nation, or other organized Indian group or community of Indians, including any Alaska Native Village or corporation as defined in or established by the Alaska Native Claims Settlement Act (43 U.S.C. 1601 *et seq*.), which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians (16 U.S.C. 470w). A list of such tribes is maintained by the Secretary of the Interior. For the purposes of this discussion "tribe" also refers to Native American groups, communities, or organizations that are not federally recognized.

Based on the Federal Energy Regulatory Commission's (FERC) initial tribal government-to-government consultation[1]; Southern California Edison Company's (SCE) outreach with the Native American Heritage Commission (NAHC) and U.S. Bureau of Land Management (BLM); and review of previously existing information from the Pre-Application Document (PAD), SCE developed a comprehensive list of potentially interested Native American Tribes. Copies of all formal correspondence from FERC and SCE along with the contact log with dates of letters, e-mails, and telephone follow-ups are contained in the CUL 1 – Ethnographic TSR, which is included in SD A.

[1] Note that government-to-government consultation is conducted only between FERC and federally recognized tribes. All other consultation between SCE and tribal representatives is conducted for the purpose of collecting information to identify tribal resources or TCPs pursuant to 36 Code of Federal Regulations (CFR) Part 800.4(a)(4).

To date, the following tribes have expressed interest in the Project. Federally recognized tribes are indicated by an asterisk (*).

- Western Mono Wuksache Tribe
- Tule River Indian Tribe*
- Dunlap Band of Mono Indians

7.13.3 Tribal Lands

Tribal lands are defined as all lands within the boundaries of an Indian reservation and all dependent Indian communities (36 CFR Part 800.16[(x]) and any lands held in trust for any tribe by the United States Bureau of Indian Affairs (BIA). There are no tribal lands located within or adjacent to the FERC Project boundary (BIA 2014).

7.13.4 Tribal Agreements

There are no known agreements between federally recognized Tribes and other entities that have a connection to the operation and maintenance of the Project apart from the trust responsibilities accorded to tribes acknowledged by agencies of the United States.

7.13.5 Tribal Resources and Interests

The following subsections describes SCE's identification efforts for tribal resources or TCPs in the vicinity of the Project. All tribal resource identification was undertaken in accordance with the requirements of Section 106 of the National Historic Preservation Act (NHPA), as codified in 36 CFR Part 800, as described below and in detail in the CUL 1 – Ethnographic TSR included in SD A.

7.13.5.1 Development of Area of Potential Effects

Section 106 of the NHPA requires that FERC develop an Area of Potential Effects (APE) to guide identification efforts for the Project. Under 36 CFR Part 800, the APE is defined as "the geographic area or areas within which an undertaking may cause changes in the character or use of historic properties" (36 CFR 800.16[d]).

In compliance with this requirement of Section 106 and as delegated by FERC, qualified personnel under the Secretary of the Interior's Professional Qualification Standards (SOI PQS) established an APE for tribal resources in consultation with the California State Historic Preservation Officer (SHPO) and Project stakeholders. The APE for tribal resources consists of the FERC boundary and any associated Project facilities outside the FERC boundary surrounded by a defined buffer area, depending upon facility type, as detailed in Table 7.12-1.[2]

While the APE for the Project is limited to the areas described above, a broader 1-mile records search research buffer surrounding the Project APE was added to aid in tribal resource study development and to develop contextual material regarding the Kaweah River Watershed. This area is referred to as the Tribal Resources Research Area. The APE and Tribal Resources Research Area for tribal resources is depicted in Map 7.13-1.

7.13.5.2 Identification of Tribal Resources

An SOI PQS Ethnographer completed a formal record search utilizing SCE's Archaeology Geographic Information System Data Viewer (AGOL), California Office of Historic Preservation (OHP) Information Center record repositories, and Bureau of Land Management (BLM) records. No previously identified tribal resources or TCPs were documented in the APE or Tribal Resources Research Area as a result of this background records review.

In addition, a variety of archival sources were consulted to provide information on the general context of the wider Kaweah River Watershed and to inform the identification and recordation of any new tribal resources, including any that might be associated with archaeological or historical resources within the APE. The focus of the ethnographic research was on the Foothill Yokuts, whose ancestral territory is along the Kaweah River downstream from the Project, and the Western Mono, or Monache, who occupied the area from Three Rivers upstream into Sequoia National Park (SNP).

Outreach efforts by FERC and SCE to potentially interested tribes included contact of 26 individuals from five federally recognized tribes and nine California Native American Tribes, as detailed in the CUL 1 – Ethnographic TSR included in SD A. These contacts with the tribes did not produce information related to identification of tribal resources or potential TCPs in the Project vicinity.

As a result of the archival research and literature review, telephone interviews, and e-mail correspondence with interested tribal representatives conducted through January 2019, no specific tribal resources, or potential TCPs, have been identified within or adjacent to the Project APE for tribal resources. Tribal representatives interviewed to date have expressed interest in visiting sites of Native American origin identified in the CUL 1 – Archaeology TSR (SCE 2019b), and in participating in future evaluation studies of those sites. For more information regarding the CUL 1 – Archaeology TSR refer to Section 7.12.

[2] SHPO approved the Study Area and proposed APE in a letter dated May 3, 2018, Reference Number: FERC_2018_0309_001. In addition, the proposed APE was presented to stakeholders for discussion and comment at a Kaweah Project Cultural TWG Meeting on March 20, 2018. No comments were received on the APE from any member of the TWG.

7.13.6 Literature Cited

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MAPS

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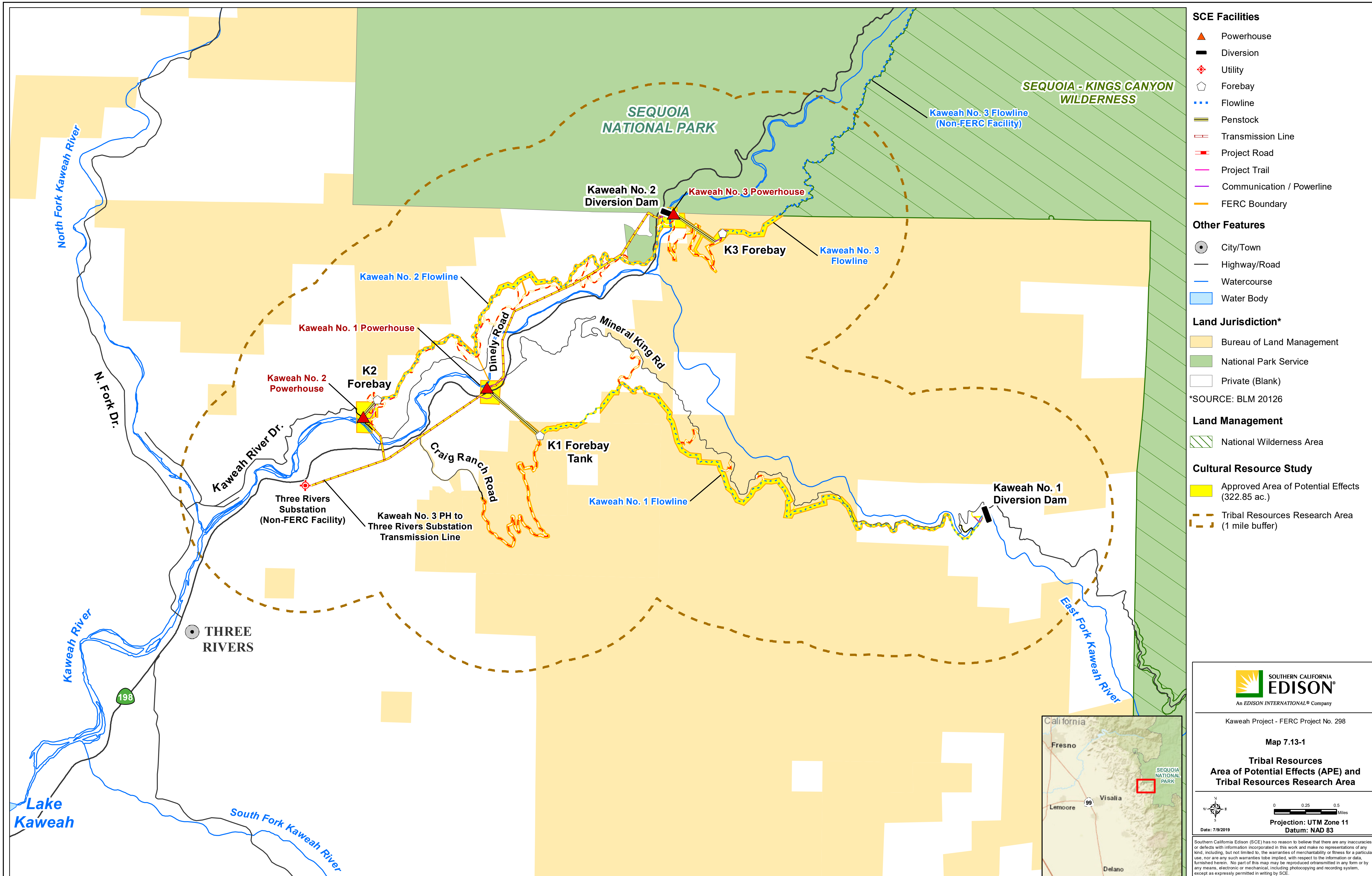

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List of Acronyms

CSD	Community Service District
EO	Executive Order
FERC	Federal Energy Regulatory Commission
FY	fiscal year
HHSA	Health and Human Services Agency
ID	Irrigation District
NEPA	National Environmental Policy Act
Project	Kaweah Project
PUD	public utility district
SCE	Southern California Edison Company

7.14 SOCIOECONOMICS AFFECTED ENVIRONMENT

This section provides a description of the socioeconomic conditions in the vicinity of the Kaweah Project (Project).

7.14.1 Information Sources

This information presented in this section was developed using the following sources:

- Tulare County financial reports and data (Tulare County 2014-2018b-c);
- Tulare County General Plan Background Report (Tulare County 2010);
- Three Rivers Community Plan Update (Tulare County 2018a);
- State of California Department of Finance reports on population and income (DOF 2012, 2018a-d);
- U.S. Census Bureau data on population and housing (U.S. Census 2010, 2017); and
- Pre-Application Document for the Kaweah Project (SCE 2016).

7.14.2 Description of Socioeconomic Conditions

Tulare County is located in a geographically diverse region of central California that encompasses, from west to east, the valley, foothill, and high country areas between the City of Tulare and the Sierra Nevada crest. The county contains approximately 4,840 square miles (3,097,600 acres) of which approximately 4,826 square miles is land and 14 square miles is water. Tulare County is bounded to the north by Fresno County, to the south by Kern County, to the east by Inyo County, and to the west by Kings County. There are eight incorporated cities within the county, including Dinuba, Exeter, Farmersville, Lindsay, Porterville, Tulare, Woodlake, and Visalia (the county seat) (Tulare County 2010; U.S. Census 2010).

Tulare County assessed land uses organized into generalized categories are summarized on Table 7.14-1. Classified lands total 3,930 square miles or approximately 81% of Tulare County. Unclassified land (16% of total) and incorporated cities (3% of total) comprise the rest of the county lands. Overall, open space, which includes wilderness, national forests, monuments and parks, and county parks, encompasses 25% of the county. Agricultural uses total over 2,150 square miles or about 44% of the county (Tulare County 2010).

The Project is located in the northeastern portion of the county on the Kaweah River and East Fork Kaweah River near the unincorporated towns of Three Rivers, Hammond, and Oakgrove, on the western slope of the Sierra Nevada between Lake Kaweah and the Sequoia National Park. Local residents in the Project vicinity live in the community of Hammond, along State Highway 198, near the Kaweah No. 1 Powerhouse; at Oakgrove, along Mineral King Road, near the Kaweah No. 1 Diversion Dam; in dispersed locations in the Kaweah River valley particularly in the vicinity of Washburn Cove, near the Kaweah No. 2 Powerhouse; and in the community of Three Rivers, about 1 mile west of the Three Rivers substation, the terminus of the Kaweah transmission line and the western end of the Project. Population density in the vicinity of the Project is low.

The Three Rivers Community Plan guides the development of the Three Rivers planning area. The community is primarily a rural, commercial-tourist area with a population of approximately 2,200 people. The planning area boundary encompasses approximately 20,085 acres, including all Project facilities with the exception of the Kaweah No. 1 Diversion and portions of the Kaweah No. 1 Flowline. The designation of most land in the Three Rivers Community Plan area is Agricultural (10,329 acres), followed by Medium Density Residential (4,213 acres), and Low Density Residential (3,843 acres) (Tulare County 2018a).

7.14.2.1 Tulare County Demographics

Key demographic variables considered in this section are population, housing, income and poverty, key industries and employment, and Project employment. Each is discussed below.

Population

The population of Tulare County increased from 442,337 to 476,909 between July 1, 2010 and July 1, 2018 (Table 7.14-2). The compound average rate of growth over the 8-year period was 0.97% per year (DOF 2018a, 2018b).

Population growth has been concentrated in the cities of Dinuba, Porterville, and Lindsay. Between 2010 and 2018, Dinuba grew at a compound annual rate of 1.99%, Porterville at 1.53% per year, and Lindsay by 1.48% per year (Table 7.14-3) (DOF 2012, 2018c).

The median age of Tulare County residents is lower than that for California overall. In 2017, the county median was 30.6, years, while that for the state was 36.4 years. The majority of Tulare County residents are Hispanic/Latino (63.6%) with white or Caucasian being the second largest group at 29.5% (U.S. Census Bureau 2017).

Population in Tulare County is projected to grow to 540,580 by 2030 and 678,607 by 2060. Relative to 2010, Tulare County population is expected to grow at a compound annual rate of 0.99% through 2030 and a 0.85% annual rate through 2060. The corresponding figures for California are 0.83% and 0.63%, respectively (DOF 2018d).

Housing

The number of housing units in Tulare County has grown along with population. Between 2010 and 2018, overall the total number of housing units in the county grew by 0.67% per year, including 0.98% annually in the incorporated areas. Between 2010 and 2018, the most rapid growth in the number of housing units was in Dinuba, 1.69% annually, followed by Porterville and Lindsay at compound annual rates of 1.09% and 1.08%, respectively (Table 7.14-4) (DOF 2012, 2018c).

Home prices in Tulare County are considerably lower than those in the Los Angeles area. In December 2018, the median price for single family and condominium homes in the county was $224,500. The comparable median price in the Los Angeles Area was $581,500, or 140% higher than Tulare County. December 2018 median prices in the incorporated cities of Tulare County ranged from $146,000 in Farmersville to $73,500 in Dinuba (CoreLogic 2018).

Income and Poverty

In 2017, Tulare County median family income was $47,280 (in 2017 dollars), and 23.0% of families lived at or below the poverty level. The median family income for the state was $76,975, 63% higher than Tulare County, and 11.1% of families lived at or below the poverty level. Per capita personal income in 2017 was $18,962 in Tulare County while it was $33,128 for the state overall, 74% higher than the county (U.S. Census Bureau 2017).

Key Industries and Employment

Economic base industries are the drivers of local and regional economies. In Tulare County, the economic base consists of agriculture and agricultural-related manufacturing. Tulare County is the second-leading agricultural-producing county in the U.S., with Fresno County the top producer. In addition to the economic base industries, there are local support industries, such as retail, construction, government, and business services, the progress of which is a function of the economic base and demographic changes.

Tulare County employment has increased and unemployment rates have decreased since 2010. Although declining, the county's average unemployment rate (10.1% in 2018) continues to be higher than the state's (4.2% in 2018) (Tulare County 2018b).

Table 7.14-5 represents the distribution of the 163,400 civilian jobs in the Visalia and Porterville area. The fastest growing industries between 2016 and 2017 by overall annual gain were: Professional & Business Services; Educational and Health Services; Mining, Logging and Construction; and Government. Table 7.14-6 shows the major private sector employers in the county (Tulare County 2018b).

Project Employment

Southern California Edison Company (SCE) employs 11 full-time personnel associated with the operation and maintenance of the Project. These employees generally work out of the Kaweah No. 1 Powerhouse Campus and live within 40 miles of the Project. These workers contribute to the local economy by consuming goods and services, and contributing to the local tax base.

7.14.3 Tulare County Government

7.14.3.1 Structure

Tulare County is governed by a Board of Supervisors, which is a five-member legislative body elected by local citizens every four years. Supervisors' terms are staggered (i.e., two supervisors are elected in one general election, and three in the next). There is one board member for each of the five supervisorial districts in the county. Other key government personnel include County Counsel, County Administrative Officer, Assessor, Auditor-Controller, Clerk-Recorder, District Attorney, Sheriff-Coroner, and Treasurer-Tax Collector.

7.14.3.2 Budget and Financial Resources

Fiscal conditions in Tulare County are directly related to the revenues it receives, mainly in the form of program revenues and tax collections, and expenditures made to fund essential public services and other programs. Tables 7.14-7 and 7.14-8 summarize Tulare County revenues and expenditures, respectively, over the past five (2013–2018) fiscal years (FY).

As shown on Table 7.14-7, Tulare County revenues in FY 2017–2018 totaled approximately \$834,520,000. Of this total, \$120,300,000 came from charges for services, \$533,926,000 from operating grants and contributions, \$175,550,000 from tax revenues, and \$4,744,000 from other sources. Total county revenues have increased by over 20% compared to FY 2013–2014 (Tulare County 2014, 2018c). SCE pays property taxes to Tulare County. The allocable property tax base of the Kaweah Project facilities is approximately \$17,278,538. In 2018, the Tulare County tax rate was 1.4% and therefore, SCE paid approximately \$241,900 in property taxes associated with the Project.

The fiscal revenues collected by Tulare County described above are expended in a variety of ways as shown in Table 7.14-8. Total government expenditures in FY 2017–2018 were \$794,143,000. Of this total, the largest government expenditures were for public assistance (\$274,833,000; 35%) and public protection (\$262,931,000; 33%) (Tulare County 2018c).

7.14.3.3 Public and Emergency Services

Tulare County provides government services to those residents that live in the unincorporated areas of the county. For county residents who live in incorporated cities or towns, the county also provides many services, including public safety and public health services. Important public services provided by Tulare County are described below. Unless otherwise indicated, the Tulare County General Plan Background Report (Tulare County 2010) and the Three Rivers Community Plan (Tulare County 2018a) were used to develop the information provided in this section.

- **Domestic Water.** Demands for water resources within Tulare County are met from four major sources. These sources include groundwater, local streams and rivers, and imported surface water. Large and small water systems that provide domestic water service to unincorporated communities in the county are typically operated and managed by community service districts (CSD), irrigation districts (ID), public utility districts (PUD), and mutual water companies. These Districts are self-governing and are not subject to county control. There are no community water systems in Three Rivers. Domestic water is provided primarily by individual wells and private water companies. Specific to the Project, SCE maintains water supply agreements (indenturements) with local water users for the delivery of consumptive water from the Kaweah No. 1 and No. 2 flowlines; and an agreement with the California Division of Forestry for the delivery of water to the Hammond Fire Station from the Kaweah No. 1 Penstock.

- **Fire Protection.** The Tulare County Fire Department serves Tulare County. The Tulare County Fire Department conducts its operations from 35 stations throughout the county. Each station is located in one of eight battalions. In addition, the Project vicinity falls within a State Responsibility Area and is therefore within the official boundaries recognized by the Board of Forestry and Fire Protection where CAL FIRE has financial responsibility for fire suppression and prevention. In Three Rivers, the Tulare County Fire Department has primary jurisdiction over structural fires while the state is responsible for wildland fires. Additional response may be augmented by the Tulare County Fire substation in Lemon Cove, the National Park Service substation at Hammond and the National Park Service heliport based at Ash Mountain.

- **Hospital and Ambulance Services.** Tulare County receives emergency medical services from three hospitals. The first and largest, Kaweah Delta District Hospital, is located in the City of Visalia. This hospital serves an average of 60,000 patients per year with 504 licensed beds. Sierra View District Hospital, located in the City of Porterville, served about 8,000 patients in 2002 with total patient service of 157 beds. Finally, Tulare District Hospital, located in the City of Tulare, served over 5,600 patients in 2002. In Three Rivers, emergency medical services are provided by the Tulare County Fire Department.

- **Law Enforcement.** Currently, the Tulare County Sheriff's Department had 605 sworn officers serving the unincorporated population of Tulare County (144,375), which generates a level of service ratio of 4.2 officers per 1,000 residents. The ratio is well above the standard of 2.0 officers per 1,000 residents set by the Federal Bureau of Investigation. The Sheriff's Department also has 272 non-sworn clerical and support staff (Tulare County 2019a). Law enforcement protection service for the unincorporated county is divided into 22 areas with four stations. Police protection services are provided in Three Rivers by the Tulare County Sheriff's Department main office located in Visalia, approximately 30 miles west of Three Rivers.

- **Libraries.** The Tulare County Public Library System is comprised of interdependent branches, grouped by services, geography and usage patterns to provide efficient and economical services to county residents. Currently, in Tulare County there are 16 branch libraries, including the Three Rivers Branch, and one main branch.

- **Sanitary Sewer.** Most of the sanitary sewer systems within the unincorporated areas of Tulare County serve individual small communities, and in some cases communities effectively share wastewater treatment facilities. Sanitary sewer service within the county is generally operated and managed by special districts including CSDs, PUDs, sanitary districts, sewer maintenance districts, and County Service Areas. Some agencies provide sewer collection service only, and contract with surrounding agencies for wastewater treatment. Many of the Districts (except for County Service Areas) are self-governing and are not subject to county control. There are no community sewer or storm drainage systems in Three Rivers. Sewage disposal is provided by individual septic systems.

- **Schools.** Currently, a total of 44 school districts provide public education service throughout Tulare County. Of the 44 school districts, nine are unified districts providing educational services for kindergarten through 12th grade. The remaining 35 districts consist of 33 elementary school districts, one high school district, and one community college. Total enrollment in county public schools is over 100,000 (Tulare County 2019b). One school is located in the Project vicinity, Three Rivers Elementary School.

- **Social Services.** The Tulare County Health and Human Services Agency (HHSA) provides social services to residents in need of assistance and includes public health, mental health, emergency medical attention, and community and family services. These services are offered through programs designed to meet the needs of a diverse population. In addition, HHSA has service and program relationships with county, school, state, local, and other organizations.

- **Solid Waste.** Solid waste collection in Tulare County is divided into sections. Currently, there are eight sections that have scheduled weekly pickup. The incorporated cities in Tulare County oversee solid waste collection within their city limits. Private companies offer solid waste collection services in other unincorporated areas of the county. Tulare County operates three active solid waste disposal facilities, or landfills: Visalia, Woodville, and Teapot Dome. These landfills serve all of Tulare County as well as parts of surrounding counties. Similarly, a small amount of solid waste from Tulare County is transported to county landfills. In addition, there are seven transfer stations located throughout the isolated rural areas of the county for the convenience of those residents who live outside of waste collection service areas. Solid waste collection in the Three Rivers area is provided by Mid Valley Disposal, which has a license with the County of Tulare.

- **Utilities**. Southern California Edison Company provides electric service to the majority of Tulare County, including the majority of the San Joaquin Valley and the foothills. Natural gas service is primarily provided by The Gas Company (formerly Southern California Gas Company). Pacific Gas & Electric also serves northern Tulare County's electric needs on a limited basis. The electrical facilities network includes both overhead and underground lines. A total of five telephone companies provide services in Tulare County: AT&T, Ducor, SBC, Sprint, and Verizon. These companies provide long distance calling, wireless services, Internet access, and other business solutions to residential and commercial consumers.

7.14.4 Environmental Justice

Environmental justice refers to the fair and equitable treatment of individuals regardless of race, ethnicity, or income level in the development and implementation of environmental management policies and actions. Executive Order (EO) 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations,” requires each federal agency to “make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low income populations” (Council on Environmental Quality 1997). The EO was accompanied by a memorandum that directs federal agencies to analyze the environmental effects, including human health, social, and economic concerns, of their actions where such analysis is required by the National Environmental Policy Act (NEPA).

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TABLES

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Table 7.14-1. Summary of Assessed Land in Tulare County by Generalized Land Use Categories, 2008

Generalized Land Use Category	Square Miles	Percentage[1]
Classified		
• Residential	110	2%
• Commercial	10	Less than 1%
• Industrial	10	Less than 1%
• Agriculture	2,150	44%
• Public (including airport, church, schools)	420	9%
• Open Space (including national forests and parks, timber preserves)	1,230	25%
Classified Subtotal	*3,930*	*81%*
Unclassified *(includes streets and highways, rivers, canals, etc.)*	780	16%
Incorporated Cities	130	3%
Total County	**4,840**	**100%**

Source: Tulare County 2010

[1] Percents reflect those estimated for the total land area of the county and may not equal 100 due to rounding.

Table 7.14-2. Tulare County Population and Growth Rates, 2010–2018

Year	Population (July 1)
2010	442,337
2011	447,361
2012	452,027
2013	456,447
2014	460,125
2015	464,567
2016	468,232
2017	472,416
2018	476,909
Compound Annual Growth Rate	
2010-2018	0.97%

Sources: DOF 2018a, 2018b

Table 7.14-3. Population and Population Growth Rates, Tulare County Cities, 2010–2018

City	Population									Compound Annual Growth Rate (Percent)
	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Dinuba	21,453	21,622	22,516	23,012	23,649	24,173	24,440	24,687	24,873	1.99
Exeter	10,334	10,444	10,608	10,695	10,777	10,940	11,051	11,094	11,169	1.01
Farmersville	10,588	10,868	11,015	11,094	11,167	11,251	11,358	11,399	11,443	1.01
Lindsay	11,768	12,081	12,515	12,627	12,761	12,826	12,990	12,947	13,162	1.48
Porterville	54,165	54,826	55,582	56,029	56,350	56,935	60,055	59,186	60,798	1.53
Tulare	59,278	60,161	60,983	61,517	62,196	62,742	63,456	64,313	65,704	1.35
Visalia	124,442	125,543	126,773	128,246	129,399	130,318	132,084	1,372	134,871	1.05
Woodlake	7,279	7,313	7,327	7,598	7,633	7,636	7,659	7,711	7,786	0.87

Sources: DOF 2012, 2018c

Table 7.14-4. Housing Units, Tulare County Cities and County Total, 2010–2018

City	Total Housing Units									Compound Annual Growth Rate (Percent)
	2010	2011	2012	2013	2014	2015	2016	2017	2018	
Dinuba	5,868	5,973	6,139	6,231	6,377	6,478	6,549	6,602	6,666	1.69
Exeter	3,600	3,602	3,602	3,604	3,614	3,638	3,646	3,656	3,667	0.23
Farmersville	2,726	2,765	2,765	2,765	2,771	2,774	2,781	2,804	2,821	0.44
Lindsay	3,193	3,245	3,342	3,354	3,381	3,399	3,431	3,445	3,468	1.08
Porterville	16,734	16,865	16,909	16,950	16,992	17,088	17,934	17,939	18,187	1.09
Tulare	18,863	18,970	19,141	19,212	19,380	19,581	19,751	20,087	20,450	1.05
Visalia	44,205	44,448	44,705	45,008	45,316	45,736	46,253	46,812	47,475	0.92
Woodlake	2,067	2,071	2,078	2,147	2,155	2,160	2,167	2,171	2,176	0.66
Incorporated	97,256	97,939	98,681	74,032	99,986	100,854	102,512	103,516	104,910	0.98
Unincorporated	44,440	44,497	44,616	44,720	44,884	45,049	44,437	44,573	44,432	-.002
Total County	141,696	142,436	143,297	143,991	144,870	145,903	146,949	148,089	149,342	0.67

Sources: DOF 2012, 2018c

Table 7.14-5. Visalia and Porterville Area Employment by Industry, 2017

Industry	2017 Annual Average Employment by Industry
Total Farming	37,582
Government	31,046
Trade, Transportation, and Utilities	27,778
Educational & Health Services	14,706
Manufacturing	13,072
Leisure & Hospitality	11,438
Professional & Business Services	13,072
Financial Activities	4,902
Mining, Logging & Construction	4,902
Information Services	1,634
Other Services	3,268
Overall Total	**163,400**

Source: Tulare County 2018b

Table 7.14-6. Tulare County Top 5 Private Sector Employers, 2017

Employer	Number of Employees
Ruiz Food Products	1,800
Wal-Mart Distribution Center	1,692
Jostens	720
CIGNA Health Care	700
Monrovia Nursery	600

Source: Tulare County 2018b

Table 7.14-7. Tulare County General Government Revenue by Source

Revenues	Fiscal Year				
	2017–2018	2016–2017	2015–2016	2014–2015	2013–2014
Program Revenues					
Charges for Services	$120,300,000	$114,336,000	$134,637,000	$120,042,000	$113,465,000
Operating Grants and Contributions	$533,926,000	$478,711,000	$457,279,000	$445,570,000	$427,991,000
General Revenues					
Property Taxes	$130,346,000	$123,861,000	$119,331,000	$112,026,000	$109,266,000
Sales and Other Taxes	$45,204,000	$37,680,000	$44,009,000	$32,034,000	$32,608,000
Other	$4,744,000	$4,050,000	$5,067,000	$4,371,000	$6,127,000
Total	**$834,520,000**	**$758,638,000**	**$760,323,000**	**$714,043,000**	**$689,457,000**

Sources: Tulare County 2014a, 2015, 2016, 2017, 2018c

Table 7.14-8. Tulare County General Government Expenditures by Function

Expenditures	Fiscal Year				
	2017–2018	2016–2017	2015–2016	2014–2015	2013–2014
General Government	$59,867,000	$53,525,000	$39,542,000	$41,610,000	$39,432,000
Public Protection	$262,931,000	$246,602,000	$221,740,000	$199,878,000	$202,075,000
Public Ways and Facilities	$39,093,000	$36,004,000	$47,021,000	$36,722,000	$37,155,000
Health and Sanitation	$148,328,000	$143,652,000	$143,286,000	$132,566,000	$129,190,000
Public Assistance	$274,833,000	$260,405,000	$248,368,000	$240,562,000	$242,378,000
Education	$5,878,000	$5,521,000	$5,300,000	$5,353,000	$5,470,000
Culture and Recreation	$2,462,000	$2,428,000	$2,266,000	$2,176,000	$431,000
Other	$751,000	$449,000	$744,000	$1,320,000	$2,451,000
Total	**$794,143,000**	**$748,586,000**	**$708,267,000**	**$660,187,000**	**$658,582,000**

Sources: Tulare County 2014a, 2015, 2016, 2017, 2018c

[1]Includes unallocated depreciation and interest expense.

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