4.0 DESCRIPTION OF EXISTING ENVIRONMENT [§ 5.6(D)(3)(I)]

4.1 GENERAL DESCRIPTION OF RIVER BASIN [§ 5.6 (D)(3)(XIII)]

Bishop Creek is a 10.1-mile-long stream in the eastern Sierra Nevada spanning across two of Inyo County's thirteen watersheds (EPA 2018) and is the largest tributary of the Owens River. Bishop Creek drains a 104-square-mile area which is largely dammed for the purposes of water storage and power generation. The largest dams on-Bishop Creek are Lake Sabrina, South Lake, and Longley Lake Dam (Figure 4-1).

Bishop Creek is composed of three forks: North, Middle and South. The North Fork of Bishop Creek flows into North Lake and is unimpaired while the Middle Fork flows into Lake Sabrina. The two forks then join southeast of the town of Aspendell, California. The South Fork of Bishop Creek flows through South Lake and continues north where it combines with the North and Middle forks approximately 2.5 miles northeast of Aspendell. Bishop Creek continues in a northeasterly direction before continuing into the Owens Valley. Bishop Creek flows through the City of Bishop, California before its confluence with the Owens River east of Bishop.

The Bishop Creek Basin is a sub-basin of the Owens River (Figure 4-2). The Owens River is a 183-mile-long river between the eastern Sierra Nevada and the Inyo and White mountains, that flows southeasterly through Lake Crowley reservoir and descends through the Owens River Gorge, emerging at the north end of the Owens Valley, and terminating at Owens Lake south of the city of Lone Pine, California. The Owens River forms a 2600-square-mile watershed. Tributaries to the Owens River include Spring Valley Wash, Silver Canyon Creek, Coldwater Canyon Creek, Hot Creek, Rock Creek, Bishop Creek, Big Pine Creek, Birch Creek, Independence Creek and Lone Pine Creek. These tributaries provide nearly 50 percent of the surface water flows of the Owens River Valley. The mouth of the Owens River begins approximately 6 miles southeast of the city of Lone Pine near Dolomite, California.

Ten miles southeast of Big Pine, the river is diverted into the Los Angeles Aqueduct, which consists of three source aqueducts from the Owens River, Haiwee Reservoir and the Mono Extension. The Los Angeles Aqueduct was constructed in 1913 and is managed and maintained by the LADWP. The aqueduct system delivers water from the Owens River to the city of Los

Angeles, California. Inyo County, LADWP and others have been implementing the Lower Owens River Plan since the early 2000s. This plan provides for re-watering a 62-mile-long stretch of river and adjacent floodplain left essentially dry after the river was diverted into the Los Angeles aqueduct in 1913. The largest cities in the Owens River Valley are Bishop, Lone Pine, Independence and Big Pine.

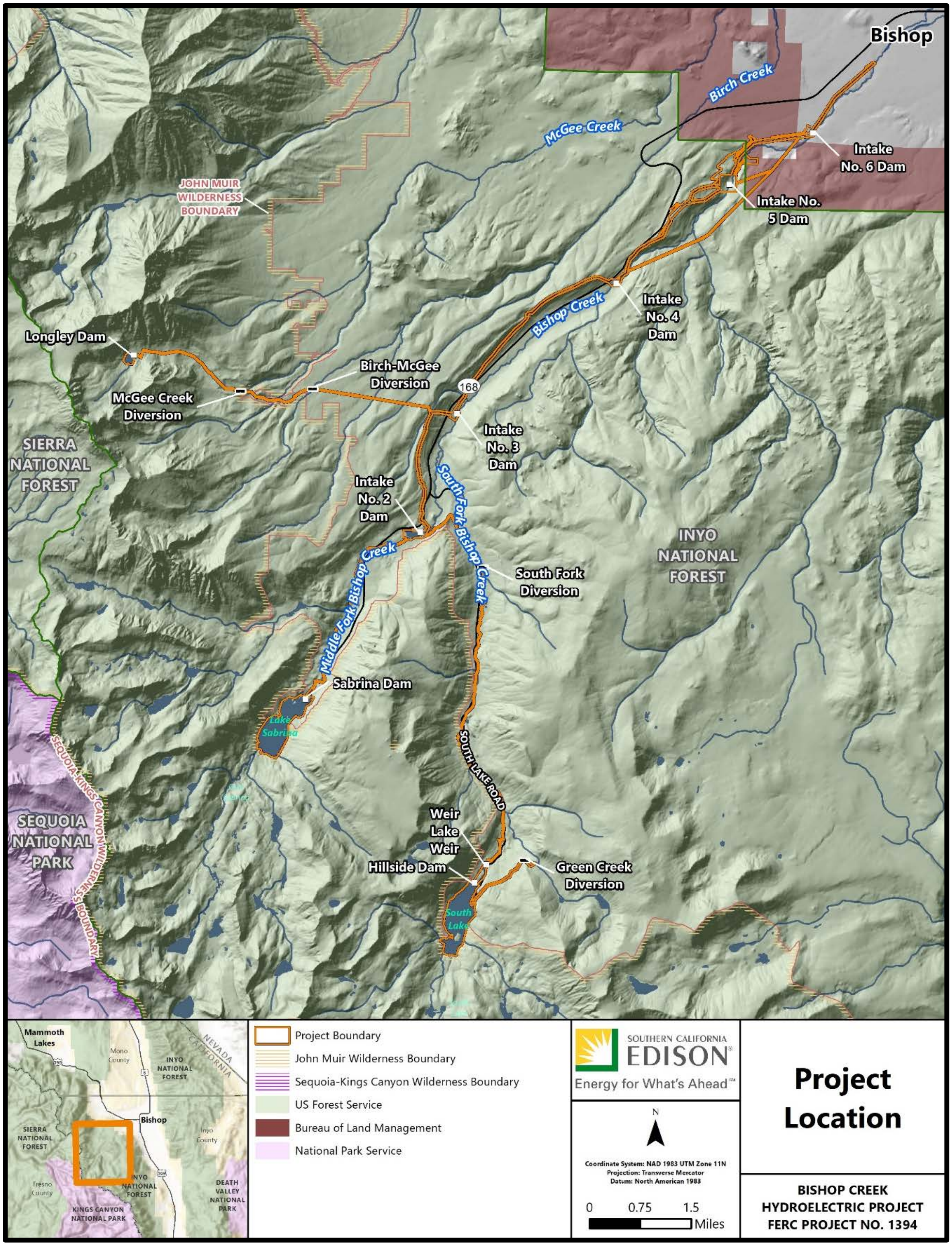

FIGURE 4-1 LOCATION OF BISHOP CREEK PROJECT

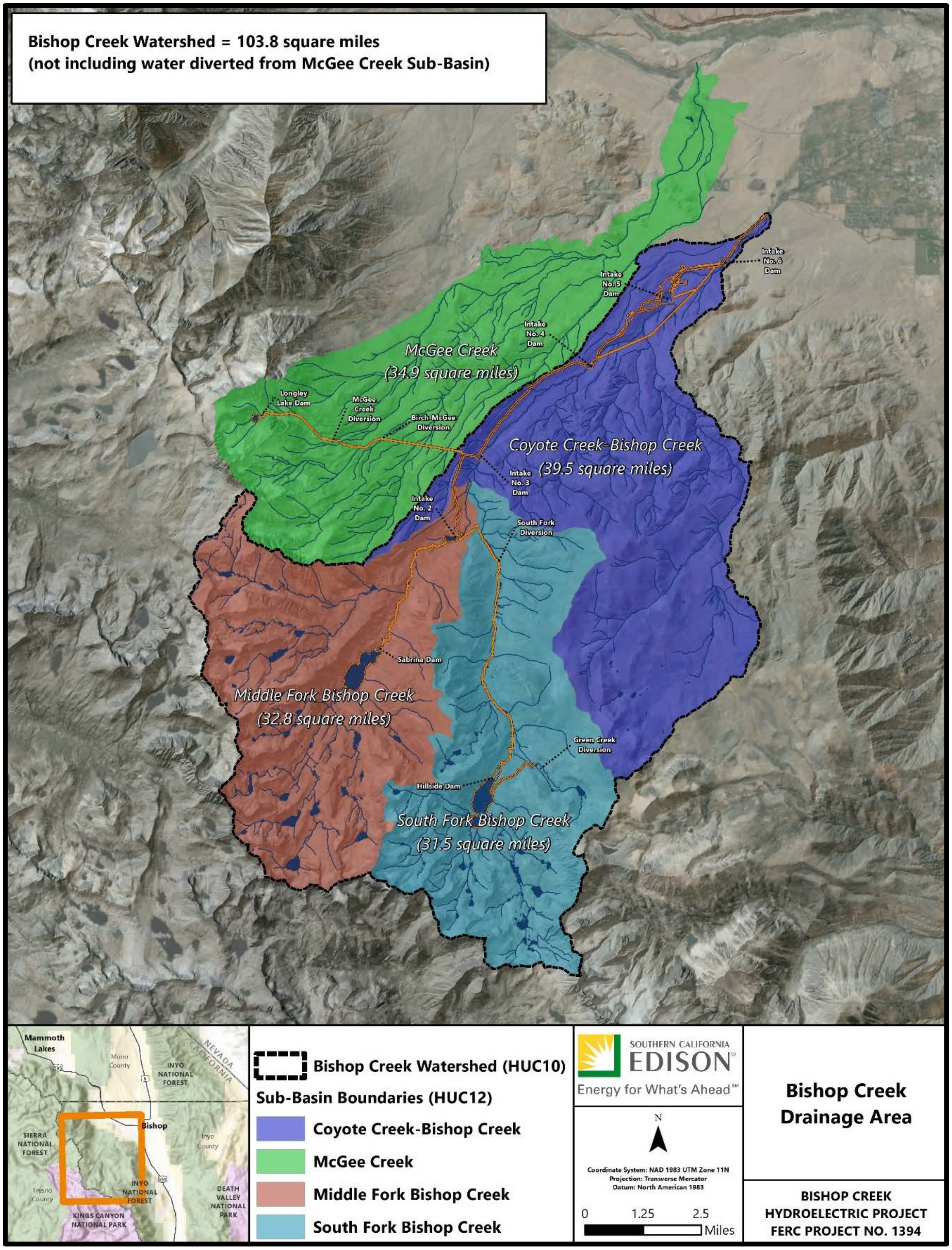

FIGURE 4-2 BISHOP CREEK DRAINAGE AREA

4.1.1 Major Land and Water Uses

4.1.1.1 California Water Right Law

Water right laws in the western states differ from water right laws in the eastern United States. California's water system is dictated heavily on seasonal, geographic and quantitative differences in precipitation, which has resulted in two types of water system management: riparian and appropriative. Additionally, California has two other types of water rights: reserved (water set aside by the federal government when it reserves land for public domain), and pueblo rights (a municipal water right based in Spanish and Mexican law). Riparian rights have a higher priority than appropriative rights.

The 1943 California Water Code established the foundation for the acquisition and protection of water rights (Inyo County 2014). The California SWRCB manages and administers various federal and state water quality programs. Locally, the Lahontan RWQCB is responsible for oversight in the Owens Valley. The Inyo County General Plan Land Use Elements contain the provisions related to both land use, public services and utilities. Inyo County and LADWP have a cooperative long-term water resources management agreement (1991) to ensure that there is a reliable water supply for export to Los Angeles, and for use in Inyo County (Inyo County 2017).

4.1.1.2 Bishop Creek Land and Water Uses

On January 1, 1974, SCE had nine claimed Supplement Statements of Water Diversion and Use rights in Inyo County and six appropriative licensed water rights that began in 1918 according to eWRIMS. Southern California Electric's water rights are outlined in Section 3.1.1.

Land ownership within and adjacent to the Project boundary is predominantly composed of federal lands jointly administered by the Inyo National Forest and BLM; a small portion of Inyo National Forest lands within the Project boundary are managed as a National Wilderness Area (John Muir Wilderness). The remainder of lands are owned by SCE, LADWP or private landowners, much of which is classified as rurally protected lands. While there is only a small portion of residential lands adjacent to the Project boundary, the Inyo National Forest provides many recreation opportunities in the area that attracts visitors. The Project boundary includes only lands necessary for Project O&M and for the conveyance of water throughout the Bishop Creek system.

4.1.1.3 Owens River Land and Water Uses

The Owens River forms a 2600-square-mile watershed, of which the Bishop Creek is the largest tributary. The confluence of Bishop Creek and the Owens River is east of the City of Bishop, California. Ten miles southeast of Big Pine, what remains of the Owens River is diverted into the Los Angeles Aqueduct, which consists of three source aqueducts from the Owens River, Haiwee Reservoir and the Mono Extension. The Los Angeles Aqueduct was constructed in 1913 and is managed and maintained by the LADWP. The aqueduct system delivers water from the Owens River to the city of Los Angeles, California.

Much of the land in the Owens Valley drainage basin is either owned by the United States government or the LADWP (307,000 acres). A small portion is owned by private citizens and municipalities. Of the United States government-owned land in the area, the two agencies that own the land generally located in the mountains and along the edges of the mountains are the USFS and the BLM (USGS 1998).

The primary economic activities in the valley are livestock, ranching and tourism. Approximately 190,000 acres of the valley floor is leased by the LADWP to ranchers for grazing, and 12,400 acres are leased for pasture for growing alfalfa. Most of the land in the area is open to the public and is used for hunting, fishing, skiing and camping (USGS 1998).

The major historical periods of water use are summarized in Table 4-1.

TABLE 4-1 MAJOR HISTORICAL PERIODS OF WATER USE

PERIOD	CHARACTERISTICS OF WATER USE
Pre-1913	Prior to the first export of water from the Owens Valley. Installation of canals to dewater the valley floor and supply water for farming and ranching.
1913 to 1969	Export of surface water from the Owens Valley by diversion of the Owens River and tributary streams into the Los Angeles Aqueduct. General decrease of farming and ranching in the valley. Brief periods of pumping to augment local surface-water supplies.
1970 to 1984	Export of some of the additional surface water. Beginning export of ground water with the addition of new wells and second aqueduct. Major fish hatcheries switch supply from surface water to ground water. Decrease in consumptive use of water by remaining ranches.
1985 to 1988	Continued export of surface and ground water. Design of cooperative water-management plan between Inyo County and the LADWP. Installation and initial operation of enhancement and mitigation wells.

Source: USGS 2017

Post-1988, the water in the Owens Valley has primarily been used for surface-water diversions and/or ground-water pumping. 1200 to 2000-acre feet of ground water is supplied to the four largest towns: Bishop (population 3879), Big Pine (1756), Independence (669), and Lone Pine (2035). Other uses of water in the Owens Valley include water delegated for Indian Reservations, stock water, irrigation for pastures, and irrigation of alfalfa (USGS 1998). There are numerous wells that are not maintained and monitored by the LADWP for domestic water supply, primarily at Mt. Whitney Fish Hatchery, on isolated ranches in the Bishop area, and on four very small Indian Reservations (USGS 1998).

4.1.2 Other Diversion Structures

There are eight dams (Hillside, Sabrina, Longley, Intake No. 2, Intake No. 3, Intake No. 4, Intake No. 5 and Intake No. 6) and four diversions (Green Creek, Birch-McGee Diversion pipe, Birch Creek [West] and McGee Creek) on Bishop Creek. A description of each can be found in Section 3.4.

4.1.3 Tributaries

The Bishop area has the most abundant native water supplies of any area in the Owens Valley as indicated by the large discharge of Bishop Creek (average annual discharge is more than 90 cfs).

In the Bishop Basin, most of the tributary streamflow that reaches the valley floor is diverted to canals that allocate water for agricultural uses, wildlife habitat or ground-water recharge. Excess water is returned to the canals and eventually to the Owens River (USGS 1998).

4.1.4 Climate

Most of the water supply for the state of California comes from snowmelt in the Sierra Nevada mountain range, therefore, climate change and how it affects precipitation is of importance to the region. As the temperatures in the Sierra Nevada increase, snowmelt increases as does precipitation, resulting in earlier snowmelt which increases the risk of flooding in the spring and water shortages in the summer (USFS 2009).

The climate in the Sierra Nevada is largely influenced by the Mediterranean climate that is similar in the rest of the state of California. The Mediterranean climate is marked by rainy winters, and dry and warm to hot summers. Between 5000 and 8000 feet elevation, precipitation is the highest, although the eastern range receives 25 inches or less of precipitation per year. Summer highs average between 42°F and 90°F.

With the snowpack being a major source of water and therefore electric power in California, there were several reservoirs constructed in the canyons of the Sierra Nevada throughout the twentieth century. Despite this, the Sierra Nevada still casts a large rain shadow that makes it largely responsible for the state of Nevada being the driest state in the United States (NOAA n.d).

4.1.5 References

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4.2 GEOLOGY AND SOILS [§ 5.6 (D)(3)(II)]

4.2.1 Bedrock Geology and Physiography

The Project is located in the Cascade-Sierra Physiographic Province (Figure 4-3). The area is characterized by large topographic relief with relative elevations ranging from over 13,000 feet above msl to slightly over 4000 feet above msl at Powerhouse No. 6. Most of the underlying bedrock is composed of Mesozoic granitic type rock that has been subjected to mechanical weathering by water and ice but largely unaffected by chemical alteration. Mechanical weathering and volcanic events have resulted in a limited variety of surficial deposits. Figure 4-4 presents the geologic map for the Project area.

The oldest exposed rocks in the area are metamorphosed remnants of a thick sequence of miogeosynclinal sediments. These sediments, typically sandstones, siltstones, shales and carbonates, were deposited along a shallow marine shelf which extended over much of the western United States during the Paleozoic. Beginning with the Mesozoic, a period of volcanism became predominant over marine sedimentation. This is evidenced by thick volcanic deposits uncomfortably overlying the older sequence. Although these later rocks are not preserved in the upper Bishop Creek drainage, the event is important to the area geology. At the time regional deformation began, probably contemporaneously with the volcanism, in which the Paleozoic rocks were folded, faulted and further metamorphosed (ESE 1974).

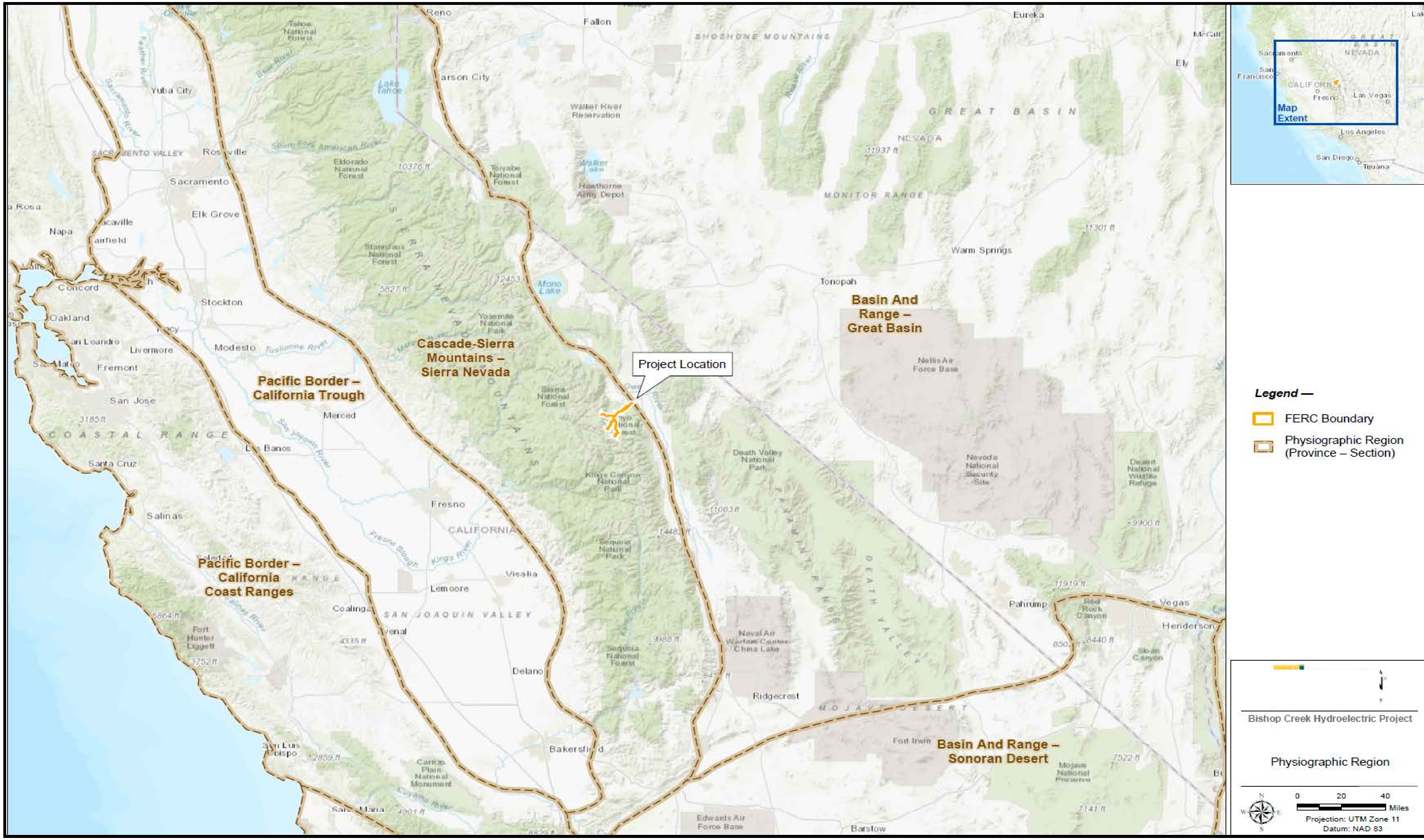

FIGURE 4-3 PHYSIOGRAPHIC REGION

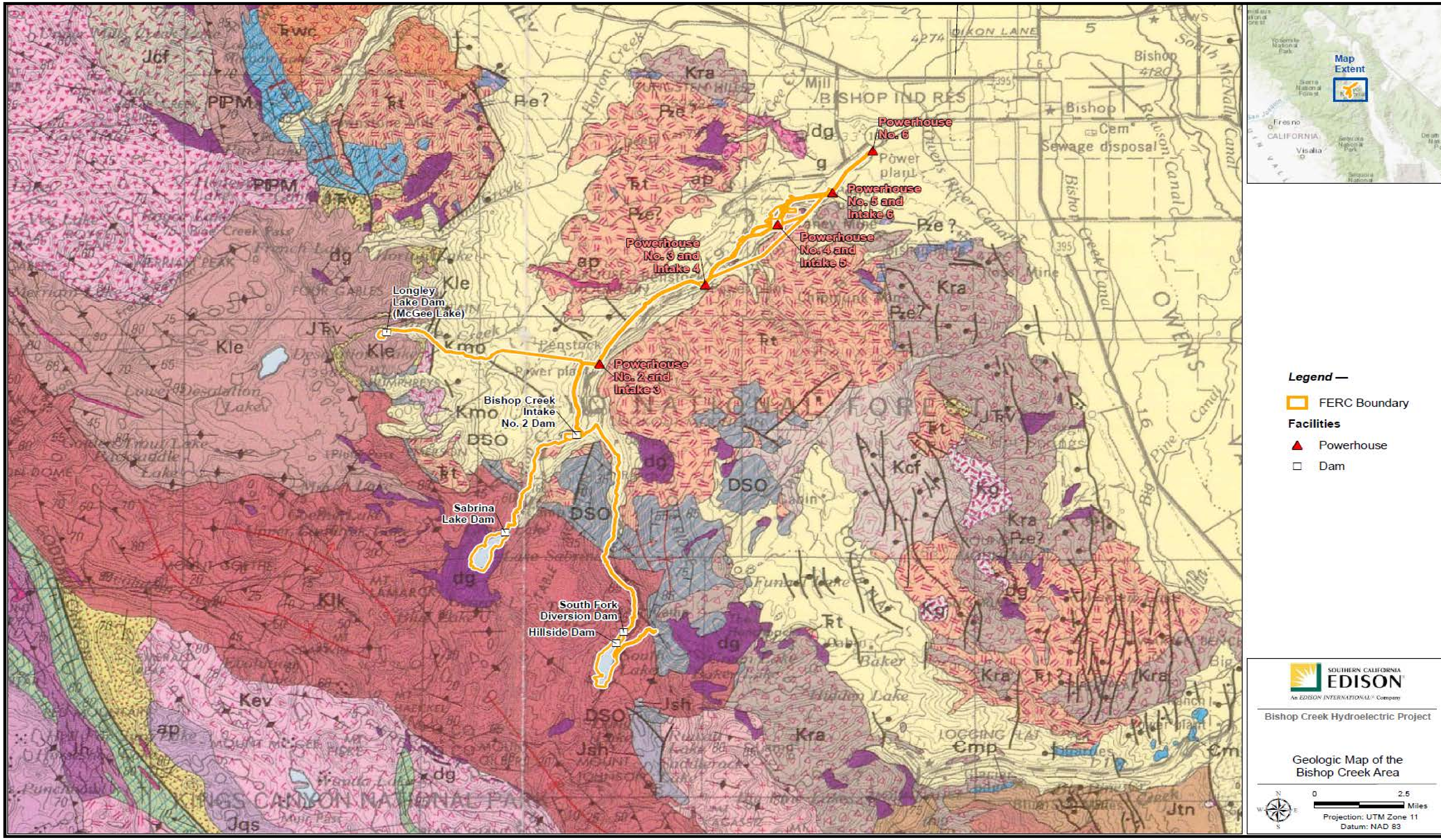

FIGURE 4-4 GEOLOGIC MAP OF THE BISHOP CREEK AREA

DESCRIPTION OF MAP UNITS

[Numbers in parentheses are optimum U-Pb isotopic ages on zircon in millions of years before present, and numbers in brackets are previously unpublished Rb-Sr whole-rock age determinations in millions of years before present by R.W. Kistler. Rocks designated mid-Createaceous have isotopic ages that indicate and optimum age in the range of 100 to 96 Ma]

Volcanic Rocks and Surficial Deposits

- **QT** — **Surficial deposits and unmetamorphosed volcanic rocks (Quaternary and Tertiary)**

Plutonic Rocks
All Areas

- **Kg** — **Granites, undivided (Late Cretaceous)**
- **ap** — **Dikes and small masses of aplite (Mesozoic**
- **g** — **Fine-grained granite in small masses (mesozoic)**
- **dg** — **Diorite and gabbro (Mesozoic) Variable** compositions, textures and ages

West slope of Sierra Nevada

Tuolyumne Intrusive Suite (Lake Cretaceous)

- **Kjp** — **Johnson Granit Porphyry-A central body of fine-grained granite bordered by network of dikes.** Contains alkali feldspar megacrysts and marolitic cavitites
- **Kcp** — **Catheral Peak Granodiorite (86) Medium-grained** biotite granodiorite. Contains Conspicuous, blocky alkali feldspar megacrysts 2 to 3 cm across

Half Dome Granodiorite

- **Khdm** — **Megacrystic facies-Medium-grained, megacrystic hornblende-biotite granodiorite with seriate texture. Biotite and hornblende commonly in euthedra**
- **Khd** — **Equigranular facies-Medium-grained granodiorite. Characterized by euhedral hornblende prisms as long as 1.5 cm, biotite books as much as 1 cm across, and conspicuous titanite**
- **Kc** — **Granodiorite of Kuna Crest (91) – As shown, includes tonalities of Glen Aulin (88) and Glacier Point and granodirotie of Grayling Lake. Dark-colored, fine- to medium-grained granodiorite and tonalite**

Possible earlier units of Tuolumne Intrusive Suite (Late Cretaceous)

- **Ksa** — **Sentieal Granodiorite-Eguigramular hornblende-biotite granodiorite. Abundant wedge-shaped titanite**
- **Kyc** — **Granodiorite of Yosemite Creek—Drak-gray, medium- to coarse- grained, porphyritic biotite-hornblende granodiorite. Locally contains plagioclase phenocrysts**

John Muir Intrusive Suite[1] (Late Cretaceous)

- **Kev** — **Evolution Basin Alaskite[1]—Light-colored, medium- to fine-grained alaskite**
- **Kmp** — **Mono Creek Granite[1] (88) – Mostly weakly foliated biotite grantie with blochy alkali feldspar megacrysts. Similar to the Cathedral Peak Granodiorite of the Tuolumne Intrusive Suite except for the eastern part of the eastward-projecting lobe, which is composed of light-colored, equigranular granite**
- **Krv** — **Round Valley Peak Granodiorite (89) – Equgranular, medium-grained granodiorite. Biotite and hornblende are evenly distributed in discrete euhedral crystals that give the rock a "tidy" look**
- **Krc** — **Granite of Rock Creek Lake—Medium- to coars-grained, light-colored biotite granite**
- **Kle** — **Lake Edison Granodiorite[1] (90) – Equigranular, medium-grained hornblende-biotite granodiorite. Contains abundant titanite**
- **Krl** — **Granodiorites of Red Lake, Eagle Peak, and Big Creek – Fine- to medium-grained hornblende-biotite granodiorites. Core area of granodiorite of Eagle Peak and parts of granodiorite of Big Creek are megacrystic**
- **Kbm** — **Leucogranite of Bald Mounatin – Medium-grained, equigranular, generally structureless biotite granite**
- **Kbb** — **Leucogranites of Big Sandy Bluffs and Lion Point, and leucogranites of Burrough and Black Mountains—Fine- to medium-grained, leucocratic granites and granodiorites**

Mount Givens Granodiorite (90)

- **Kmgm** — **Megacrystic facies-Megacrystic biotite granite and granodiorite.** Tabular alkali-feldspar megacrysts average 1.5 cm thick and 3 cm wide
- **Kmg** — **Equigranular facies- Medium-grained, well-foliated hornblende-biotite granodiorite. Minerals lack sharp definition. Biotite and hornblende occur both as discrete grains and in clusters**
- **Klk** — **Lamarck Granodiorite (90)-Medium-grained, generally seriate, hornblende-biotite granodiorite. Biotite and hornblende are evenly distributed both in clusters and as discrete crystals**
- **Kbu** — **Granodiorite of Bearup Lake (Late Cretaceous)-Equigranular granodiorite characterized by euhedral crystals of biotite and hornblende**
- **Kgl** — **Quartz diorite of Mount Gibson (Late Cretaceous)-Dark, medium-grained pyroxene-bearing biotite-hornblende quartz diorite and tonalite**

Intrusive suite of Washburn Lake (mid-Cretaceous)

- **Kcc** — **Granite porphyry of Cony Crags-Contains sparse phenocrysts of plagioclase, quarts and alkali feldspar in fine-grained groundmass**
- **Ktl** — **Granite of Turner Lake-Granite and felsic granodiorite containing tabular alkali feldspar megacrysts 1 to 2 mm across in a medium-grained groundmass**
- **Krd** — **Granodiorite of Red Devil Lake (98)- Zoned from inclusion-rish hornblende-biotite granodiorite in the outer margins to inclusion-free biotite granite at the contact with the granite of Turner Lake**

Intrusive suite of Merced Peak (mid-Cretaceous)

- **Ktk** — **Leucogranites of Timber Knob and Norris Creek-Very light, gray,fine-grained, equigranular biotite leucogranite**
- **Kja** — **Granodiorite of Jackass Lakes (98)-Light-gray, medium-grained biotite granodiorite. Contains numerous remnants of metamorphic and older plutonic rocks**

Intrusive suite of Buena Vista Crest (mid-Cretaceous)

- **Kcl** — **Granite of Chilnualna Lake-Fine-grained biotite granodiorite**
- **Kbd** — **Bridalveil Granodiorite[2]-As shown, includes and granodiorite of Horse Ridge. Mostly fine-grained granodiorite but includes tonalite and quartz diorite**
- **Kbz** — **Granodiorite of Breeze Lake-Light-gray, seriate biotite granodiorite**
- **Kol** — **Granodiorite of Ostrander Lake-medium-grained, equigranular hornblende-biotite granodiorite and granite. Includes Hodgdon Ranch pluton. Generally contains 6 to 10 percent anhedral hornblende and biotite**
- **Ki** — **Granodiorites of Illilouette Creek (100) and Tamarack Creek, tonalite of Crane Creek, and Leaning Tower Grainite[2]-Mostly dark, medium-grained, equigranular hornblende-biiotite granodiorite and hornblende tonalite. Leaning Tower Granite is medium gray**
- **Kqe** — **Quartz diorite dikes in El Capitan-Intrusive dike like masses in the face of El Capitan**

Granitoids between the Goddard septum and Ritter Range roof pendant (mid-Cretaceous)

- **Ksf** — **Granodiorite of Shelf Lake-Medium-grained hornblende-biotite granodiorite and quartz diorite. Hornblende prisms commonly contain pyroxene cores**
- **Kgp** — **Leucogranite of Graveyard Peak (99)-Light-colored, medium-grained, equigranular rock**
- **Kkf** — **Granodiorites of King and Fish Creeks and of Margaret Lakes-Fine- to coarse-grained and of varied composition and texture. Granodiorite of Margaret Lakes is generally sheared**

Granitoids at the northwest end of the Mount Givens Granodiorite (Early Cretecous?

- **Kcs** — **Granodiorite of Camino Creek-Fine- to medium-grained rock of variable composition and texture. Composition ranges from quartz diorite to granite**
- **Kbe** — **Granodiorites of Beasore Meadow and Grizzly Creek-Medium-grained; equigranular hornblende-biotite granodiorite and tonalite. Granodiorite of Grizzly Creek is characterized by conspicuous rounded quartz henocrysts averaging about 5mm across**

Granitoids southwest of the Goddard septum (Early Cretaceous)

- **Kwd** — **Granitoids southwest of the Goddard septum (Early Cretsceous)**
  Granodiorite of the White Divide-

Megacrystic granodiorite and granite

- **Kfp** — **Granite of Finger Peak-Medium-grained, light-colored biotite granite. Contains about 5 percent biotite**
- **Kmr** — **Granodiorite of Mount Reinstein-Hornblende-biotite granodiorite** containing 16 to 23 percent mafic minerals
- **Ktu** — **Granite of Tunemah Lake-Flesic biotite granite containing 3 to 7 percent biotite**
- **Kub** — **Granodiorite of upper Blue Canyon-Medium-grained granodiorite**
- **Kav** — **Tonalite of Aspen Valley (Early Cretaceous?)- Dark, medium-grained biotite-hornblende tonalite and quartz diorite**
- **Kt** — **Intrusive suite of Yosemite Valley (Early Cretaceous)**
  Taft Granite and leucogranite of Ten Lakes-Biotitle granite. Taft Granite is fine to medium grained; leucogranite of Ten Lakes is medium to coarse grained
- **Krm** — **Granite of Rancheria Mountain-Coarse-grained biotite granite and granodiorite. Alkali feldspar megacrysts are locally abundant**
- **Kec** — El Capitan Granite (102) – Includes Double Rock, Mount Hoffman, and Gray Peak plutons. Coarse-grained, equigranular to megacrystic biotite granite and granodiorite
- **Kdd** — **Shaver Intrusive Suite[1] (Early Cretaceous) Granites of Dinkey Dome, Mushroom Rock and north of Snow Corral Meadow-Medium-grained, equigramlar biotite granites. These rocks appear to have been emplaced during approximately the same interval of time but may not be exact equivalents**
- **Ksp** — **Granite of Shuteye Peak (102)-Medium-grained, equigranular to megacrystic granite and granodiorite**
- **Ko** — **Granite of Ordinance Creek – Fine- to medium-grained, highly variable rock ranging in composition from leucogranite to tonalite**
- **Kps** — **Granodiorite of the Pick and Shovel Mine area – Fine- to medium-grained, highly variable rock ranging in composition from leucogranite to tonalite**
- **Kmk** — **Granodiorite of McKinley Grove-Megacrystic hornblende-biotite granodiorite. Alkali feldspar megacrysts 2 to 3 cm across are set in a medinum-grained groundmass**
- **Kdcm** — **Dinkey Creek Granodiorite[1] (104)**
- **Kdc** — **Equigranular facies- Medium-grained, generally strongly foliated hornblende-biotite granodiorite. Contains abundant mafic inclusions and small clots. Euhedral crystals of biotite and hornblende are scarce**
- **Kwr** — **Possible additional unit of the Shaver Intrusive Suite (Early Cretaceous)**
  Granodiorites of Whisky Ridge (103) and Stevenson Creek – Hornblende-biotite granodiorites of uncertain ffiliation
- **Ksl** — **Granite porphyry of Star Lakes (108 +/) (Early Cretaceous) –** Granite porphyry, leucogranite porphyry, and granodiorite porphyry
- **Kkn** — **Fine Gold Intrusive Suite[1] (Early Cretaceous)**
  Knowles Granodiorite1 (112) – Includes granodiorite and southwest of Rabbit Hill and trondhjemite north of Eastman Lake. Medium-grained biotite granite. A widely used building stone
- **Kwt** — **Ward Mountain Trondhjemite1 (115)-Medium-grained biotite trondhjemite. Has a strong ductile (protoclastic) foliation in most places**
- **Kar** — **Granodiorites of Arch Rock, Sawmill Mountain (116), and Crane Flat; granites of Hogan, Goat and Thornberry Mountains; tonalite south of the Experimental Range; and other small plutons of biotite granite and granodiorite- Medium- to coarse-grained rocks of variable composition, ranging from biotite granite and granodiorite to hornblende-biotitle trondhejemite**
- **Kbl** — **Bass Lake Tonalite[1] (114)-Equigranular, typically medium gray, medium-grained hornblende-biotite**
- **Kro** — **Tonalite of Ross Creek (113)-Dark, fine- to medium-grained tonalite. Locally grades to augite-biotite granodiorite**
- **Kml** — **Tonalite of Millerton Lake (134) (Early Cretaceous)-Medium-grained hornblende-biotite tonalite similar to, but older than, Bass Lake Tonalite**
- **Jbd** — **Sheared granitoids of the Goddard septum (Jurassic? And Jurassic)**
  Granite of Bear Dome (Jurassic?)- Medium-grained, xenomorphic-granular biotite granite. Fine-grained margins
- **Jh** — **Leucogranite of Hell for Sure Pass (Jurassic) – Light-colored, medium-grained biotite granite**
- **Jgd** — **Granodiorite of Goddard Canyon (Jurassic)-Strongly sheared and altered**
- **Jqs** — **Fing-grained quartz syenite (157) Late Jurassic**
  Older granitic rocks of the western foothills (late and Middle Jurassic)
- **Jwr** — **Granite of Woods Ridge (151) (Late Jurassic)-Fine- to medium-grained, megacrystic biotite granite and granodiorite. Contains tabular to blocky, euhedral alkali feldspar megacrysts and fine-grained, anhedral biotite flakes**
- **Jgc** — **Tonalite of Granite Creek (163) (Middle Jurassic) – Medium-grainedhornblende-biotite tonalite. Has a strong ductile foliation that parallels the principal cleavage in adjacent country rocu. Locally shows lineation**
- **um** — **Ultramafic rocks (Jurassic? To late Paleozoic?) – Chiefly light- to dark-green and black serpentinite, conspicuously reddish on weathered surfaces. Locally metamorphosed to aggregates of talc and olivine plus anthophyllite or actinolite**

Eastern Sierra Nevada and Benton Range

- **Kcf** — **Granodiorites of Coyote Flat and Cartridge Pass (Late Createceous)-Form two small plutons. Both plutons are compositionally zoned, the Coyote Flat wealy and the Cartridge Pass strongly, from granodiorite in the margins to granite in the core**
- **Kae** — **Quartz monzodiorite of Aeolian Buttes, granite of Mono Lake, and leucogranites of Ellery Lake and Williams Butte (Late Createceous)-Granite of Mono Lake is medium-grained hornblende-biotite granite, and quartz monzodiorite of Aeolian Buttes is white to light-gray granite that is strongly jointed and is characterized by discrete biotite books, hornblende needles, and large titanite subhedra**
- **Kjl** — **Granite of June Late (Late Cretaceous)-Medium-grained megacrystic rock containing small alkalia feldspar megacrysts averaging about 1 cm across**
- **Kmd** — Granodiorites of Mono Dome (93+/-) and Tioga Lake (Late Cretaceous)-Medium-grained, dark-gray rocks. Granodiorite of Mono Dome grades from granodiorite to quartz diorite and contains pyroxene as well as amphiobole. Amphibole in granodiorite of Mono Dome is mostly altered to chlorite
- **Kra** — **Leucogranite of Rawson Creek (95) (Late Createceous)-Light-colored equigranular, medium-grained biotite granite**
- **Kin** — **Leucogranite of Rawson Creek (95) (Late Createceous)-Light-colored equigranular, medium-grained biotite granite**
  Inconsolable Quartz Monzodiorite[2] (105 +/-11) (Early Cretaceous)-Dark, equigranular, fine-grained rock that contains less than 20 percent quartz
- **Jcd** — **Leucogranite of Casa Diablo Mountain (161) (Late Jurassic)-Medium-grained biotite leucogranite**
  Leucogranite of Casa Diablo Mountain (161) (Late Jurassic)-Medium-grained biotite leucogranite

Palisade Crest Intrusive Suite[1] (Middle Jurassic)

- **Jmc** — **Granodiorite of McMurry Meadows (171 +/-)-Forms a bimodal pluton. Dark quartz monzodiorite in the margins grades inward through a narrow transitional zone to granite in the core**
- **Jtn** — **Tinemaha Granodiorite (164) (169 +/-) – Weakly megacrystic to seriate biotite-hornblende granodiorite and hornblende-biotite granite. The rock in the western lobe is more felsic inward from the west margin and upward in the interior and eastern part**
- **Jtb** — **Leucogranite of Taboose Creek-Fine-grained rock that forms the core of nested pair with the leucogranite of Red Mountain Creek**
- **Jrm** — **Leucogranite of Red Mountain Creek – Medium-grained, equigranular rock**
- **Jcf** — **Granite of Chickenfoot Lake (172 +/-) (Middle Jurassic) – Fine- to medium-grained rock of variable composition and texture. Progressively darker southward toward a mass of gabbro**
- **Jsh** — **Sheared granites of Koip Crest and the South Fork of Bishop Creek (Middle Jurassic)**

Scheelite Intrusive Suite[1] (210) (Late Triassic)

- **TRt** — **Tungsten Hills Granite[2]-Medium-grained, seriate biotite granite**
- **TRlv** — **Granite of Lee Vining Canyon-Light-colored, medium-grained granite. Equigramular margins and megacrystic interior**
- **TRwc** — **Wheeler Crest Granodiorite2-Typical rock is megacrystic (patterned ara). Tabular alkali feldspar megacrysts as long as 10 cm are set in a medium-grained groundmass**
- **Kwb** — **Granite of Boundary Peak**
- **Kwm** — **Granite of Marble Creek**
- **Kwed** — **Granite east of Dyer**
- **Kwl** — **Granite of Leidy Creek**
- **Kwe** — **Granite of McAfee Creek (100)**
- **Kwig** — **Granite of Indian Garden Creek**
- **Kpp** — **Megacrystic granites of Papoose Flat, Birch Creek and Redding Canyon (mid-Cretaceous)-Light-colored, coarse-grained, megacrystic. Granites of Papoose Flat and Birch Creek are strongly foliated near their margind**
- **Kpe**, **rbx**
- **Jsf**
- **Jca**
- **Jmb**
- **Je**
- **Jj**

Metamorphosed Sedimentary and Volcanic Rocks and Hypabyssal Intrusive Rocks

All Areas

- **Mzv** — **Metavolcanic rocks, undivided (Mesozoic)**

West Slope of Sierra Nevada

- **Kmp** — **Minarets sequence (mid-Cretaceous)**
  Porpphyries and other subvolcanic intrusions (100)
- **Kmv** — **Ash-flow tuff, breccia, and thinly laminated tuff (100)**
- **Jm** — **Mariposa Formation and adjacent strata (Late Jurassic)**
- **Jmgb** — **Metagabbro (Late? Jurassic)**
- **Jbu** — **Greenstone of Bullion Mountain (187) (Late and [or] Early Jurassic)**
- **JTRk** — **Kings sequence (Jurassic and/or Triassic) –** Quartzite, schist, hornfels and marble
- **TRb** — **Phyllite of Briceburg (Triassic)**
- **TRh** — **Phyllite and chert of Hite Cove (Early Triassic)**
- **TRbh** — **Phyllite of Briceburg and phyllite and chert of Hite Cove, undivided (Ttiassic)**
- **Pzp** — **Quartzite of Pilot Ridge (Paleozoic)-Includes argillite and phyllite** Eastern Sierra Nevada, Benton Range, and White and Inyo Mountains
- **Kdp** — **Dana sequence (mid-Cretaceous)**
  Dacite porphyry
- **Kd** — **Metavolcanic tuff, lapilli tuff, shale, calc-silicate hornfels, and marble-Possibly correlative with Minarets sequence**
- **Kvp** — **Dominantly pyroclasitic strata (Early Cretaceous)-Iincludes flow and hypabyssal intrusions ranging in composition from rhyolite to basalt**
- **JTRp** — **Hypabyssal rocks of andesitic composition and diorite**
- **JTRv** — **Ash-flow tuff, bedded tuff, lapilli tuff, tuff breccia, slump breccia lava flows and hypabyssal rocks of andesitic composition and diorite**
- **PPM** — Sedimentary and metasedimentary rocks (Permian to Mississippian)-Perdido formation (Mississippian), Rest Spring Shale (Mississippian), and Keeler Canyon Formatin (Pennsylvanian and Permian) in the Inyo Mountains, and the Bright Dot Formation (Pennsylvanian?) Mount Baldwin Marble (Pennsylvanian), Mildred Lake Hornfels (Pennsylvanian and or Permian), Lake Dorothy Hornfels (Pennsylvanian and or Permian), and Bloody Mountain Formation (Permian?) in the Mount Morrison roof pendant. Also includes metasedimentary strata in the Pine Creek septum and other remnants of metasedimentary rocks in the eastern Sierra Nevada
- **DSO** — **Sedimentary and metasedimentary strata (Devonian, Silurian?, and Ordovician)**-Palmetto, Al Rose, Badger Flat, Barret Spring, and Johnson Spring Formations (Ordovician) and the Sunday Canyon Formation (Devonian) in the Inyo and White Mountains, and the Buzztail Spring and Mount Aggie Formations (Ordovician?), Convict Lake Formation Morrison Sandstone (Ordovician or Silurian?), and sandstone and hornfels of Sevehah Cliff (Ordovician or Silurian?), in the Mount Morrison roof pendant. Also includes strata in the Bishop Creek septum and in smaller remnants of metasedimentary rocks. Devonian strata may also be present
- **Ꞓe** — Emigrant (?) Formation (Late Cambrian)
- **Ꞓtn** — **Tamarack Canyon and Bonanza King Dolomites and Monola Formation (Lake and Middle Cambrian)**
- **Ꞓmp** — **Sedimentary and metasedimentary rocks (Early Cambrian)-Mule Spring, Saline Valley, Harkless, and Poleta Formations. In the White and Inyo Mountains. Marble and hornfels along the lower reaches of** Big Pine Creek
- **Ꞓu** — Undivided sedimentary rocks (Cambrian)-In the White and Inyo Mountains
- **Pze** — **Marble, slate, pelitic hornfels, calc-hornfles, metachert, and calcareous quartz sandstone (early Paleozoic?) - In the eastern sierra Nevada and Benton Range**
- **ꞒZc** — **Campito Formation (Cambrian and Late Proterozoic)**
- **Zl** — **Deep Spring Formation, Reed Dolomite and Wyman Formation (Late Proterozoic)**

1 New name (Bateman, 1989)
2 Lithic term of name changed (Bateman, 1989) to reflect compositional classification recommended by the International Union of Geological Sciences (Streckeisen, 1973)

GEOLOGIC MAP LEGEND

By Early Cretaceous, regional deformation had ceased and the Sierra Nevada batholith was beginning to be emplaced. The batholith itself is composed of several discrete intrusive episodes, which are either in sharp contact with one another or separated by remnant metamorphic rocks. In general, the older intrusive bodies are dark, mostly mafic rocks classified as gabbro, diorite or quartz diorite. Succeeding younger plutons were emplaced ranging in composition from granodiorite, through quartz monzonite to alaskite (ESE 1974).

Emplacement of the batholith was mostly by forcible intrusion, in which older rocks were displaced by and sometimes incorporated into the intruding body. After emplacement, metalliferous solutions expelled by the cooling plutons reacted with the surrounding metamorphic rocks to form contact ore bodies, many of commercial grade (ESE 1974).

By late Cretaceous and extending into mid-Tertiary period, a broad upwarp occurred that tilted the eroded Sierra Nevada batholith to the west, forming low relief topographic arch over the present-day Owens Valley. Subsequent block faulting has raised the Sierra Valley escarpment throughout the Pleistocene to recent times. Volcanism associated with this orogeny is evidenced by cinder cones, remnant lava flows, and volcanic necks throughout the region. The topography was further modified by a series of glacial events, during which time vast ice fields extended from the ridge crest down through the major canyons, leaving U-shaped canyons, moraines and other classic glacial erosional features. That the most recent moraines are still identifiable indicates that Holocene erosion has been a minor factor since the last glaciation (ESE 1974).

Remnant metasedimentary rocks comprise one of the more striking, geological features of the Project area. The largest mass is the Bishop Creek pendant, located eastward of the Middle Fork of Bishop Creek. This roof pendant is trapped between two intrusive bodies of different ages, a relationship which is most evident in the thin septum which extends across the Middle Fork and alongside North Lake. Another thin unit, extending southeast from a younger metasedimentary sequence on Mount Humphreys, crosses over into the Project area at Mount Emerson and thins at the North Fork of Bishop Creek (ESE 1974).

An older unit consists of the siliceous calcic hornfels and marble of the Middle Fork septum and the bleached marble of Mount Emerson. These rocks were originally derived from a wide spectrum of carbonate-rich sediments. The Middle Fork hornfels are commonly light to yellowish grey and very hard. Mineral content generally consists of a fine-grained quartz groundmass enclosing larger calcic-silicate minerals such as diopside or tremolite. The unit grades to marble in the lower Middle Fork section and is predominantly marble on Mount Emerson (ESE 1974).

The marbles are generally light to medium grey, bleached white near igneous contacts. Mineral content is mostly calcite, with the more impure rocks containing quartz and various calcic-silicates. Near magmatic contacts are zones consisting mainly of garnet, pyroxene, or epidote, which, when scheelite is present locally, have created in some instances historically commercial tungsten ore deposits (ESE 1974).

A younger unit consists of coarse-grained micaceous quartzite grading to finer grained pelitic hornfels. This unit is easily identified due to the characteristic red-brown iron oxide staining of both rock masses. Derivation of such rocks was from aluminum rich shales and siltstones. Mineral contents vary, but a typical hornfel would contain feldspar and biotite, increasing in quartz content to a quartzite. Accessory minerals of both units are commonly apatite, magnetite, pyrite and sphene (ESE 1974).

The predominant igneous rock of the area is the Lamarck granodiorite. It was forcibly emplaced approximately 100 million years ago, tearing off and assimilating large blocks of older more mafic plutons. Sometime later, the Tungsten Hills quartz monzonite was intruded alongside the granodiorite, usually separated by remnant metamorphic rocks or mixed granitic zones. This composite batholith accounts for most of the exposed bedrock in the Project area (ESE 1974).

The older hornblende gabbro and quartz diorite rocks, though mapped as one unit, probably represent remnants of different plutons. Hornblende gabbro is generally a medium grained, dark rock consisting of calcic plagioclase as the principal feldspar, hornblende, the principal mafic mineral, and a small percentage of quartz. Quartz diorite is a lighter rock, with slightly more sodic plagioclase, roughly equal amounts of biotite and hornblende, and some quartz. These rocks are apparent throughout the Project area as dark blotches enclosed by the younger, lighter intrusive rock (ESE 1974).

The Lamarck granodiorite is most visible around Lake Sabrina as a light grey, commonly foliated, massive rock. Generally, it is medium grained, consisting of sodium rich plagioclase, approximately equal amounts of potassium feldspar and quartz, and evenly distributed hornblende and biotite (ESE 1974).

The Tungsten Hills quartz monzonite has been altered to an albite facies over much of the Project area, visible as a light brown-orange rock. This alteration occurred adjacent to the metamorphic rocks, a possible explanation being sodic metasomatism during emplacement. The rock ranges in composition from nearly equal amounts of quartz and feldspars to a predominance of sodic plagioclase. Mafic rocks comprise very little of the total composition. The albitized facies grades away from the contact into a quartz monzonite. This rock is typically medium grained, consisting of roughly equal amounts of quartz, potassium feldspar and sodic plagioclase, with some biotite (ESE 1974).

4.2.2 Structural Features

Broad upwarping during the late Cenozoic is locally responsible for much of the present topography. The Project area is located on the northern flank of the Coyote warp, a region once eroded to grade. Increased uplift renewed deep dissection by streams such as Bishop Creek. It was during this period that Pleistocene glaciation reached its peak. As a result, the valleys of the North Fork, Middle Fork and South Fork were carved. This resulted in extensive deposits of glacial till piled up along Bishop Creek, especially the lower reaches downstream of Powerhouse 4. Although mapped as one unit, these tills represent at least four advances, with each moraine stacked against the preceding one. Isolated patches of olivine basalt around North Lake and basalt boulders in older till testify to the fact that volcanism was at least contemporaneous with early uplift (ESE 1974).

The Sierra Nevada frontal fault zone forms the eastern escarpment of the Sierra Nevada, extending approximately 373 miles from north of the Garlock fault (located at the southern end of the Sierra Nevada) to the Cascade Range (in Oregon), and juxtaposes extensive Quaternary alluvial fan, glacial, and rockslide deposits in the hanging wall upon bedrock in the footwall. The character of the eastern escarpment of the Sierra Nevada frontal fault zone varies along strike from wide zones of en echelon escarpments to narrow zones characterized by a single escarpment. South of Bishop, the eastern margin of the Sierra Nevada is defined by a continuous north northwest-striking escarpment (Le et al. 2007).

The Owens Valley Fault, one of the nearest (varies from 3 to 14 miles) active faults to the Project area, has generated earthquakes of a magnitude of 8.0 and greater. The fault passes through Lone Pine near the eastern base of the Alabama Hills and follows the floor of the Owens Valley northward to the Poverty Hills, where it steps 1.8 miles to the west and continues northward across Crater Mountain and through the Bishop area (Le et al. 2007).

The Round Valley fault, a high-angle, down-to-east normal fault along the prominent eastern front of central Sierra Nevada is in one of the most seismically active region along the eastern front of the Sierra Nevada. A moderate earthquake (magnitude 5.8) occurred approximately 15 miles north of the Project area on November 23, 1984 along a portion of the Round Valley Fault (Priestley et al. 1988).

Most important to a hydrologic study of the area is the regional system of jointing in the granitic rocks. These joints are in conjugate sets, striking northwest and northeast, and dipping steeply. The joints cross intrusive contacts uninterrupted indicating that the formation of the joints came after emplacement of the batholith. Both surface and subsurface water movement is strongly influenced by this system. Notable examples include the northeast trending chasm through which Loch Leven empties, and the well-developed joints northeast of North Lake (ESE 1974).

4.2.2.1 Glacial Features

As previously noted, the last major erosion that occurred in the area was due to glacial erosion. In most places the divide is a "knife-edged" ridge, passable on foot in only a few places. The upper slopes are largely steep-walled glacial cirques that are mantled with talus. Moraines commonly fringe the lower sides of cirque basins, and in the larger canyons extend downward to altitudes as low as 5200 feet. Below the glaciated zone, the slopes are less precipitous but, in most places, are still steep (ESE 1974).

The most complete representation of glacial deposits in the Project area is along Bishop Creek. Differences in the degree of dissection and in the throws along two faults that cut across the different tills on the northwest side of Bishop Creek indicate that the glacial deposits are successively younger to the southeast. Each successive glacier was southeast of its predecessor, and all the morainal ridges on the northwest side of Bishop Creek are lateral moraines that were deposited along the northwest sides of these glaciers (Bateman 1965).

4.2.2.2 Mineral Resources

The contact metasomatic, scheelite bearing tungsten deposits contain the principal ores of the Bishop district. At the end of 1953, Bateman (1965) reported that the mines in the Bishop district, which includes Bishop Creek, produced approximately 1.3 million short-ton units of tungsten trioxide (WO_3). While most of these deposits are located outside the Bishop Creek watershed, the south fork of Bishop Creek, contains many metamorphic inclusions and are the only ones in which notable amounts of scheelite-bearing tactite has been found.

The Schober mine was located on the east side of the South Fork of Bishop Creek. The deposit was discovered in late 1940 and placed in operation from 1942 to 1943. In 1943, the ore body was exhausted and, after exploration at depth failed to reveal additional ore, the mine was closed. In addition, several prospects were noted in the Coyote Creek drainage and the South Fork.

Bateman (1965) also reported that gold was mined from the Cardinal Mine located approximately 1 mile south of Lake Sabrina at an elevation of 8700 feet. The mine was operated from 1911 to 1922 and 1934 to 1938. The amount of gold, silver and copper mined was not reported. The mine opening collapsed, and no activity has occurred since 1938.

4.2.3 Soils

The USFS (a division of the U.S. Department of Agriculture [USDA]) (USFS 1995b) divided the soil types occurring in the general area of the Project into various regimes. Of the total of four regimes identified for the Inyo National Forest, three were located beneath or immediately adjacent to the Project facilities (Figure 4-5). They included the following major soil regimes.

4.2.3.1 Soils in the Mesic Soil Temperature Regime

In the Mesic soil temperature regime, the mean annual soil temperature is 47°F to 59°F. The soils in this group are widely distributed throughout the survey area. The soils in this group are found in material that weathered from granitic, basalt, metamorphic rocks, pumice and tuff. The elevation ranges from 4300 feet to 9600 feet. The soils are found on mountainsides, hillsides, valley bottoms, lake terraces, fan terraces, moraines, ridges and colluvial slopes; slopes range from 0 percent to 90 percent. Annual precipitation ranges from 4 inches to 30 inches. The soils in this group are shallow to very deep and are well to excessively drained.

Wrango-Berent-Waterman Families—Rock Outcrop (2)

The soils in this map unit formed in material that weathered from granitic rock. These soils are found on mountainsides, hillsides, lake terraces, moraines, ridges and colluvial slopes of slopes of 0 to 90 percent.

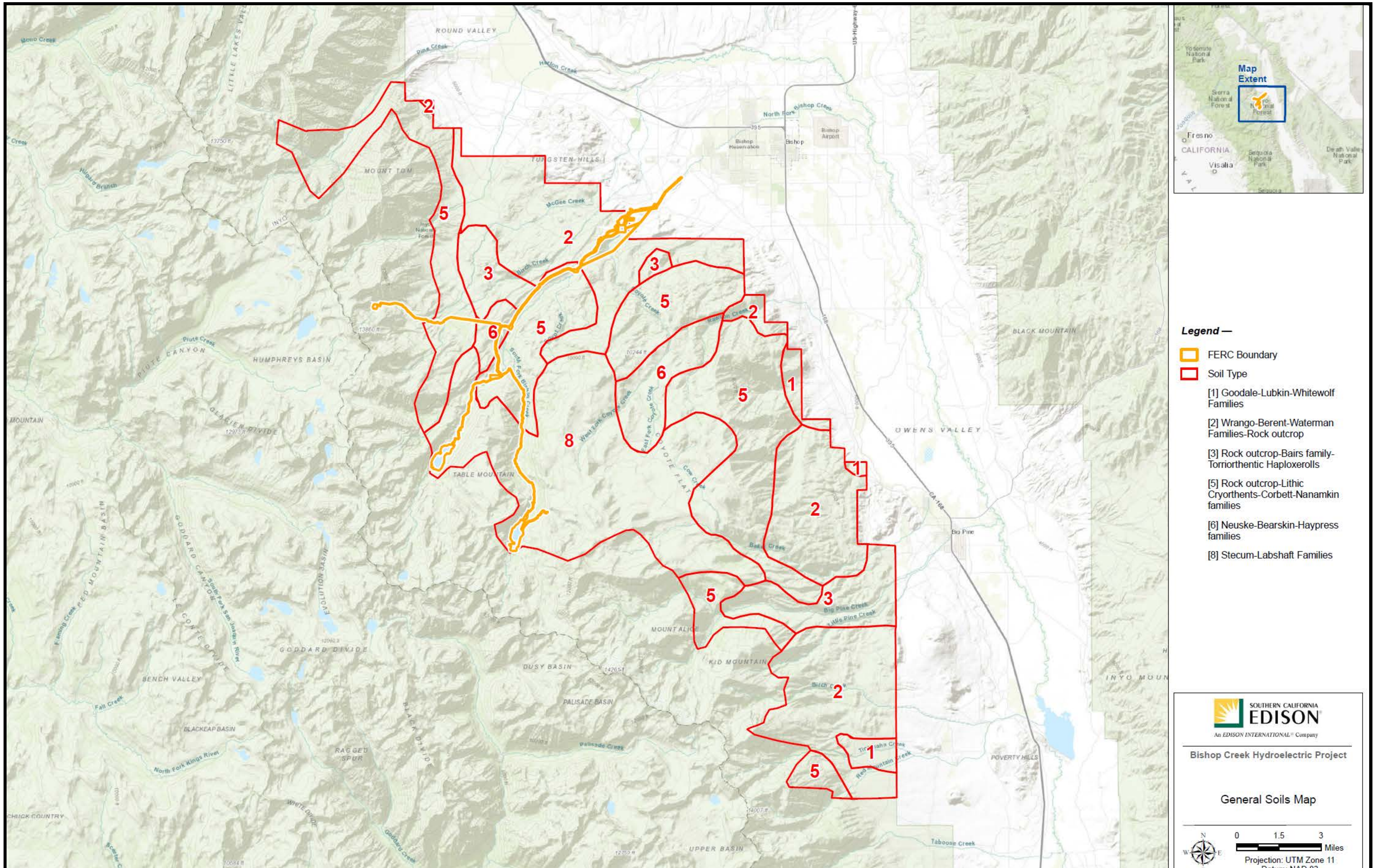

FIGURE 4-5 GENERAL SOILS MAP

4.2.3.2 Soils in the Frigid Soil Temperature Regime

The soils in this group formed in material that weathered from granitic, basalt, metamorphic rocks, pumice, ash and tuff. The elevation ranges from 5000 feet to 13,000 feet that produce frigid soil temperatures with an annual mean soil temperature of 32°F to 47°F. The soils are found on mountainsides, hillsides, basalt flows, mountain toes, moraines, hilltops, ridges and colluvial slopes. Slopes range from 0 percent to 90 percent. Annual precipitation ranges from 8 inches to 45 inches. The soils in this group are shallow to very deep and are well drained to excessively drained.

4.2.3.2.1 Rock Outcrop-Lithic Cryorthents-Corbett-Nanamkin Families (5)

The soils in this map unit were in material that weathered from mixed granitic, rhyolitic and andesitic rocks. These soils are found on mountainsides, ridges and colluvial slopes, with slope gradients in the range of 0 percent to 90 percent.

4.2.3.2.2 Neuske-Bearskin-Haypress Families (6)

The soils in this map unit were formed in material that weathered from granitic, basalt, metasedimentary and mixed rock. These soils are found on hillsides, basalt flows, mountain toes and mountainsides, on slopes of 0 percent to 90 percent.

4.2.3.2.3 Soils in the Cryic Soil Temperature Regime

In the cryic soil temperature regime, the mean annual soil temperature is 32 to 47°F. The mean annual summer soil temperature is lower than 47°F if a thin layer is present, and the soil is not saturated during some portion of the summer and 59°F if a thin layer is not present. Conversely, if the soil is saturated for a portion of the summer, then the soil temperature must be lower than 43°F if a thin layer is present and 55°F if it is not present.

The soils in this group were formed in material that weathered from granitic, basalt, metamorphic rocks, pumice, rhyolite, obsidian and ash. The elevation ranges from 7400 feet to 13,400 feet. These soils are found on mountainsides, hillsides, mountaintops, hilltops, terraces, and mountain basin; slopes range from 0 percent to 70 percent. Annual precipitation ranges from 12 inches to 45 inches.

4.2.3.2.4 Stecum-Labshaft Families (8)

The soils in this map unit were formed in material that weathered from granitic, metavolcanic, metasedimentary and mixed rocks. These soils are found on mountainsides, mountain tops, moraines and terraces of slopes of 0 percent to 70 percent.

4.2.3.3 Soil Characteristics

Shallow soils are defined as soils less than 20 inches deep (USDA 2013) and are sensitive because they are susceptible to erosion. These soils are generally weakly developed, with relatively little organic matter, and therefore have low nutrient levels. Any soil displacement or loss can affect their productivity. When soil is shallow, runoff can infiltrate to the bedrock layer and run along that layer, carrying the overlying shallow soil with it. Shallow soils are found throughout the forest, on most sites. These soils are most common in steeper areas, high elevation areas, and areas of recent geologic deposition, such as volcanic deposits. Forest coverage illustrates that shallow soils are most common, predictably, in rocky areas of the forest, and almost the entire White and Inyo Mountains (USDA 2013).

Most soils in the Project area include a variety of soils with varying characteristics.
Table 4-2 and Table 4-3 present summaries of the physical characteristics of the typical soils underlying the Project area. Figure 4-6 and Figure 4-10 present the various mapped soil units in the Project area.

TABLE 4-2 SOIL TYPES AND CHARACTERISTICS BENEATH AND ADJACENT TO THE PROJECT FACILITIES

MAP SYMBOL (a)	NAME	SLOPE (%)	Available Water Cap. (inches)	Permeability (in/hr)	Max. Erosion Hazard	Erosion Factor (K) (b)	Soil Productivity
105	Typic Cryorthents	0-35	NR (c)	Mod. (d) High (NR)	Mod.-High	0.24	NR
107	Typic Cryorthents	50-85	NR	Mod. High (NR)	Very High	0.24	NR
111	Typic Cryorthents-Typic Cryochrepts-Rock Outcrop Complex	0-45	NR	Mod. High-High (NR)	Mod.-High	0.24-0.37	NR
117	Rock Outcrop - Rubbleland Complex	20-60	NA (e)	NA	NA	NA	NA
125	Bairs-Kilburn Family	8-30	Moderate	Rapid (6-20)	Mod.-High	0.10	NR
129	Berent-Glenbrook-Nanamkin Families	30-50	NR	Rapid (6-20)	NR	0.15	NR
147	Rock Outcrop – Typic Cryorthents Complex	0-45	NR	Mod. High (NR)	Mod.-High	0.24	NR
148	Rock Outcrop-Typic Cryorthents Complex	40-85	NR	Mod. High (NR)	Very High	NR	NR
152	Cartago Gravelly Loamy Coarse Land	5-30	NR	NR	NR	0.15	NR
154	Cartago Gravelly Loamy Sand	0-2	NR	NR	NR	0.24	NR
170	Conway-Conway Cobbly-Chesaw Family	0-15	Low-Mod.	Mod. Rapid (NR)	Slight	0.15	Low-Mod.
196	Goodale Loamy Coarse Sand	5-15	Very Low	Rapid (NR)	Slight	0.15	NR
199	Goodale-Cartago Complex	2-5	Very Low	Rapid (NR)	Slight	0.02-0.15	NR
200	Goodale-Cartago Complex	5-15	Very Low	Rapid (NR)	Slight	0.10-0.15	NR
201	Goodale-Cartago Complex	2-5	Very Low	Rapid (NR)	Slight	0.02-0.15	NR
222	Inyo Sand	9-15	Very Low	Rapid (NR)	Moderate	0.17	NR
226	Kilburn Family-Watterson Association	4-15	Very Low	Mod. Rapid (NR)	Moderate	0.05-0.15	NR
227	Kilburn Family-Watterson Wet Association	4-30	Very Low to Low	Mod. Rapid (NR)	Moderate	0.05-0.15	NR
231 /.232	Lithic Torriorthents-Lithic Haplargids-Rock Outcrop Complex	30-75	Very Low	Rapid (NR)	Severe to Very Severe	0.10-0.24	NR
244	Lubkin-Tinemaha Complex,	5-15	Very Low to Low	Mod. Rapid (NR)	Moderate	0.10-0.15	NR
247	Lucerne Gravelly Loamy Sand	2-5	Low	Mod. Rapid (NR)	Moderate	0.10-0.15	NR
313	Wrango - Atter Families	60-90	Very Low	Rapid (6-20)	High to Very High	0.10-0.15	Low-Mod.
320	Waterman - Sur Families	30-60	Very Low	Rapid (6-20)	Mod. to High	0.05-0.10	Very Low

MAP SYMBOL (a)	NAME	SLOPE (%)	Available Water Cap. (inches)	Permeability (in/hr)	Max. Erosion Hazard	Erosion Factor (K) (b)	Soil Productivity
330	Wrango Family	30-60	Very Low	Rapid (6-20)	Mod. to High	0.15-0.22	Low-Mod.
340	Ulymeyer-Rovana Complex	5-15	Very Low	Rapid (NR)	Slight	0.10-0.15	NR
347	Nanamkin Family	15-60	Very Low	Rapid (6-20)	Low-High	0.05	Low
355	Kilburn - Nanamkin Families	5-15	Low	Mod. Rapid (2-6)	Low	0.15	Low-Mod.
359	Rock outcrop - Powment Family	30-60	Very Low	Rapid (6-20)	Mod.-High	0.10	Low
361	Wrango - Berent Families	2-30	Very Low	Rapid (6-20)	Low-Mod.	0.15	Low
364	Preston Family, Rock Outcrop	30-60	Low	Rapid (6-20)	Mod.-High	0.22	Low-Mod.
366	Stecum Family	2-30	Very Low	Rapid (6-20)	Low-Mod.	0.10	Low
367	Stecum Family	30-60	Very Low	Rapid (6-20)	Mod.-High	0.10	Low
368	Bearskin - Mascamp Families	15-30	Very Low	Mod. Rapid (2-6)	Low-Mod.	0.17	Low-Mod.
369	Xeric Haplodurids	2-9	Very Low	Rapid (NR)	Slight	0.15	NR
370	Xerofluvents	0-5	Low to Mod.	Mod. Slow (NR)	Slight	0.05-0.17	NR
402	Bairs Family	15-50	Low	Mod. (0.6-2)	Low-High	0.10	Low-Mod.
406	Artray - Chesaw Families	0-5	Moderate	Mod. (0.6-2)	Low	0.24	Mod.-High
413	Wrango - Pizona Families	5-30	Very Low	Rapid (6-20)	Low-Mod.	0.15	Low-Mod.

Notes:
a – See Figure 4-6 through Figure 4-10
b – Does not apply to rock outcrops
c – NR=Not reported
d – Mod=Moderate
e – NA=Not Applicable

Source: USFS 1996, 1995a and 1995b

TABLE 4-3 PARTICLE SIZE DISTRIBUTION AND ROCK FRAGMENT PERCENTAGE FOR VARIOUS SOIL TYPES IN THE PROJECT AREA

MAP SYMBOl (a)	NAME	SLOPE (%)	PARTICLE SIZE % BY WEIGHT (a,b)			FRAGMENTS >2 MM (% BY VOLUME OF TOTAL SOIL)				
			SAND >0.05MM <2MM	SILT >0.002MM <0.05 MM	CLAY <0.002 MM	TOTAL FRAGMENTS	FRAGMENTS 2-74 MM	FRAGMENTS 75-249 MM	FRAGMENTS 250-599 MM	FRAGMENTS >=600 MM
105	Typic Cryorthents	0-35	65	29	6	44	30	12	0	2
107	Typic Cryorthents	50-85	-(c)	-	-	-	-	-	-	-
111	Typic Cryorthents-Typic Cryochrepts-Rock Outcrop Complex	0-45	-	-	-	-	-	-	-	-
117	Rock Outcrop - Rubbleland Complex	20-60	-	-	-	-	-	-	-	-
125	Bairs-Kilburn Family	8-30	84	8	8	26	19	7	0	0
129	Berent-Glenbrook-Nanamkin Families	30-50	79	17	4	22	22	0	0	0
147	Rock Outcrop – Typic Cryorthents Complex	0-45	-	-	-	-	-	-	-	-
148	Rock Outcrop-Typic Cryorthents Complex	40-85	-	-	-	-	-	-	-	-
152	Cartago Gravelly Loamy Coarse Land	5-30	83	11	7	31	24	5	0	2
154	Cartago Gravelly Loamy Sand	0-2	79	16	5	30	28	2	0	-
170	Conway-Conway Cobbly-Chesaw Family	0-15	68	20	13	8	8	0	0	0
196	Goodale Loamy Coarse Sand	5-15	82	11	8	41	17	12	0	12
199	Goodale-Cartago Complex	2-5	84	9	8	40	36	2	0	2
200	Goodale-Cartago Complex	5-15	82	11	8	41	17	12	0	12
201	Goodale-Cartago Complex	2-5	84	9	8	40	36	2	0	2
222	Inyo Sand	9-15	79	17	4	19	15	2	0	2
226	Kilburn Family-Watterson Association	4-15	84	9	8	45	27	5	0	13
227	Kilburn Family-Watterson Wet Association	4-30	84	9	8	45	27	5	0	13
231, 232	Lithic Torriorthents-Lithic Haplargids-Rock Outcrop Complex	30-75	85	9	6	30	28	2	0	0
244	Lubkin-Tinemaha Complex,	5-15	84	9	8	32	22	5	0	5
247	Lucerne Gravelly Loamy Sand	2-5	85	9	6	30	28	2	0	0
313	Wrango - Atter Families	60-90	80	18	2	15	10	5	0	0
320	Waterman - Sur Families	30-60	79	17	5	20	15	0	3	2
330	Wrango Family	30-60	18	18	2	15	10	5	0	0
340	Ulymeyer-Rovana Complex	5-15	83	11	7	29	21	5	0	3
347	Nanamkin Family	15-60	79	17	4	42	26	6	5	5
355	Kilburn - Nanamkin Families	5-15	66	29	5	34	14	19	1	0
359	Rock outcrop - Powment Family	30-60	97	2	2	44	42	2	0	0
361	Wrango - Berent Families	2-30	80	18	2	15	10	5	0	0
364	Preston Family, Rock Outcrop	30-60	80	17	3	25	10	10	5	0
366	Stecum Family	2-30	79	17	4	39	9	30	0	0
367	Stecum Family	30-60	79	17	4	39	9	30	0	0
368	Bearskin - Mascamp Families	15-30	80	17	3	25	25	0	0	0
369	Xeric Haplodurids	2-9	82	10	8	22	22	0	0	0
370	Xerofluvents	0-5	67	20	13	31	27	2	0	2
402	Bairs Family	15-50	82	11	7	24	20	1	2	1
406	Artray - Chesaw Families	0-5	68	23	9	15	15	0	0	0
413	Wrango - Pizona Families	5-30	80	18	2	15	10	5	0	0

Notes:
a - Particle sizes are for the uppermost soil horizon.
b -Total percentage may not equal 100 percent due to clay values being an average for multiple samples.
c - The "-" indicates data not available or not reported.

Source: USFS 2018

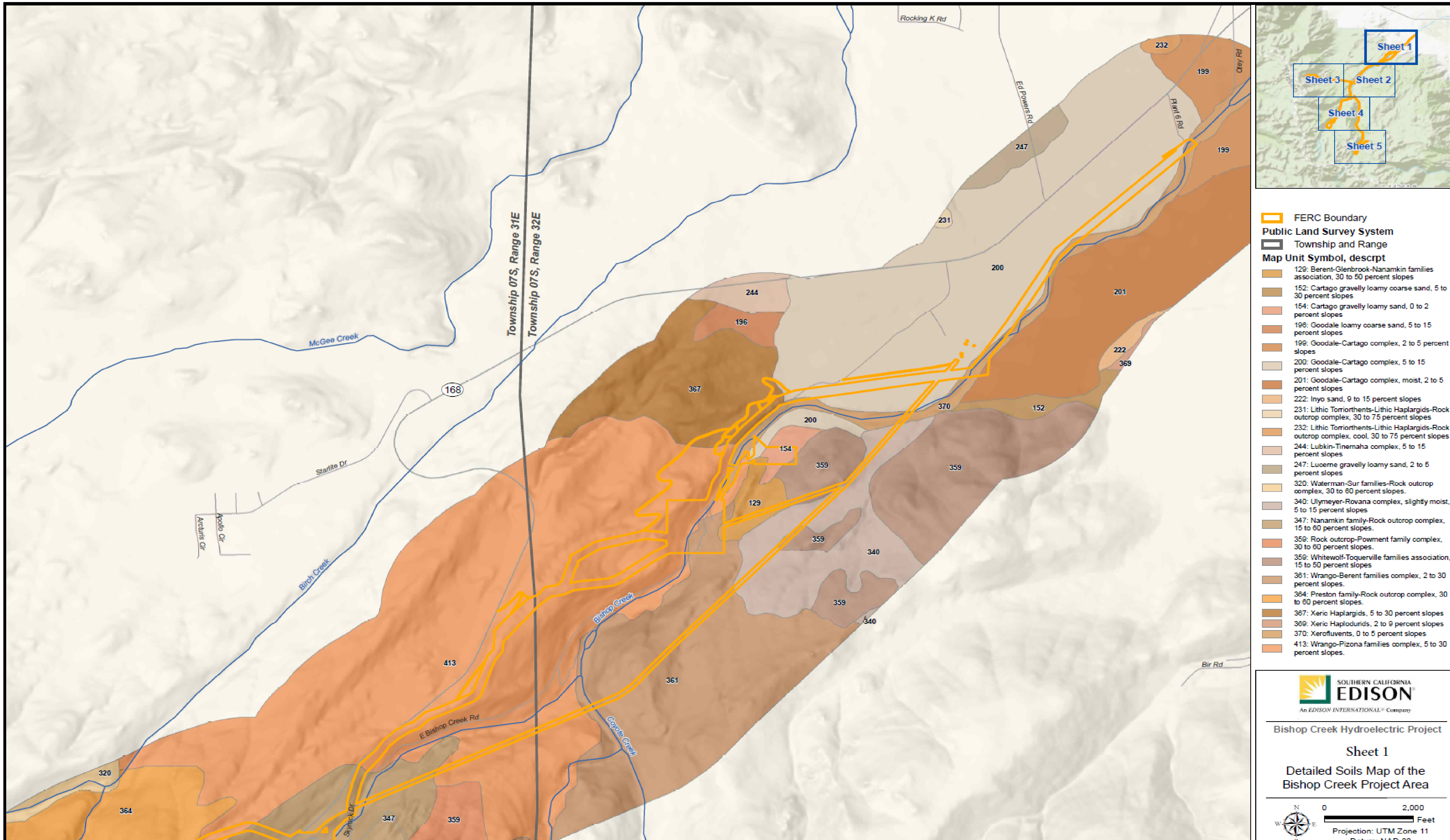

FIGURE 4-6 DETAILED SOILS MAP OF THE BISHOP CREEK PROJECT AREA – SHEET 1

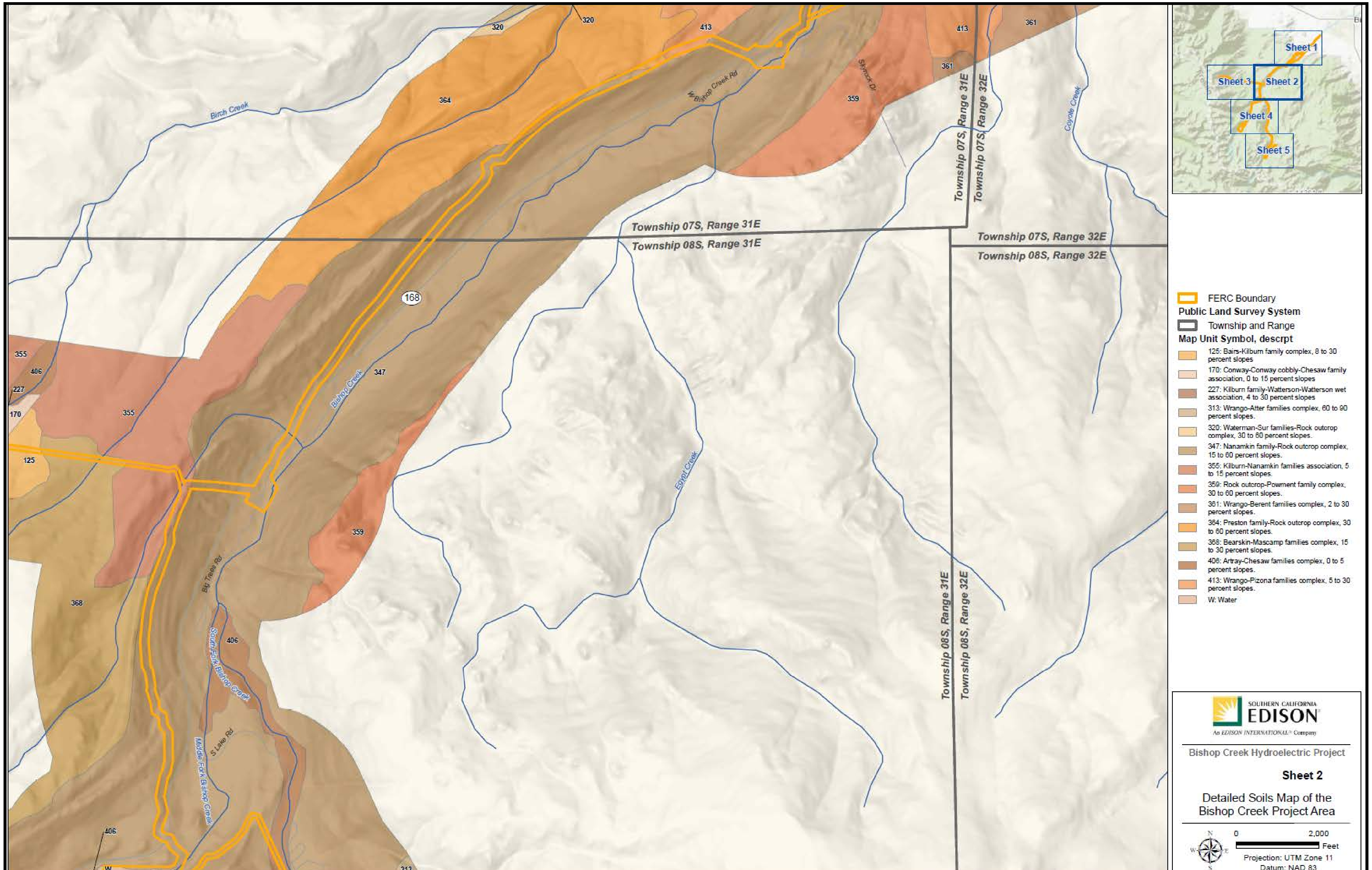

FIGURE 4-7 DETAILED SOILS MAP OF THE BISHOP CREEK PROJECT AREA - SHEET 2

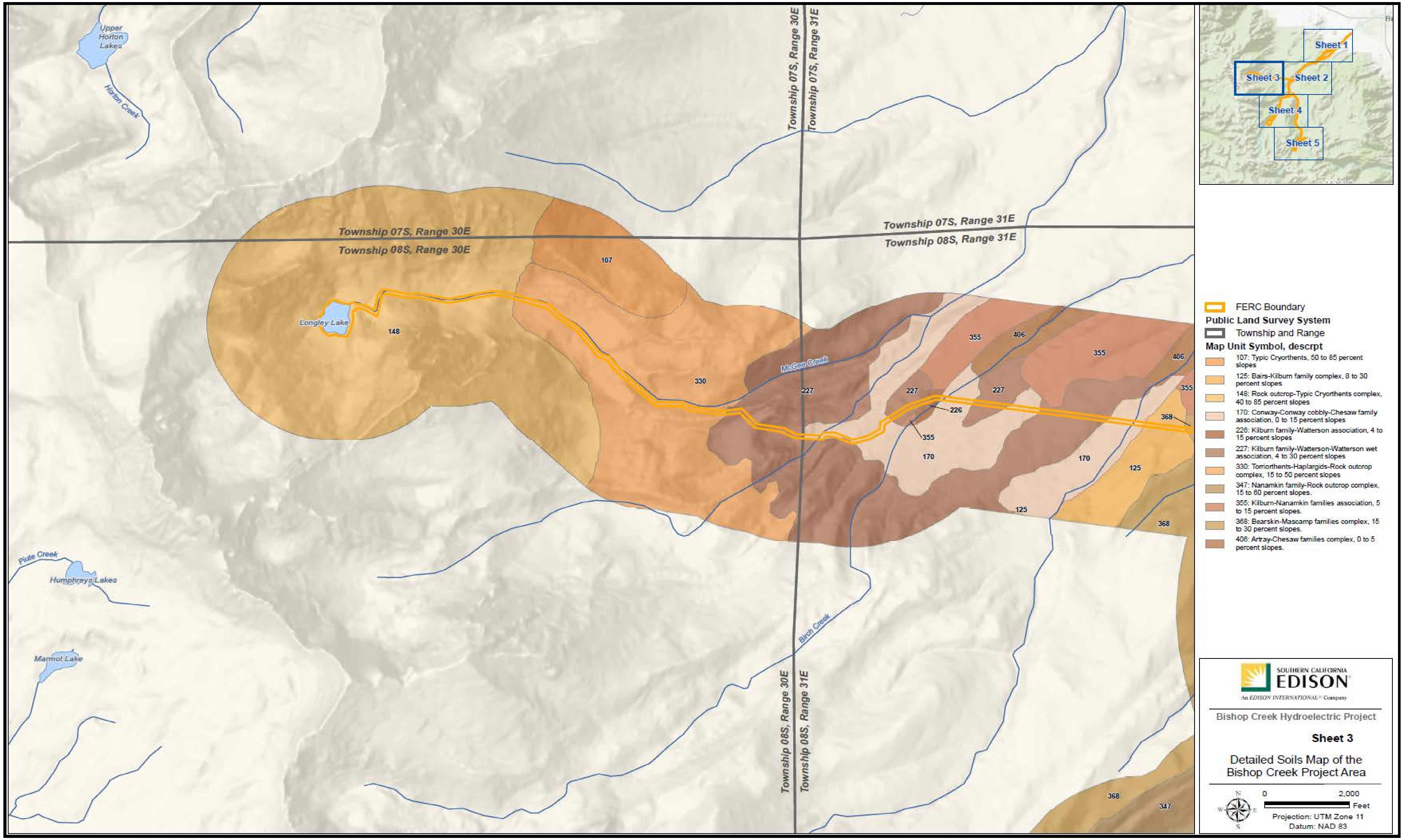

FIGURE 4-8 DETAILED SOILS MAP OF THE BISHOP CREEK PROJECT AREA - SHEET 3

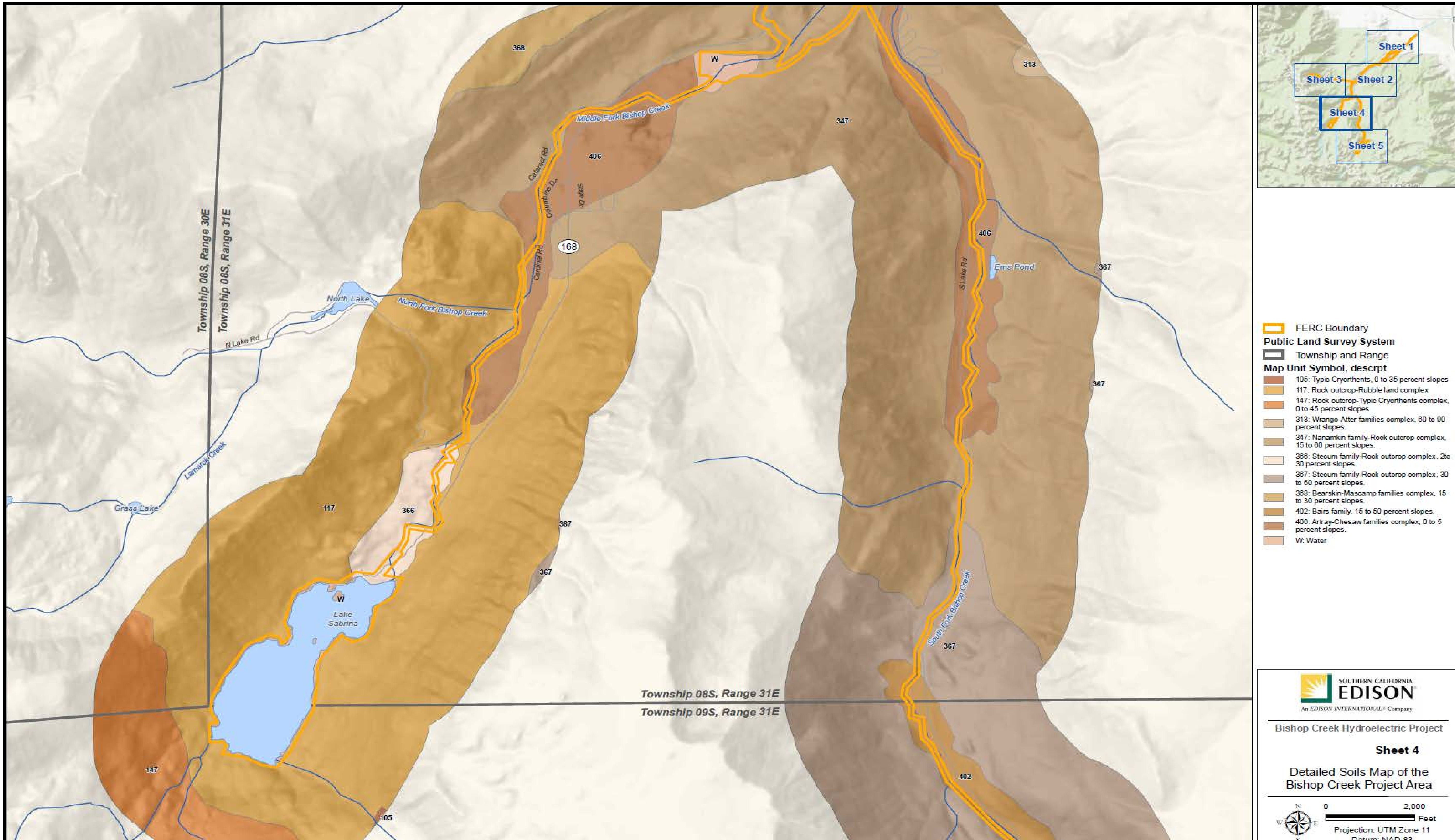

FIGURE 4-9 DETAILED SOILS MAP OF THE BISHOP CREEK PROJECT AREA - SHEET 4

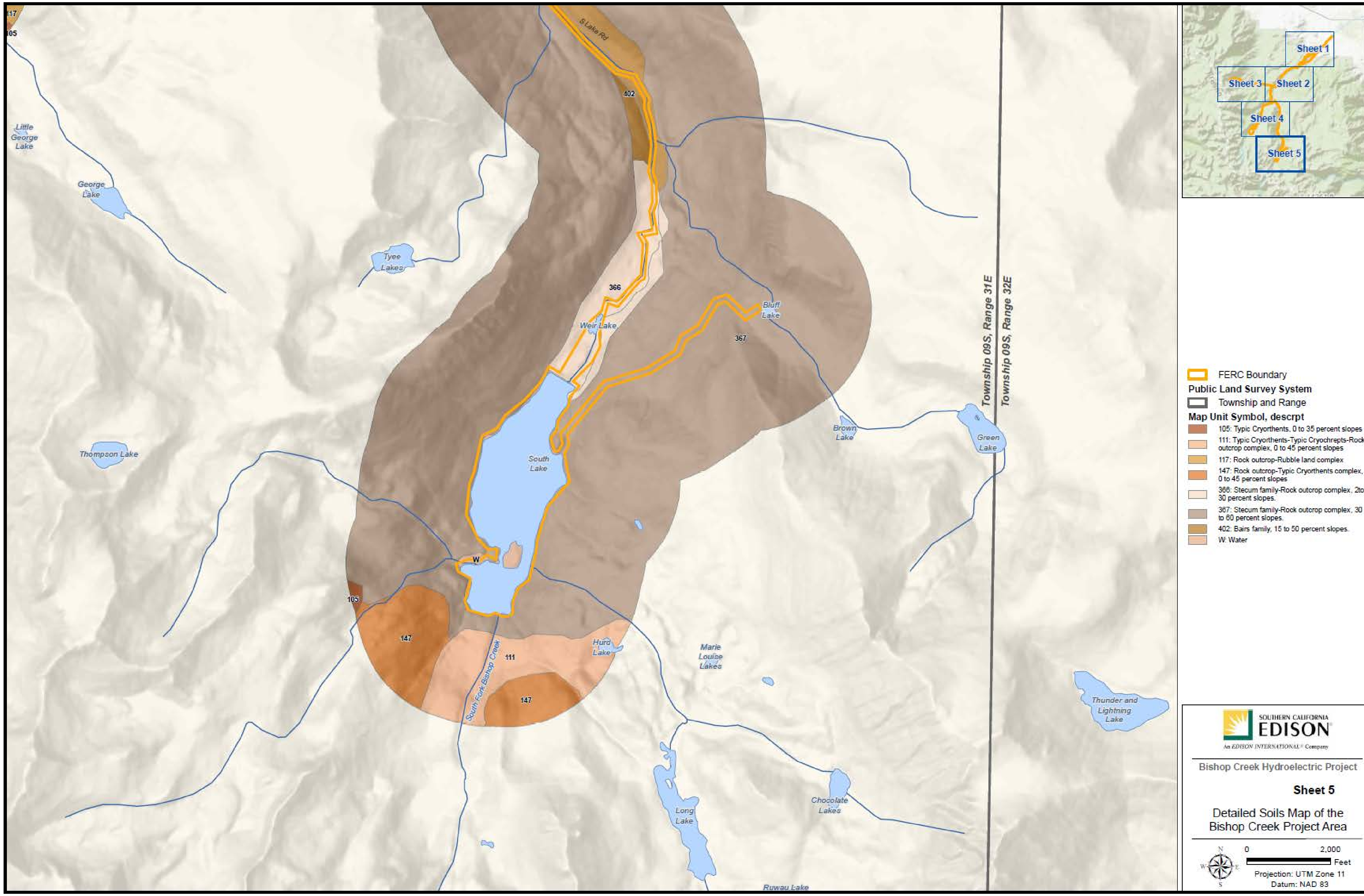

FIGURE 4-10 DETAILED SOILS MAP OF THE BISHOP CREEK PROJECT AREA - SHEET 5

Most soils underlying the Project area are comprised of sand greater than 80 percent by weight. Silt size particles comprise between 10 percent and 20 percent by weight and clay size particles generally less than 9 percent by weight. Most Project area soils have rock fragments between 0.07 inches and 9.8 inches in size constituting approximately 20 percent to 30 percent of the soil by volume. In some instances, rock fragments exceeding 23 inches in size were reported.

4.2.4 Reservoir Shoreline and Streambank Conditions

Reservoirs at the Project have surface areas spanning from 0.6 acres (Intake 3 dam) to 184 acres (Lake Sabrina) at elevations ranging from 4500 feet to 10,700 feet above msl. This variation in elevation introduces a large range of climatic regimes and ecosystems across the Project. Generally, the shorelines of the reservoirs and streambanks are moderately vegetated (Figure 4-11) and the riparian vegetation monitoring survey in 2014 found that the riparian vegetation was increasing in density or remaining the same along Bishop Creek, as compared to the baseline condition in the early 1990s (Read 2015).

FIGURE 4-11 SHORELINE ALONG PROJECT RESERVOIRS AND STREAMS

Due to the climatic and ecosystem variability, vegetative cover is generally highest in locations with adequate soil development and hydrology (near Project streams and reservoirs), while areas with inadequate hydrology (areas away from reservoirs and streams) and areas that are closely underlain by bedrock, boulders or cobble have lower vegetative cover. There are very few locations with vertical banks along the reservoirs or stream banks, aside from localized stream bank erosion that results in vertical, or nearly vertical, banks. Based on monitoring from 2014 (the most recent data), "there were no significant changes in channel geomorphology detected at the riparian monitoring sites during the post-baseline period except at the Upper McGee site," which was affected by a tree that fell in the channel and affected the stream meander pattern (Read 2015).

Most of the reservoirs have moderately sloping banks and consist of colluvium deposited along the shoreline, alluvium transported into the reservoir or stream by fluvial processes, or bedrock outcroppings. Stream bed substrate is dominated by boulders and cobble from glacial deposition, as well as alluvium (gravel and cobbles) transported by periodic high flows. There is a general armoring of the stream bed due to the presence of glacially deposited stones larger than the stream sediment transport capacity during annual snow-melt runoff. An analysis of stream bed substrate was performed in 1990 by Simon, Li & Associates (1990 SLA) to characterize substrate size from the junction of the Middle and South forks of Bishop Creek down to the downstream end of the Project. This study found that the channel substrate generally consisted of cobble or boulder-dominated substrates, with limited gravel substrates (although there were still boulders in the gravel-dominated substrates reaches). Additionally, this study indicated that the stream course development was controlled by bedrock and large boulders which limit streamflow to a relatively narrow channel. Soils in the region typically have particles ranging from boulder to clay (Table 4-3). Stream classification of the Project streams at the riparian vegetation monitoring sites resulted in classifications of B2a, B3a, and A3/A2 under the Rosgen geomorphology classification system (Rosgen 1996). This classification indicates that the channels are generally steeper than 2 percent (most are between 3 percent and 11 percent, Table 4-3) and have substrates consisting of cobble or boulder (Read 2015).

The 1990 SLA Report also evaluated stream channel processes in the Project area. This report included a review of Project geomorphology, hydrology, hydraulics and incipient motion of particles at six locations from the confluence of the South Fork and the Middle Fork of Bishop Creek down to Plant 6. The reader is referenced to the SLA Report for a summary of geology and hydrology near the Project, as well as relevant sections of this document. Following completion of the 1990 SLA Report, riparian vegetation monitoring (Psomas 2005; Read and Sada 2013; Read 2015) and aquatic habitat monitoring (Psomas 2005; Read and Sada 2013) has occurred approximately every five years at the Project. These reports provide good historical data spanning an approximate 30-year period.

4.2.5 Erosion

As described in the most recent report on periodic surveys of the channel cross section (Read 2015), the channel geomorphology at the monitored sites (on Bishop Creek, McGee Creek and Birch Creek) generally showed no significant changes from the baseline condition in the early 1990s. This result is expected given channel armoring by bedrock and large boulders as described in Section 4.2.4. A minimum flow release for Bishop Creek was initiated in 1994 after the baseline study, which proved to have no detectable effect on channel stability. Historically there are still periods of each year (often during snowmelt or fall thunderstorms) during which the flow in Bishop Creek exceeds the capacity of the powerhouses. This flow would be less than the historic channel forming flows due to the use of some of the flow for power generation; therefore, the channel is still experiencing smaller flows than the pre-Project condition, assuming all other climatic variables are similar. The hydrology of streams within the Project are further described in later sections of this report, but in general, the Project is not known to have an adverse effect on erosion within the Project streams. In contrast, increased riparian vegetation growth on stream banks in reaches that were historically dry in summer prior to the minimum releases has added to stabilizing effects of bedrock and large boulder substrates.

4.2.6 Potential Adverse Effects and Issues

SCE's review of readily available information, and early consultation with interested parties have identified sediment management as an area of potential interest for the Project; sediment may accumulate in the forebays and intakes associated with each powerhouse and diversion. Aside from minimum flow requirements of Article 105, there are no license requirements to move sediment throughout the Project; however, the long-term agreement provides a mechanism for SCE to manage sediment during O&M procedures through flushing flows. The Aquatics TWG discussed potential connections between sediment management and the downstream condition of aquatic and riparian habitat. Article 108 of the existing license requires the submission of plans to USFS and FERC for the control of erosion, stream sedimentation, dust and soil mass movement before starting land disturbing activities on USFS lands.

4.2.7 Proposed Mitigation and Enhancement Measures

SCE anticipates continuing with the PMEs identified above in the new license; although no additional mitigation or enhancement measures relating to geology and soils are planned at this time, SCE intends to evaluate the issues identified above as part of the licensing Study Plan, and in consultation with stakeholders. If any major structural changes of the Project are planned, appropriate BMPs to minimalize effects on geology and soils will be implemented; however, no structural changes are proposed at this time.

4.2.8 References

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4.3 WATER RESOURCES [§ 5.6 (D)(3)(III)]

This section describes water resources in the Project vicinity. FERC requirements for this section are specified in Title 18 of the CFR Chapter I § 5.6(d)(3)(iii). FERC regulations require information on water resources, including water use (quantity) and water quality of waters affected by the Project.

4.3.1 Drainage Area

The Project area is composed of moderate to steep ridge and valley topography with elevations ranging from approximately 4000 feet above msl to over 13,000 feet msl. Bishop Creek is a major stream with a total drainage area of approximately 70-square-miles, flowing northeastward approximately 28 miles from its headwaters to its confluence with the Owens River east of the City of Bishop. The North, Middle, and South forks of Bishop Creek originate in nearby glacial basins separated by ridges. South Lake and Lake Sabrina on the south and middle forks of Bishop Creek are the major storage reservoirs in the watershed. McGee and Birch creeks, with a combined drainage area of approximately 25-square-miles, originate on alpine slopes north of the Bishop Creek watershed and are diverted to Bishop Creek through the existing hydroelectric facilities. Figure 4-12 illustrates the relative areas of each of these drainage areas.

SCE in cooperation with U.S. Geological Survey (USGS) maintain streamflow gages on Bishop Creek and some of its tributaries. The following discussion presents the current understanding of streamflow conditions in the Bishop Creek watershed.

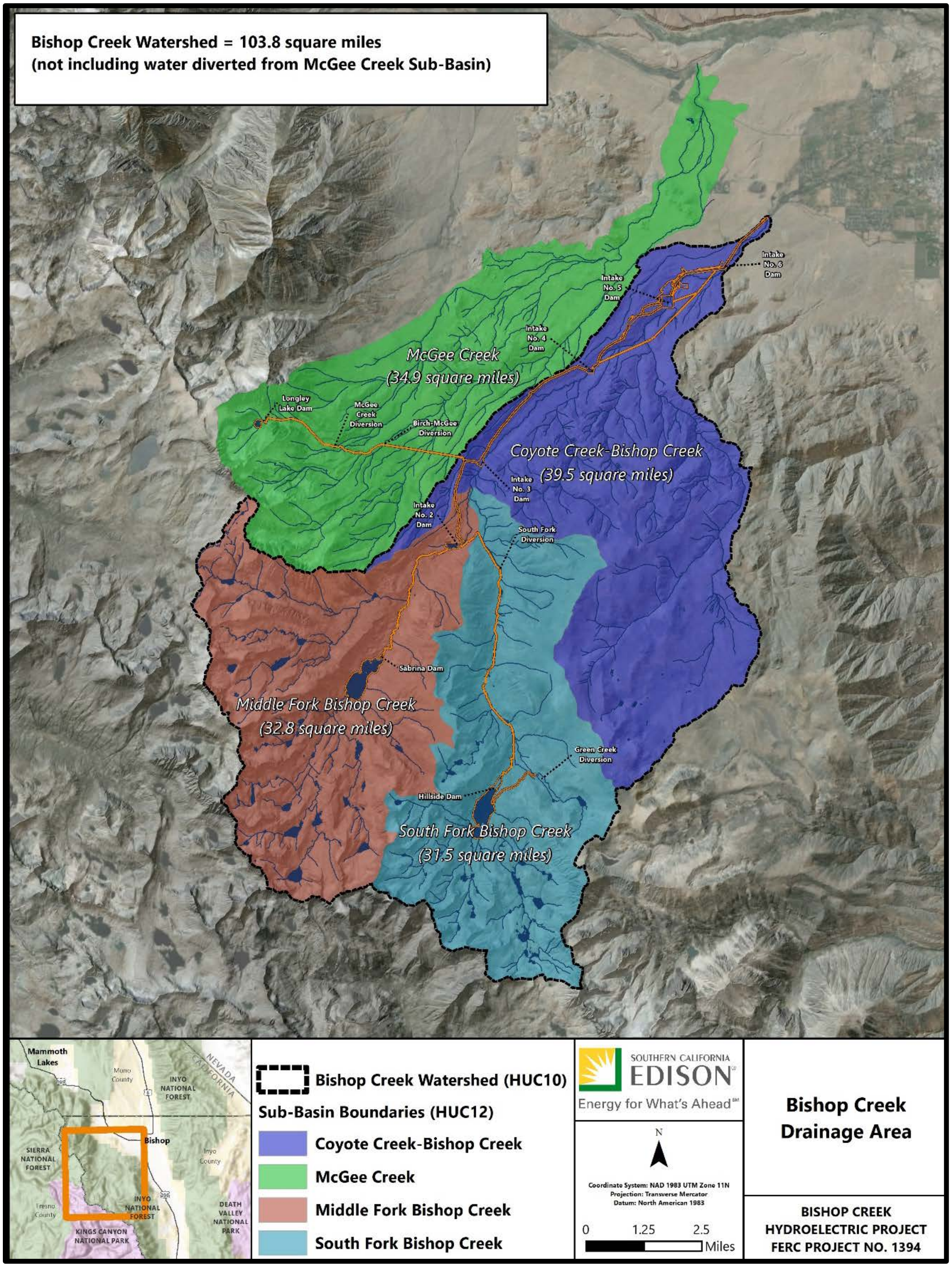

FIGURE 4-12 BISHOP CREEK DRAINAGE AREA

4.3.2 Flow Statistics

The monthly mean, minimum and maximum flows for the Project are listed below for the several gages monitored by Project staff.

Green Creek is a small tributary that normally flows into South Fork of Bishop Creek, below South Lake. SCE maintains a diversion on Green Creek and USGS gage #10270680 that (Table 4-4) presents the historical monthly mean flows measured from gage since 1986.

TABLE 4-4 MONTHLY MEAN FLOW FOR GREEN CREEK CONDUIT OUTLET NEAR BISHOP, CA[1]

WATER YEAR	MONTHLY MEAN FLOW[2]											
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
1987-88	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.220	0.960	0.501	0.074	0.000
1988-89	0.000	0.000	0.000	0.000	0.000	0.000	0.047	0.758	0.389	0.297	0.086	0.001
1989-90	0.000	0.000	0.000	0.000	0.000	0.000	0.047	0.305	0.195	0.305	0.057	0.000
1990-91	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.958	0.896	0.181	0.107
1991-92	0.000	0.000	0.000	0.000	0.000	0.000	0.015	0.916	1.14	0.445	0.230	0.046
1992-93	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.764	2.35	4.04	1.39	0.250
1993-94	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.743	1.89	0.538	0.232	0.094
1994-95	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.368	1.55	1.09	0.083	0.000
1995-96	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.598	4.46	2.85	1.31	0.537
1996-97	0.223	0.239	0.015	0.000	0.000	0.000	0.000	2.98	4.06	2.30	1.23	0.659
1997-98	0.367									5.75	2.81	2.08
1998-99									2.33	0.875	0.213	0.089
1999-00									1.84	0.402	0.130	
2000-01								1.74	1.77	0.538	0.027	
2001-02										0.110	0.000	0.000
2002-03									3.01	0.806	0.212	
2003-04									0.844	0.581	0.025	0.000
2004-05	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2005-06												
2006-07	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2007-08												
2008-09	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2009-10	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2010-11										0.000	0.000	0.000
2011-12												
2012-13	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.220	0.960	0.501	0.074	0.000
2013-14	0.000	0.000	0.000	0.000	0.000	0.000	0.047	0.758	0.389	0.297	0.086	0.001
2014-15	0.000	0.000	0.000	0.000	0.000	0.000	0.047	0.305	0.195	0.305	0.057	0.000
2015-16	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.958	0.896	0.181	0.107
Mean	0.04	0.02	0	0	0	0	0.01	0.63	1.5	1	0.38	0.2

Source: USGS 2018

[1] At USGS Station No. 10270680
[2] Cubic feet per second

USGS gage #10270800 (Sf Bishop C Bl S Lk Nr Bishop Ca) is located on the South Fork of Bishop Creek below South Lake. The maximum flow measured with the USGS gage, for the period of record (1985 through 2017), was 168 cfs (1.61-feet gage height) on July 18, 2017. Table 4-5 provides the monthly mean flow, measured by the USGS gage, at the South Fork of Bishop Creek site. Most runoff occurs between May and September with the remainder of the period with monthly mean flows generally less than 24 cfs.

TABLE 4-5 MONTHLY MEAN FLOW FOR SOUTH FORK OF BISHOP CREEK BELOW SOUTH LAKE, BISHOP, CA[1]

WATER YEAR	MONTHLY MEAN FLOW[2]											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1985-86	29.4	25.5	24.3	17.3	26.3	26.1	45.8	38.2	55.5	72.8	56.5	34.2
1986-87	44.7	18.4	37.2	24.5	9.36	9.49	9.49	18.6	15.1	27.8	33.4	22.9
1987-88	20.3	21.4	22.6	29.4	34.6	28.5	16.1	32.2	22.8	20.3	17.0	27.2
1988-89	16.5	12.4	12.1	10.1	13.7	9.53	16.7	35.3	14.0	17.1	39.4	38.3
1989-90	29.5	6.73	6.96	7.48	7.37	6.71	14.0	19.7	17.1	12.1	16.9	15.6
1990-91	10.8	10.6	9.98	7.59	7.45	7.75	10.2	20.5	7.70	9.45	20.5	26.4
1991-92	41.0	22.9	24.8	16.8	8.81	7.92	7.74	17.2	15.4	21.5	25.7	36.4
1992-93	21.2	13.4	13.3	35.8	54.2	19.3	12.8	26.0	15.0	19.4	49.4	29.2
1993-94	30.3	24.0	32.6	23.5	13.0	13.7	14.7	10.6	22.8	21.6	31.0	27.0
1994-95	15.7	16.4	18.3	17.1	47.0	52.5	52.6	31.8	23.7	61.4	87.7	39.8
1995-96	15.5	14.8	17.4	34.2	44.8	55.3	57.4	36.7	28.8	50.8	43.1	41.6
1996-97	25.1	20.9	23.0	29.5	51.7	61.6	21.0	18.6	15.3	61.1	41.7	29.7
1997-98	41.6	41.1	35.3	34.1	32.5	35.2	34.0	15.2	19.9	51.7	64.1	47.6
1998-99	27.8	39.2	35.7	26.5	21.8	23.0	31.4	22.0	17.4	20.9	31.6	30.7
1999-00	31.9	34.1	30.5	16.6	16.7	29.1	51.0	18.8	15.9	15.2	27.3	25.2
2000-01	17.4	30.1	27.2	18.8	15.5	20.3	20.0	16.2	16.5	34.1	29.3	17.0
2001-02	14.8	31.2	44.1	40.0	32.5	16.2	14.9	26.9	14.0	15.0	14.0	35.4
2002-03	30.4	17.6	18.0	15.6	15.0	14.2	17.4	21.4	16.2	16.7	28.4	21.0
2003-04	23.2	23.1	22.7	21.2	30.6	22.7	17.5	15.8	16.4	14.7	14.8	32.4
2004-05	22.0	19.4	22.1	21.5	22.7	26.5	34.9	22.6	45.8	74.9	41.7	27.8
2005-06	24.6	14.4	21.3	30.0	44.6	43.8	44.4	42.8	50.5	95.5	42.8	18.9
2006-07	28.5	38.5	36.8	24.0	18.7	18.0	16.5	15.5	14.8	15.8	19.3	24.2
2007-08	17.3	16.2	16.0	16.0	14.8	15.9	14.3	22.5	18.2	15.7	27.7	19.5
2008-09	16.0	15.9	16.0	15.4	14.5	14.0	15.4	15.9	16.9	26.8	38.3	30.1
2009-10	26.1	26.3	27.8	25.6	21.9	21.7	29.6	36.0	23.3	19.4	33.5	28.7
2010-11	24.7	45.8	43.5	42.3	39.9	41.6	16.3	38.0	41.4	15.9	34.3	27.9
2011-12	24.5	19.7	24.6	17.2	15.3	14.8	16.4	33.5	38.7	28.6	34.6	15.0
2012-13	14.1	24.5	14.8	14.0	14.0	15.6	19.4	24.8	39.4	36.5	41.5	11.3
2013-14	5.52	5.01	5.06	4.28	4.95	6.14	14.8	31.8	37.5	31.4	22.8	9.40
2014-15	5.41	4.31	5.57	4.77	5.71	6.68	8.23	16.5	14.6	14.1	15.5	13.3
2015-16	8.86	8.82	8.59	8.57	8.64	8.50	14.3	21.5	14.7	17.6	20.8	18.2
2016-17	14.0	13.8	13.1	13.3	18.8	58.1	42.7	65.3	72.8	110.6	63.3	41.8
Mean	22	21	22	21	23	23	23	26	25	33	35	27

Source: USGS 2018

[1] At USGS Station No. 10270800
[2] Cubic feet per second

Further downstream on the South Fork of Bishop Creek, SCE has a diversion structure that diverts a portion of the flow of South Fork to the Intake No. 2 reservoir. Streamflow gage USGS #10270830 is maintained just below the diversion structure. Table 4-6 provides the monthly mean flow, measured by the USGS gage, at the South Fork of Bishop Creek site. Most runoff occurs between May and October with the remainder of the period with monthly mean flows generally less than 10 cfs.

TABLE 4-6 MONTHLY MEAN FLOW FOR SOUTH FORK OF BISHOP CREEK BELOW SOUTH FORK DIVERSION DAM NEAR BISHOP, CA[1]

WATER YEAR	MONTHLY MEAN FLOW[2]											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1994-95	10.9	7.97	7.83	7.79	8.02	7.73	8.41	11.1	11.5	19.4	16.1	11.9
1995-96	11.0	8.53	8.13	8.19	8.40	8.86	9.5	11.2	12.1	12.6	12.4	12.5
1996-97		8.35	8.25	7.60	7.63	7.69	8.35	11.0	10.6	16.3	10.8	
1997-98	10.8	7.53	7.41	7.45	7.37	7.30	8.04	10.1	12.5	15.1	14.1	10.9
1998-99	10.9	7.39	8.43	7.58	7.54	7.65	8.11	10.6	10.5	10.4	10.5	10.5
1999-00	10.7		7.59	7.61	7.62	8.88	8.49	10.1	10.4	10.5	10.9	10.2
2000-01	10.1	7.42	7.29	7.33	7.46	7.47	7.9	10.1	10.5	10.8	10.9	11.3
2001-02	10.8	7.9	7.73	8.45	8.13	7.73	8.44	10.9	10.7	10.8	11.0	10.9
2002-03	11.0	9.05	7.57	7.55	7.63	7.60	8.12	11.0	11.0	11.0	10.7	10.9
2003-04	11.0	7.60	8.34	8.86	7.76	7.66	8.20	10.9	10.7	11.5	13.0	2.58
2004-05	0.000	0.000	0.000	0	0	0	1.25	13.4	13.7	14.6	14.3	12.0
2005-06	11.6	8.24	7.65	7.62	9.69	13.4	13.0	13.3	12.3	11.9	11.6	12.9
2006-07	13.2	11.0	11.0	12.9	11.0	14.0	14.0	14.0	14.0	12.5	11.0	11.0
2007-08	10.6	10.7	10.4	10.3	10.3	10.3	10.3	10.4	10.4	11.1	10.4	10.4
2008-09	10.1	9.13	7.48	7.49	7.50	7.50	8.15	10.0	10.7	11.0	11.0	11.0
2009-10	10.6	7.79	7.29	7.72	7.34	7.73	8.63	10.7	10.9	11.4	12.0	11.2
2010-11	10.6	7.83	7.75	7.64	7.70	7.64	7.64	11.9	10.8	10.6	11.0	11.0
2011-12	11.0	7.55	7.61	7.62	7.91	7.83	8.26	7.39	7.49	7.15	9.13	10.9
2012-13	11.0	8.01	7.40	7.55	7.50	7.50	8.00	10.6	10.4	10.9	10.3	10.4
2013-14	10.5	0.000	0.000	0.000	0.000	0.000	0.000	5.36	10.5	10.9	10.8	10.0
2014-15									10.0	10.0	10.0	10.2
2015-16	11.0	8.37	7.30	7.30	7.30	7.52	8.06	10.9	11.0	10.7	10.6	10.2
2016-17	10.7	8.05	7.79	7.80	7.82	8.13	8.50	10.9				13.0
Mean	10	7.5	7.3	7.4	7.3	7.7	8.2	11	11	12	11	11

Source: USGS 2018

[1] At USGS Station No. 10270830
[2] Cubic feet per second

USGS streamflow gage is located on the Middle Fork of Bishop Creek, just below Lake Sabrina (USGS #10270872). The maximum flow measured with the USGS gage, for the period of record (1985 through 2017), was 249 cfs (2.04-feet gage height) on July 21, 1998. Table 4-7 provides the monthly mean flow, measured by the USGS gage, at the Middle Fork of Bishop Creek site. Most runoff occurs between May and September with the remainder of the period with monthly mean flows generally less than 30 cfs.

TABLE 4-7 MONTHLY MEAN FLOW FOR MIDDLE FORK OF BISHOP CREEK BELOW LAKE SABRINA NEAR BISHOP, CA[1]

Water Year	Monthly Mean Flow[2]											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1985-86	21.0	21.3	22.2	17.4	18.4	29.4	34.8	60.8	106.4	113.7	69.4	36.0
1986-87	32.5	14.7	21.9	20.5	11.5	11.8	9.91	19.2	29.5	43.0	35.9	25.5
1987-88	19.7	16.1	17.4	21.4	23.2	18.7	14.1	21.7	29.8	23.1	39.0	33.8
1988-89	20.1	15.7	13.5	13.5	20.5	24.4	34.8	13.2	24.7	32.9	17.5	21.9
1989-90	20.7	11.7	8.57	9.01	9.20	18.3	16.7	30.8	23.5	22.2	34.5	35.0
1990-91	11.8	9.74	11.3	7.63	7.11	6.91	24.1	18.7	11.6	48.0	36.0	26.9
1991-92	17.8	16.0	14.4	16.4	8.81	21.2	27.3	20.5	26.2	34.6	33.8	28.7
1992-93	16.7	8.56	10.2	25.8	43.8	15.6	10.4	42.5	50.1	85.1	59.3	29.8
1993-94	20.5	19.1	24.8	35.2	37.2	28.1	15.1	9.28	9.14	30.6	36.5	22.7
1994-95	18.0	20.1	20.3	21.1	43.6	41.6	34.8	18.8	50.0	147.2	107	49.4
1995-96	19.0	16.2	15.2	29.7	36.2	36.2	41.1	43.4	57.5	93.7	62.8	44.2
1996-97	19.1	20.5	20.4	29.7	46.1	32.3	17.0	25.0	91.1	81.7	46.1	33.2
1997-98	40.9	24.7	17.9	19.7	21.0	21.2	25.7	20.9	35.5	145.6	81.2	48.2
1998-99	25.5	36.4	30.3	25.0	20.8	20.0	13.6	21.0	31.3	68.4	37.6	33.9
1999-00	25.0	29.6	15.5	15.1	24.8	43.1	12.1	17.4	34.8	59.8	44.7	26.2
2000-01	19.5	29.9	26.2	16.5	14.5	14.8	18.0	17.5	55.6	58.5	40.6	41.1
2001-02	39.4	20.5	16.3	14.6	13.8	15.5	20.4	21.0	14.6	22.6	42.5	27.1
2002-03	13.0	10.2	16.8	15.0	17.0	15.1	20.3	20.5	50.5	60.0	46.8	23.4
2003-04	16.1	14.7	15.1	14.3	22.3	23.9	26.5	27.1	23.7	80.4	98.7	19.0
2004-05	7.84	10.0	7.39	9.40	9.13	8.94	10.4	21.4	82.0	118.5	59.2	41.0
2005-06	45.7	51.9	32.6	13.2	7.42	10.1	14.4	102.9	102.0	118.9	57.7	27.1
2006-07	16.1	26.0	25.8	21.2	18.0	17.6	16.9	15.8	17.2	23.5	23.8	22.6
2007-08	18.5	17.9	13.8	13.2	14.8	15.9	22.7	25.1	20.7	39.9	40.7	21.5
2008-09	16.6	15.6	16.4	14.2	13.9	14.6	17.3	19.3	36.4	78.0	38.8	26.2
2009-10	22.9	18.6	16.6	16.6	21.3	44.6	30.1	17.9	18.9	121.5	44.8	27.1
2010-11	26.3	15.3	14.9	16.0	15.4	17.6	54.6	64.3	42.2	106.0	67.3	38.2
2011-12	38.9	22.8	22.5	17.0	15.3	15.3	15.0	16.1	29.0	43.4	38.5	42.3
2012-13	48.0	8.75	9.27	7.14	5.27	6.22	15.9	36.8	29.5	40.0	35.7	10.7
2013-14	5.46	4.41	4.94	4.29	4.96	6.64	14.0	25.4	26.1	21.7	15.4	17.4
2014-15	12.3	10.7	9.45	10.2	9.84	9.58	8.37	19.5	15.4	19.6	27.8	21.3
2015-16	9.99	10.0	9.21	7.82	7.35	9.36	16.2	26.6	35.7	55.7	55.0	25.8
2016-17	18.0	18.5	17.5	13.7	18.6	31.2	44.0	83.7	132.4	151.4	79.0	55.3
Mean	22	18	17	17	19	20	22	30	42	68	49	31

Source: USGS 2018

[1] At USGS Station No. 10270872
[2] Cubic feet per second

Further downstream on the Middle Fork of Bishop Creek, a streamflow gage USGS #10270877 is maintained below Intake No. 2 reservoir. Table 4-8 provides the monthly mean flow, measured by the USGS gage, at the Middle Fork of Bishop Creek site. Most runoff occurs between May and October with the remainder of the period with monthly mean flows generally less than 7 cfs.

TABLE 4-8 MONTHLY MEAN FLOW FOR MIDDLE FORK OF BISHOP CREEK BELOW INTAKE NO. 2 RESERVOIR NEAR BISHOP, CA[1]

WATER YEAR	MONTHLY MEAN FLOW[2]											
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
1988-89	3.03	2.30	2.61	2.50	2.50	2.62	3.56	2.66	2.54	2.63	3.90	5.15
1989-90	3.96	2.34	2.78	2.61	2.61	2.60	2.63	2.71	2.72	2.78	2.51	2.57
1990-91	2.71	2.73		5.96	2.47	2.75	17.8				6.75	3.45
1991-92		2.44	2.37	2.38	2.42	2.32	2.34	2.52	2.69	2.59	2.54	2.52
1992-93	2.49	2.47	2.36	2.46	2.37	2.82	3.27					2.77
1993-94	2.85	2.74	2.52	2.47	2.9	2.96	2.71	2.65	2.58	2.54	4.35	6.07
1994-95	6.02	5.64	5.50	5.56	5.61	5.72	6.37	10.8				
1995-96	11.8	9.71	8.27	8.11	8.05	8.16	9.30					12.2
1996-97		7.9	7.39		7.30	7.42	8.01					10.9
1997-98		8.06	7.81	7.92	7.86	7.89		10.1				
1998-99	13.0		7.37	7.66	7.77	7.69	8.65	10.7	12.9		10.7	11.0
1999-00	11.3		7.5	7.47	7.51	7.68	7.91	11.2			11	11.0
2000-01	11.6		8.15	8.06	8.16	8.34	8.20				6.07	6.02
2001-02			5.68	5.53	5.49	5.56	5.56	5.50	6.04	6.01	5.89	
2002-03				7.06	6.77	6.66	6.99	11.6		11.6	11.0	11.0
2003-04	11.0	9.14	8.21	7.83	7.93	8.00						
2004-05	15.5	18.0	14.9	18.5	17.0	18.1						12.8
2005-06	11.3	8.76	8.58		8.53	8.83	9.09					15.0
2006-07	14.9		16.0						8.19	8.47	8.37	8.30
2007-08	8.36						10.6		13.9		11.0	11.0
2008-09	11.0	10.1	8.47		8.64		9.05	11.6				12.9
2009-10		8.31	7.80	7.84	7.60	7.67	8.83	11.1	11.2	12.0	12.0	11.4
2010-11	11.0	7.99	7.82	7.99	7.77	7.83	8.19	11.0	11.0	11.0	11.0	11.2
2011-12	11.1	8.01	7.89	7.89	8.57	8.59	8.15	8.14	8.10	7.67	6.16	6.10
2012-13	6.11	6.12	6.13	6.15	5.85	5.87	5.84	5.76	5.71	5.75	5.88	5.76
2013-14	5.9	5.89	6.19	6.16	6.27	6.27	6.25	5.88	5.76	5.74	5.73	5.75
2014-15	5.71	5.86	5.76	5.66	5.67	5.67	5.66	5.65	5.71	5.77	5.65	5.80
2015-16	5.83	5.81	5.85	5.86	5.69	5.67	6.08	11.0	11.0	11.0	11.3	11.0
2016-17	11.0	7.92	7.99	7.89	7.80	7.83	8.10	11.0	10.8	10.0	11.6	11.2
Mean	8.6	6.7	7.0	6.6	6.6	6.6	7.2	8.0	7.6	7.0	7.7	8.5

Source: USGS 2018

[1] At USGS Station No. 10270877
[2] Cubic feet per second

Immediately below Intake No. 3 reservoir, a streamflow gage USGS #10270885) is maintained by the USGS in Bishop Creek. Table 4-9 provides the monthly mean flow, measured by the USGS gage, at the Bishop Creek site. Monthly mean flow of this portion of Bishop Creek has been fairly-consistent ranging from 12 to 15 cfs.

TABLE 4-9 MONTHLY MEAN FLOW FOR BISHOP CREEK BELOW INTAKE NO. 3 DIVERSION DAM NEAR BISHOP, CA[1]

WATER YEAR	MONTHLY MEAN FLOW[2]											
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
1994-95		13.9	14.9	15.0	15.0							
1995-96	13.7	14.0		14.5	14.9	15.0						15.0
1996-97		15.1	14.8			15.0	14.4					15.0
1997-98		15.9		16.1	16.0	16.0	15.9	15.1				
1998-99			14.0	14.4	15.0	15.0	14.5	13.9	13.9		14.2	
1999-00			18.6	17.3	15.0		14.6	15.0			14.1	14.0
2000-01			15.0	14.7	14.0	14.0	14.4		14.0		13.1	14.0
2001-02			14.0	14.0	14.0	14.0	14.0	13.1	13.1	14.0	13.8	13.5
2002-03	14.0		14.3	14.2	14.0	14.0	14.0			15.0	14.2	14.6
2003-04	14.8	15.0	15.1	15.0	15.0	15.2						
2004-05	16.7	16.0	15.0		14.0		15.2					
2005-06						15.0						17.0
2006-07										14.0	14.0	14.0
2007-08							15.7					15.0
2008-09			15.0	15.0		15.0		15.0			15.0	15.0
2009-10		15.0	15.0	15.0	15.0	15.0						15.0
2010-11				15.0	15.0							
2011-12	15.0	16.3	16.6	16.8	15.2	14.8	15.0	15.0	14.6			15.0
2012-13		15.0	15.0	15.0	15.1		15.0		15.0			
2013-14	14.0	14.0	14.0	14.0	14.1	14	14.0			14.0		
2014-15			13.6	13.7	13.8		15.9	15.2	14.5	15.1	15.2	14.4
2015-16	14.0	14.0	14.0	14.0	14.0	14.0		14.4	14.0	14.9	15.0	14.6
2016-17	14.5	14.4	14.8	15.7	15.8	14.4	14.1	14.1	13.4	14.2	14.6	15.9
Mean	15	15	15	15	15	15	15	15	14	14	14	15

Source: USGS 2018

[1] At USGS Station No. 10270885
[2] Cubic feet per second

Immediately below Intake No. 4 reservoir, a streamflow gage USGS #10270940 is maintained by the USGS in Bishop Creek. Table 4-10 provides the monthly mean flow, measured by the USGS gage, at the Bishop Creek site. Monthly mean flow of this portion of Bishop Creek has been fairly-consistent ranging from 6 to 8 cfs.

Table 4-10 Monthly Mean Flow for Bishop Creek below Intake No. 4 Diversion Dam near Bishop, CA[1]

Water Year	Monthly Mean Flow[2]											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1994-95	6.16	5.65	5.87	6.31	6.41	7.72	6.66	6.22				
1995-96	6.26	5.79	6.25	6.09	6.11	6.09						7.38
1996-97		6.23	5.84		7.48		5.88					5.58
1997-98		6.04		5.33	5.50	5.60	6.29	5.81				
1998-99			6.15	5.88	8.19	5.70	5.79	5.53			6.21	6.43
1999-00			6.26	6.21	6.10		6.35	7.39			5.66	6.00
2000-01	6.12		6.30	6.10	5.54		5.79	7.33			6.33	6.53
2001-02			6.19	6.28	6.25	5.91	5.72		5.66	5.76	7.06	6.07
2002-03	6.28	6.84	7.08	6.35	5.72	5.31	5.36				6.75	6.23
2003-04	6.15	6.04	6.35		5.35	5.55						
2004-05	6.90	6.78	7.10	7.32	7.10		7.14					11.0
2005-06	11.0	11.9	12.0	11.6		8.37	8.08					13.0
2006-07			11.1								6.82	
2007-08	7.98					7.63	7.53					8.58
2008-09			8.59	8.73				8.04				6.9
2009-10	6.90	6.92	6.93	7.09	7.22		7.43	7.00				6.00
2010-11		6.35	7.40	7.36		7.67						
2011-12					9.11		6.73	6.91				
2012-13				5.71	5.69							5.65
2013-14	5.72	6.42	5.56	5.20	5.20				5.82	5.79	6.02	6.22
2014-15	6.08	6.57	5.40	5.30	5.23	5.25	5.21	6.25	6.23	6.19	6.21	6.29
2015-16	6.32	6.36	6.39	6.29	6.21	6.20	5.83	5.75	5.72	5.99		
2016-17			5.53	5.66	5.70	5.71	5.79	5.93	5.86	5.80	5.78	6.64
Mean	6.8	6.8	7.0	6.6	6.3	6.4	6.3	6.6	5.9	5.9	6.3	7.1

Source: USGS 2018

[1] At USGS Station No. 10270940
[2] Cubic feet per second

Immediately below Intake No. 5 reservoir, a streamflow gage USGS #10270970 is maintained by the USGS in Bishop Creek. Table 4-11 provides the monthly mean flow, measured by the USGS gage, at the Bishop Creek site. Monthly mean flow of this portion of Bishop Creek has been fairly-consistent ranging from 19 to 21 cfs.

TABLE 4-11 MONTHLY MEAN FLOW FOR BISHOP CREEK BELOW INTAKE NO. 5 DIVERSION DAM NEAR BISHOP, CA[1]

WATER YEAR	MONTHLY MEAN FLOW[2]											
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
1994-95	18.8	18.7	19	19.0	19.0	19.3	18.9	18.9				
1995-96	19.0	19.0		19.1	19.0	18.9						19.3
1996-97		18.6	18.3		19.0		20.0					
1997-98		19.0	18.9	18.2	19.0							
1998-99			20.0	19.5	19.9	19.6	19.4	19.5	18.3		20.1	20.5
1999-00			20.1	20.0				19.3				20.7
2000-01	20.8		19.1	19.0	19				20.5			19.0
2001-02											20.0	20.0
2002-03				20.2	19.8	20.1	19.9				19.7	19.6
2003-04	19.4	19.3			19.6	19.6		20.4				
2004-05	19.7		19.7		20.0		20.0					
2005-06												20.3
2006-07								19.4	19.5	19.7		19.8
2007-08					21.1		20.3					20.0
2008-09		19.7	19.5	20.1				20.7				
2009-10		19.0		23.3	22.1							20.9
2010-11												
2011-12					21							
2012-13		21.1	21.8	22.7	19.4		19.0		19.0			19.4
2013-14	19.1	20.1	20.0	19.5	19.6	19.1	19.0				20.3	20.5
2014-15					20.2	19.9	19.0	19.0		18.7	20.0	20.0
2015-16	19.1	19.2	19.0	19	19.7	20.0		20.0			21.6	21.0
2016-17				19	19.7	21.1						
Mean	19	19	20	20	20	20	20	20	19	19	20	20

Source: USGS 2018

[1] At USGS Station No. 10270970
[2] Cubic feet per second

The USGS also maintains gage USGS #10271200 (Bishop C AB PP No 6 Nr Bishop Ca) on Bishop Creek immediately above Powerhouse No. 6. Table 4-12 provides the monthly mean flow, measured by the USGS gage, at the Bishop Creek site. Similar to the South Fork gage, most runoff occurs between May and September with the remainder of the period with monthly mean flows generally less than 20 cfs. The maximum flow measured with the USGS gage, for the period of record (1988 through 2017), was 453 cfs (3.77-feet gage height) on July 23, 1998.

TABLE 4-12 MONTHLY MEAN FLOW FOR BISHOP CREEK ABOVE POWER PLANT NO. 6, BISHOP, CA[1]

WATER YEAR	MONTHLY MEAN FLOW[2]											
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
1988-89	0.211	0.369	0.278	5.92	0.306	0.184	0.20	0.133	0.114	0.026	0.107	0.357
1989-90	0.180	0.268	0.325	0.252	0.412	7.72	5.02	0.252	0.12	0.140	0.167	0.216
1990-91	0.193	0.190	0.196	0.211	0.244	5.46	0.21	0.153	0.504	1.25	0.354	0.372
1991-92	0.171	0.285	0.333	0.385	2.35	0.188	0.177	0.124	0.064	0.035	0.048	0.082
1992-93	0.106	0.193	0.187	0.171	0.21	0.277	0.193	19.1	23.4	61.0	35.9	1.98
1993-94	1.78	14.9	1.58	1.55	1.58	7.54	1.87	1.92	1.66	1.65	1.93	2.42
1994-95	1.76	1.56	2.36	8.50	2.15	1.69	2.01	1.71	61.6	239.7	171.1	17.8
1995-96	1.97	1.89	5.34	1.89	1.41	1.36	15.9	29.9	74.6	97.5	26.7	2.33
1996-97	5.78	1.78	1.52	38.6	1.01	1.65	2.16	15.5	86.7	94.5	22.2	2.90
1997-98	37.4	4.37	1.29	1.35	10.9	1.23	0.75	1.12	35.1	229.2	103.9	37.5
1998-99	12.7	24.0	1.25	0.945	3.53	4.61	1.18	1.55	10.3	24.6	1.15	0.951
1999-00	3.82	32.3	1.02	0.819	0.999	2.23	1.09	2.12	39.9	11.6	7.25	0.799
2000-01	22.6	28.4	6.09	1.59	1.68	1.57	7.48	27.8	13.7	65.1	1.31	0.956
2001-02	12.2	68.1	79.1	31.6	14.9	53.1	66.0	44.9	0.974	2.43	1.02	1.15
2002-03	27.4	1.24	2.95	1.04	1.14	1.55	2.55	2.40	21.1	3.43	1.34	1.18
2003-04	0.951	0.605	0.713	0.476	0.627	1.41	9.61	1.11	16.5	13.9	36.5	40.8
2004-05	55.1	54.3	52.9	5.36	0.539	0.597	0.514	14.8	86.1	171.9	39.9	82.9
2005-06	96.2	91.5	81.2	72.5	79.9	0.996	0.987	110.7	147.8	204.0	36.8	0.812
2006-07	2.96	2.04	1.27	1.09	0.904	1.17	0.843	0.590	5.24	0.401	0.36	0.399
2007-08	2.32	47.5	33.5	1.84	0.920	0.986	8.36	99.3	111	38.6	0.256	0.260
2008-09	0.437	0.332	0.382	0.606	0.924	2.87	0.985	1.83	4.42	29.3	0.302	0.182
2009-10	0.420	32.6	65.9	63.7	63.3	85.8	86.0	97.5	151.7	262.6	117.4	0.954
2010-11	0.594	28.3	0.674	0.663	1.21	3.88	77.2	34.3	65.5	120.4	51.5	3.31
2011-12	0.948	1.13	1.00	1.01	1.83	3.85	1.96	1.26	0.803	1.03	1.14	1.22
2012-13	5.23	0.825	0.657	0.672	0.494	0.498	0.758	0.657	0.463	6.60	0.346	6.05
2013-14	0.46	0.392	0.445	0.462	0.497	0.593	0.436	0.734	1.02	1.18	1.26	1.24
2014-15	0.974	15.6	13.2	1.31	1.29	1.20	1.04	1.11	0.914	0.565	1.51	1.55
2015-16	1.66	2.04	2.20	1.84	1.89	1.84	1.66	1.35	15.1	8.82	1.10	1.17
2016-17	1.05	48.4	1.17	0.903	0.860	1.26	9.41	114.6	252.8	275.1	80.1	14.8
Mean	10	17	12	8.5	6.8	6.8	11	22	42	68	26	7.8

Source: USGS 2018

[1] At USGS Station No. 10271200
[2] Cubic feet per second

Immediately below Power Plant No.6 conduit, a streamflow gage USGS #10271060 is maintained by the USGS in Bishop Creek. Table 4-13 provides the monthly mean flow, measured by the USGS gage, at the Bishop Creek site. Monthly mean flow of this portion of Bishop Creek has been fairly-consistent ranging from 19 cfs to 21 cfs.

TABLE 4-13 MONTHLY MEAN FLOW FOR BISHOP CREEK POWER PLANT NO. 6 CONDUIT NEAR BISHOP, CA[1]

WATER YEAR	MONTHLY MEAN FLOW[2]											
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
1989-90	79.6	44.8	42.1	42.4	42.2	44.3	61.3	91.2	88.8	83.4	81.1	79.4
1990-91	46.8	45.6	44.2	37.2	36.2	33.4	62.5	84.4	97.7	115.2	87.1	82.5
1991-92	82.7	63.0	60.5	56.6	38.0	52.2	67.8	85.5	86.1	86.7	86.9	87.8
1992-93	62.3	45.9	45.7	87.3	120.6	64.2	62.1	135.3	142.8	143.0	133.8	94.9
1993-94	75.7	53.4	81.4	81.2	72.3	58.6	63.3	70.4	104.7	100.2	96.3	75.5
1994-95	60.8	58.4	58.0	54.5	118.5	131.2	127.3	122.4	151.4	152.9	153.5	138.2
1995-96	73.4	65.5	63.3	98.2	120.5	135.2	142.9	147.4	146.3	151.5	149.5	132.2
1996-97	73.2	82.3	80.5	87.6	143.5	143	96.1	135.9	143.1	143.5	135.3	109.0
1997-98	79.7	100.3	88.4	89.0	80.1	95.6	105.3	102.8	143.4	143.5	145.9	135.0
1998-99	81.2	99.2	100.8	83.7	71.0	77.1	80.1	108.8	126.0	126.4	109.4	96.0
1999-00	80.1	57.5	71.2	57.3	67.7	99.3	99.0	104.9	103.5	120.2	104.3	81.0
2000-01	39.8	58.2	76.2	60.5	55.1	66.7	70.1	99.4	129.1	85.8	107.5	89.5
2001-02	71.2	0.409	0.322	51.8	61.6	0.000	0.000	49.5	111.2	92.8	87.7	88.1
2002-03	37.9	56.8	58.9	56.7	56.9	54.1	67.0	101.1	144.2	133.4	110.8	72.2
2003-04	62.5	63.6	64.9	62.1	81.6	81.5	73.0	96.6	100.8	136.7	109.6	35.5
2004-05	0.017	0.034	0.001	53.6	54.8	62.4	77.2	122.2	145.4	140.5	133.8	16.9
2005-06	0.000	0.000	0.292	0.771	0.369	89.0	98.9	147	143.6	143	129.8	86.5
2006-07	80.8	99.5	96.3	77.4	65.8	65.2	66.0	77.2	73.1	77.5	77.4	78.1
2007-08	60.8	4.43	18.5	51.4	52.9	56.1	63.1	0.00	0.00	82.6	109.1	71.8
2008-09	60.3	56.8	58.1	56.6	56.0	54.8	67.5	98.0	114.9	143.3	111.9	82.9
2009-10	73.5	34.0	0.000	0.023	0.000	0.000	0.006	0.000	0.000	0.000	4.23	83.8
2010-11	80.1	63.2	94.3	91.5	86.6	90.5	43.2	142.5	142.1	138.1	137.5	113.0
2011-12	106.0	77.6	76.3	62.9	57.8	57.5	66.4	93.8	107.1	107.4	107.6	82.6
2012-13	80.8	57.6	49.7	46.3	43.5	47.8	61.7	95.4	107.4	101.2	103.7	32.3
2013-14	27.8	26.3	28.1	27.5	27.6	31.4	51.9	91.0	105.7	79.9	62.7	44.6
2014-15	33.5	17.1	20.7	33.4	34.1	34.3	34.5	62.1	66.9	66.3	63.5	49.1
2015-16	36.7	35.6	34.4	34.0	34.1	38.8	59.1	92.8	125.2	119.8	106.3	63.1
2016-17	50.0	0.595	50.5	54.1	67.2	124.3	131.8	147.6	146.9	147.1	149.0	148.6
Mean	61	49	52	57	62	67	71	97	111	113	107	84

Source: USGS 2018

[1] At USGS Station No. 10271060
[2] Cubic feet per second

The USGS also maintained for a short period (1990 to 1996) gage USGS #10270960 (Coyote C Nr Bishop Ca) on Coyote Creek, an approximately 26-square-mile tributary to Bishop Creek that merges with Bishop Creek between Powerhouse No. 3 and No.4. Table 4-14 provides the monthly mean flow for the period of record, measured by the USGS gage, at the Coyote Creek site. Similar to the Bishop Creek stations, most runoff occurs between March and June with the remainder of the period with monthly mean flows generally less than 4 cfs. The maximum flow measured with the USGS gage, for the period of record (1990 through 1996), was 26 cfs (1.67-feet gage height) on June 12, 1995.

TABLE 4-14 MONTHLY MEAN FLOW FOR COYOTE CREEK NEAR, BISHOP, CA[1]

WATER YEAR	MONTHLY MEAN FLOW[2]											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1990-91	3.09	3.30	3.15	3.25	3.61	3.67	4.35	4.71	3.15	2.31	2.14	2.32
1991-92	2.72	3.19	3.07	3.10	3.33	3.46	4.97	3.28	2.51	2.01	1.92	2.07
1992-93	2.63	3.00	2.99	3.20	3.23	3.63	5.08	7.30	4.09	2.67	2.85	2.78
1993-94	3.60	3.76	3.73	3.65	3.78	4.17	4.82	3.83	2.51	2.26	2.13	2.70
1994-95	2.93	2.98	3.00	3.42	3.44	3.98	4.37	9.20	12.9	6.06	3.89	3.88
1995-96	4.70	5.10	5.34	5.00	5.35	5.49	8.16	7.65	5.13	4.61	4.60	
Mean	3.3	3.6	3.5	3.6	3.8	4.1	5.3	6.0	5.0	3.3	2.9	2.8

Source: USGS 2018

[1] At USGS Station No. 10270960
[2] Cubic feet per second

McGee and Birch creeks are minor streams with a combined drainage area of approximately 25-square-miles. McGee Creek flows approximately 15 miles to its confluence with the Owens River, while Birch Creek flows approximately 3 miles to the existing diversion, after which it becomes intermittent. Both streams originate on alpine slopes to the north of Bishop Creek watershed.

SCE and USGS maintained gage USGS #10268225 on the McGee Creek diversion.
Table 4-15 provides the monthly mean flow for the period of record, measured by the USGS gage, at the McGee Creek diversion site. Flows are limited by the size of the diversion pipe.

TABLE 4-15 MONTHLY MEAN FLOW FOR MCGEE CREEK DIVERSION NEAR BISHOP, CA[1]

WATER YEAR	MONTHLY MEAN FLOW[2]											
	Oct	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**
1986-87	3.69	1.68	1.19	1.09	0.739	0.784	1.74	4.07	9.12	9.08	6.73	3.82
1987-88	2.16	1.49	0.958	0.797	0.725	0.891	1.55	3.85	6.55	9.71	6.01	6.68
1988-89	1.94	1.14	0.95	0.877	1.04	1.06	2.27	3.88	5.95	8.23	5.11	4.33
1989-90	3.25	1.13	0.759	0.659	0.715	0.99	2.08	3.06	4.46	8.38	4.60	5.58
1990-91	1.62	1.04	0.765	0.656	0.554	0.821	0.911	2.60	7.79	7.12	5.21	4.97
1991-92	2.90	1.48	1.19	0.806	0.747	0.851	1.77	3.48	4.71	5.55	4.63	2.71
1992-93	3.94	1.27	1.03	0.822	0.781	0.888	1.43	5.57	10.2	13.4	8.68	7.71
1993-94	2.39	1.51	1.20	0.878	0.830	1.01	1.88	3.48	8.91	8.32	4.77	3.45
1994-95	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.22	17.1	11.0	5.88
1995-96	1.36	0.101	0.000	0.000	0.000	0.000	0.000	2.92	14.5	15.8	8.23	3.87
1996-97	1.40							6.36	12.9	12.9	8.38	5.54
1997-98	1.96									13.5	10.4	8.31
1998-99	1.31								9.15	11.3	6.06	3.00
1999-00	1.19								10.7	9.07	5.86	3.65
2000-01									7.03	7.85	4.59	2.86
2001-02	2.06							2.19	8.7	8.58	3.33	1.66
2002-03	1.30								11.2	8.80	3.81	2.90
2003-04									7.84	7.66	3.49	1.25
2004-05										10.6	7.19	1.99
2005-06	0.807									11.8	7.23	2.71
2006-07									4.21	5.00	4.52	3.58
2007-08									8.58	9.95	4.89	3.08
2008-09	0.597								4.42	10.4	4.39	
2009-10										13.5	6.06	3.20
2010-11	1.03									2.49	7.71	5.50
2011-12									3.37	5.38	4.21	2.95
2012-13									4.52	5.45	3.80	
2013-14								1.61	4.93	5.45	3.54	2.33
2014-15	0.593								4.69	5.42	3.19	0.929
2015-16									9.35	8.08	4.48	2.27
2016-17												4.72
Mean	1.8	1.1	0.80	0.66	0.61	0.73	1.4	3.3	7.5	9.2	5.7	3.8

Source: USGS 2018

[1] At USGS Station No. 10268225
[2] Cubic feet per second

The USGS maintained for a short period (1995-1999) gage USGS #10268282 on Birch Creek below the diversion structure. Table 4-16 provides the monthly mean flow for the period of record, measured by the USGS gage. Similar to the Bishop Creek stations, most runoff occurs between June and August with the remainder of the period with monthly mean flows generally less than 1 cfs.

TABLE 4-16 MONTHLY MEAN FLOW FOR BIRCH CREEK BELOW DIVERSION DAM NEAR BISHOP, CA[1]

Water Year	Monthly Mean Flow[2]											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1995-96		0.739	0.806	0.794	0.798	0.765	0.721	1.01	3.43	6.84	1.47	0.814
1996-97			0.456		0.430	0.415	0.382	0.483			0.579	
1997-98		0.406	0.408	0.412	0.391	0.379	0.411	0.387				0.754
1998-99			0.429	0.367	0.393	0.396	0.350					0.945
Mean	1.2	1.1	0.65	0.52	0.50	0.49	0.47	0.63	3.4	6.8	1.0	0.84

Source: USGS 2018

[1] At USGS Station No. 10268282
[2] Cubic feet per second

The combined diverted flows for both Birch Creek and McGee Creek are gaged prior to entering Intake No. 2 reservoir (USGS #10270900). Table 4-17 provides the monthly mean flow for the period of record, measured by the USGS gage. Monthly mean flows vary from 0 to over 20 cfs with the highest values recorded generally during the months of July, August and September.

4.3.3 Monthly Flow Duration Curves

Because the Project utilizes storage that is managed year-round, the critical stream flow for determining critical capacity is not applicable here; rather, the lowest hydraulic capacity of any single development was used in determining a dependable capacity of 28.565 MW. Flow duration curves for the Project are provided below.

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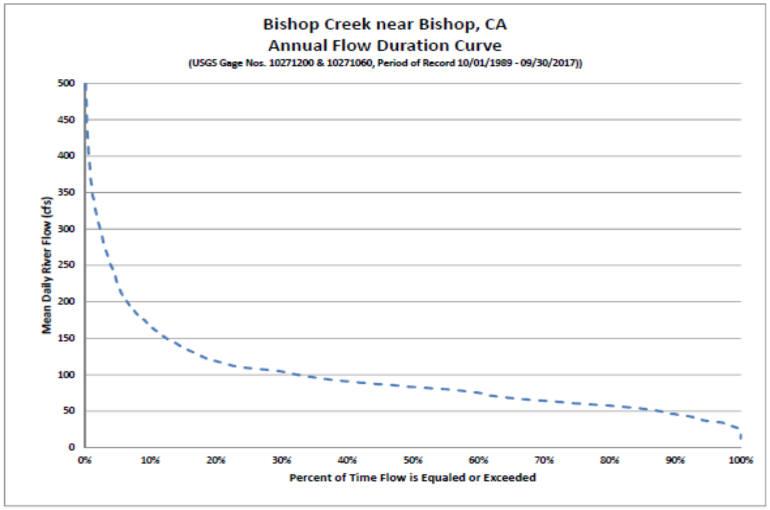
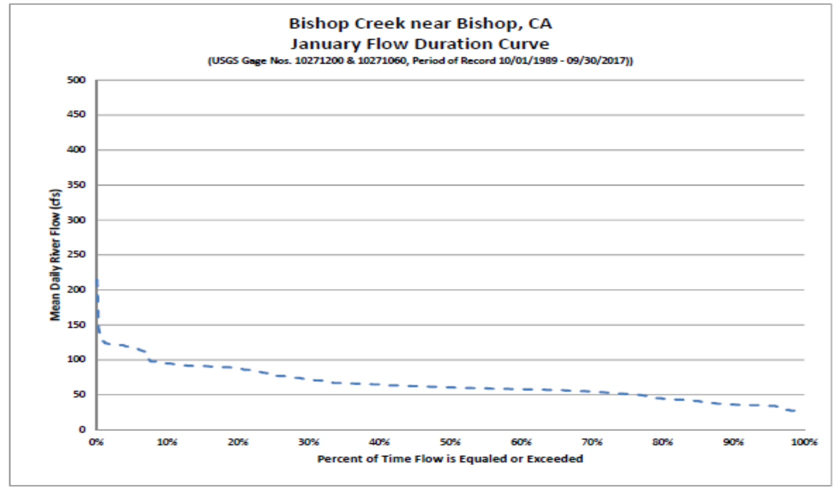
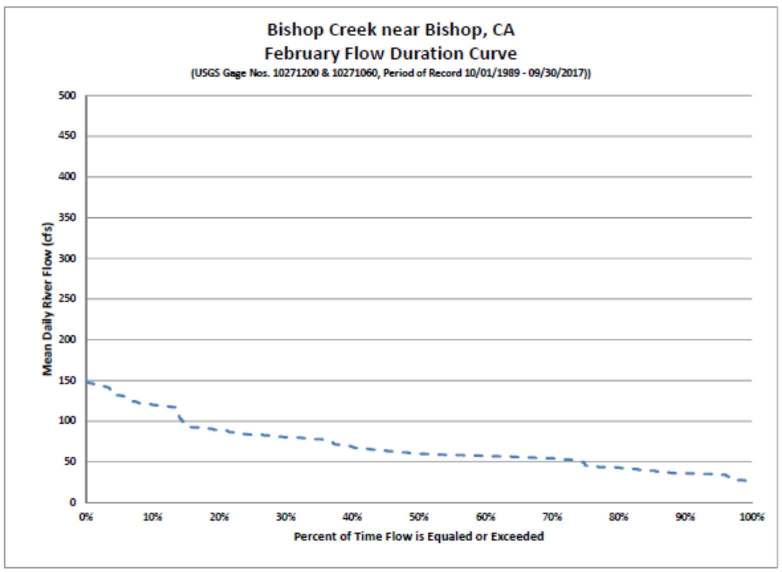
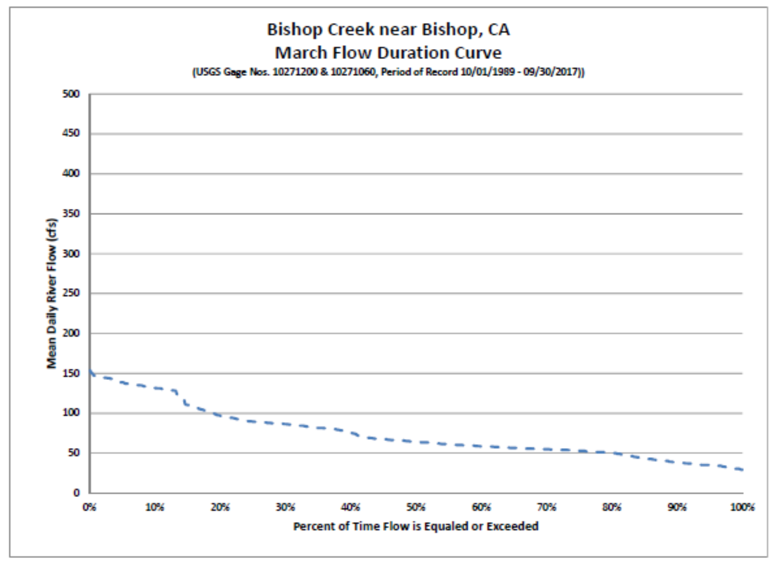
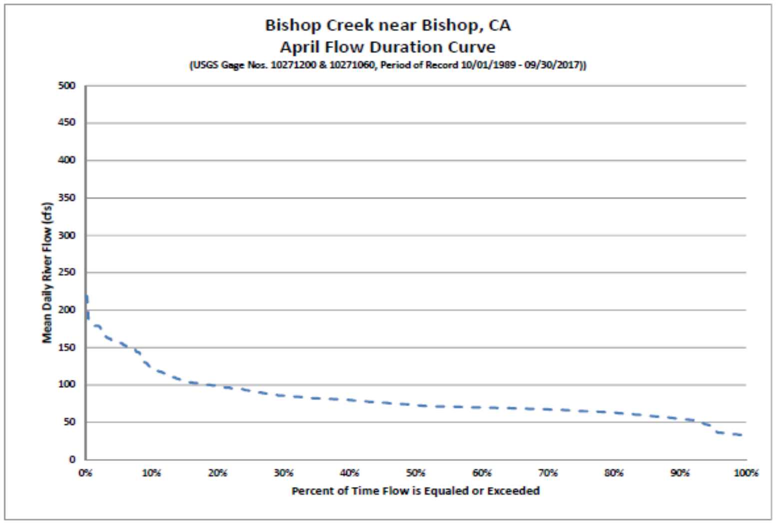
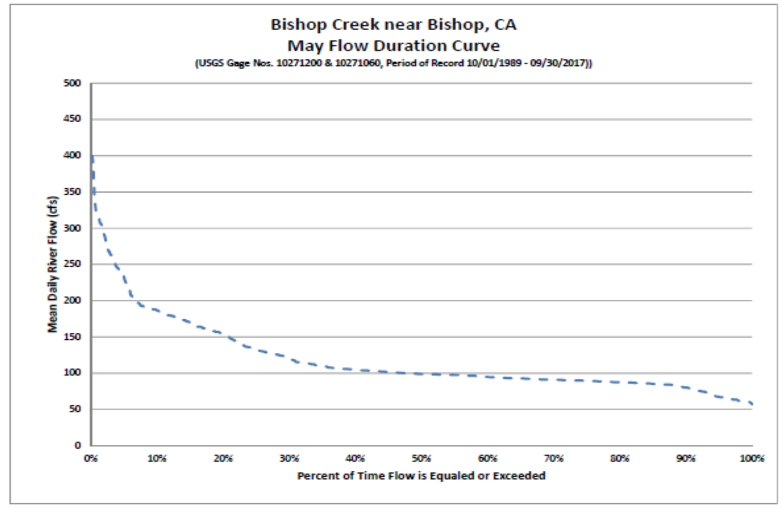

Bishop Creek near Bishop, CA
Annual Flow Duration Curve
(USGS Gage Nos. 10271200 & 10271060, Period of Record 10/01/1989 - 09/30/2017))
Mean Daily River Flow (cfs)
Percent of Time Flow is Equaled or Exceeded

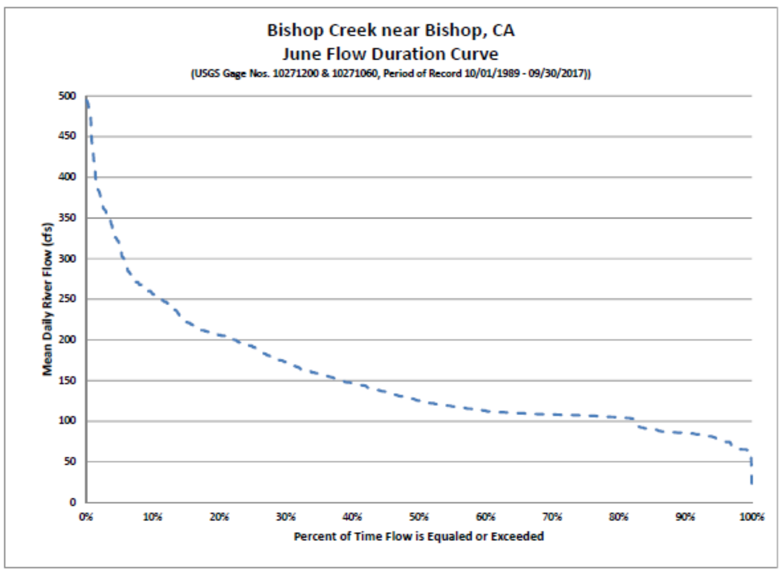

Bishop Creek near Bishop, CA
January Flow Duration Curve
(USGS Gage Nos. 10271200 & 10271060, Period of Record 10/01/1989 - 09/30/2017))
Mean Daily River Flow (cfs)
Percent of Time Flow is Equaled or Exceeded

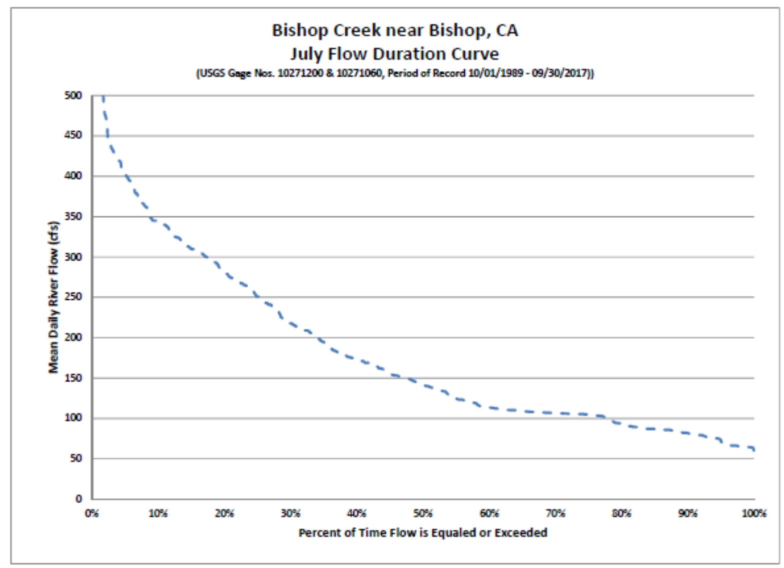

Bishop Creek near Bishop, CA
February Flow Duration Curve
(USGS Gage Nos. 10271200 & 10271060, Period of Record 10/01/1989 - 09/30/2017))
Mean Daily River Flow (cfs)
Percent of Time Flow is Equaled or Exceeded

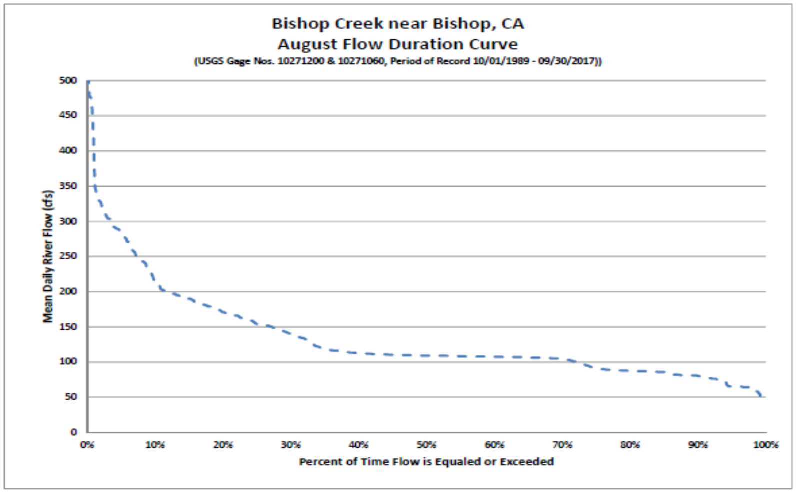

Bishop Creek near Bishop, CA
March Flow Duration Curve
(USGS Gage Nos. 10271200 & 10271060, Period of Record 10/01/1989 - 09/30/2017))
Mean Daily River Flow (cfs)
Percent of Time Flow is Equaled or Exceeded

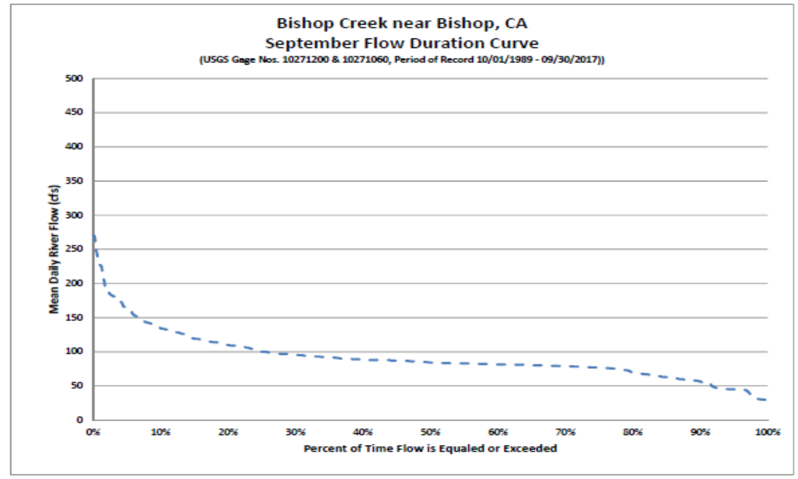

Bishop Creek near Bishop, CA
April Flow Duration Curve
(USGS Gage Nos. 10271200 & 10271060, Period of Record 10/01/1989 - 09/30/2017))
Mean Daily River Flow (cfs)
Percent of Time Flow is Equaled or Exceeded

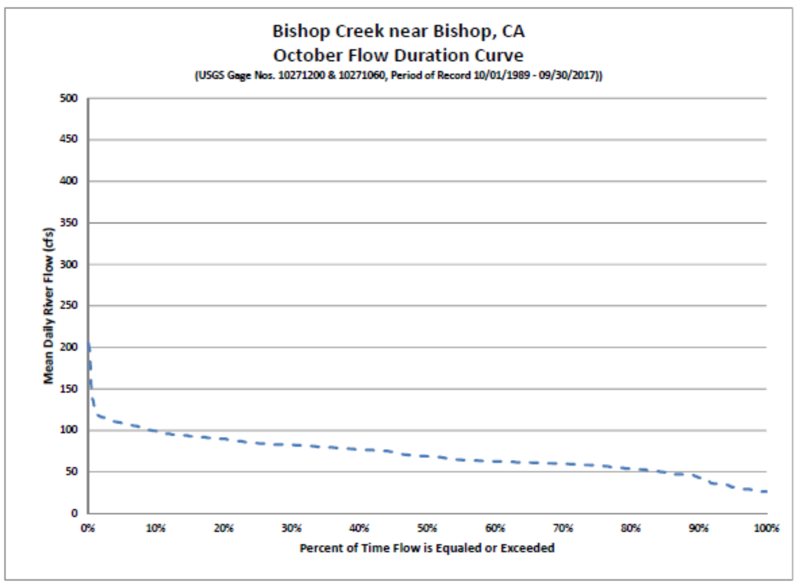

Bishop Creek near Bishop, CA
May Flow Duration Curve
(USGS Gage Nos. 10271200 & 10271060, Period of Record 10/01/1989 - 09/30/2017))
Mean Daily River Flow (cfs)
Percent of Time Flow is Equaled or Exceeded

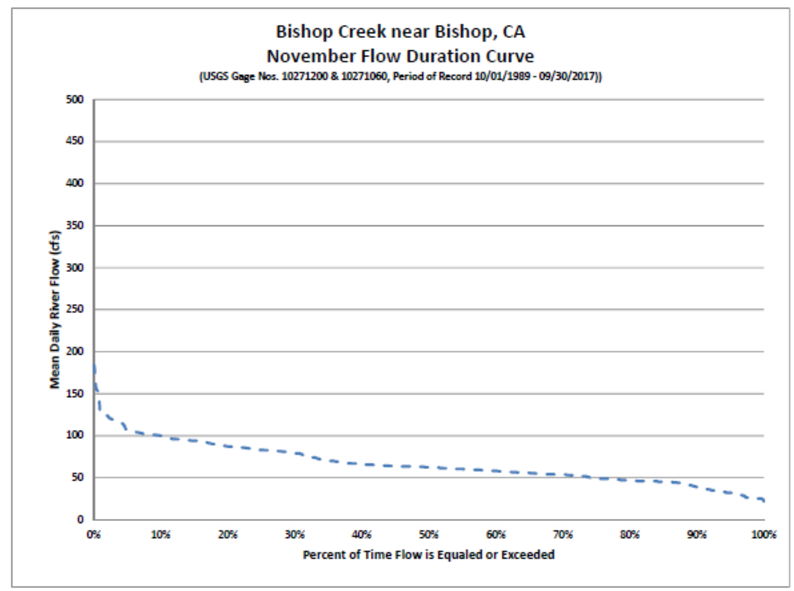

Bishop Creek near Bishop, CA
June Flow Duration Curve
(USGS Gage Nos. 10271200 & 10271060, Period of Record 10/01/1989 - 09/30/2017))
Mean Daily River Flow (cfs)
Percent of Time Flow is Equaled or Exceeded


Bishop Creek near Bishop, CA
July Flow Duration Curve
(USGS Gage Nos. 10271200 & 10271060, Period of Record 10/01/1989 - 09/30/2017))
Mean Daily River Flow (cfs)
Percent of Time Flow is Equaled or Exceeded


Bishop Creek near Bishop, CA
August Flow Duration Curve
(USGS Gage Nos. 10271200 & 10271060, Period of Record 10/01/1989 - 09/30/2017))
Mean Daily River Flow (cfs)
Percent of Time Flow is Equaled or Exceeded


Bishop Creek near Bishop, CA
September Flow Duration Curve
(USGS Gage Nos. 10271200 & 10271060, Period of Record 10/01/1989 - 09/30/2017))
Mean Daily River Flow (cfs)
Percent of Time Flow is Equaled or Exceeded


Bishop Creek near Bishop, CA
October Flow Duration Curve
(USGS Gage Nos. 10271200 & 10271060, Period of Record 10/01/1989 - 09/30/2017))
Mean Daily River Flow (cfs)
Percent of Time Flow is Equaled or Exceeded


Bishop Creek near Bishop, CA
November Flow Duration Curve
(USGS Gage Nos. 10271200 & 10271060, Period of Record 10/01/1989 - 09/30/2017))
Mean Daily River Flow (cfs)
Percent of Time Flow is Equaled or Exceeded

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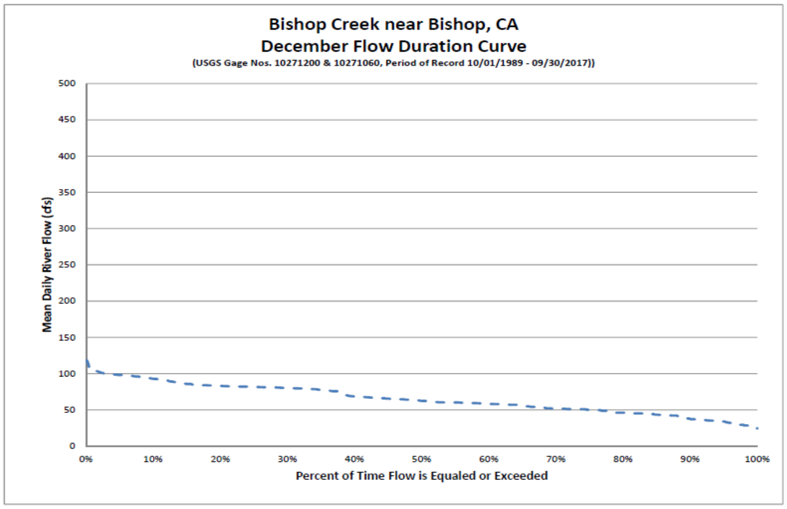

4.3.4 Existing Instream Flow Uses

The operating powerhouses, in order of decreasing elevation, are numbered 2 through 6 and utilize the entire available head from an elevation of 8099 feet (the intake of Powerhouse No. 2) down to 4512 feet (the nozzle of Powerhouse No. 6). A common pool forms the after bay of each upstream powerhouse and the forebay of the next powerhouse downstream.

There are two major storage reservoirs in the Bishop Creek watershed, Lake Sabrina and South Lake. Other reservoirs are small, and their storage is insignificant. Lake Sabrina Reservoir on the Middle Fork has a usable storage capacity of 7,350 acre-feet, a water surface area of 194 acres, and a surface elevation of 9132 feet when full. The South Lake Dam has a usable storage capacity of 12,883-acre-feet, a surface area of 173 acres, and surface elevation of 9751 feet when full.

TABLE 4-17 BIRCH-MCGEE DIVERSION TO BISHOP CREEK POWERPLANT NO. 2 NEAR BISHOP, CA[1]

WATER YEAR	MONTHLY MEAN FLOW[2]											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1989-90	7.65	3.98	4.35	4.11	4.26	4.59	5.07	5.80	8.55	12.1	8.36	8.50
1990-91	4.65	4.19	3.70	3.61	3.48	3.55	4.23	5.36	11.9	15.5	10.0	8.72
1991-92	5.91	4.61	4.14	4.02	3.92	4.13	5.09	6.65	11.2	9.81	8.35	5.62
1992-93	6.48	4.16	3.99	3.93	3.77	4.35	5.53	8.89	17.2	31.7	23.5	19.7
1993-94	9.95	10.9	8.71	8.60	10.9	10.8	11.5	8.50	16.0	15.6	9.12	6.10
1994-95	2.89	2.70	2.57	2.48	2.47	2.45	2.43	2.76	4.99	6.83	4.82	2.98
1995-96	2.87	3.51	4.15	4.55	5.32	4.86	4.89	9.65	28.3	31.6	6.29	5.74
1996-97												
1997-98	8.60	6.39	5.79	5.31	5.01	4.86	4.83	4.70	8.1	34.8	33.5	22.8
1998-99	7.71	6.62	6.40	5.81	5.27	4.96	4.73	6.59	15.6	20.3	15.4	9.81
1999-00	5.83	6.66	4.35	4.15	4.01	3.93	3.79	8.93	26.3	22.0	15.2	9.56
2000-01	6.00	3.50	3.87	3.70	3.56	3.65	3.56	12.7	18.7	19.2	11.8	8.27
2001-02	5.46	2.50	3.78	3.54	3.41	3.17	3.37	5.79	19.2	20.0	9.81	3.72
2002-03	0.367	0.613	2.69	3.39	3.23	3.25	3.13	4.93	24.6	20.9	11.0	7.90
2003-04	5.40	3.84	2.88	2.62	2.53	2.75	1.91	6.54	16.9	19.0	10.2	5.83
2004-05	6.60	3.73	2.95	3.31	0.389	2.21	1.99	3.88	10.6	19.5	21.8	9.62
2005-06	6.47	5.15	4.77	4.30	4.05	3.83	4.02	7.07	16.1	35.4	21.8	10.6
2006-07	7.02	5.23	4.09	3.71	0.554	0.000	0.000	0.600	10.1	9.05	10.5	8.37
2007-08	3.98	0.057	0.000	0.000	0.000	0.000	1.31	5.59	18.7	22.6	12.1	7.62
2008-09	4.44	1.41	3.08	3.01	2.86	2.68	2.46	5.27	12.3	18.6	12.3	7.26
2009-10										29.5	15.0	8.69
2010-11	5.62	4.38	3.28	3.39	3.44	3.39	3.82	1.55	11.4	19.7	24.2	13.5
2011-12	9.22	5.37	3.72	3.75	3.59	3.42	3.19	4.93	8.48	11.4	9.38	6.66
2012-13	4.29	3.31	3.21	2.96	2.70	2.62	2.35	3.34	9.40	10.3	7.68	0.583
2013-14	0.000	0.000	0.000	0.000	0.000	0.000	0.000	4.05	9.85	11.1	7.69	5.50
2014-15	3.33	2.79	2.61	2.44	2.36	2.24	2.09	2.68	7.66	8.51	5.86	3.43
2015-16	2.90	2.58	2.48	2.41	2.23	2.30	2.27	4.23	15.1	15.3	9.99	5.99
2016-17	3.20	3.22	3.14	3.05	2.98	3.05	3.49					15.3
Mean	5.3	3.9	3.6	3.5	3.3	3.3	3.5	5.6	14	19	13	8.5

Source: USGS 2018

[1] At USGS Station No. 10270900
[2] Cubic feet per second

The bedrock of the ridge upon which the South Lake dam is constructed lies at a higher level than the bottom of the former natural lake. To realize the benefit of the storage below the old lake surface, a tunnel was constructed through bedrock below the lower point in the dam's foundation. The upper portal of this outlet tunnel extends into the lake approximately 1380-feet upstream of the dam. The outlet is approximately 600-feet downstream of the dam. The total length of the tunnel is approximately 1980 feet and has a drop of 11.4 feet from the upper to the lower end. With a full reservoir, the upper gate of the tunnel sustains a head of 130 feet.

Green Creek Diversion diverts the flow in Green Creek from just below Bluff Lake into South Lake. This diversion is only activated if the combined flow from Lake Sabrina and North Fork of Bishop Creek is not sufficient to operate the power plants and South Lake will not concurrently spill. These conditions occur in approximately one out of three years.

Water released from these two reservoirs can be utilized through Powerhouses No. 2 through No. 6. They are operated primarily for power generation within the court decree restraints of prior water rights held by downstream irrigation interests (Chandler Decree 1922). A minimum flow of 106 cfs must be released below Powerhouse No. 6 during the irrigation season.

Powerhouse No. 2 receives its water supply primarily from Bishop Creek. The supply from the South Fork is diverted by means of a small concrete diversion structure located on the South Fork. The water is carried through a steel pipeline, 8163-feet in length, to a regulating reservoir, having a 78 acre-feet capacity on the Middle Fork, known as Intake No. 2.

In addition to Bishop Creek water, Powerhouse No. 2 receives a supplementary water supply from Birch Creek and McGee Creek, the next two streams northwest of Bishop Creek watershed. From Birch Creek, the water is carried through a 9513-foot-long pipe and discharged directly into the penstock of Plant No. 2. At Powerhouse No. 2, water is discharged through the impulse turbines directly into the intake of Powerhouse No. 3.

Powerhouse No. 3 is built on the northwest bank of Bishop Creek with its main axis parallel to the stream. The water from the turbines is discharged through arched raceways into the Powerhouse No. 4 intake diversion pond. The conduit from Intake No. 4 Dam consists of a 6242-foot-long, 60-inch-diameter steel pipe with air vents every 100 feet. At the lower end, this pipe bifurcates into two lines.

Two pressure mains run by divergent routes from the bifurcation to the two impulse turbines at the power house. The first line has a total length of 5314 feet. The second is 5665 feet. The discharge from Powerhouse No. 4 discharges to the intake dam immediately below Powerhouse No. 4 and the pond formed is common to the Powerhouse No. 4 tailrace. Coyote Creek, the only significant tributary within the diverted section of Bishop Creek, enters Bishop Creek between

Intake No. 4 and Powerhouse No. 4. The additional water from this creek is therefore available for use through Powerhouse No. 5 and No. 6.

The intake reservoir for Powerhouse No. 6 lies immediately below the point of discharge of Powerhouse No. 5. The flowline from the dam curves gently along the bank of Bishop Creek. The first section is a 3000-foot-long, 60-inch-diameter, steel pipe, followed by a penstock consisting of a 4360-foot-long riveted steel pipe. The total length is 7,360 feet from dam to power house.

The primary use of the water within the Bishop Creek watershed is for power generation. The power houses within this Project are operated at a level consistent with the available water supply. During periods of high streamflow, the power houses are operated at capacity level and during periods of low flow, water is used conservatively to assure a continuous water supply throughout the season.

A secondary use of water from the Bishop Creek watershed is for irrigation. Consistent with this use, a certain level of flow must be maintained below Powerhouse No. 6 in compliance with the Chandler Decree, as presented in Table 4-18.

TABLE 4-18 AVERAGE DAILY FLOW REQUIREMENTS IN BISHOP CREEK BELOW POWERHOUSE NO. 6

PERIOD	FLOW (cfs)
April 1-15, inclusive	44
April 16-30, inclusive	68
May 1-15, inclusive	87
May 16-31, inclusive	98
June-August	106
September 1-15, inclusive	76
September 16-30, inclusive	58

Source: Chandler Decree 1922

4.3.5 Precipitation

SCE maintains precipitation gages in the Bishop Creek watershed at three locations: at Intake No. 2, Lake Sabrina, and South Lake (Figure 4-13). Data collected from the gages indicate the months with the highest precipitation generally occur from November through March with the higher elevation gages averaging approximately 4 inches to 6 inches more precipitation than the lower elevation gages.

The precipitation gage at Intake No 2 had an average precipitation of 11.97 inches per year over the 89-year operating period and the most recent 30-year period averaging 11.95 inches per year (Appendix C). The highest annual precipitation was 24.76 inches recorded during the 1937 to 1938 water year and the lowest annual precipitation was 3.85 inches recorded during the 1959 to 1960 water year.

The precipitation gage at Lake Sabrina had an average precipitation of 16.20 inches per year over the 91-year operating period and the most recent 30-year period averaging 14.92 inches per year (Appendix C). The highest annual precipitation was 36.19 inches recorded during the 1937 to 1938 water year and the lowest annual precipitation was 6.95 inches recorded during the 1959 to 1960 water year.

The precipitation gage at South Lake had an average precipitation of 18.52 inches per year over the 91-year operating period and the most recent 30-year period averaging 18.81 inches per year and is tabulated in Appendix C. The highest annual precipitation was 39.10 inches recorded during the 2016 to 2017 water year and the lowest annual precipitation was 8.51 inches recorded during the 1976 to 1977 water year.

SCE also operated snow survey points at six locations near the Bishop Creek watershed and the locations are depicted in Figure 4-13. Average water content ranged from 7 percent at North Lake (9300 feet msl) in January to 35 percent at Piute Pass (11,300 feet msl) in April. Snow accumulation averaged 25.8 inches at North Lake (9300 feet msl) in January to 91.3 inches at Piute Pass (11,300 feet msl) in April. In general, the highest water content and greatest snow accumulation at the various snow survey points were associated with above average precipitation measured for the area and is presented in Appendix C.

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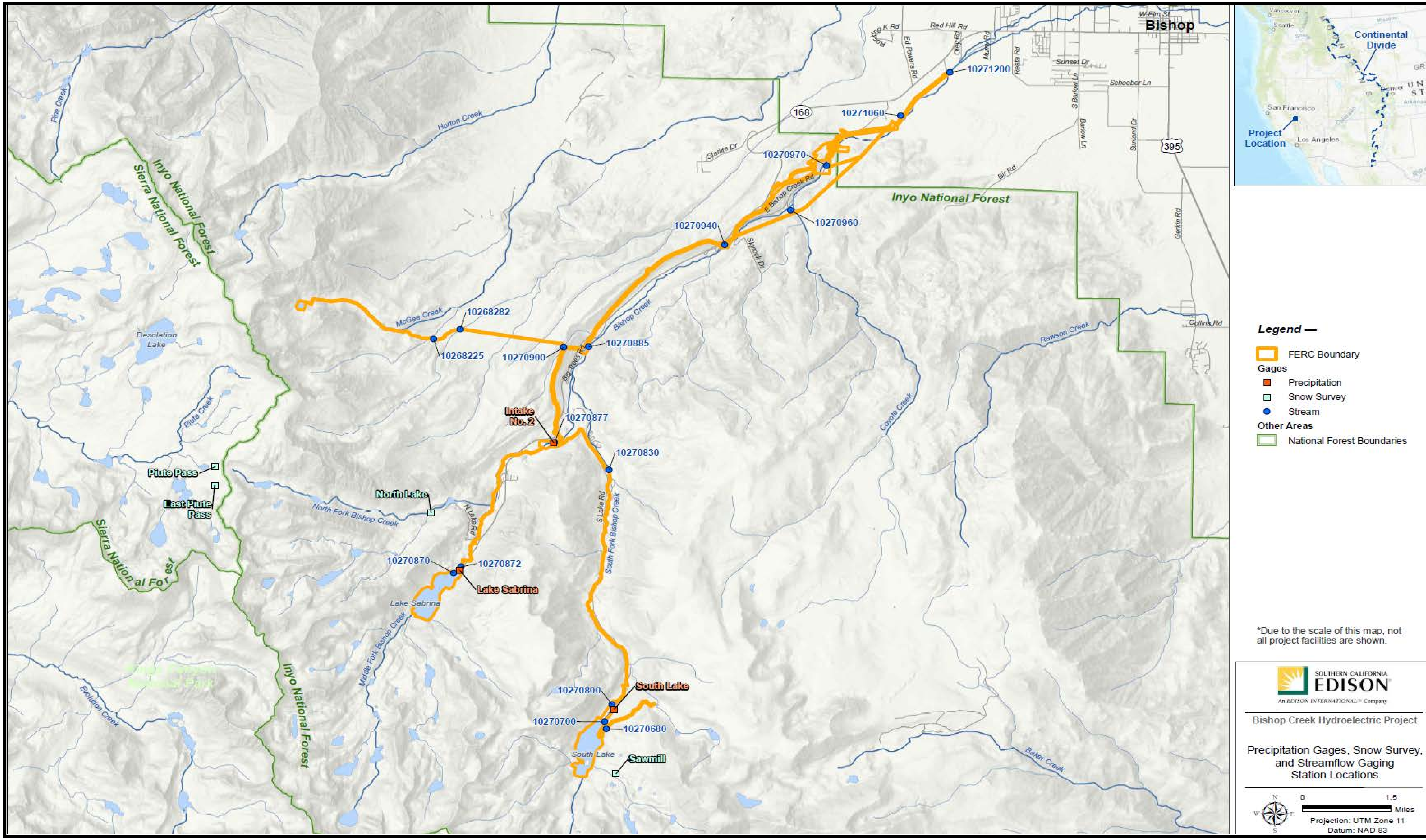

FIGURE 4-13 PRECIPITATION GAGES, SNOW SURVEY, AND STREAMFLOW GAGING STATION LOCATIONS

4.3.6 Existing Water Rights

There has been very little development of the Bishop Creek drainage. More than one-half of the drainage is in the John Muir Wilderness and much of the remainder is the Inyo National Forest. Developed recreational areas are found only along Middle and South forks from Lake Sabrina and South Lake to the confluence of the forks and on North Fork at North Lake.

Before the completion of Lake Sabrina Dam in 1908 and South Lake Dam in 1911, the flows of Bishop Creek were uncontrolled. The dams provided storage and permitted diversion of Bishop Creek waters from a small regulating reservoir through a flowline and penstock to Bishop Creek Powerhouse No. 2. Diversions were constructed on McGee and Birch creeks in approximately 1925 to divert waters to Bishop Creek Powerhouse No. 2.

The Project has no existing or proposed consumptive uses of water for Bishop Creek except for minor domestic use by employees at Project facilities. Although water is stored in upstream reservoirs for power generation at Bishop Creek Powerhouses Nos. 2 through 6, there is no long-term net loss of water to downstream areas. Figure 4-14 presents a schematic of the flow regime for the Project.

There are many water rights that have been filed by with the state and Table 4-19 provides a summary of the known water rights and Figure 4-15 provides the reported locations of the diversions.

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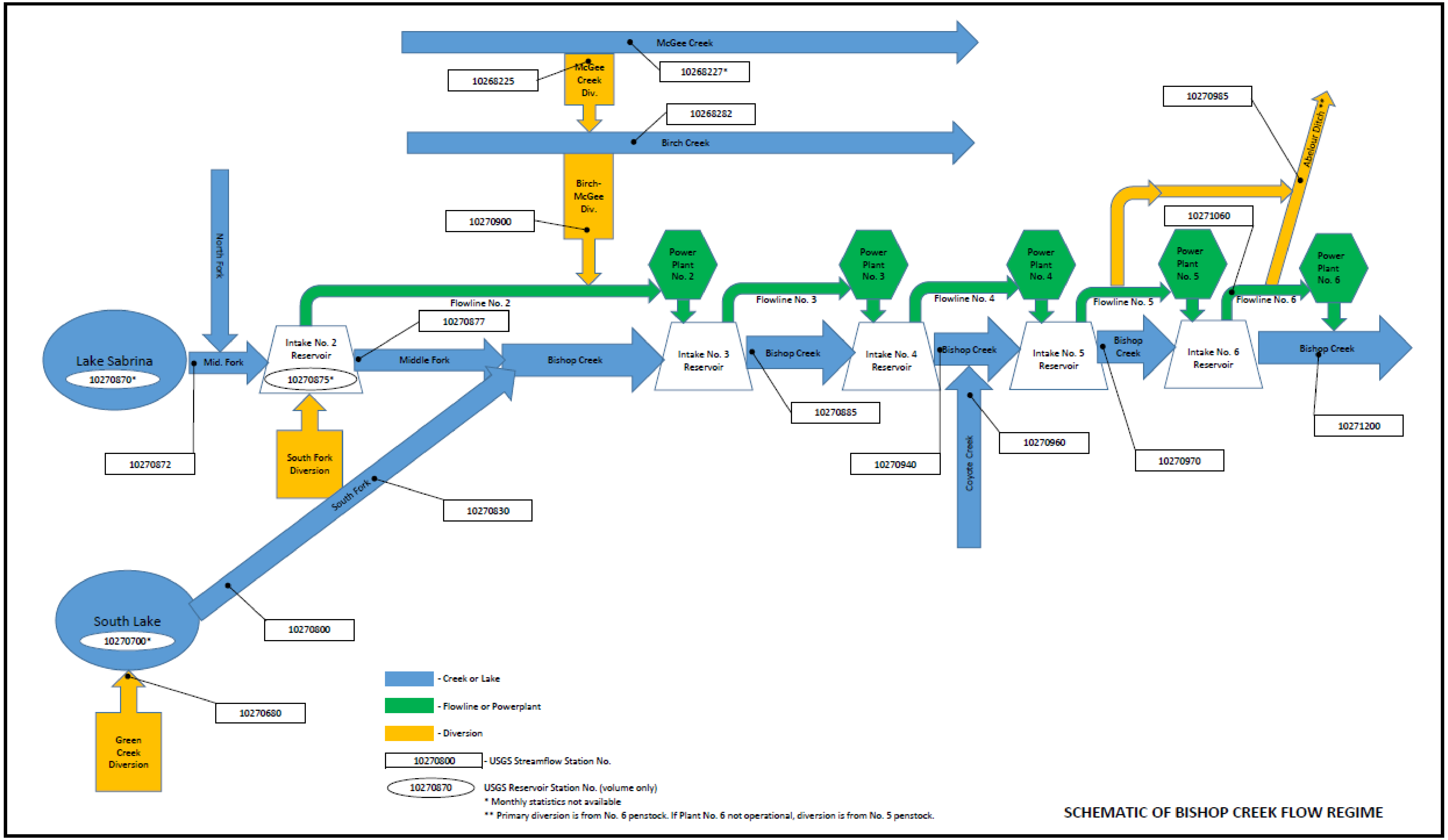

FIGURE 4-14 SCHEMATIC OF BISHOP CREEK FLOW REGIME

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TABLE 4-19 SUMMARY OF EXISTING WATER RIGHTS IN THE BISHOP CREEK WATERSHED

POD ID	APPLICANT ID	NAME	DIVERSION AMOUNT	MAP ID
65767	S025388	Armstrong	0.5 cfs	ARMSTRONG
20586	A017443	Kelsey	30 gpd	KELSEY
33525	S001711	LA Department of Water and Power	45 cfs	LADWP
8071	S005258	LA Department of Water and Power	175 cfs	LADWP
16282	S001713	LA Department of Water and Power	8 cfs	LADWP
4774	S007753	Southern California Edison Company	127 cfs	SCE
19531	S007754	Southern California Edison Company	145 cfs	SCE
45122	S007755	Southern California Edison Company	142 cfs	SCE
25163	S007752	Southern California Edison Company	150 cfs	SCE
36950	S010558	US Inyo National Forest	14 gpd	USFS
Notes: cfs=cubic feet per second; gpd=gallons per day.				

Source: Cal SWRCB 2018

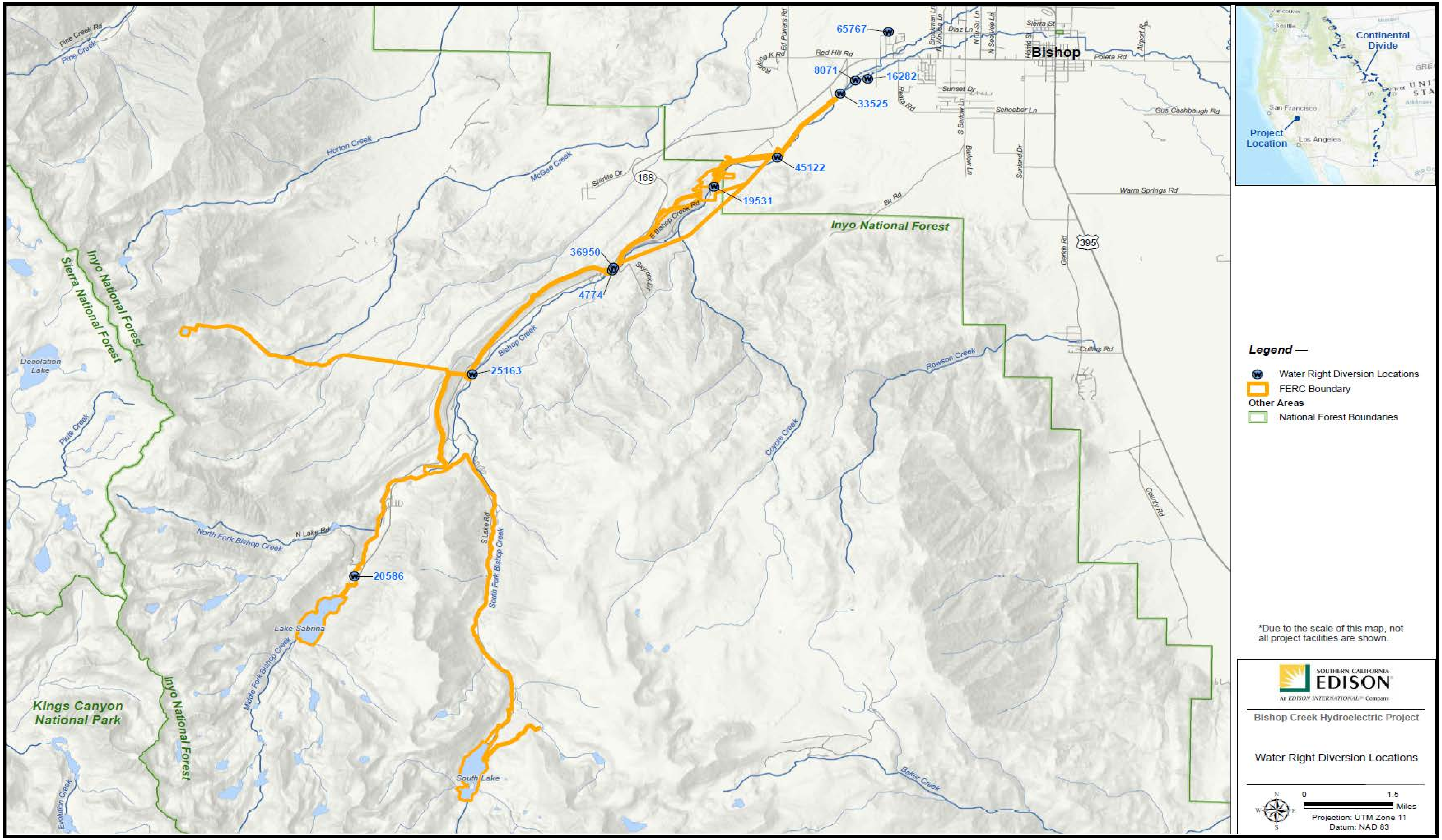

FIGURE 4-15 WATER RIGHT DIVERSION LOCATIONS

4.3.7 Morphometric Data for Existing Reservoirs

Sabrina Dam is located at the north end of Lake Sabrina on the Middle Fork of Bishop Creek at an elevation of 9132 feet at spillcrest. The surface area of the lake varies from a maximum of 194 acres with a depth of 78 feet to a minimum of 18 acres with a depth of 15 feet. This lake is one of two main Project storage reservoirs. The USGS maintains a gage on Lake Sabrina and reports daily volume of water of the lake based on a capacity table dated August 12, 1981. The USGS reports that the usable capacity is 7350 acre-feet, based on the invert elevation of 9068.42 feet, and the crest of the spillway of 9131.62 feet. The maximum reported storage was recorded on July 10, 1995 with a reported volume of 7598 acre-feet.

South Lake Dam is located on the South Fork of Bishop Creek at an elevation of 9751 feet at the spill crest and is the other major Project storage reservoir. The surface area of the lake varies from a maximum of 173 acres with a depth of 130 feet to a minimum of 45 acres with a depth of 45 feet. South Lake is similar to Lake Sabrina as numerous lakes and streams feed into the southern end. The USGS maintains a gage on South Lake and reports daily volume of water of the lake based on a capacity table dated August 5, 1981. The USGS reports that the usable capacity is 12,883 acre-feet, based on the invert of outlet tunnel elevation of 9621.20 feet, and the crest of the spillway of 9751.31 feet. The maximum reported storage was on August 4, 1993 with a reported volume of 13,038 acre-feet.

4.3.8 Gradient of Downstream Reaches

In 1986, SCE conducted instream flow and fisheries study in both Bishop Creek and the Birch and McGee creek watersheds. As part of that study, various stream reaches were identified and are presented in Figure 4-16. In addition, gradients were calculated and are presented in Table 4-20 and are discussed below.

The Bishop Creek stream gradient ranged from 173 feet per mile (3.27 percent slope) at Reach 1 (at Powerhouse No.6) to over 500 feet per mile (greater than10 percent) in the upper reaches of South Fork of Bishop Creek. The steepest portions generally were in the upper reaches, however portions of South Fork (Reaches 8 and 10) had gradients similar to what was observed down near Powerhouse No. 6.

The Birch Creek stream gradient ranged from 300-feet per mile (5.69 percent slope) at the Lower Reach to 431-feet per mile (greater than 10 percent) in the Upper Reach of Birch Creek. The McGee Creek watershed ranged from 258-feet per mile (4.89 percent slope) at the Lower Reach to 539-feet per mile (10.21 percent) in the Upper Reach of McGee Creek.

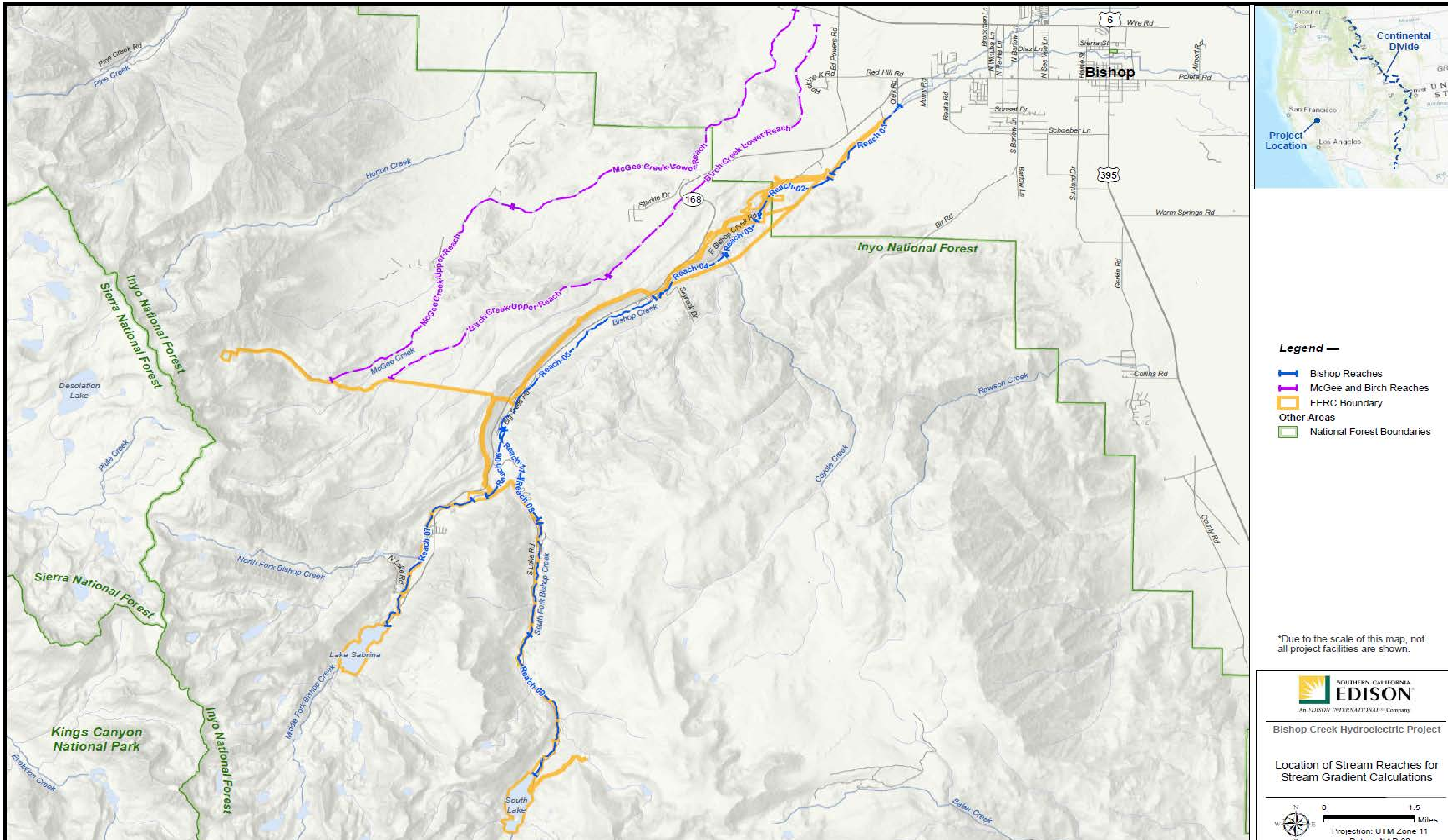

FIGURE 4-16 LOCATION OF STREAM REACHES FOR STREAM GRADIENT CALCULATIONS

4.3.9 Federally Approved Water Quality Standards

The state of California has responsibility for maintaining water quality standards through implementation of the federal Clean Water Act (CWA). The SWRCB and Regional Water Quality Control Board (RWQCB) are responsible for the protection of beneficial uses of water resources within its jurisdiction and uses planning, permitting and enforcement authorities to meet this responsibility. Every water body within the jurisdiction of the RWQCB is designated a set of beneficial uses that are protected by appropriate water quality objectives.

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TABLE 4-20 APPROXIMATE STREAM LENGTH AND GRADIENT FOR VARIOUS STREAM REACHES IN BISHOP CREEK, MCGEE CREEK AND BIRCH CREEK WATERSHEDS

DRAINAGE NAME	Reach (a)	LENGTH OF REACH (FEET) (b)		ELEVATION OF REACH (c)			STREAM GRADIENT	
		(IN FEET)	(IN MILES)	TOP OF REACH (FEET MSL)	BOTTOM OF REACH (FEET MSL)	ELEVATION CHANGE (FEET)	(FEET/MILE)	%
BISHOP CREEK	Reach 01	9,778	1.85	4,780	4,460	320	173	3.27%
	Reach 02	8,546	1.62	5,200	4,780	420	259	4.91%
	Reach 03	4,636	0.88	5,520	5,200	320	364	6.90%
	Reach 04	7,577	1.44	6,340	5,520	820	571	10.82%
	Reach 05	19,971	3.78	7,420	6,340	1,080	286	5.41%
MIDDLE FORK BISHOP CREEK	Reach 06	7,717	1.46	8,080	7,420	660	452	8.55%
	Reach 07	17,327	3.28	9,120	8,100	1,020	311	5.89%
SOUTH FORK BISHOP CREEK	Reach 08	4,516	0.86	8,220	8,060	160	187	3.54%
	Reach 09	27,939	5.29	9,720	8,220	1,500	283	5.37%
	Reach 10	5,205	0.99	9,000	8,800	200	203	3.84%
	Reach 11	5,748	1.09	8,060	7,420	640	588	11.13%
BIRCH CREEK	Lower Reach	33,741	6.39	6,360	4,440	1,920	300	5.69%
	Upper Reach	23,517	4.45	8,280	6,360	1,920	431	8.16%
MCGEE CREEK	Lower Reach	38,431	7.28	6,320	4,440	1,880	258	4.89%
	Upper Reach	27,420	5.19	9,120	6,320	2,800	539	10.21%

Notes:
b – Extrapolated from ArcGIS calculation tool of SCE 1986a and 1986b.
c – Extrapolated from USGS topographic contour map.

Source: SCE 1986a, 1986b

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For smaller tributary streams in which beneficial uses are not specifically designated, they are designated with the same beneficial uses as the streams, lakes or reservoirs to which they are tributary. Table 4-21 lists the water bodies to which this Project drains and their beneficial use designations.

The RWQCB has established water quality objectives for specific beneficial water uses in the Water Quality Control Plan (Basin Plan) for the Lahotan Region (LRWQCB 1995). The water quality objectives include both numeric and narrative standards for surface water that are based on criteria that protect both human health and aquatic life. If water quality is maintained at levels consistent with these objectives, beneficial uses are considered protected. Applicable water quality objectives and standards in the Basin Plan are provided in Table 4-21.

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TABLE 4-21 WATER BODY BENEFICIAL USE DESIGNATIONS

SURFACE WATER BODY	BENEFICIAL USE																					
	MUN	AGR	PRO	IND	GWR	FRSH	NAV	POW	REC1	REC-2	COMM	AQUA	WARM	COLD	SAL	WILD	BIOL	RARE	MIGR	SPWN	WQE	FLD
	Municipal and Domestic Supply	Agricultural Supply	Industrial Process Supply	Industrial Service Supply	Groundwater Recharge	Freshwater Replenishment	Navigation	Hydropower Gen.	Water Contact Recreation	Non-Contact Water Recreation	Commercial and Sport Fishing	Aquaculture	Warm Freshwater Habitat	Cold Freshwater Habitat	Inland Saline Water Habitat	Wildlife Habitat	Special Biological Habitats	Rare, Threatened & Endangered Species	Migration of Aquatic Organisms	Spawning, Reproduction & Dev.	Water Quality Enhancement	Flood Peak Attenuation/Flood Water Storage
Upper Owens Hydrologic Area Hydrologic Unit 603.20																						
McGee Creek	X	X			X	X		X	X	X	X			X		X	X			X		
Bishop Creek (above intakes)	X	X						X	X	X	X			X		X				X		
Intake 2 Reservoir	X							X	X	X	X			X		X						
Bishop Creek (below intakes)	X							X	X	X	X			X		X				X		
Bishop Creek (below last Powerhouse)	X	X		X	X				X	X	X			X		X				X		

Source: LRWQCB 1995

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The Basin Plan defines the beneficial use abbreviations as the following:

- **Municipal and Domestic Supply (MUN) –** Uses of water for community, military or individual water supply systems including, but not limited to, drinking water supply.
- **Agricultural Supply (AGR) –** Beneficial uses of waters used for farming, horticulture or ranching, including, but not limited to, irrigation, stock watering and support of vegetation for range grazing.
- **Industrial Process Supply (PRO)** – Uses of water for industrial activities that depend primarily on water quality.
- **Industrial Service Supply (IND) –** Uses of water for industrial activities that do not depend primarily on water quality including, but not limited to, mining, cooling water supply, geothermal energy production, hydraulic conveyance, gravel washing, fire protection or oil well repressurization.
- **Ground Water Recharge (GWR)** - Beneficial uses of waters used for natural or artificial recharge of ground water for purposes of future extraction, maintenance of water quality, or halting of saltwater intrusion into freshwater aquifers.
- **Freshwater Replenishment (FRSH) -** Beneficial uses of waters used for natural or artificial maintenance of surface water quantity or quality (e.g., salinity).
- **Hydropower Generation (POW) –** Uses of water for hydroelectric power generation.
- **Water Contact Recreation (REC-1) –** Uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, whitewater activities, fishing or use of natural hot springs.
- **Non-Contact Water Recreation (REC-2) –** Uses of water for recreational activities involving proximity to water, but not normally involving body contact with water where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tide pool and marine life study, hunting, sightseeing and aesthetic enjoyment in conjunction with the above activities.
- **Commercial and Sportfishing (COMM) -** Beneficial uses of waters used for commercial or recreational collection of fish or other organisms including, but not limited to, uses involving organisms intended for human consumption.
- **Cold Freshwater Habitat (COLD) –** Uses of water that support cold water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish or wildlife, including invertebrates.
- **Wildlife Habitat (WILD)** – Uses of water that support terrestrial or wetland ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats or wetlands, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.
- **Preservation of Biological Habitats of Special Significance (BIOL)** - Beneficial uses of waters that support designated areas or habitats, such as established refuges, parks,

sanctuaries, ecological reserves and areas of special biological significance, where the preservation and enhancement of natural resources requires special protection.

- **Spawning, Reproduction, and/or Early Development (SPWN) –** Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.

The Basin Plan for chemical constituents provides numeric water quality objectives that are derived from various sources. These objectives include references to maximum contaminant levels (MCLs) that are provided in Title 22 of the California Code of Regulations which sets standards for waters designated for domestic or municipal use. Additional, and often more stringent criteria are provided by the California Toxics Rule "Water Quality Standards: Establishment of Numeric Criteria for Priority Toxic Pollutants for the State of California" (Federal Register, 65 FR 31682, EPA 2000) and the National Toxics Rule (NTR) Water Quality Standards: Establishment of Numeric Criteria for Priority Toxic Pollutants" (Federal Register, 57 FR 60848, EPA 1992) to protect aquatic life, and human health.

TABLE 4-22 WATER QUALITY OBJECTIVES FOR HYDROLOGIC UNIT 603.20 - UPPER OWENS RIVER HYDROLOGIC UNIT

CONSTITUENT/ PARAMETER	WATER QUALITY OBJECTIVE
Ammonia	Shall not exceed the values in Tables 3-1 to 3-4 in LaRWQCB Basin Plan.
Bacteria	The fecal coliform concentration during any 30-day period shall not exceed a log mean of 20/100 milliliters (ml), nor shall more than 10 percent of all samples collected during any 30-day period exceed 40/100 ml.
Biostimulatory Substances	Waters shall not contain biostimulatory substances in concentrations that promote aquatic growths to the extent that such growths cause nuisance or adversely affect the water for beneficial uses.
Chemical Constituents	Waters designated as MUN shall not contain concentrations of chemical constituents in excess of the maximum contaminant level (MCL) or secondary maximum contaminant level (SMCL) based upon drinking water standards specified in Title 22.
Chlorine, total residual	For the protection of aquatic life, total chlorine residual shall not exceed either a median value of 0.002 milligrams per liter (mg/L) or a maximum value of 0.003 mg/L. Median values shall be based on daily measurements taken within any 6-month period.
Color	Water shall be free of discoloration that causes nuisance or adversely affects beneficial uses.
Dissolved Oxygen (DO)	The DO concentration, as percent saturation, shall not be depressed by more than 10 percent, nor shall the minimum DO concentration be less than 80 percent of saturation. For waters with the beneficial uses of COLD, COLD with SPWN, WARM, and WARM with SPWN, the minimum DO concentration shall not be less than that specified in Table 3-6 of the Lahoton Regional Water Quality Control Board (LRWQCB) Basin Plan.
Floating Material	Water shall not contain floating material, including solids, liquids, foams, and scum, in concentrations that cause nuisance or adversely affect beneficial uses.
Oil & Grease	Waters shall not contain oils, greases, waxes, or other materials in concentrations that cause nuisance, result in a visible film or coating on the surface of the water or on objects in the water, that cause nuisance, or that otherwise adversely affect the water for beneficial uses.
pH	In fresh waters with designated beneficial uses of COLD or WARM, changes in normal ambient pH levels shall not exceed 0.5 pH units. For all other waters of the region, the pH shall not be depressed below 6.5 nor raised above 8.5.
Radioactivity	Radionuclides shall not be present in concentrations that are deleterious to human, plant, animal, or aquatic life or that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal, or aquatic life.
Sediment	The suspended sediment load and suspended sediment discharge rate of surface waters shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses.
Settleable Material	Waters shall not contain substances in concentrations that result in the deposition of material that causes nuisance or adversely affects beneficial uses.
Suspended Material	Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses.
Tastes and Odors	Waters shall not contain taste or odor-producing substances in concentrations that impart undesirable tastes or odors to fish or other edible products of aquatic origin, that cause nuisance, or that adversely affect the water for beneficial uses.
Temperature	The natural receiving water temperature of intrastate waters shall not be altered unless it can be demonstrated to the satisfaction of the RWQCB that such alteration in temperature does not adversely affect beneficial uses.
Toxicity	All waters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life.
Turbidity	Waters shall be free of changes in turbidity that cause nuisance or adversely affect the water for beneficial uses. Increases in turbidity shall not exceed natural levels by more than 10 percent.

Source: LRWQCB 1995

TABLE 4-23 WATER QUALITY OBJECTIVES FOR CERTAIN WATER BODIES IN UPPER OWENS RIVER HYDROLOGIC UNIT

SURFACE WATERS	OBJECTIVE (mg/L)[a,b]						
	TDS	Cl	F	B	NO_3-N	Total N	PO_4
Lake Sabrina	10 / 17	2.0 / 3.0	0.10 / 0.10	0.05 / 0.05	0.2 / 0.3	0.3 / 0.6	0.03 / 0.05
South Lake	12 / 20	3.7 / 4.3	0.10 / 0.10	0.02 / 0.02	0.1 / 0.1	0.1 / 0.4	0.03 / 0.04
Bishop Creek (Intake No. 2)	27 / 29	1.9 / 3.0	0.15 / 0.15	0.02 / 0.02	0.1 / 0.2	0.1 / 0.4	0.05 / 0.09

[a] Annual average value/90th percentile value.

[b] Objectives are in mg/L and are defined as follows:
B = Boron
Cl = Chloride
F = Fluoride
N = Nitrogen, Total
NO_3-N = Nitrate as Nitrogen
SO_4 = Sulfate
PO_4 = Orthophosphate, dissolved
Total Dissolved Solids (Total Filterable Residue)

Source: LRWQCB 1995

4.3.10 Existing Water Quality Data

The information presented in this section provides an overview of the existing physical and chemical water quality conditions in the Project vicinity. Water quality information presented in this section was derived from existing published reports and publicly available databases.

Existing information sources indicate that the physical and water chemistry conditions in the streams and rivers associated with the Project (bypass reaches) are of high quality and conform to regulatory water quality objectives and standards. No persistent, widespread water quality issues were found. There is no agriculture or water treatment plants that discharge into the bypass reaches.

Many studies have been conducted in the Project area by various entities including SCE, USFS and the USGS. The following discussion is a summary of the findings of those studies.

4.3.10.1 SCE Monitoring Data

In 1974, Environmental Science and Engineering (ESE) in cooperation with the University of California at Los Angeles conducted an environmental baseline study of the water quality of

Bishop Creek. The report concluded that the water quality of Bishop Creek was excellent and displayed the following characteristics:

- Total dissolved solids remained very low throughout the summer, less than 30 mg/l
- Calcium was the predominant cation in all sampled waters and surface water composition reflected the general geology of the drainage basin
- Nitrate and phosphate levels were low, generally less than 0.10 mg/1 and 0.05 mg/L, respectively
- Water temperatures generally increased downstream; the report further stated that calcium was the dominant cation and that North Fork had higher values than other drainages and appeared to be related to the geology (marble roof pendants) that is found in the upper reaches of North Fork. In addition, the reported noted that as flow decreased in Bishop Creek increases in various ions were noted and was attributed to groundwater making up a larger percentage of the baseflow of the stream. The groundwater generally having more contact time with the underlying bedrock and accordingly higher concentrations of major ions (ESE 1974).

Table 4-24 presents a summary of the water quality observed in Bishop, McGee and Birch creeks. Figure 4-17 presents the locations of the various stations were water quality samples were collected.

In 1985, SCE investigated South Fork, McGee Creek and Birch Creek to characterize the water quality of the adjacent drainages and additional points on Bishop Creek and is summarized in Table 4-25.

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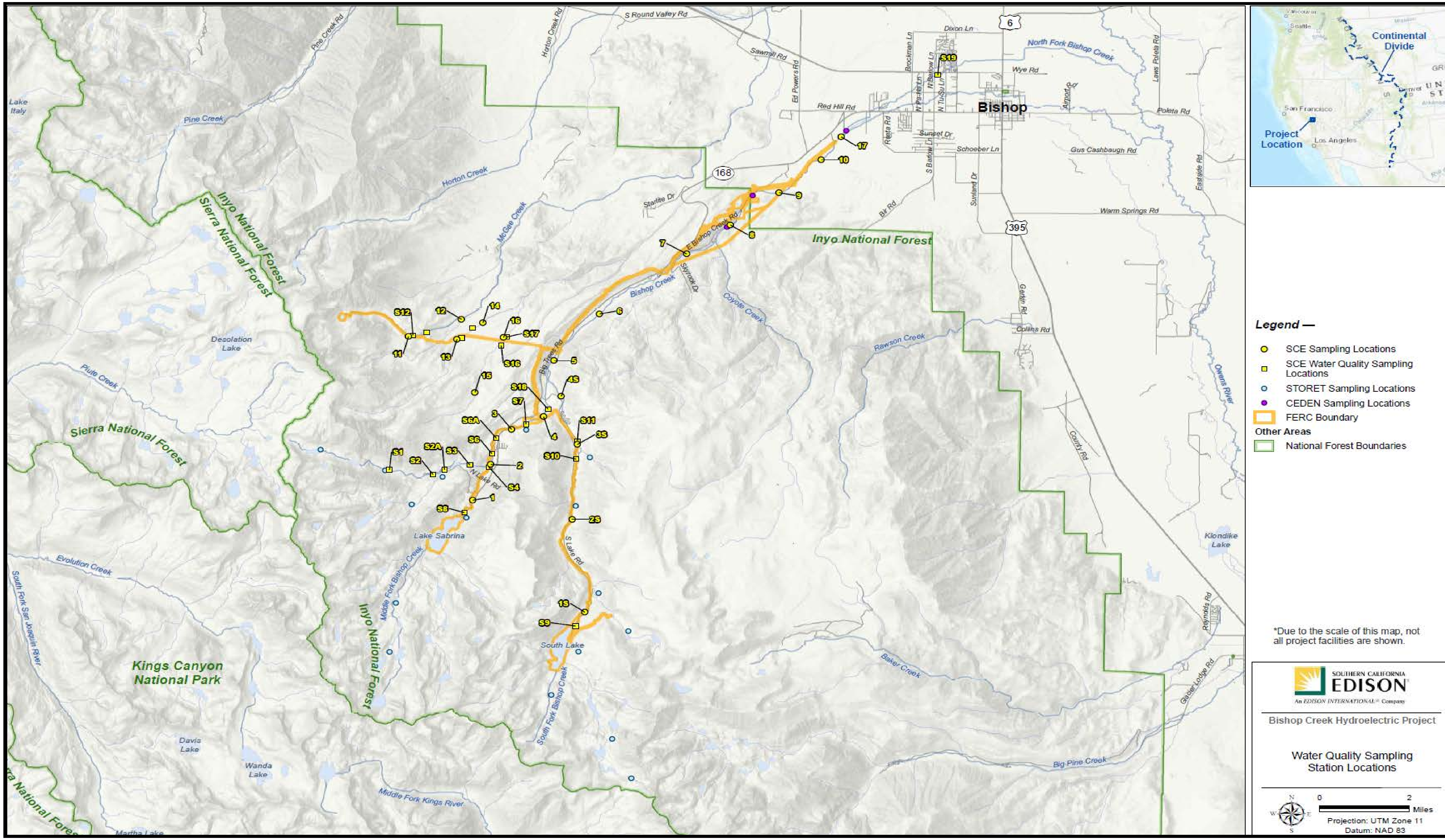

FIGURE 4-17 WATER QUALITY SAMPLING STATION LOCATIONS

TABLE 4-24 BISHOP CREEK - PROJECT NO. 1394 PHYSICAL AND CHEMICAL CHARACTERISTICS OF NORTH AND MIDDLE FORKS OF BISHOP CREEK [A] JUNE-NOVEMBER 1974

PARAMETER	SAMPLE LOCATION										
	S1	S2	S2A	S3	S4	S6	S6A	S7	S8	S19 BISHOP CREEK @ HWY 395 (*)	
	RANGE	RANGE	RANGE	RANGE	RANGE	RANGE	RANGE	RANGE	RANGE	SPRING	FALL
Calcium (mg/L)	1.7-3.7	2.3-4.9	1.9-2.9	1.9-3.2	2.2-2.6	2.3-3.0	2.3-3.3	2.1-2.7	2.1-3.0	9.6	8.8
Magnesium (mg/L)	0.1-0.16	0.13-0.18	0.12-0.16	0.14-0.22	0.17-0.19	0.18-0.22	0.18-0.23	0.13-0.22	0.13-0.16	0.7	0.5
Sodium (mg/L)	0.4-0.8	0.8-1.1	0.6-1.0	0.5-1.0	0.6-0.8	0.80.8-1.1	0.7-1.1	0.8-1.2	0.6-0.7	4.5	3.4
Nitrate as N (mg/L)	0.03-0.11	0.08-0.13	0.05-0.12	0.05-0.1	0.05-0.12	0.05-0.13	0.06-0.12	0.06-0.12	0.06-0.1	0.3	0.8
Phosphate as P (mg/L)	0.03-0.04	0.02-0.05	0.02-0.05	0.02-0.04	0.02-0.05	0.02-0.03	0.01-0.03	0.01-0.04	0.01-0.03	--	--
Total Dissolved Solids (mg/L)	6-27	8-26	7-20	8-21	9-16	11-21	20	11-21	8-10	--	--
Water Temperature (deg °C)	10.0-11.5	8.5-11.0	10.0-13.5	9.0-13.5	10.0-14.0	10.0-15.0	12.5-14.5	11.0-15.0	9.9-15.0	12.5	8.5
pH (units)	5.5-7.5	5.0-7.1	5.0-8.8	5.0-7.4	5.0-6.8	5.0-8.2	5.5-7.2	5.0-8.4	5.0-7.3	7.5	7.29
Diss. Oxygen (mg/L)	6.6-8.1	6.7-9.4	6.8-9.1	6.8-8.8	6.8-7.5	6.4-8.6	6.3-7.7	7.46.6-8.1	6.2-7.8	9.2	9.3

(*) Spring: May 1974; Fall: November 1974
(--) indicates analysis not performed

Source: Source: ESE 1974

TABLE 4-25 BISHOP CREEK - PROJECT NO. 1394 PHYSICAL AND CHEMICAL CHARACTERISTICS OF SOUTH FORK BISHOP CREEK, MCGEE CREEK, AND BIRCH CREEK

PARAMETER	WATERSHED/SAMPLE LOCATION NUMBER									
	SOUTH FORK OF BISHOP CREEK			MCGEE CREEK		BIRCH CREEK				MIDDLE FORK
	S9	S10	S11	S12	S13	S14	S15	S16	S17	S18
Calcium (mg/L)	2.61	14.03	13.23	1.20	1.40	**	15.63	6.81	5.01	6.61
Magnesium (mg/L)	0.24	1.22	1.22	0.10	0.10	**	1.46	0.24	0.24	0.73
Sodium (mg/L)	0.46	0.92	0.69	0.23	0.23	**	0.92	0.46	0.46	0.46
Potassium (mg/L)	1.56	7.04	6.65	0.78	2.35	**	3.13	4.30	2.74	2.74
Nitrate as N (mg/L)	0.03	0.05	0.02	0.06	0.06	**	0.02	0.1	0.06	0.03
Sulfate as S (mg/L)	0.49	7.18	6.27	0.20	0.19	**	1.83	1.62	0.89	1.96
Acid Neutralizing Capacity (µeq/L)	152	707	684	72.4	80.8	**	1023	409	283	384
Water Temperature (deg °C)	9.6	10.1	9.2	8.2	10.0	**	8.2	7.8	8.8	9.4
pH (units)	7.26	7.77	7.88	7.05	7.11	**	7.80	7.69	7.58	7.55
Diss. Oxygen (mg/L)	8.9	8.1	8.3	--	--	**	--	--	--	--
Samples collected September 1985. (--) indicates analysis not performed. (**) indicates sample not taken due to dry creek.										

Source: SCE 1986c

In 1986, the University of California at Riverside conducted a water quality investigation of Bishop Creek and selected eastern Sierra Nevada lakes for SCE. The following discussion presents the results of that investigation.

4.3.10.1.1 Bishop Creek

The report found that similar water characteristics that were reported from previous investigations with increasing dissolved constituents coincides with decreasing elevation. The dominant anion was bicarbonate and the dominant cations were calcium and sodium. In addition, the water quality of Bishop Creek at the furthest downstream site (below Powerplant No. 6) had lower concentrations of alkalinity and dissolved constituents. The report stated that the likely reason for the decrease was the routing of water for power generation purposes. Table 4-26 presents a summary of the water quality characteristics for the various watershed sampled.

In addition, minor amounts of boron, barium, aluminum, iron and manganese were found in the various drainages with the highest levels generally found in Bishop Creek below the confluence with South Fork.

4.3.10.1.2 South Lake and Lake Sabrina

Like most Sierra reservoirs, South Lake and Lake Sabrina have very steep sides and considerable annual fluctuations in surface elevations which severely limit the production of littoral aquatic vegetation. There have been no comprehensive limnological studies of these lakes. Limited water quality profiling of the lakes was conducted from June 1986 until November 1987 and are presented in Table 4-27 and Table 4-28. Field measurements of water temperature, pH, and dissolved oxygen was conducted at one point on each lake. In general, water temperature varied from lows of 32.3°F in March to 59.7°F in late August. In general, water temperature decreased with increasing depth.

Dissolved oxygen ranged from 11.98 mg/L in early March to 2.44 in late August and was generally above 100 percent saturation except in August when dissolved oxygen values dropped to less than 38 percent saturation. Dissolved oxygen inversely followed water temperature and decreased values were observed as water temperatures increased. Values for pH ranged from 6.81 to 9.32, however most values were between 7 and 8 pH units.

The chemical characteristics of the lakes are given in Table 4-29. The measurements were taken in the fall of 1985. The chemical composition of these lake waters appears typical for reservoirs of this elevation and latitude in the Sierra Nevada. There are three basic factors which cause the high elevation reservoirs of this portion of the High Sierra to be mineral and nutrient-poor. First, the watersheds are generally undisturbed and support very little human habitation. Second, the substrates in these drainages are dominantly igneous intrusive rocks, and third, the drainages contain very shallow and poorly vegetated soils. The combination of these factors results in very little leaching of minerals and nutrients into waters entering the reservoirs.

TABLE 4-26 BISHOP CREEK PROJECT NO. 1394 PHYSICAL AND CHEMICAL CHARACTERISTICS OF MIDDLE AND SOUTH FORKS, MCGEE CREEK AND BIRCH CREEK ([A, B]) MAY 1986 - DECEMBER 1987

	WATERSHED/SAMPLE LOCATIONS (c)					
	MIDDLE FORK OF BISHOP CREEK	SOUTH FORK OF BISHOP CREEK	BISHOP CREEK BELOW SOUTH FORK	MCGEE CREEK	NORTH FORK OF BIRCH CREEK	SOUTH FORK OF BIRCH CREEK
PARAMETER	1, 2, 3, 4	1S, 2S, 3S, 4S	5, 6, 7, 8, 9, 10, 17	11, 12	13, 14	15, 16
Calcium (mg/L)	1.3-10.0	2.5-47.3	4.1-20	2.58-10.3	5.5-13.9	13.8-15.3
Magnesium (mg/L)	0.1-0.9	0.3-5.7	0.4-4.9	0.20-0.77	0.3-0.5	1.34-1.59
Sodium (mg/L)	0.3-2.7	0.7-4.8	1.2-16.7	1.00-2.77	1.8-2.5	1.93-2.85
Potassium (mg/L)	0.04-1.0	0.4-3.3	0.1-2.0	0.50-1.67	0.6-1.3	1.38-1.56
ANC (µeq/L) (d)	122-447	146-2,532	235-1,537	153-651	321-789	893-1,006
Chloride (mg/L)	0.1-0.5	0.2-1.0	0.2-5.6	0.12-0.28	0.2-0.3	0.23-0.25
Nitrate (mg/L)	ND(e)-1.1	ND-0.8	ND-1.2	0.55-0.59	ND-0.5	ND
Sulfate (mg/L)	0.1-13.3	1.3-23.2	1.7-13.0	1.16-2.76	2.9-3.5	1.78-2.25
Silica (mg/L)	1.5-9.1	2.52-13.9	5.65-22.7	NS (f)	9.65-11.4	16.63-19.58
Boron (mg/L)	ND-0.01	ND-0.02	ND-0.04	NS	ND	ND
Barium (mg/L)	ND	ND-0.019	ND-0.054	NS	ND-0.003	0.001-0.005
Aluminum (mg/L)	ND-0.07	ND-0.09	ND-0.60	NS	ND-0.16	ND-0.15
Iron (mg/L)	ND-0.83	ND-0.19	ND-0.74	NS	ND-0.002	0.02-0.04
Manganese (mg/L)	ND-0.042	ND-0.035	ND-0.028	NS	ND	ND-0.002

b - Values presented are estimated. Original values were reported in µmoles/L (UCR, 1988) and converted to mg/L.
c - ANC=Acid Neutralizing Capacity.
d - ND=Not detected (no detection limit provided).
e - NS=Not sampled.

Source: Lund undated

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TABLE 4-27 1986 FIELD WATER QUALITY DEPTH PROFILES FOR LAKE SABRINA

DATE	DEPTH (METERS)	WATER TEMPERATURE (DEG °C)	pH (UNITS)	DISSOLVED OXYGEN	
				mg/L	% SATURATION
06/24/86	0.5	12.61	7.25	8.31	108.3
	2.5	11.16	7.26	8.72	110.1
	4.5	9.33	7.33	9.07	110.0
	6.5	8.64	7.34	9.31	111.3
	8.5	8.01	7.43	9.46	111.5
	10.3	7.50	7.46	9.59	111.8
08/19/86	0.5	15.41	7.27	7.93	109.9
	2.5	15.25	7.23	7.72	106.6
	4.5	15.23	7.25	7.63	105.3
	6.5	14.91	7.45	8.11	111.1
	8.5	14.50	7.71	8.23	111.8
	10.3	14.03	8.06	8.44	113.5
	12.5	12.81	7.89	8.45	110.6
	14.5	10.82	7.65	8.43	105.7
	16.5	10.05	7.30	6.97	85.9
10/27/86	0.5	7.29	6.81	9.33	108.3
	2.5	7.29	7.01	8.96	104.0
	4.5	7.31	7.09	8.91	103.4
	6.5	7.30	7.13	8.85	102.7
	8.5	7.26	7.15	8.82	102.3

Source: Lund undated

TABLE 4-28 1987 FIELD WATER QUALITY DEPTH PROFILES FOR LAKE SABRINA

DATE	DEPTH (METERS)	WATER TEMPERATURE (DEG °C)	pH (UNITS)	DISSOLVED OXYGEN	
				mg/L	% SATURATION
03/18/87	0.5	0.14	7.14	11.98	114
	1.0	0.49	7.21	11.03	106
	2.0	1.66	7.26	10.45	105
	3.0	2.24	7.31	10.09	103
	4.0	2.80	7.35	9.70	100
	4.6	2.94	7.38	9.47	98
06/30/87	0.0	14.8	*	8.61	121
	0.5	14.5	*	8.70	122
	1.5	14.4	*	8.64	121
	2.5	14.4	*	8.62	120
	3.5	14.3	*	8.64	120
	4.5	14.3	*	8.64	120
	5.5	14.3	*	8.61	120
	6.5	14.2	*	8.74	122
	7.5	13.7	*	9.05	124
	8.5	13.1	*	9.26	126
	9.5	12.8	*	9.41	127
	10.5	12.1	*	9.64	128
	11.5	11.6	*	9.81	128
	12.5	10.5	*	10.41	133
08/24/87	0.5	15.39	7.74	2.58	37
	2.5	15.42	7.69	2.44	35
	4.5	15.42	7.66	2.44	35
	6.5	15.41	7.66	2.44	35
	8.5	15.37	7.62	2.48	35
	10.5	14.91	7.62	2.55	36
	12.5	13.47	7.63	2.60	36
	14.5	12.25	7.78	2.71	36
	15.l	11.92	7.75	2.72	36
11/03/87	0.5	8.48	7.04	8.42	102
	2.5	8.50	7.23	8.25	100
	4.5	8.52	9.32	7.87	95
	6.5	8.51	7.55	8.34	101
	8.5	8.53	7.66	8.07	98
	10.5	8.42	7.40	7.82	95
	11.0	8.52	7.66	8.14	99

* Probe failure. No readings collected.
Note: low dissolved oxygen readings in the August 1987 measures are suspected to be erroneous as no corresponding fish kill was reported.

Source: Lund undated

TABLE 4-29 CHEMICAL CHARACTERISTICS FOR SOUTH LAKE AND LAKE SABRINA[A]

PARAMETER	SOUTH LAKE		LAKE SABRINA	
	SURFACE	BOTTOM	SURFACE	BOTTOM
Calcium (mg/L)	1.98	1.98	1.94	1.88
Magnesium (mg/L)	0.16	0.16	0.11	0.11
Sodium (mg/L)	0.34	0.34	0.18	0.28
Potassium (mg/L)	0.98	0.98	0.78	0.78
Nitrate as N (mg/L)	0.035	0.026	0.016	0.013
Sulfate as S (mg/L)	0.438	0.399	0.136	0.138
Bicarbonate	---	---	---	---
Notes: a - Samples collected September 1985.				

Source: Lund undated

As part of an ongoing program to monitor for changes in stream geomorphology at specific locations along Bishop Creek, water temperature data was collected at six locations along Bishop Creek, two locations along McGee Creek and one location on Birch Creek and are depicted in Figure 4-18. In general, water temperature was collected during the periods from October 2003 to October 2004 and April 2009 to October 2014. The actual available data varied with each of the locations and is summarized in Table 4-30.

The water temperature data collection varied from every 15 minutes to hourly during the monitoring periods. The data was summarized and daily average, maximum and minimum values were obtained for each day of monitoring and are plotted in Appendix D. The results indicate that water temperature varied throughout the year with lows averaging near 32^{0}F) during the winter months (December to March) and rising to slightly less than 95^{0}F in the summer months (June to August). The variations between maximum and minimum water temperatures for a given day was generally very small in the winter months and rose up to as much as 59^{0}F in the summer months.

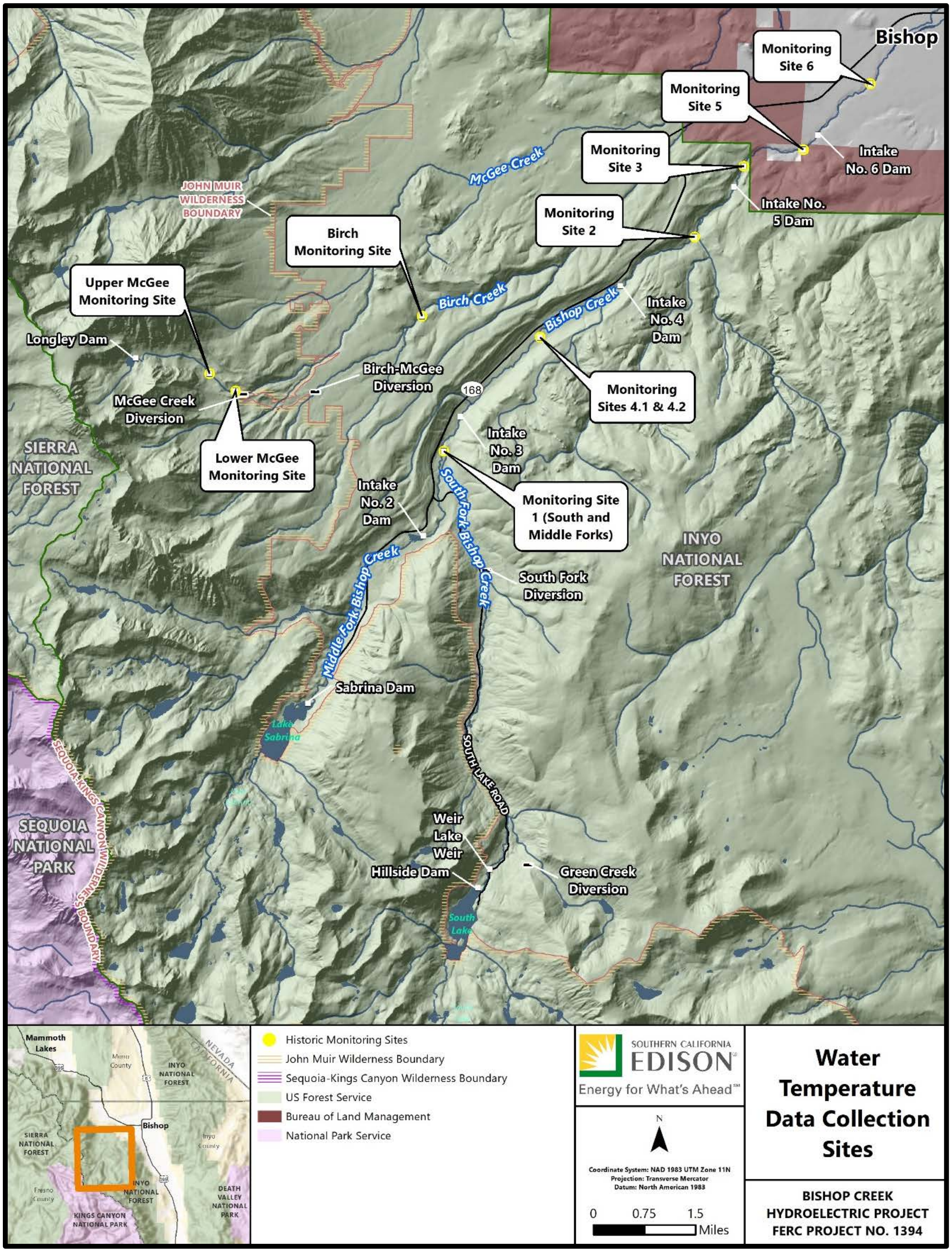

FIGURE 4-18 WATER TEMPERATURE DATA COLLECTIONS SITES

Where available, daily streamflow discharge data from nearby USGS stations were plotted with the water temperature data to assess if there was a correlation between streamflow and water temperature. The chart patterns suggest that the correlation is poor. Air temperature data (maximum and minimum daily values) were obtained from the Global Historical Climatology Network (GHCN) station located at Bishop Airport (COOP Station USW00023157) for the same period in which water temperature data was collected along Bishop Creek. The water temperature data was plotted along with air temperature data for Bishop Creek Site 1 for the period October 2003 to October 2004. The chart suggests that the correlation between air temperature and water temperature is very good with daily increases and decreases in air temperature strongly tracking water temperature changes in Bishop Creek.

4.3.10.2 Water Temperature Monitoring Locations

TABLE 4-30 SUMMARY OF WATER TEMPERATURE MONITORING LOCATIONS ALONG BISHOP, BIRCH AND MCGEE CREEKS

SITE	LOCATION	CLOSEST USGS STATION	MONITORING PERIODS
Bishop Creek - Site 1	Between Intake 2 and confluence of Middle and South Forks of Bishop Creek. Adjacent to Big Trees Campground.	10270877	10/12/2003-10/27/2004
Bishop Creek - Site 2	Between Plant 3/Intake 4 and confluence of Bishop and Coyote Creeks	10270940	1/1/2004-10/27/2004
			4/26/2009-9/17/2013
Bishop Creek - Site 3	Between Plant 4 and Site 5	10270970	10/12/2003-8/25/2004
			4/26/2009-10/29/2009
			9/18/2013-10/25/2014
Bishop Creek - Site 4	Between Plant 2/Intake 3 and Plant 3/Intake 4	10270885	10/12/2003-10/27/2004
			4/26/2009-10/29/2009
			9/18/2013-10/25/2014
Bishop Creek - Site 5	Between Site 3 and Plant 5	10270970	10/11/2003-10/28/2004
			4/26/2009-10/29/2009
			9/18/2013-10/25/2014
Bishop Creek - Site 6	Upstream of Plant 6	10271200	10/11/2003-5/7/2004
			4/26/2009-10/16/2011
Birch Creek	Approximately 1 mile downstream of point where instream flows are released	10268282	10/12/2003-10/27/2004
			4/27/2009-5/2/2013
			9/17/2013-10/27/2014
McGee Creek Above Diversion		NA	10/12/2003-10/24/2004
			6/10/2009-10/25/2014
McGee Creek Below Diversion		NA	10/12/2003-10/24/2004
			6/10/2009-5/2/2013
			10/12/2013-10/27/2014
Notes: NA=Not Applicable.			

A second period was evaluated (September 2013 to October 2014) for Bishop Creek Site 4. Maximum and minimum daily air temperature data was obtained from Bishop Creek Airport (COOP station USW00023157) and plotted with average, maximum and minimum daily water temperature data calculated for Bishop Creek Site 4. Water temperature results observed at Bishop Creek Site 1 for the 2003-2004 period, appeared to track with the daily changes observed for air temperature at Bishop Airport. This suggests that regional air temperature changes are the major factors affecting water temperature in Bishop Creek.

4.3.10.3 Other Project Related Monitoring Data

In 1980, the National Park Service Water Resources Division conducted a surface water quality study of 13 selected sites in the upper reaches of North, Middle and South forks of Bishop Creek (Table 4-31). A total of 13 samples were collected and analyzed for major ions and selected trace constituents and are presented in Table 4-31. All constituents/parameters were below their respective MCL or basin standard except for chloride. Chloride ranged from 5 mg/L to 8 mg/L; the water quality objective for Bishop Creek at Intake No. 2 is 1.9 mg/L.

As part of the California's Surface Water Ambient Monitoring Program (SWAMP) for perennial streams, the CSWRCB undertook a water quality monitoring program on Bishop Creek from 2013 to 2016 (Table 4-32). The water quality was similar to that observed in previous studies with calcium and sodium the dominant cations. Total dissolved solids were rated as low, ranging from 25 mg/L to 66 mg/L; however, the solids averaged above the Basin Plan value of 27 mg/L for above Intake No. 2. Water temperature was generally less than 17°C. Two biological parameters that were detected were total coliform and Escherichia coli (E. Coli) and ranged from 1 to 66 colony forming units (cfu) per100 ml and 1 to 61 cfu per100 ml, respectively; exceeding the basin standard of 20 cfu/100 ml for fecal coliform.

Samples were collected over a two-year period from 2015 to 2016 that indicated non-detectable values for fecal coliform and E. coli for Bishop Creek (total of three samples) at the USFS boundary. Studies conducted by the RWQCB on Bishop Creek concluded that the impaired portion of Bishop Creek was located below Powerplant No. 6 and was likely the result of cattle grazing in or near Bishop Creek and potentially leaking sanitary sewer systems in lower Bishop Creek (Knapp et al. 2016).

Table 4-31 Summary of National Park Service Water Quality Sampling on North, Middle and South Forks of Bishop Creek

Parameter/Constituent (a)	Units	No. of Samples	Maximum	Minimum	Mean (b)	Basin Standards
Water Temperature	(deg °C)	13	10	3	7.9	NA
pH	(units)	13	8.4	6.9	7.7	6.5-8.5 (c)
Alkalinity (as $CaCO_3$)	(mg/L)	13	23	3	9.1	NA (d)
Specific Conductance	(µmhos/cm)	13	60	10	21.2	900-1,600 (e)
Calcium	(mg/L)	13	14.8	1.6	6.2	NA
Magnesium	(mg/L)	13	0.9	ND<0.1	0.3	NA
Sodium	(mg/L)	13	2.06	ND<0.1	0.82	NA
Potassium	(mg/L)	13	1.1	ND<0.1	0.5	NA
Chloride	(mg/L)	13	**8**	**5**	6.8	1.9 (f)
Silicon	(mg/L)	13	4.6	0.5	1.2	NA
Boron	(µg/L)	13	71	5	20.6	200 (g)
Bromide	(µg/L)	10	82.3	50.3	65.5	NA
Phosphorus	(µg/L)	13	7,477	ND<40	2,138	NA
Aluminum	(µg/L)	13	71	ND<10	37.3	200 (e)
Barium	(µg/L)	13	6	ND<2	3.7	1,000 (g)
Beryllium	(µg/L	13	1	ND<1	1.0	4
Cobalt	(µg/L)	13	5	ND<2	3.6	NA
Copper	(µg/L)	13	5	ND<2	3.1	1,000 (e)
Iron	(µg/L)	13	42	ND<10	22.3	300 (e)
Lithium	(µg/L)	13	95	ND<2	60.6	NA
Manganese	(µg/L)	13	5	ND<2	3.0	50 (e)
Molybdenum	(µg/L)	13	21	ND<4	9.9	NA
Nickel	(µg/L)	13	11	ND<4	8.0	100
Strontium	(µg/L)	13	21	3	9.6	NA
Titanium	(µg/L)	13	3	ND<2	2.3	NA
Uranium	(µg/L)	13	0.583	0.014	0.209	NA
Vanadium	(µg/L)	13	4	ND<0.1	'--- (h)	NA
Zinc	(µg/L)	13	15	ND<4	7.2	5,000 (e)

Notes:
a – Cerium, Chromium, Dysprosium, Scandium, Silver, Yttrium, & Zirconium were analyzed but not detected in all samples collected.
b - Only detectable values were used in the calculation of the mean.
c - U.S. Environmental Protection Agency (EPA) secondary standard for pH.
d – NA = Not Applicable – no current MCL.
e - CDWP secondary MCL.
f - Basin Plan for Bishop Creek at Intake No. 2.
g – California Drinking Water Program primary maximum contaminant level (MCL).

Source: EPA 2018 (STORET)

TABLE 4-32 SUMMARY OF SWAMP WATER QUALITY SAMPLING ON BISHOP CREEK AT NATIONAL FOREST BOUNDARY (STATION 603BSP111)

PARAMETER/CONSTITUENT (A)	UNITS	NO. OF SAMPLES	MAXIMUM	MINIMUM	MEAN	BASIN STANDARDS
Oxygen, dissolved	(mg/L)	1	10.7	10.7	'---	varies
Water Temperature	(deg °C)	12	16.4	2.2	9.84	NA
pH	(units)	12	**10.3**	7	7.97	6.5-8.5 (b)
Alkalinity (as $CaCO_3$)	(mg/L)	12	44	19	30.4	NA (c)
Turbidity	(NTU)	12	1.54	0.33	0.724	5 (d)
Specific Conductance	(µS/cm)	12	104.4	40.7	74.63	900-1,600 (d)
Total Dissolved Solids (TDS)	(mg/L)	12	**66**	25	**46.0**	27 (a)
Calcium	(mg/L)	12	13.7	0.6	7.99	NA
Magnesium	(mg/L)	11	1.63	0.43	1.032	NA
Sodium	(mg/L)	11	4.82	1.1	3.085	NA
Potassium	(mg/L)	10	2.86	0.31	1.636	NA
Chloride	(mg/L)	12	1.6	0.36	0.884	1.9 (a)
Sulfate (as SO_4)	(mg/L)	12	9.55	3.15	6.157	250-500 (d)
Fluoride	(mg/L)	11	0.143	0.046	0.1014	0.15 (a)
Boron	(mg/L)	12	**0.481**	0.0058	0.1271	0.2 (a)
Nitrate and Nitrite (as N)	(mg/L)	11	0.0475	0.0065	0.01999	10 (e)
Nitrogen, Total	(mg/L)	12	**0.125**	0.049	0.0794	0.1 (a)
Phosphorus as P	(mg/L)	9	0.0094	0.0054	0.00752	NA
Orthophosphate as P	(mg/L)	12	0.0132	0.0051	0.00880	0.05 (a)
Fecal Coliform	cfu/100 ml(f)	27	**66**	**1**	**8.9**	20 (g)
E. Coli	cfu/100	24	61	1	8.0	NA

Notes:

a – Basin Plan for Bishop Creek at Intake No. 2.
b – U.S. Environmental Protection Agency (EPA) secondary standard for pH.
c – NA = Not Applicable – no current MCL.
d - CDWP secondary MCL.
e - California Drinking Water Program primary maximum contaminant level (MCL).
f –.cfu - colony forming units
g – Lahontan Basin Plan
BOLD Equal to or above current MCLs or notification levels.

Source: CEDEN 2018

4.3.11 Potential Adverse Effects and Issues

SCE’s review of readily available information, and early consultation with interested parties have not identified significant water management or water quality impacts associated with the Project. Short-term increases in turbidity and sedimentation would likely occur from pond intake maintenance; the Project would reduce streamflow below the diversion structures. Article 105 of the existing license has protected and enhanced habitat by maintaining year-round minimum flows in the creek. Compliance with these requirements are measured through the installation and maintenance of gages pursuant to the approved stream gaging plan (Articles 106 and 403). Water quality data will be needed to support certification of the Project pursuant to Section 401 of the CWA; the TWG is interested in understanding how stream flows might be managed to improve aquatic and riparian habitat.

4.3.12 Proposed Mitigation and Enhancement Measures

SCE anticipates continuing with the PME's identified above in the new license; although no additional mitigation or enhancement measures relating water resources are planned at this time, SCE plans to evaluate the issues identified above as part of the licensing Study Plan, and in consultation with stakeholders. If any major structural changes of the Project are planned, appropriate BMPs to minimalize effects on water resources would be implemented; however, no structural changes are proposed at this time.

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4.4 FISH AND AQUATIC RESOURCES [§ 5.6 (D)(3)(IV)]

4.4.1 Aquatic Resources and Habitats

Aquatic habitat in the Project area is comprised of a network of oligotrophic small high-elevation lakes and reservoirs and high-gradient stream segments dominated by riffles, chutes, runs and occasional small pocket pools. Gradient exceeds 2 percent in places (Dienstadt et al. 1985). Bishop Creek upstream from Plant 2 as well as tributaries such Coyote Creek are generally higher in gradient than the lower reaches of Bishop Creek. Water clarity is generally very high due to the inherently nutrient-poor ecosystem and lack of suspended solids, riverine stream segments are bordered by native riparian vegetation such as horsetail and wild rose, including scattered outgrowth of tree species such as Jeffrey pine willow, aspen, and cottonwood. Riparian vegetation has become denser and more diverse since the 1980s, in part due to the introduction of an instream base flow below each forebay diversion. The stream bed is generally dominated by cobble and boulder; however, patches of gravel and sand occur in places. Instream cover is provided by boulders, undercut banks overhead vegetation and woody debris (Figure 4-19). Most of the riverine aquatic habitat holding fish ranges between approximately 4000 to 7000 feet msl elevation. Plant intake forebays create pools that are large enough to provide aquatic habitat for fish species Figure 4-19.

FIGURE 4-19 TYPICAL SUBSTRATE, COVER AND RIPARIAN VEGETATION IN THE MIDDLE AND LOWER BISHOP CREEK PROJECT AREA

FIGURE 4-20 PLANT INTAKE FOREBAY POOLS PROVIDE AQUATIC HABITAT

Habitat-based minimum stream flows were established in Bishop Creek in the early 1990s, using the results from an Instream Flow Incremental Methodology model and analysis based on habitat requirements for several trout species (EA Science 1986) (Table 4-33 and Figure 4-21). Prior to implementing the stream flows, Bishop Creek stream flow below Plant 4 was inconsistent and experienced extensive periods with no flow other than groundwater accretion, and therefore did not historically support an aquatic community (SCE 1986). At other locations above Plant 4 and through McGee Creek there historically was sufficient natural accretion to provide limited habitat to support a self-sustaining brown trout population (SCE 1986).

TABLE 4-33 BISHOP HABITAT-BASED PROJECT INSTREAM FLOW REQUIREMENTS UNDER EXISTING LICENSE ARTICLE 105

REACH	MINIMUM FLOW (CFS)	DURATION
Lake Sabrina to Intake 2	13 cfs or natural flow whichever is less	Year round
South Lake to S. Fork diversion	13 cfs or natural flow whichever is less	Year round
Intake 2	10 cfs	Last weekend in April through October 31
Intake 2	7 cfs	Nov 1 through most of April
Intake 2	At least 5 cfs	Dry years
Plant 2 to Plant 3	13 cfs	Year round
Plant 3 to Plant 4	5 cfs	Year round
Plant 4	No less than 18 cfs	Year round
McGee Creek diversion	1 cfs or natural inflow whichever is less	Year round
Birch Creek diversion	0.25 cfs or natural inflow whichever is less	Year round
Horse Creek diversion	All flow	Year round
Annual flushing flows	To be determined via consultation with USFS	Annually

Source: FERC 1994

Notes:

[1]Intake 2 Reach, for purposes of describing minimum flows, includes the bypassed reach below the South Fork Diversion

[2]See Table 3-1 for hydraulic capacities of powerhouses

[3]Birch Creek diversion is also known as the Birch-McGee diversion

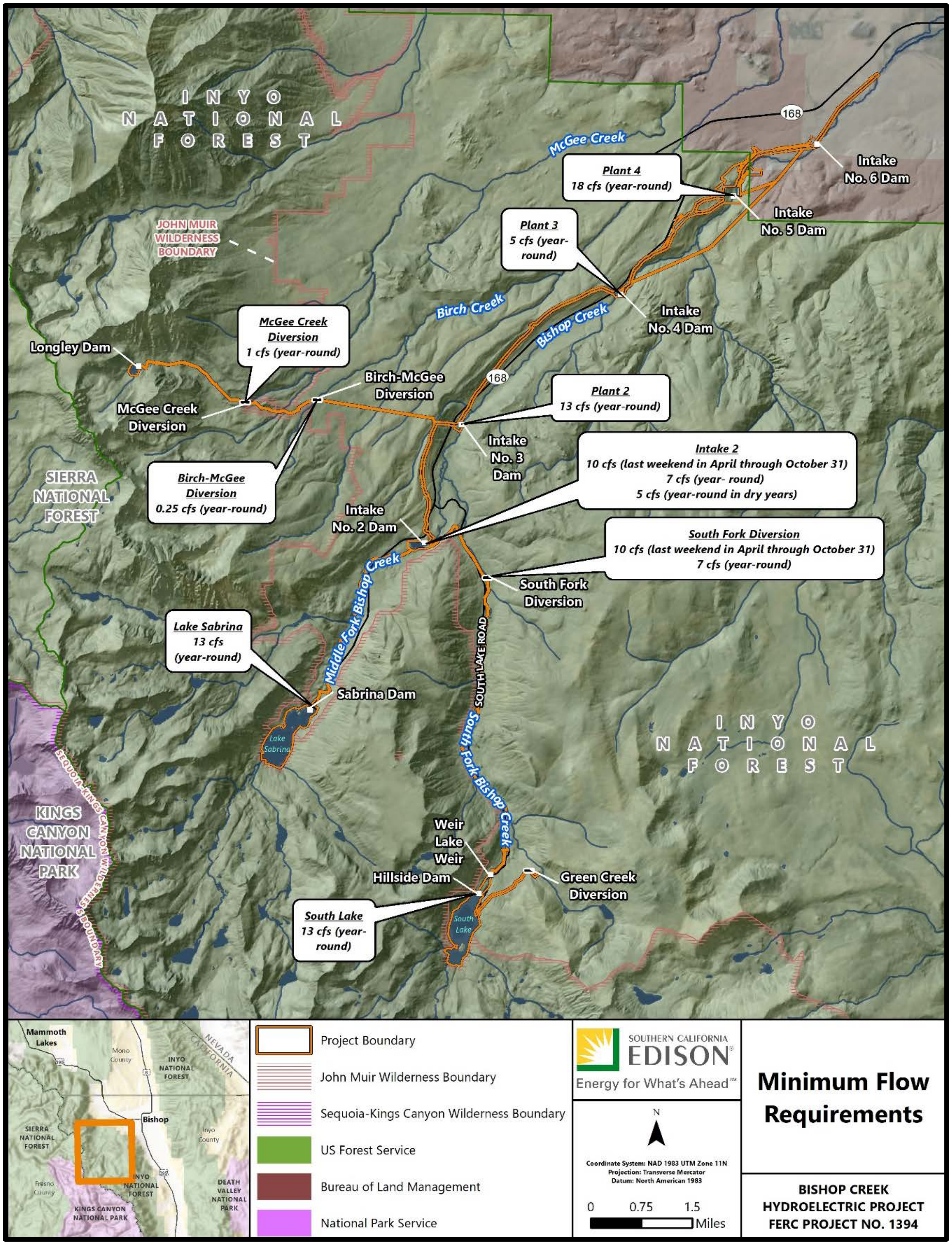

FIGURE 4-21 MINIMUM FLOW REQUIREMENTS

4.4.2 Fish

The CDFW introduced brook trout, rainbow trout and brown trout to Project area waters, which are managed to support an angling harvest. All three species are nonindigenous, and stocking is required to support heavy angling exploitation for the put and take rainbow trout fishery. Segments of the lower reaches of Bishop Creek maintain self-sustaining brown trout populations, and McGee and Birch creeks maintain scattered populations of brook trout.

Dienstadt et al. (1985), conducted a fishery survey of various parts of the Owens River watershed, including Bishop, McGee and Birch creeks. Table 4-34 summarizes both habitat and fish and trout abundance data recorded at each sampling station in the Project area. SCE conducted more recent monitoring studies of the fishery to document the abundance and growth of the trout fishery, which are described below.

The CDFW manages Bishop Creek downstream from Plant 4 primarily for indigenous fish species, including the Owens sucker and speckled dace, and manages Bishop Creek upstream through the Project area as a self-sustaining brown trout sport fishery (N. Buckmaster, CDFW, *personal communication*, October 2018 TWG meeting).

SCE conducted a fish entrainment study at Plant 5 and Plant 3 during the prior relicensing. (Biosystems 1988). After 883 hours of sampling at Plant 5, it was estimated that approximately 4 brown trout and 10 rainbow trout per month were entrained. After 1259 hours of sampling at Plant 3, 6 brown trout and 1 rainbow trout were reported as entrained, however several of the fish were suspected of being residual following net calibration tests or fish that were tailrace resident fish that intruded into the tailrace netting system. FERC approved the final entrainment report, which concluded that approximately 1.4 percent to 1.7 percent of brown trout were entrained.

TABLE 4-34 SUMMARY OF HABITAT AND TROUT DENSITY FROM BISHOP, MCGEE AND BIRCH CREEKS, 1983-1984

STREAM SEGMENT	HABITAT	TROUT PER MILE			NOTES
		Brown	Rainbow	Brook	
Bishop Creek 2	riffle and run cobble and sand	1716			~300 yards below Coyote Creek
Bishop Creek 5	cascading glacial deposits, fair cover, pocket water	3442			~ 3 miles above Coyote Creek
Bishop Creek 4	cascading glacial deposits, boulder cover, pocket water	3980			3.5 miles above Coyote Creek
Bishop Creek 3	stair-stepping pools and riffle, boulder and cobble substrate fair cover -boulders	1866			~ 1/4 mile downstream from Birch Creek inflow
Bishop Creek 1	stair-stepping pools cascades, boulder cobble and gravel substrate	1369			immediately upstream from South Fork
S. Fork Bishop Ck 4	riffle, run, pool; fair cover, limiting to larger fish	2939			1.5 miles upstream from Bishop Creek
S. Fork Bishop Ck 3	riffle and run, few pools; boulder dominant, good cover undercut banks	1456	155		~ 4 miles above Bishop Creek
S. Fork Bishop Ck 2	pocket water, runs and riffles, boulder, cobble, sand and gravel, undercut banks	3941	325		~ 5 miles above Bishop Creek
S. Fork Bishop Ck 1	high gradient stair-stepping riffle and small pools, boulder/cobble, fair cover	1630	619		~6 miles above Bishop Creek
N. Fork Bishop Ck. 1	wet meadow, excellent cover overhanging vegetation, undercut banks and pools	1626	84	2112	annually stocked with 20,000 rainbow trout
Birch Creek 1	hillside meadow with fast flow			138	not stocked
McGee Creek 2	shallow run and riffle with boulder and cobble, dense riparian vegetation	1109			in Longley Meadow
McGee Creek 1	plunge pools and short cascades, logs and small pools - fair cover	940		1162	~ 12 miles above Highway 395

Source: Dienstadt et al. 1985

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Headwater lakes and reservoirs are located at higher elevations (i.e. greater than 9,000 feet msl). One or more of these lakes contain introduced, self-sustaining populations of Owens sucker, specifically in South Lake. During an early June 2018 field visit to Lake Sabrina, adult Owens sucker were observed spawning in a shallow arm near the eastern end of the Lake Sabrina dam. Owens sucker are believed to have been informally introduced (N. Buckmaster, CDFW, *personal communication*). EA Science Engineering and Technology (1987) conducted gillnet surveys of several SCE east-Sierra reservoirs, including Sabrina and South lakes. The survey yielded brook trout, brown trout and rainbow trout in both those reservoirs, however only the rainbow trout were stocked. CDFW heavily stocks each lake with rainbow trout (approximately 500 to 1000 fish per week during the fishing season) to support a heavily used put and take fishery (N. Buckmaster, CDFW, *personal communication*). EA Science Engineering and Technology (1987) also netted unidentified sucker from Lake Sabrina, which the authors speculated were Owens sucker. EA Science Engineering and Technology (1987) observed that upstream migration of spawning trout was possible from South Lake and Lake Sabrina into tributary streams (i.e. there were no natural barriers such as ledges, falls on inlet stream channels). Stomach content analyses of trout indicated that most of their diet was composed of benthic chironomid larvae and pupae, and various planktonic and terrestrial invertebrates.

Other higher elevation lakes in the Bishop Creek watershed (upstream of the Project area) are reported to contain self-sustaining populations of non-indigenous golden trout, as well as brown and brook trout (CDFW 2018). Introduction of these species to these previously fishless ecosystems has resulted in negative impacts to other aquatic organisms such as yellow-legged frogs; as a result, the CDFW developed an *Aquatic Biodiversity Management Plan for Lakes in the Bishop Creek Basin of the Sierra Nevada* (CDFW 2004) to attempt to protect amphibian populations at risk. Table 4-35 summarizes CDFW's records of the current distribution of trout at representative reference points throughout the Bishop Creek drainage.

TABLE 4-35 DISTRIBUTION OF CATCHABLE TROUT THROUGHOUT THE BISHOP CREEK BASIN, LISTED IN DESCENDING ORDER OF ELEVATION

LOCATION	ACRES	ELEVATION (ft)	SPECIES	COMMENTS
Schober Holes	3.91	11,847	brook trout, golden trout	back country
Tyee Lake	11.9	11,011	brook trout, rainbow trout	back country
Piute Lake	2106	10,952	brook trout, rainbow trout	back country
Wonder Lakes	5.24	10,893	brook trout	back country
Treasure Lake	12.1	10,667	golden trout	back country
Dingleberry Lake	5.9	10,486	Brook trout, brown trout	back country
South Lake	*180*	*9,750*	*hatchery trout*	*last stocked 2017*
North Lake	*20*	*9,255*	*hatchery trout*	*last stocked 2017*
Lake Sabrina	*186*	*9,000*	*hatchery trout*	*last stocked 2017*
SCE Intake 2	*15*	*9,000*	*hatchery trout*	*last stocked 2017*
Middle Fork Bishop Creek	*n/a*	*variable*	*hatchery trout*	*last stocked 2017*
South Fork Bishop Creek	*n/a*	*variable*	*hatchery trout*	*last stocked 2017*

Source: CDFW 2018

Note: *Italicized* entries are within Project area
[1] Based on CDFW data.

4.4.2.1 Monitoring Studies

SCE conducted regular monitoring studies of brown trout abundance and growth in the Project area from 1991 through 2010, following the introduction of a continuous minimum flow of 18 cfs in Bishop Creek (EA Science 1986; Sada and Knapp 1993; Sada 1997; Sada, 2006; Sada and Rosamond 2010). Studies were conducted in Bishop Creek below the diversions for Plants 3 and 5 and in McGee Creek at established reference stations and using the same methodology each year of monitoring. Reference stations were selected in areas relatively isolated from angling to minimize the effect of angler exploitation on population metrics. Fish were collected at each site using a multiple-pass depletion sampling design with backpack shocking gear and block nets. Standing crop estimates were generated, and length-weight data gathered on a target of at least 50 fish per site. Fish ages were determined based on length class and confirmed with scale-aged samples.

Based on these data, Sada (2006) found that populations and standing crop of brown trout remained relatively stable and had longevity and growth rates comparable to other similar high elevation trout streams. The final survey (2009 to 2010) determined that fish density had declined to an extent at each site from historic levels, however size classes and age distribution indicated that spawning recruitment and natural reproduction appeared normal. In addition, brook trout and a few rainbow trout were present for the first time. Sada and Rosamond (2010) did not identify a specific cause for the change in density.

Biosystems Analysis, Inc. (1991a) documented the ecology, movement and reproduction of adult brown trout, spawning habitat, entrainment and angler use in Bishop Creek, in support of TROUT[3], a population model applied to Bishop Creek (Biosystems 1991b). Of 858 adult trout captured, 65.1 percent dispersed downstream, and 23.5 percent moved upstream primarily immediately prior to spawning. Relatively little movement to and from tributaries was detected. Redd surveys revealed that females often selected sub-optimal substrates to spawn, and that poor substrates yielded longer incubation periods prior to fry emergence relative to optimal substrates. Spawning occurs throughout November, with the peak in the latter half of the month. Most reds were located within 0.37 miles upstream from intake diversion forebay pools and these pools provided significant roles in maintaining the adult-sized brown trout population, where 2+ and 3+ aged brook trout were dominant.

The TROUT model (Biosystems 1991b and 1991c) results indicated that downstream movement appeared to be dominated by escapement from forebay pools in response to density-dependent carrying-capacity factors, and that any related entrainment appeared to be a result of intraspecific competition in the forebays. Neither the exit of these fish from forebay populations nor angling pressure materially affected localized forebay populations. The forebays provide a reserve of

[3] The TROUT model was designed to examine the effects of different water resource and fishery management alternatives in Bishop Creek. It was written in FORTRAN 77 for use on DOS-based computers (Biosystems Analysis, Inc. 1991c).

adults that maintains the population and allow reproduction to both sustain the population and for recovery following population collapses.

TABLE 4-36 FISHES KNOWN OR EXPECTED TO OCCUR IN THE IMMEDIATE VICINITY OF THE PROJECT

FAMILY	SCIENTIFIC NAME	COMMON NAME	NOTES
Catostomidae	*Catostomus fumeiventris*	Owens sucker	Believed by CDFW to occupy South Lake
Cyprinidae	*Siphateles bicolor*	Tui chub	Recorded by CDFW in Bishop Creek and canal below Project area
Gasterosteida	*Gasterosteus aculeatus*	3-spine stickleback	Recorded by CDFW in Bishop Creek and canal below Project area
Salmonidae	*Salvinus fontinalis*	Brook trout	Non-indigenous to Bishop Creek drainage
Salmonidae	*Oncorhynchus mykiss*	Rainbow trout	Non-indigenous to Bishop Creek drainage
Salmonidae	*Salmo trutta*	Brown trout	Non-indigenous to Bishop Creek drainage
Salmonidae	*Oncorhynchus mykiss aguabonita*		Non-indigenous to Bishop Creek drainage

Source: CDFW 2018; EA Science 1986; Sada and Knapp 1994a; Sada and Knapp 1994b; Sada 1997; Sada 2005; Dienstadt, et al. 1985

4.4.2.2 Anadromous Fish

Bishop Creek rises on the east slope of the Sierra Mountains and is a tributary of the Owens River. The Owens River does not discharge into a larger river or the Pacific Ocean. Therefore, there are no anadromous fish species in the watershed.

4.4.2.3 Catadromous Fish

There are no catadromous fish in the Project area.

4.4.2.4 Benthic Macroinvertebrate Communities

There are no published studies regarding benthic macroinvertebrates in Bishop, Birch, or McGee creeks. This data gap is not unusual for most of the Sierra Nevada, where invertebrate inventories or studies at the species level are scarce (Erman 1996). Field notes from a study conducted in 1976, provided by the CDFW, indicated an attempt to characterize aquatic invertebrate fauna in relation to water temperature and reach features (e.g. pool, riffle, channel substrate) on ten sites on Bishop Creek extending from below Lake Sabrina to below Plant 3. The study detected at least ten orders of invertebrates, but many of these were identified only to the family level, not to species. There was no discernible pattern of distribution relative to stream reach.

4.4.2.5 Freshwater Unionids

Unpublished field notes from an invertebrate study conducted in 1976 detected taxa from two classes of mollusks (Gastropoda, Pelecypoda) in Bishop Creek but no bivalves or invasive species such as the quagga mussel (*Dreissena rostriformis bugensis*) or zebra mussel (*Dreissena polymorpha*).

Quagga and zebra mussels are freshwater bivalves native to Eastern Europe and Western Asia that made their way into the Great Lakes in the late 1980s. They have been highly successful invaders, reproducing and adapting quickly to hundreds of freshwater lakes and waterways in the midwestern and eastern United States. Scattered populations have been detected in southern California (SCE 2017). The mussels have significant adverse impacts to aquatic ecosystems and water delivery systems. The spread of these mussels is believed to be through infected watercraft.

SCE personnel have not reported any sightings or indications of quagga or zebra mussels, but the extensive network of waterways and reservoirs and multiple public access launch ramps and popular recreational sites, presents a risk of introduction to SCE’s managed water bodies. Therefore, SCE developed a quagga and zebra mussel prevention plan which assesses the vulnerability of invasion into SCE lakes. The prevention plan includes a monitoring program to detect the presence of adult and/or veliger dreissenid mussels, and includes long-term management steps to ensure continued recreational use of healthy SCE lakes including the educational outreach to inform the public about the biology and management of the mussels.

4.4.3 Essential Fish Habitat as Defined Under the Magnuson-Stevens Fishery Conservation and Management Act

There is no Essential Fish Habitat as defined under the Magnuson-Stevens Fishery Conservation and Management Act in the Project area.

4.4.4 Potential Adverse Effects and Issues

SCE's review of readily available information, and early consultation with interested parties indicated that the Project may potentially have an adverse impact on aquatic habitat required to support CDFW's management of self-sustaining riverine game species (brown, brook and rainbow trout) and native species (Owens sucker and speckled dace) living in Bishop Creek downstream of plants 2 through 5 by altering flows that provide suitable habitat. There is concern that stream conditions and management objectives have evolved since the time of prior flow recommendations such that existing flows may require modification to optimize CDFW management objectives.

The Project presently provides base flows in each stream reach below the spillway diversion of each plant, based on recommendations derived from an instream flow study conducted as part of the previous relicensing. These flows are specified in license Article 105 in the existing license. Article 404 provides a mechanism for SCE and CDFW to agree on brown trout stocking numbers.

Due to the absence of native migratory anadromous or catadromous fish species in the Owens River basin, there are no agency management goals requiring fish passage in the Project area. Therefore, SCE does not anticipate the need for fish passage facilities in the Project area.

4.4.5 Proposed Mitigation and Enhancement Measures

SCE anticipates continuing with the PME's identified above in the new license; although no additional mitigation or enhancement measures relating to fishery resources are planned at this time, SCE intends to evaluate the issues identified above as part of the relicensing Study Plan, and in consultation with stakeholders. Should any major structural changes be planned for the Project, appropriate BMPs to minimize effects on fishery resources would be implemented; however, no structural changes are proposed at this time.

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4.5 UPLAND WILDLIFE AND BOTANICAL RESOURCES [§ 5.6 (D)(3)(V)]

4.5.1 Botanical Resource

4.5.1.1 Upland Botanical Resources

This section is based on keys and descriptions from the USFS using the Calveg[4] classification system. This is the preferred key in use by the Inyo National Forest and is used here to be consistent with the Inyo National Forest Plan (USFS 2018a). In this system, differences between community types (also referred to as alliances) are based on canopy cover as determined from aerial photography and satellite imagery. Maps are provided in Appendix E.

For analysis purposes, map limits are 200 feet around Project facilities, creeks and lakes. Table 4-42 lists all community types and areas they represent, both in acres and as percentages of the total mapped area.

4.5.1.1.1 Tree Dominated

Canyon Live Oak

With a canopy cover of at least 50 percent, the canyon live oak (*Quercus chrysolepis*) community generally occurs on relatively dry, shallow colluvial soils in steep canyons between approximately 1600 feet and 8400 feet. Understory shrubs can include deerbrush (*Ceanothus integerrimus*) and whiteleaf Manzanita (*Arctostaphylos viscida*), as well as annual grasses and forbs.

Eastside Pine

This community is defined by presence of Jeffrey pine (*Pinus jeffreyi*), either alone or in combination with ponderosa pine (*P. ponderosa*), with a canopy cover of at least 75 percent. The

[4] The CALVEG ("Classification and Assessment with Landsat of Visible Ecological Groupings") system was initiated in January 1978 by the Region 5 Ecology Group of the U.S. The Calveg team's mission was to classify California existing vegetation communities for use in statewide resource planning considerations. It is a hierarchical classification originally based on "formation" categories: forest, woodland, chaparral, shrubs and herbaceous in addition to non-vegetated units. They were originally identified by distinctions calculated among canopy reflectance values used in the LANDSAT satellite. Since then, the classification has been expanded from an initial 129 types occurring throughout the eight regions of the state to the current 213 occurring in nine regions, and image resolution has been enhanced. https://www.fs.fed.us/r5/rsl/Projects/classification/system.shtml accessed January 16, 2019.

community generally occurs at moderate to upper montane elevations, especially in an elevation range of approximately 5400 feet to 10,000 feet.

Limber Pine

With a canopy cover of at least 75 percent, the limber pine (*Pinus flexilis*) community is associated with dry, steep, high elevation sites generally in the range of 8000 feet to 10,600 feet. These slopes are often east facing, eroded, rocky, coarse-textured, and with low soil nutrient levels.

Lodgepole Pine

The lodgepole pine (*Pinus contorta* ssp. *murrayana*) alliance, with at least 75 percent canopy cover of this species, generally occurs at elevations from approximately 5800 feet to 11,200 feet. Lodgepole pine is an important invader species following fire or disturbance.

Singleleaf Pinyon Pine

With a canopy cover of at least 75 percent, the singleleaf pinyon pine (*Pinus monophylla*) community typically occupies dry slopes within a wide elevation range. Understory shrub species commonly include big sagebrush (*Artemisia tridentata*), bitterbrush (*Purshia tridentata*), cacti (*Opuntia* spp.) and rabbitbrush (*Chrysothamnus* spp.).

Subalpine Conifers

A combination of two or more conifer species, with a canopy cover of at least 50 percent, comprises this community. Depending on location, the mixture may include three or more of the following species: mountain hemlock (*Tsuga mertensiana*), lodgepole pine (*Pinus contorta* ssp. *murrayana*), limber pine (*P. flexilis*) and/or whitebark pine (*P. albicaulis*). The elevation range of this community is approximately 7600 feet to 11,800 feet.

Whitebark Pine

With a canopy cover of whitebark pine (*Pinus albicaulis*) of at least 75 percent, this community occurs on high windswept ridges within an elevation range of 8600 feet to 12,000 feet. In these areas, a krummholzed form is common, but an upright form also grows in areas of glacial scouring where soil development is poor.

4.5.1.1.2 Shrub Dominated

Alpine Mixed Scrub

Alpine Mixed Scrub communities consist of a mixture of tall and dwarf shrubs and some low graminoid and forb species, often including cushion or rosette-leaved plants that survive harsh climatic conditions above timberline. In the Sierra Nevada, the Alpine Mixed Scrub Alliance has been mapped chiefly in the range of approximately 8000 feet to 12,600 feet. Common shrubs include creambush oceanspray (*Holodiscus discolor*), Greene's goldenweed (*Ericameria greenei*) and mountain white heather (*Cassiope mertensiana*). Shrubby willows (*Salix* spp.) are also common in this type. Non-shrub species include those represented in the Alpine Grasses and Forbs Alliance.

Bitterbrush

Bitterbrush (*Purshia tridentata*) is dominant in this alliance and can include the varieties antelope bitterbrush (*P. t.* var. *tridentata*) and desert bitterbrush (*P. t.* var. *glandulosa*). The alliance has been mapped at elevations from approximately 4800 feet to 8000 feet. Bitterbrush is a high value forage species that is associated with species such as big sagebrush (*Artemisia tridentata*), singleleaf pinyon pine (*Pinus monophylla*) and Jeffrey pine (*P. jeffreyi*).

Blackbush

This community is defined by occurrence of blackbush (*Coleogyne ramosissima*) with a canopy cover of at least 50 percent. Other upland shrubs, especially Mormon tea (*Ephedra* spp.), white bursage (*Ambrosia dumosa*) and saltbush (*Atriplex* spp.) may be present.

Curlleaf Mountain Mahogany

This community occurs on gently to steeply sloping mountain uplands and ridge tops, usually in association with rocky outcrops. Curlleaf mountain mahogany (*Cercocarpus ledifolius*) has been mapped more frequently in its shrub form than as a tree in the southern Sierras. It is abundant mainly at elevations above approximately 5400 feet.

Great Basin Mixed Scrub/Big (Basin) Sagebrush

A mixture of common Great Basin shrubs, with big basin sagebrush (*Artemisia tridentata* ssp. *tridentata*) cover of at least 50 percent, defines this type. It commonly occurs in the range of approximately 5000 feet to 10,600 feet in the southern Sierras. Other species can include mountain sagebrush (*A. t.* ssp. *vaseyana*), bitterbrush (*Purshia tridentata*), curlleaf mountain mahogany (*Cercocarpus ledifolius*), currant (*Ribes* spp.), snowberry (*Symphoricarpos* spp.) and/or interior rose (*Rosa woodsii*).

High Desert Mixed Scrub

This mixture of shrub species, found up to approximately 7400 feet, is defined by the presence of abundant (but not dominant) ephedra species, especially green ephedra (*Ephedra viridis*), spiny menodora (*Menodora spinescens*) and horsebrush (*Tetradymia* spp.).

Rabbitbrush

This community occurs on dry slopes and flats that are dominated by various species of rabbitbrush (*Chrysothamnus* spp.). In the Sierra Nevada it occurs chiefly within an elevation range of approximately 2600 feet to 9000 feet, often in proximity to the annual grasses and Forbs Alliance.

Saltbush

This alliance is a combination of shadscale (*Atriplex confertifolia*), fourwing saltbush (*A. canescens*), and/or other *Atriplex* species. It generally occurs at elevations of approximately 3000 feet to 5000 feet. Other alkaline desert shrub species such as rabbitbrush (*Chrysothamnus* spp.) can be closely associated with this type.

4.5.1.1.3 Herbaceous Dominated

Alpine Grasses and Forbs

Prostrate or low-growing herbaceous species predominate in this botanically diverse community rather than shrubs or trees. The community occurs most often within an elevation range of approximately 8200 feet to more than 13,000 feet. Due to high evaporative potential, the short growing season and abrasion or desiccation by wind, morphological adaptions by particular species are often similar to those in the desert. For example, several cushion-forming plants occur within these rocky sites, as well as species with basal rosette-type leaves. Nevertheless, there are a rich variety of herbaceous species that may be found in this Alliance, partially due to diverse habitats and moisture. On dry, open fell-fields, phlox (*Phlox condensata*) often dominate a site and on granite and metamorphics, oval-leaved buckwheat (*Eriogonum ovalifolium*) is a prominent species in many areas. Other species that may be identified in this community include prostrate sibbaldia (*Sibbaldia procumbens*), knotweed (*Polygonum davisiae*), buttercup (*Ranunculus eschscholtzii*), rockcress (*Arabis lemmonii*), mountain sorrel (*Oxyria digyna*), pussypaws (*Calyptridium umbellatum*), Indian paintbrush (*Castilleja lemmonii*), and (on moist sites) columbine (*Aquilegia pubescens*).

Annual Grasses and Forbs

This community is dominated by annual grasses such as bromes (*Bromus* spp.), needlegrass (*Achnatherum* spp.) and wild oats (*Avena* spp.), as well as forbs such as owl's clover (*Orthocarpus* spp.), fiddleneck (*Amsinckia intermedia*) and stork's bill (*Erodium* spp.). This community is often associated with burn areas, xeric or disturbed conditions.

Perennial Grasses and Forbs

This community consists of at least 50 percent cover of perennial grasses and forbs, retaining some moisture in mid-summer and growing in an elevation generally within approximately 6400 feet to 12,000 feet. Upper elevations are often associated with subalpine conifers such as whitebark pine (*Pinus albicaulis*) and lodgepole pine (*P. contorta* ssp. *murrayana*).

4.5.1.2 Special-Status Plant Resources

This section describes special-status plants that are known to occur or may potentially occur in the Project vicinity. Threatened and endangered plants are discussed in Section 4.6.

For the purposes of this document, a special-status plant is defined as a plant species considered by one or more branches of the federal government (e.g., USDA, USFS or BLM) or by the state of California to merit regulatory consideration in association with prosecution of a Project. The state of California classifies such plant species as California Species of Special Concern, and will also employ the California Native Plant Society (CNPS) California Rare Plant Rank, a ranking system for rare, threatened or endangered plants in California. The California Environmental Quality Act requires consideration of plant species with the following California Rare Plant Rank (CRPR) rankings:

- 1A presumed extirpated in California and either rare or extinct elsewhere;
- 1B rare, threatened or endangered in California and elsewhere;
- 2A presumed extirpated in California, but common elsewhere; and
- 2B rare, threatened or endangered in California, but common elsewhere.

CRPR employs a threat rank extension that further clarifies the level of endangerment of a plant species.

- An extension of **.1** is assigned to plants that are considered seriously threatened in California (i.e., over 80 percent of known occurrences are threatened or have a high degree and immediacy of threat).
- Extension **.2** indicates the plant is fairly threatened in California (i.e., between 20 and 80 percent of the occurrences are threatened or have a moderate degree and immediacy of threat).
- Extension **.3** is assigned to plants that are considered not very threatened in California (i.e., less than 20 percent of occurrences are threatened or have a low degree and immediacy of threat or no current threats are known).
- The absence of a threat code extension indicates that this information is lacking for the plant(s) in question.

A list of special-status plant species was compiled from the following sources:

- The California National Diversity Data Base (CNDDB) (CDFW 2018a) and the CNPS Inventory of Rare, Threatened and Endangered Plants (CNPS 2018). The following

USGS 7.5-minute topographic quadrangles were queried for special status plant species: Coyote Flat, North Palisade, Tungsten Hills, Mt. Darwin, Mount Tom, Bishop and Mt. Goddard.

This resulting list was then evaluated to determine which plant species have the potential to occur or are known to occur in the Project vicinity based a review of the following:

- Supplemental information (e.g., habitat descriptions and known occurrences) obtained from a review of the following Project-specific sources:
  - Psomas Biological Survey Reports (a total of 14 reports prepared for SCE between 2004 and 2014)
  - Environmental Assessment (EA), Bishop Creek Project (FERC Project No. 1394-004) (FERC 1991)
- Plant species on the list were then categorized as follows:
- **Known to occur in the Project vicinity**: Special-status plants with recorded populations in the Project vicinity, as determined by CNDDB or SCE studies;
- **May potentially occur in the Project vicinity**: Special-status plants that may potentially occur in the Project vicinity based on the geographic location and elevation of the Project and vegetation alliances and other habitat features present; and
- **Unlikely to occur in the Project vicinity**: Special-status plants that are unlikely to occur because their range does not overlap the Project; or for which the Project vicinity does not support appropriate habitat.

Table 4-37 provides a list of special-status plant species evaluated for their potential to occur in the Project vicinity. Species listed in the table are categorized as known to occur; may potentially occur or unlikely to occur. Table 4-37 also summarizes pertinent information for each species, including status, blooming period, and preferred habitat, with information on the location of occurrences, if applicable.

Figure 4-22 Plant CNDDB Records in the Project vicinity, shows known occurrences based on the results of the CNDDB query.

TABLE 4-37 PLANT SPECIES OCCURRENCE IN PROJECT VICINITY

SCIENTIFIC/ COMMON NAME	FEDERAL STATUS	STATE STATUS AND CRPR RANK	BLOOMING PERIOD/ FERTILE	HABITAT	LIKELIHOOD FOR OCCURRENCE/OCCURRENCE NOTES
KNOWN TO OCCUR					
Draba praealta tall draba	–	CRPR 2B.3	July–Aug	Meadows, seeps, and wetlands from 9596 ft. to 11,302 ft.	Known to occur. This species is located along Lake Sabrina, south of Lake Sabrina Dam.
Mentzelia inyoensis Inyo blazing star	BLMS, USFS_S	CRPR 1B.3	Apr–Oct	Great Basin scrub, pinyon-juniper woodland from 3789 ft. to 6496 ft.	Known to occur. This species is located along Bishop Creek, 0.4 miles north of Bishop Creek South Fork Diversion Dam.
Myurella julacea small mousetail moss	–	CRPR 2B.3	N.A.	Alpine boulder and rock field, subalpine coniferous forest, growing on damp limestone rock and soil; crevices, under hangs, shelves, in filtered light; sometimes on granite, from 8858 ft. to 9842 ft.	Known to occur. This species is located along Middle Fork Bishop Creek 0.6 miles northeast of Lake Sabrina Dam.
Solorina spongiosa fringed chocolate chip lichen	–	CRPR 2B.2	N.A.	Meadows and seeps, including seeps within subalpine coniferous forest, on moss mats in areas with calcareous seepage. Generally, in high altitude sites with north or east exposure, from 9498 ft.	Known to occur. This species is located 0.5 miles north of South Lake Dam, along South Lake Road within South Fork Bishop Creek Drainage.
Trichophorum pumilum little bulrush	–	CRPR 2B.2	Aug	Limestone soils within bogs and fens, marshes and swamps, and riparian scrub from 9448 ft. to 10,662 ft.	Known to occur. This species is located 0.5 miles north of South Lake Dam, along South Lake Road within South Fork Bishop Creek Drainage.
Triglochin palustris marsh arrow-grass	–	CRPR 2B.3	July–Aug	Meadows and seeps, freshwater marsh, subalpine coniferous forest from 6988 ft. to 11,597 ft.	Known to occur. This species is located 0.8 miles southwest of Bishop Creek Intake No. 2, 0.15 miles east of Highway 168.
MAY POTENTIALLY OCCUR					
Allium atrorubens var. atrorubens Great Basin onion	–	CRPR 2B.3	May–Jun	In sandy, rocky, gravelly, or sometimes clay soils in Great Basin scrub and pinyon-juniper woodland from 3937 ft. to 3937 ft.	May potentially occur. This species has been recorded outside the Project boundary, 2.2 miles north of Birch Creek Diversion, on McGee Creek.
Boechera dispar pinyon rock cress	–	CRPR 2B.3	Mar–Jun	Granitic, gravelly slopes and mesas in Joshua tree woodland, pinyon and juniper woodland, and Mojavean desert scrub from 3297 ft. and 9202 ft.	May potentially occur. This species has been recorded outside the Project watershed, 1.5 miles southeast of Powerhouse No. 4, east of Coyote Creek.
Boechera tularensis Tulare rockcress	USFS_S	CRPR 1B.3	Jun–Jul	Rocky slopes in Subalpine coniferous forest, upper montane coniferous forest from 5987ft. to 11,007 ft.	May potentially occur. This species has been recorded 3.3 miles to the west of the Project watershed’s western boundary, 6 miles west of Lake Sabrina.
Botrychium crenulatum scalloped moonwort	USFS_S	CRPR 2B.2	Jun–Sept	Moist meadows and seeps, upper montane coniferous forest, lower montane coniferous forest, marshes and swamps from 3887 ft. to10,203 ft.	May potentially occur. This species has been recorded within the Project watershed boundary, 4.3 miles east of South Fork Bishop Creek and 4.8 miles southeast of Bishop Creek South Fork Diversion Dam, along the East Fork Coyote Creek.
Bruchia bolanderi Bolander's bruchia	USFS_S	CRPR 4.2	N.A.	Moss which grows on damp clay soils in lower montane coniferous forest, meadows and seeps, and upper montane coniferous forest; ephemeral nature and disturbance adapted; from 5282ft. to 10,958 ft.	May potentially occur. This species has been recorded 2 miles south of the Project watershed’s southern boundary, 5.5 miles south of South Lake.
Calochortus excavatus	BLMS, USFS_S	CRPR 1B.1	Apr–Jul	Mostly on fine, sandy loam soils with alkaline salts; grassy meadows	May potentially occur. This species has been recorded outside the Project’s northeastern watershed boundary, 2.9

SCIENTIFIC/ COMMON NAME	FEDERAL STATUS	STATE STATUS AND CRPR RANK	BLOOMING PERIOD/ FERTILE	HABITAT	LIKELIHOOD FOR OCCURRENCE/OCCURRENCE NOTES
Inyo County star-tulip				and seeps in shadscale scrub from 393 ft. to 7,201 ft.	miles northeast of Powerhouse No. 6 off Highway 168 in Bishop.
Carex scirpoidea ssp. pseudoscirpoidea western single-spiked sedge	–	CRPR 2B.2	Jul–Sept	Often on limestone in alpine boulder and rock field, meadows and seeps, and subalpine coniferous forest from 6988 ft. to 12,007 ft.	May potentially occur. This species has been recorded within the Project watershed boundary, 4 miles east of Bishop Creek South Fork Diversion Dam, along West Fork Coyote Creek.
Helodium blandowii Blandow's bog moss	USFS_S	CRPR 2B.3	N.A.	Moss growing on damp soil, especially under willows among leaf litter in meadows, seeps, and subalpine coniferous forest from 6108 ft. to 8858 ft.	May potentially occur. This species has been recorded 1.3 miles south of the Project watershed southern boundary, 3.6 miles south of South Lake and 4.8 miles south of South Lake Dam, along Middle Fork Kings River.
Lupinus magnificus var. hesperius Mcgee Meadows lupine	BLMS	CRPR 1B.3	Apr–Jun	Sandy substrates in Great Basin scrub and upper montane coniferous forest from 5298 ft. to 7103 ft.	May potentially occur. This species was last recorded in 1906, 1 mile west of the Project watershed's western boundary, 1.6 miles northwest of Powerhouse No. 3 and Intake No. 4, and 2 miles west of Powerhouse No. 4 and Intake No. 5, near McGee Meadow.
Packera indecora rayless mountain ragwort	–	CRPR 2B.2	Jul–Aug	Mesic meadows and seeps from 5593 ft. to 10,006 ft.	May potentially occur. This species has been recorded 3.7 miles west of the Project watershed's western boundary, 6.3 miles west of Lake Sabrina.
Parnassia parviflora small-flowered grass-of-Parnassus	–	CRPR 2B.2	Aug–Sept	Wet areas, meadows and rocky seeps from 6594 ft. to 9104 ft.	May potentially occur. This species was last recorded in 1937 in Buttermilk County, outside the Project watershed's northern boundary, 1.9 miles north of Birch-McGee Diversion.
Plagiobothrys parishii Parish's popcornflower	–	CRPR 1B.1	Mar–Jun	Alkaline soils; mesic sites in Great Basin scrub and Joshua tree woodland from 8070.8 ft to 15,068.8 ft.	May potentially occur. This species was last recorded in 1913 outside the Project watershed's northern boundary, located in a meadow along Highway 395 approximately 1.5 miles east of Bishop.
Potamogeton robbinsii Robbins' pondweed	–	CRPR 2B.3	Jul–Aug	Deep water, lakes, marshes and swamps from 5003 ft. to 11,466 ft.	May potentially occur. This species has been recorded 1.7 miles southeast of the Project watershed's eastern boundary, 4.6 miles southeast of South Lake Dam, along Fourth Lake.
Ranunculus hydrocharoides frog's-bit buttercup	–	CRPR 2B.1	Jun–Sept	In or bordering shallow springs or freshwater marshes and seeps from 4133 ft. to 7611 ft.	May potentially occur. This species has been recorded outside the Project watershed's northern boundary, 3.5 miles from Powerhouse No. 6, located in a channel within the town of Bishop.
Sabulina stricta bog sandwort	–	CRPR 2B.3	Jul–Sept	Moist, granitic gravelly sites in sedge meadows, seeps, alpine boulder and rock field, and alpine dwarf scrub from 8000 ft. to 12,992 ft.	May potentially occur. This species was last recorded in 1977 along Coyote Ridge within the Project watershed, 1.5 miles east of Green Creek Diversion Dam.
Viola pinetorum ssp. grisea grey-leaved violet	–	CRPR 1B.2	Arp–Jul	Dry mountain peaks and slopes in subalpine coniferous forest, upper montane coniferous forest, meadows, and seeps from 5183ft. to 12,139 ft.	May potentially occur. This species has been recorded 1.3 miles southeast of the Project watershed's eastern boundary, 4.3 miles southeast of South Lake Dam, along Fifth Lake.
UNLIKELY TO OCCUR					
Botrychium ascendens upswept moonwort	USFS_S	CRPR 2B.3	Jul–Aug	Grassy fields, meadows and seeps, coniferous woods near springs and creeks in lower montane coniferous forest from 3658 ft. to 10,712 ft.	Unlikely to occur. This species was last recorded in 1920, outside the Project watershed's eastern boundary, 1.9 miles

SCIENTIFIC/ COMMON NAME	FEDERAL STATUS	STATE STATUS AND CRPR RANK	BLOOMING PERIOD/ FERTILE	HABITAT	LIKELIHOOD FOR OCCURRENCE/OCCURRENCE NOTES
					east of Powerhouse No. 5 and Intake No. 6, along Rambaud Creek.
Botrychium minganense Mingan moonwort	USFS_S	CRPR 2B.2	Jul–Sept	Creekbanks in lower montane coniferous forest, upper montane coniferous forest, bogs and fens, meadows and seeps from 3904 ft. to 10,810 ft.	Unlikely to occur. This species was last recorded in 1920, 6.6 miles south of the Project watershed's southern boundary, 9 miles south of South Lake, along Kings River.
Crepis runcinata fiddleleaf hawksbeard	–	CRPR 2B.2	May–Jun	Moist, alkaline valley bottoms in Mojavean desert scrub and pinyon and juniper woodland from 1246 ft. to 10,200 ft.	Unlikely to occur. This species was last recorded 4.6 miles east of the Project watershed's eastern boundary, 10 miles east of Powerhouse No. 2 and Intake No. 3, near Rawson Creek.
Draba sierrae Sierra draba	–	CRPR 1B.3	Jun–Aug	In coarse sandy and gravelly soil; granitic or carbonate substrate in alpine boulder and rock fields from 11,482 ft. to 13,992 ft.	Unlikely to occur. Although this species has been recorded within the Project's watershed boundary (1.5 miles northeast of Green Creek Diversion Dam along Coyote Ridge) it is unlikely to occur because the Project vicinity lies outside this species' elevation range and the Project vicinity does not support habitat appropriate for this species.
Fimbristylis thermalis hot springs fimbristylis	–	CRPR 2B.2	Jun–Sept	Near hot springs in meadows and seeps from 378 ft. to 5200 ft.	Unlikely to occur. This species was last recorded in 1964, 5.2 miles east of the Project watershed's eastern boundary, 10 miles east of Bishop Creek South Fork Diversion Dam, at Keough Hot Springs. 5.2 miles east of Project watershed eastern boundary, and last observed in 1964. Additionally, the Project vicinity lies outside this species' elevation range, and the Project vicinity does not support habitat appropriate for this species.
Poa lettermanii Letterman's blue grass	–	CRPR 2B.3	Jul–Aug	Sandy or rocky sites in alpine boulder and rock fields from 11,040 ft. to 14,009 ft.	Unlikely to occur. Although this species has been recorded within the Project watershed boundary (1.8 miles northeast of Green Creek Diversion Dam and located at the head of West Fork Coyote Creek), it is unlikely to occur because the Project vicinity is outside the species' elevation range, and the Project vicinity does not support habitat appropriate for this species.
Pohlia tundrae tundra thread moss	–	CRPR 2B.3	N.A.	Moss growing on gravelly, damp soil in alpine boulder and rock fields from 8858 ft. to 9842 ft.	Unlikely to occur. Although this species has been recorded within the Project watershed boundary (2 miles southeast of South Lake Dam along Long Lake), the Project vicinity does not support habitat appropriate for this species.
Potentilla morefieldii Morefield's cinquefoil	USFS_S	CRPR 1B.3	Jul–Aug	Low areas in alpine calcareous (or granite) rocks in alpine boulder and rock fields from 10,712 ft. to 13,123 ft.	Unlikely to occur. Although this species has been recorded within the Project watershed boundary (1.3 miles northeast of Green Creek Diversion Dam along Coyote Ridge) the Project vicinity lies outside the species elevation range and does not support habitat appropriate for this species.

USFS: USFS; BLM; CDFW; CNPS; CRPR
LEGEND:

BLM:

Scientific/ Common Name	Federal Status	State Status and CRPR Rank	Blooming Period/ Fertile	Habitat	Likelihood for Occurrence/Occurrence Notes

S: Sensitive
USFS
S Sensitive
CRPR
1B Plants Rare, Threatened or Endangered in California and elsewhere
2B Plants Rare, Threatened or Endangered in California but more common elsewhere
4 Plants of limited distribution – A Watch List
CRPR Threat Code Extensions
.1 Seriously threatened in California (over 80% of occurrences threatened; high degree and immediacy of threat)
.2 Fairly threatened in California (20–80% of occurrences threatened; moderate degree and immediacy of threat)
.3 Not very threatened in California (less than 20% of occurrences threatened; low degree and immediacy of threat or no current threats known)

Source: CDFW 2018a

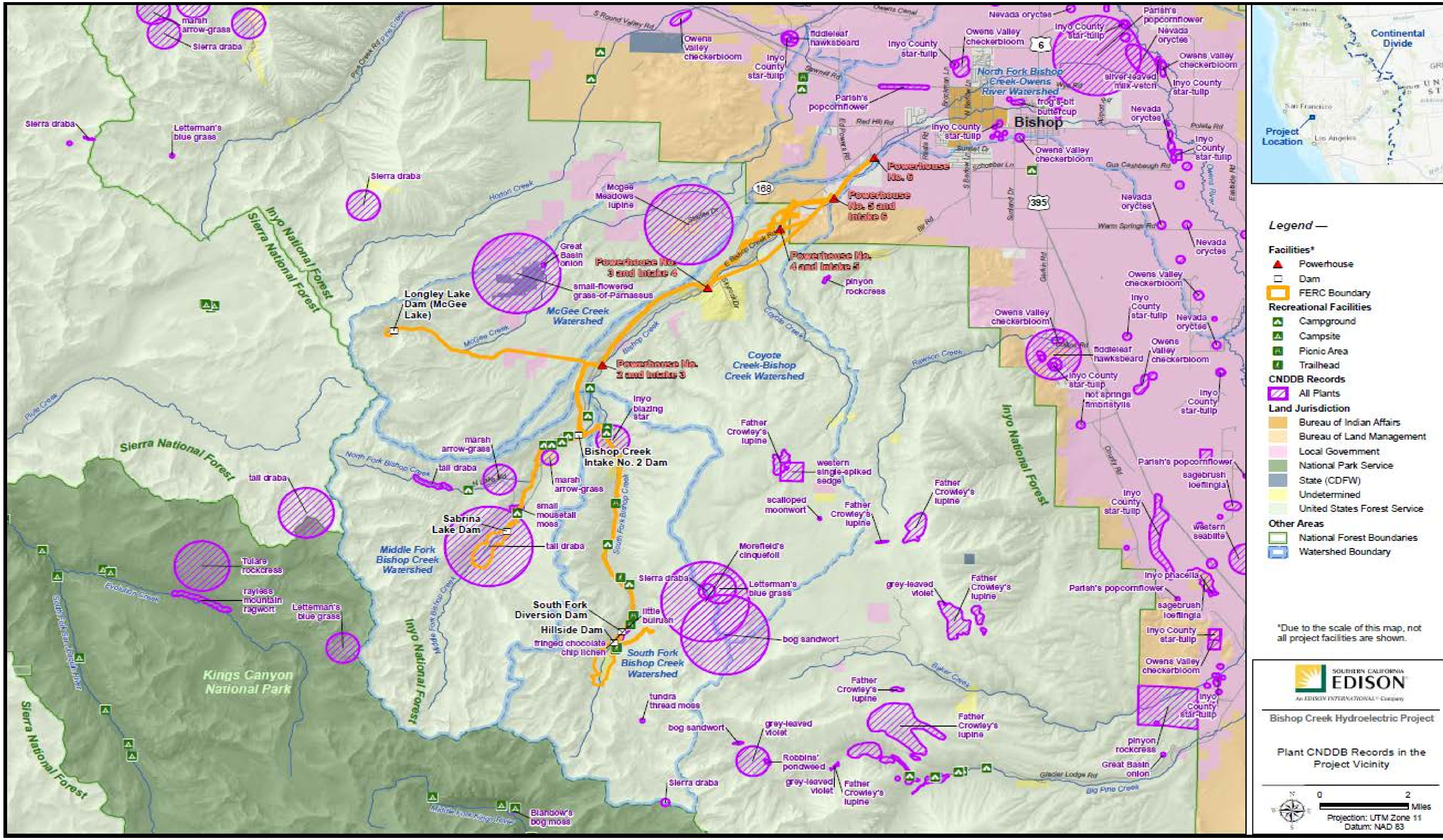

FIGURE 4-22 PLANT CNDDB RECORDS IN THE PROJECT VICINITY

4.5.1.3 Other Plant Resources

The following categories are part of the above referenced California-vegetation classification system, but fit within neither the upland habitat types, nor the riparian habitats.

4.5.1.3.1 Barren

These areas consist of naturally barren landscapes, such as cliffs and bedrocks, where there is less than 50 percent vegetation cover.

4.5.1.3.2 Urban

These features consist of areas classified as urban-related bare soil and urban or industrial impoundment. Together these areas comprise approximately 32 acres, or approximately 1 percent of the mapped area. Urban-related bare soil consists of dry urbanized or developed lands where at least 50 percent of the area is unvegetated. The “urban or industrial impoundment” is limited to a sewage treatment pond north of the Birch-McGee flowline.

4.5.1.4 Non-Native Invasive Plants

Information on non-native invasive plants (NNIPs) potentially occurring in the Project vicinity was obtained from the California Invasive Plant Inventory (Cal-IPC). Cal-IPC defines NNIPs as plants that 1) are not native to, yet can spread into, wildland ecosystems, and that also 2) displace native species, hybridize with native species, alter biological communities, or alter ecosystem processes (Cal-IPC 2017).

Cal-IPC categorizes plants as high, moderate or limited, according to the degree of ecological impact in California (Cal-IPC 2017).

- **High –** Severe ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of dispersal and establishment. Most are widely distributed ecologically.
- **Moderate –** Substantial and apparent, but generally not severe, ecological impacts on physical processes, plant and animal communities, and vegetation structure. Their reproductive biology and other attributes are conducive to moderate to high rates of

dispersal, though establishment is generally dependent upon ecological disturbance. Ecological amplitude and distribution may range from limited to widespread.

- **Limited –** Invasive but ecological impacts are minor on a statewide level (or not enough information to justify a higher score). Their reproductive biology and other attributes result in low to moderate rates of invasiveness. Ecological amplitude and distribution are generally limited, but these species may be locally persistent and problematic.

Cal-IPC was queried to obtain a list of NNIPs based on two parameters:

- Jepson region: The NNIP uses geographic floristic provinces and subdivisions within California as described by the Jepson Manual (Hickman 1993).
- Habitat types: Based on a comparison with vegetation alliances within 1 mile of the Project, three habitat types were selected: grassland, riparian and woodland habitat.

The query of the Cal-IPC yielded a list of 54 species that have the potential to occur in the Project vicinity (Table 4-38). Two of these species, cheat grass (*Bromus tectorum*) and black locust (*Robinia pseudoacacia*) are known to be present in the Project vicinity. One species, hairy whitetop (*Lepidium appelianum*, formerly *Cardaria pubescens*) has been tentatively identified as occurring the landscape area near Plant 4.

TABLE 4-38 NNIPS POTENTIALLY OCCURRING IN THE PROJECT VICINITY

SCIENTIFIC NAME	COMMON NAMES	RATING
POTENTIALLY OCCURRING		
Acroptilon repens	Russian knapweed	Moderate
Agrostis stolonifera	creeping bent	Limited
Ailanthus altissima	tree-of-heaven	Moderate
Arundo donax	giant reed	High
Asparagus asparagoides	bridal creeper	Moderate
Avena barbata	slender oat	Moderate
Avena fatua	wild oats	Moderate
Bassia hyssopifolia	five-hook bassia	Limited
Brassica tournefortii	Sahara mustard	High
Bromus diandrus	ripgut brome	Moderate
Bromus japonicus	Japanese brome	Limited
Bromus madritensis ssp. rubens	red brome	High
Bromus tectorum	cheatgrass	High
Centaurea diffusa	diffuse knapweed	Moderate
Centaurea melitensis	tocalote	Moderate
Centaurea solstitialis	yellow starthistle	High
Cirsium arvense	Canada thistle	Moderate
Cirsium vulgare	bull thistle	Moderate
Conium maculatum	poison-hemlock	Moderate
Cynodon dactylon	Bermuda grass	Moderate
Dactylis glomerata	orchard grass	Limited
Descurainia sophia	tansy mustard	Limited
Digitalis purpurea	foxglove	Limited
Dipsacus fullonum	common teasel	Moderate
Dittrichia graveolens	stinkwort	Moderate
Elaeagnus angustifolia	Russian olive	Moderate
Erodium cicutarium	redstem filaree	Limited
Festuca arundinacea	reed fescue	Moderate
Foeniculum vulgare	fennel	Moderate
Halogeton glomeratus	Halogeton	Moderate
Helminthotheca echioides	bristly ox-tongue	Limited
Hirschfeldia incana	short-pod mustard	Moderate
Holcus lanatus	common velvet grass	Moderate
Lepidium appelianum (=Cardaria pubescens)	hairy whitetop	Limited
Lepidium latifolium	perennial pepperweed	High

SCIENTIFIC NAME	COMMON NAMES	RATING
Marrubium vulgare	horehound	Limited
Plantago lanceolata	English plantain	Limited
Poa pratensis	Kentucky bluegrass	Limited
Polypogon monspeliensis	rabbitsfoot grass	Limited
Ricinus communis	castor bean	Limited
Robinia pseudoacacia	black locust	Limited
Rubus armeniacus	Himalayan blackberry	High
Rumex acetosella	sheep sorrel	Moderate
Rumex crispus	curly dock	Limited
Salsola paulsenii	barbwire Russian thistle	Limited
Salsola tragus	Russian thistle	Limited
Saponaria officinalis	bouncing-bet	Limited
Schismus arabicus	Mediterranean grass	Limited
Sisymbrium irio	London rocket	Limited
Spartium junceum	Spanish broom	High
Stipa miliacea var. miliacea	smilo grass	Limited
Tamarix aphylla	athel	Limited
Tribulus terrestris	puncture vine	Limited
Verbascum thapsus	woolly mullein	Limited

Source: Cal-IPC 2018

4.5.2 Terrestrial Wildlife Resources

4.5.2.1 Upland Wildlife Resources

This section describes common, special-status, and game species having the potential to occur in the Project vicinity. The upland wildlife resources described below are based on direct observation from past biological studies (Brown-Berry 2014, Psomas 2004a, 2004b, 2005, 2006a, 2006b, 2007a, 2007b, 2008a, 2008b, 2010 and 2014). In addition, the following FERC documents were reviewed: Environmental Assessment, Bishop Creek Project and the Order Issuing New License (FERC 1991 and 1994), California Natural Diversity Database (CDFW 2018a) was queried for special status wildlife species for the following USGS 7.5-minute topographic quadrangles: Coyote Flat, North Palisade, Tungsten Hills, Mt. Darwin, Mount Tom, Bishop and Mt. Goddard, USFWS's Information for Planning and Consultation (IPaC) website (USFWS 2018), eBird database for observations within the Project area including South Lake,

Lake Sabrina, North Lake, Intake No 2, Bishop Plant 4 and Aspendell; and the list of USFS Management Indictor Species (USFS 2018b).

As described in the Section 4.5.2, numerous upland plant communities are present within the Project vicinity supporting a variety of wildlife species. These plant communities mix and blend one into another providing a complex of habitats with an overstory of one community supporting an understory of a second community. This complexity is reflected in the wildlife species that occur in multiple communities.

The intermixing of the vegetation communities in the Project vicinity provides for a complex habitat allowing wildlife to utilize many different plant communities throughout a great range of elevations. For this analysis the plan communities have been lumped into lower midrange and higher elevation associations:

Lower elevation plant communities (4000 feet to 6000 feet above msl) are an interdigitated mix of canyon live oak, single leaf pinyon pine, eastside pine, lodgepole pine, high desert mixed scrub, pine, rabbit brush, salt bush, Great Basin mixed scrub/big (basin) sagebrush, and annual grasses and forbs.

Mid-elevation communities from 5000 feet to 7000 feet above msl consists of a mix of canyon live oak, single leaf pinyon pine, eastside pine, lodgepole pine, limber pine, rabbit brush, Great Basin Sagebrush, curlleaf mountain mahogany, and annual grasses and forbs.

Higher elevation communities above 7000 feet msl consist of a mix of canyon live oak, eastside pine, limber pine, lodgepole pine, subalpine confers and whitebark pine, bitterbrush, and Great Basin Sagebrush, alpine mixed scrub, curlleaf mountain mahogany, alpine grasses and forbs, and perennial grasses and forbs.

Some representative wildlife species found within the Project vicinity are listed below. The list below is based on the literature review and the following references, FERC 1991; Laws 2007; SCE 1986; and Schoenherr 1992. Nomenclature for scientific and common names for wildlife followed the following references, unless otherwise cited: American Fisheries Society 2013; Bradley et. al. 2014; Chesser et. al. 2018; Crother 2017; and Wilson and Reeder 2005.

Representative wildlife life associated with the lower elevation habitats include Mourning Cloak (*Nymphalis antiopa*), Great Basin spadefoot toad (*Scaphiopus intermontanus*), western toad (*Anaxyrus boreas*), desert horned lizard (*Phrynosoma platyrhinos*), desert spiny lizard (*Sceloporus magister*), northern alligator lizard (*Elgaria coerulea*), gopher snake (Pituophis catenifer), western rattlesnake (*Crotalus oreganus*), California quail (*Callipepla californica*), western bluebird (*Sialia mexicana*), American crow (*Corvus brachyrhynchos*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), house finch (*Haemorhous mexicanus*), Say's Phoebe (*Sayornis saya*), Cassin's king bird (*Tyrannus vociferans*), scrub jay (*Aphelocoma californica*), white-crowned sparrow (*Zonotrichia leucophrys*), pallid bat (*Antrozous pallidus*), black-tailed jackrabbit (*Lepus californicus*), Botta's pocket gopher (*Thomomys bottae*), deer mouse (*Peromyscus maniculatus*), pinyon mouse (*Peromyscus truei*), California ground squirrel (*Otospermophilus beecheyi*), least chipmunk (*Neotamias minimus*), California vole (*Microtus californicus*), southern grasshopper mouse (*Onychomys torridus*), coyote (*Canis latrans*), and mule deer (*Odocoileus hemionus*).

Representative wildlife life associated with the mid-elevation habitats include, Sierra sulfur (*Colias behrii*), Mourning Cloak (*Nymphalis antiopa*), Sierra treefrog (*Pseudacris sierra*), Mt. Lyell salamander (*Hydromantes platycephalus*) sage brush lizard (*Sceloporus graciosus*), pinyon jay (*Gymnorhinus cyanocephalus*) is very common in the pinyon-sagebrush zone: other common bird species include the black-billed magpie (*Pica pica*), gray flycatcher (*Empidonax wrightii*), red-tailed hawk (*Buteo jamaicensis*), dark-eyed junco (*Junco hyemalis*), Mountain chickadee (*Poecile gambeli*), brown creeper (*Certhia americana*), white-crowned sparrow (*Zonotrichia leucophrys*), Brewer's sparrow (*Spizella breweri*), purple finch (*Haemorhous purpureus*), American pika (*Ochotona princeps*), California ground squirrel (*Otospermophilus beecheyi*), golden-mantled ground squirrel (*Callospermophilus lateralis*), Douglas' squirrel (*Tamiasciurus douglasii*), long-tailed vole (*Microtus longicaudus*), deer mouse (*Peromyscus maniculatus*), pinyon mouse (*Peromyscus truei*), bushy-tailed woodrat (*Neotoma cinerea*), coyote (*Canis latrans*), and mule deer (*Odocoileus hemionus*).

Representative wildlife life associated with the higher elevation habitats include Sierra skipper (*Hesperia miriamae*), Sierra treefrog (*Pseudacris sierra*), sage brush lizard (*Sceloporus graciosus*), Williamson's sapsucker (*Sphyrapicus thyroideus*), Stellar's jay (*Cyanocitta stelleri*), Clark's nutcracker (*Nucifraga columbiana*), mountain bluebird (*Sialia currucoides*), hermit thrush *(Catharus guttatus*), Cassin's finch (*Carpodacus cassinii*), Northern goshawk (*Accipiter gentilis*), American pika (*Ochotona princeps*), alpine chipmunk (*Neotamias alpinus*), yellow-pine chipmunk (*Neotamias amoenus*), Douglas' squirrel (*Tamiasciurus douglasii*), Belding's ground squirrel (*Urocitellus beldingi*), and yellow-bellied marmot (*Marmota flaviventris*).

4.5.2.2 Special-Status Wildlife

This section describes special-status wildlife that occur or may potentially occur in the Project vicinity. This section addresses only special-status terrestrial wildlife species. Amphibians and reptiles that utilize aquatic habitats are included in this section because of their utilization of adjacent terrestrial habitats. Fish are addressed in Section 4.3 Fish and Aquatic Resources. Threatened and Endangered Wildlife are discussed in Section 4.6.

- Special status wildlife species are those species that are considered Species of Special Concerns (CSC) by the state of California, categorized as sensitive by the USFS and/or the BLM, or as a species of conservation concern by the USFWS.

A list of special status wildlife species was compiled from the following sources:

- A query of the CNDDB (CDFW 2018a) to obtain information on known occurrences in the Project vicinity. The following USGS 7.5-minute topographic quadrangles were queried for special status wildlife species: Coyote Flat, North Palisade, Tungsten Hills, Mt. Darwin, Mount Tom, Bishop, Mt. Goddard.
- USFWS Information, Planning, and Conservation System (IPaC) website (USFWS 2018)
- The geographic location and elevation of the Project and vegetation communities and other habitat features present to determine those species which may potentially occur.

Wildlife species on the list were then categorized as follows:

- Known to occur in the Project vicinity: wildlife species with recorded occurrences in the Project vicinity, as determined by CNDDB or SCE studies;
- May potentially occur in the Project vicinity: wildlife species that may potentially occur in the Project vicinity based on the geographic location and elevation of the Project and wildlife habitats present.

Table 4-39 provides a list of special-status wildlife species evaluated for their potential to occur in the Project vicinity. Species listed in the table are categorized as known to occur or having the potential to occur in appropriate habitat. Table 4-39 summarizes pertinent information for each species, including status and preferred habitat, with information on the location of the occurrence.

Figure 4-23 Wildlife CNDDB records depicts the location of special-status wildlife that occur in the Project vicinity.

TABLE 4-39 SPECIAL STATUS WILDLIFE SPECIES OCCURRENCE

SCIENTIFIC/ COMMON NAME	FEDERAL STATUS	STATE STATUS	HABITAT	LIKELIHOOD FOR OCCURRENCE/OCCURRENCE NOTES
KNOWN TO OCCUR IN THE PROJECT VICINITY				
Accipiter gentilis northern goshawk	BLM_S, USFS_S	CDF_S, CDFW_SSC	Usually nests on north slopes, near water. Red fir, lodgepole pine, Jeffrey pine, and aspens are typical nest trees within north coast coniferous forest, Subalpine coniferous forest, and Upper montane coniferous forest habitats from 915 ft. to 9900 ft.	Known to occur. This species has been recorded 0.18 miles north of Birch-McGee Diversion, near Birch Creek; and 0.75 miles south of South Lake Dam on the east side of South Lake.
MAY POTENTIALLY OCCUR IN THE PROJECT VICINITY				
Corynorhinus townsendii Townsend's big-eared bat	USFS_S, BLM_S	CDFW_SSC	Roosts in the open, hanging from walls and ceilings throughout California in a wide variety of habitats, including chaparral, chenopod scrub, Great Basin grassland, Great Basin scrub, Upper and Lower montane coniferous forest, Meadow and seep Riparian forest/woodland, and valley and foothill grassland. Most common in mesic sites. Roosting sites limiting. Extremely sensitive to human disturbance. Found from 4000 ft. to 10,800 ft.	May potentially occur. This species has been recorded at Yaney Mine, approximately 1.1. miles east of the Project watershed's eastern boundary, 1.6 miles northeast of Powerhouse No. 5 and Intake 6.
Euderma maculatum spotted bat	BLM_S	CDFW_SSC	Feeds over water and along washes. Feeds almost entirely on moths. Needs rock crevices in cliffs or caves for roosting within wide variety of habitats from arid deserts and grasslands through mixed conifer forests from mostly 900 ft. to 2700 ft. but up to 9700 ft.	May potentially occur. This species has been recorded 1.5 miles northeast of Powerhouse No. 6, located in a residential area between Highway 395 and Highway 168, northeast of the Project watershed northeastern-most boundary.
Hydromantes platycephalus Mount Lyell salamander	–	CDFW_WL	Active on the surface only when free water is available, in the form of seeps, drips, or spray. Found in rocky habitat, including cliff faces and cave walls, within mixed conifer, red fir, lodgepole pine, and subalpine habitats, from 4000 ft. to 11,600 ft. in elevation. Occasionally found under woody debris.	May potentially occur. This species has been recorded 4.6 miles northwest of the Project watershed's northwestern boundary, 5.3 miles northwest of Longley Lake Dam/McGee Lake, along Pine Creek Trail.
Lepus townsendii western white-tailed jackrabbit	–	CDFW_SSC	Open areas with scattered shrubs and exposed flat-topped hills with open stands of trees, brush and herbaceous understory within sagebrush, subalpine conifer, juniper, alpine dwarf shrub and perennial grassland habitats, from 120 ft. to 12,000ft.	May potentially occur. This species has been recorded north of Bishop, northeast of the Project watershed's northeastern-most boundary, 4.5 miles northeast of Powerhouse No. 6 along North Fork Bishop Creek near Highway 6.
Lithobates pipiens northern leopard frog	–	CDFW_SSC	Highly aquatic species. Shoreline cover, submerged, and emergent aquatic vegetation are important habitat characteristics within freshwater marsh, Great Basin flowing waters, Great Basin standing waters, marsh and swamp, wetland habitats, from sea level to 7000 ft.	May potentially occur. This species has been recorded northwest of the Project watershed's northernmost boundary, 1.7 miles northwest of Powerhouse No. 6, 0.4 mile east of Birch Creek, 4 miles west of Bishop.

SCIENTIFIC/ COMMON NAME	FEDERAL STATUS	STATE STATUS	HABITAT	LIKELIHOOD FOR OCCURRENCE/OCCURRENCE NOTES
Martes caurina sierrae Sierra marten	USFS_S	–	Needs variety of different-aged stands, particularly old-growth conifers and snags which provide cavities for dens/nests, within mixed evergreen forests with more than 40% crown closure along Sierra Nevada and Cascade mountains, from 8000 ft. to 10,300 ft.	May potentially occur. This species has been recorded 2.7 miles southwest of Lake Sabrina Dam, along Middle Fork Bishop Creek just south of Dingleberry Lake.

USFS; BLM; CDFW; CDF
LEGEND:

USFWS:
S: Sensitive
USFS
S Sensitive
BLM
S Sensitive
CDFW
SSC Species of Special Concern
WL Watch List

Source: CDFW 2018a

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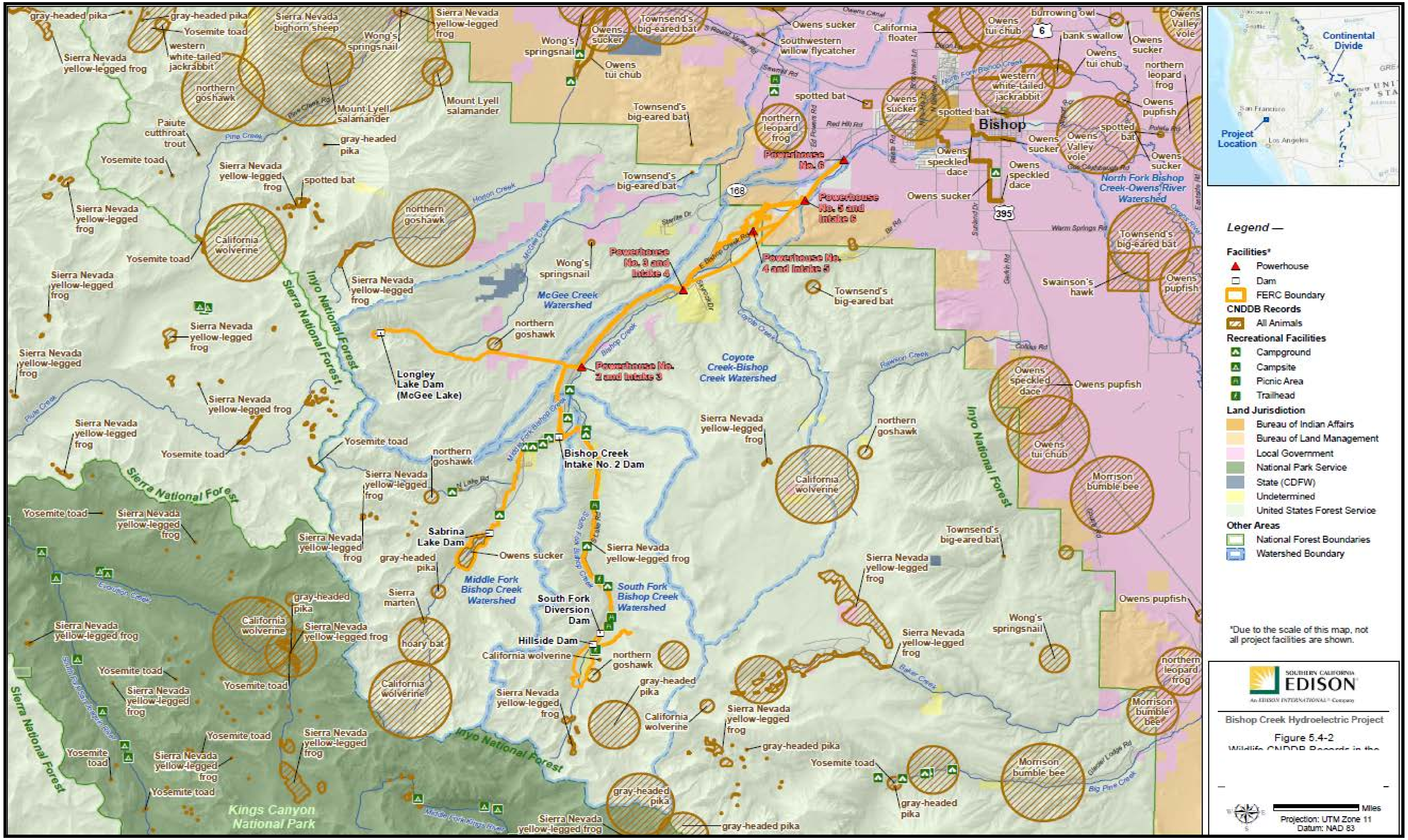

FIGURE 4-23 WILDLIFE CNDDB RECORDS IN THE PROJECT VICINITY

Table 4-40 provides a list of bird species deemed to be species of conservation concern by the USFWS.

TABLE 4-40 USFWS BIRD SPECIES OF CONSERVATION CONCERN

SPECIES	BREEDING SEASON	HABITAT	POTENTIAL TO OCCUR
Black Rosy-finch *Leucosticte atrata*	Jun 15 to Aug 31	Above timberline throughout its range, wherever proper cliffs and rock slides provide nest sites with protection from falling rocks and hail, and where there are adequate feeding grounds on tundra, fellfields, rock slides, snowfields and glaciers within commuting distance. May occur in enclaves of alpine habitat on northeast faces of mountains whose summits are below timberline, but where cliffs, shade, and snow produce alpine climate.	Observed at Aspendell; suitable habitat.
Brewer's Sparrow *Spizella breweri*	May 15 to Aug 10	Breeds in shrublands; most closely associated with landscapes dominated by big sagebrush (*Artemisia tridentata*). Overwinters in sagebrush shrublands and brushy desert habitat, including desert scrub dominated by various saltbush species (*Atriplex* spp.) and creosote (*Larrea tridentata*).	Observed at Aspendell, Intake 2, Lake Sabrina, South Lake, and North Lake; suitable habitat.
Cassin's Finch *Carpodacus cassinii*	May 15 to Jul 15	Generally open coniferous forests of interior western mountains over a broad elevational range. Often found in mature forests of lodgepole pine (*Pinus contorta*) and ponderosa pine (*P. ponderosa*)	Observed at Intake 4, Aspendell, Intake 2, Lake Sabrina, South Lake, and North Lake; suitable habitat.
Green-tailed Towhee *Pipilo chlorurus*	May 1 to Aug 10	Habitat varies with elevation. Dry shrubby hillsides (shrub-steppe) and post-disturbance shrubby second growth are most commonly used. Vegetation may be characterized as low brush cover, often interspersed with trees; avoids typical forest.	Observed at Aspendell, Intake 2, Lake Sabrina, South Lake, and North Lake; suitable habitat.
Lesser yellowlegs *Tringa flavipes*	Breeds elsewhere	Common breeder in boreal forest (generally open forest) and forest/tundra transition habitats; less abundant in adjacent subarctic tundra. Also nests in man-made habitats such as seismic and gas line right-of-ways, road allowances, and mine clearings. Typical foraging areas are located along the shores of large, shallow, freshwater lakes and sloughs (interior breeders) or in brackish portions of salt marshes (coastal breeders).	Not expected to occur for breeding; no potentially suitable breeding habitat; may occur as a migrant.
Lewis's Woodpecker *Melanerpes lewis*	Apr 20 to Sep 30	Important aspects of breeding habitat include an open canopy, a brushy understory offering ground cover, dead or downed woody material, available perches, and abundant insects. Three principal habitats are open ponderosa pine forest, open riparian woodland dominated by cottonwood, and logged or burned pine (*Pinus* spp.) forest; also found in oak (*Quercus* spp.) woodland, nut and fruit orchards, piñon pine–juniper (*Pinus cembroides – Juniperus* spp.) woodland, a variety of pine and fir (*Abies* spp.) forests, and agricultural areas including farm- and ranchland. Often classified as a specialist in burned pine forest habitat.	Observed at Aspendell; suitable habitat.
Long-billed curlew *Numenius americanus*	Apr 1 to Jul 31	Nests primarily in short-grass or mixed-prairie habitat with flat to rolling topography. Wide range of habitats used during migration, including dry short-grass prairie, wetlands associated with alkali lakes, playa lakes, wet coastal pasture, tidal mudflats, salt marsh, alfalfa fields, barley fields, fallow agriculture fields, and harvested rice fields. Overwinters in tidal estuaries, wet pasture habitats, and sandy beaches.	Not expected to occur for breeding; no potentially suitable breeding habitat; may occur as a migrant
Marbled Godwit *Limosa fedoa*	Breeds elsewhere	In northern prairies of Canada and United States, breeds in short, sparsely to moderately vegetated landscapes that include native grassland and wetland complexes with a variety of wetland classes (ephemeral to semi-permanent). Away from breeding areas, most migrants found in flocks at coastal estuaries, mudflats, salt marshes, lagoons, and sandy beaches. Habitats used by birds in winter like those of coastal migrants: coastal mudflats adjoining savannas or meadows, estuaries, sandy beaches, and sandflats; sometimes roosting at salt ponds.	Not expected to occur for breeding; no potentially suitable breeding habitat; may occur as a migrant
Olive-sided Flycatcher *Contopus cooperi*	May 20 to Aug 31	Primarily montane and northern coniferous forests. May occur at any elevation from sea level to timberline, but usually at mid- to high-elevation forest (3018 ft. to 6988ft.). Within the coniferous forest biome, most often associated with forest openings, forest edges near natural openings (e.g., meadows, canyons, rivers) or human-made openings (e.g., harvest units), or open to semi-open forest stands. Frequently occurs along wooded shores of streams, lakes, rivers, beaver (*Castor canadensis*) ponds, bogs, and muskegs, where natural edge habitat occurs and standing dead trees often are present.	Observed at Aspendell, Intake 2, Lake Sabrina, South Lake, and North Lake; suitable habitat.

Species	**Breeding Season**	**Habitat**	**Potential to Occur**
Pinyon Jay *Gymnorhinus cyanocephalus*	Feb 15 to Jul 15	Piñon-juniper woodland is used most extensively but flocks also breed in sagebrush (*Artemisia* spp.), scrub oak (*Quercus spp*.) and chaparral communities. In parts of its range (central Arizona, southern California), inhabits ponderosa and Jeffrey pine (*Pinus jeffreyi*) forests.	Observed at Intake 4, Aspendell, and Intake 2; suitable habitat.
Rufous Hummingbird *Selasphorus rufus*	Breeds elsewhere	Breeds in dense mature and second growth coniferous forests, deciduous woods, riparian thickets, swamps and meadows, farmland, pasture edges, orchards and city yards, parks and gardens; in the Pacific Northwest United States and Canada. Migrants utilize montane meadows; alpine meadows in the Sierras as high as 11,500 ft. Overwinter in Mexico.	Observed at Aspendell, Intake 2, Lake Sabrina, South Lake, and North Lake; suitable habitat.
Sage Thrasher *Oreoscoptes montanus*	Apr 15 to Aug 10	Shrub-steppe dominated by big sagebrush (*Artemisia tridentata*). Considered a sagebrush obligate but noted in black greasewood (*Sarcobatus vermiculatus*) habitat in Utah and Nevada and bitterbrush (*Purshia tridentata*) habitat in Washington. Migrants utilize sagebrush plains, arid shrub, grassland with scattered bushes, and open piñon-juniper woodland, primarily in arid or semiarid situations; rarely around towns. Overwinter in arid to semiarid, open and semi-open country with scrub, scattered bushes, and sagebrush.	Observed 0.85 miles northeast of Powerhouse No. 3; suitable habitat.
Sagebrush Sparrow *Artemisiospiza nevadensis*	Mar 15 to Jul 31	Prefers semi-open habitats with evenly spaced shrubs 3 ft. to 6 ft. high. Vertical structure, habitat patchiness, and vegetation density may be more important in habitat selection than specific shrub species, but this sparrow is closely associated with big sagebrush throughout most of its range. observed in creosote bush, low desert scrub, and coastal sagebrush scrub during migration. In northern portions of its range, favors big sagebrush. Farther south, fairly common to uncommon during winter in desert washes, big sagebrush, creosote bush, sparse cactus scrub, arid grasslands, and arboreal yucca (*Yucca* spp.) mixed with greasewood	Observed at Intake 4, and Intake 2; suitable habitat.
Virginia warbler *Vermivora virginiae*	May 1 to Jul 31	Over most of its range, typically found breeding in piñon-juniper and oak woodlands. May also occur in high-altitude life zones dominated by large conifers but tends to select patches of shrubby vegetation for breeding; never occurs in coniferous forests where there is not a deciduous mix. Strong association for breeding in steep draws, drainages, or slopes with oak or other shrubby vegetation.	Observed at Aspendell and South Lake; suitable habitat.
White-headed woodpecker *Picoides albolarvatus*	May 1 to Aug 15	Requires montane coniferous forests dominated by pines (*Pinus* ssp.), with tree species composition varying geographically. Within the Sierra Nevada, occupies mixed coniferous forest of ponderosa and sugar pines, white fir, red fir (*Abies magnifica*), Douglas-fir, and black oak (*Quercus kelloggii*); occurs more locally on drier east-slope forests dominated by Jeffrey pine (*P. jeffreyi*) and in high-elevation lodgepole pine and western white pine (*P. monticola*) forests, and is generally absent from digger pine (*P. sabiniana*)-dominated habitats at lower elevations on western flank of the Sierra Nevada.	Observed at Aspendell, Intake 2, Lake Sabrina, and South Lake; suitable habitat.
Willet *Tringa semipalmata*	Apr 20 to Aug 5	On the prairies, uses short, sparse cover in wetlands and grasslands. Breeds on semiarid plains near bodies of water (eastern Oregon), in grasslands associated with shallow wetlands (s. Alberta), in native grasslands and to a lesser extent cropland (N. Dakota), in uplands near brackish or saline wetlands, and less frequently on alkali flats (Utah) and lakes in forested mountain areas. During nonbreeding season, found in diverse California coastal types: mudflat, marsh, sandy beach, and rocky coast.	Not expected to occur for breeding; no potentially suitable breeding habitat; may occur as a migrant
Williamson's Sapsucker *Sphyrapicus thyroideus*	May 1 to Jul 31	Throughout range, breeds in middle to high elevation conifer and mixed conifer-deciduous forests. Common in montane western larch, Douglas fir (*Pseudotsuga menziesii*), ponderosa pine, and pine-fir forests.	Observed at Aspendell, Lake Sabrina, South Lake, and North Lake; suitable habitat.
Willow Flycatcher *Empidonax traillii*	May 20 to Aug 31	In general, prefers moist, shrubby areas, often with standing or running water; *e.g.*, in California, restricted to thickets of willows, whether along streams in broad valleys, in canyon bottoms, around mountain-side seepages, or at the margins of ponds and lakes in the West, generally occurs in beaver meadows, along borders of clearings, in brushy lowlands, in mountain parks, or along watercourses to 7500 ft.	Observed at Aspendell, Lake Sabrina, South Lake, and North Lake; suitable habitat.

Source: USFWS 2018

TABLE 4-41 U.S. FOREST SERVICE SIERRA NATIONAL FORESTS MANAGEMENT INDICATOR SPECIES

SPECIES	HABITAT/ECOSYSTEM	CATEGORY FOR ANALYSIS[1]
Aquatic macroinvertebrates	Riverine and Lacustrine	Category 2
Fox sparrow *Passerella iliaca*	Shrubland (west-slope chaparral types)	Category 2
Mule deer *Odocoileus hemionus*	Oak-associated hardwood and hardwood/conifer	Category 2
Yellow warbler *Dendroica petechia*	Riparian	Category 2
Sierra tree frog *Pseudacris sierra*	Wet meadow	Category 2
Mountain quail *Oreortyx pictus*	Early seral coniferous forest	Category 2
Mountain quail *Oreortyx pictus*	Mid seral coniferous forest	Category 2
Sooty (blue) grouse *Dendragapus obscurus*	Late seral open canopy coniferous Forest	Category 2
California spotted owl *Strix occidentalis*	Late seral closed canopy coniferous forest	Category 2
American marten *Martes americana*	Late seral closed canopy coniferous forest	Category 2
Humboldt's lying squirrel[2] *Glaucomys oregonensis*	Late seral closed canopy coniferous forest	Category 2
Hairy woodpecker *Picoides villosus*	Snags in green forest	Category 2
1 **Category 1:** MIS whose habitat is not in or adjacent to the Project area and would not be affected by the Project. **Category 2:** MIS whose habitat is in or adjacent to Project area but would not be either directly or indirectly affected by the Project. **Category 3:** MIS whose habitat would be either directly or indirectly affected by the Project.		
2 Formerly included within *Glaucomys sabrinus*. Elevated to species status in California, Oregon and portions of Washington by Arbogast, et. al. 2017.		

Source: USFS 2018a

4.5.2.3 Game Species

Game species are animals hunted for sport or pleasure. Information on game species potentially present in the Project vicinity is provided in this section because of their commercial and recreational value. Game species are regulated by CDFW (2018b) and are defined under the California Fish and Game Code as follows:

- Resident and migratory game birds are defined in California Fish and Game Code §3500. Examples of upland resident game birds listed include blue grouse, wild turkey, mountain quail and California quail. Upland migratory game birds include (but are not limited to) Wilson's snipe, band-tailed pigeon, and mourning dove.
- Game mammals are defined in California Fish and Game Code §3950(a) to include (but are not limited to) deer, elk, wild pig, black bear, rabbits and hares, and tree squirrels, as small game mammals. Note that mountain lions are included in §3950 but are explicitly excluded as a game mammal in §3950.1.

A summary of some game species in the Project vicinity, including resident game birds, migratory game birds and game mammals, is provided below.

4.5.2.3.1 Resident and Migratory Game Birds

Upland birds occurring in the Project vicinity that meet the definition of resident game birds (California Fish and Game Code §3500) include (but are not limited to) mountain quail and California quail. Birds that meet the definition of migratory game birds (California Fish and Game Code §3500) include mourning dove (CDFW 2018c).

4.5.2.3.2 Game Mammals

Mule Deer

Mule deer are found throughout the Project area at elevation habitats of 4000 feet to high elevation habitats up to and above 11,000 feet. Mule deer are among the most visible and widespread wildlife species in California. Deer hunting is regulated by California state law through CDFW.

A hunting license and a hunting tag are required to take mule deer, and only bucks with antlers with demonstrable forks (or greater) may be taken, except during special hunts. Antlers must be forked on one side in the upper two-thirds section of the antler.

Other Game Mammals

Other game mammals occurring in the Project vicinity include, but are not limited to, jackrabbit, western gray squirrel, black bear and bobcat.

4.5.3 Potential Adverse Effects and Issues

SCE's review of readily available information, and early consultation with interested parties have not identified upland wildlife and botanical resource issues associated with the Project. Most Project facilities are located on or adjacent to Inyo National Forest Lands and close coordination between SCE and the USFS relating to both ongoing O&M and minor construction activities is a standard operating procedure. For this reason, a high level of environmental protection is already in place. These include an Avian Protection Plan that includes employee training, reporting and compliance with federal and state laws protecting migratory birds, and SCE's Nesting Bird Management Guidance for Small Projects.

The Project has been in operation since the early 1900s, and the current flow regime has provided for instream flows under the current license. No major modifications of the facilities or operations are expected to be proposed under the new license. Therefore, Project-related activities will generally be limited to routine O&M. Sources of potential ongoing impacts on terrestrial wildlife species would be associated with small construction activities outside of routine O&M of the Project facilities, including:

- Ground disturbing activities such as minor grading. This potential impact would normally be limited to small areas typically a fraction of an acre in size.
- Impacts to obligate riparian bird species through loss of small areas of riparian vegetation, typically a fraction of an acre in size.
- Noise and other construction related potential disturbance to wildlife species.
- Ongoing activities that may result in potential impacts include electrical transmission line mortality (potential impact to raptors)

Other potential ongoing impacts on the wildlife are due to the presence of penstocks, above-ground flowlines, and access roads. Resident and migratory species over the course of Project operation have, most likely, adapted to the presence of Project facilities and operations. For example, deer herds have modified their routes around the facilities and no additional impacts are anticipated. Penstocks (and flowlines) may have presented some feeding and movement barriers to mule deer in the past; however, in consultation with resource agencies, flowline mule deer crossovers were constructed, and appear to be in routine use by mule deer. The presence of non-Project roads may still impact mule deer movements because of human activity. These impacts most likely vary seasonally, with more potential impacts occurring during the tourist season. To the degree tourism may be associated with Project facilities and operations, these impacts may be an indirect Project effect.

In addition to mule deer discussed above, roads have had a potential impact on the biological resources in the Project area. Improvement of these roads to provide improved recreational access to the reservoirs and streams creates a continuing indirect impact to riparian areas and associated wildlife. Actual Project operation is not the controlling factor in this impact; rather, recreational use of the Project area is responsible for most continuing impacts.

The utilization of transmission facilities for raptor roosting and perching presents a potential impact to raptors in the Project area. Raptor use of transmission facilities has been determined to be minimal, because these transmission lines are not on a major raptor flyway or key feeding area. Consistent with Articles 406 SCE maintains a Raptor Protection Plan for the Project.

Plant community composition changes gradually with elevation, but the various recognized plant communities interdigitate at all elevations, thus buffering any potential Project operational impact (e.g. altered stream flow) to wildlife utilization of any one plant community. For example, riparian habitat is present along the Project alignment at all elevations and mixes with the various upland plant communities at all elevations; either as an understory or as a canopy with an upland understory. However, since total riparian habitat has not been significantly reduced by Project operations, the total impact to wildlife utilization of riparian habitat due to Project operation is not significant.

4.5.4 Proposed Mitigation and Enhancement Measures

SCE anticipates continuing the PME's identified above for the new license. Although no additional mitigation or enhancement measures relating to upland botanical and wildlife are planned at this time, SCE intends to evaluate the issues identified as part of the licensing Study Plan, and in consultation with stakeholders. Should any major structural changes be planned for the Project, appropriate BMPs to minimalize effects on upland botanical and wildlife would be implemented; however, no structural changes are proposed at this time.

Based on the results of mule deer herd studies in the Project area, if the deer herd is determined to be adversely impacted by Project facilities, the existing flowline deer crossovers would be modified, or additional deer crossovers constructed in coordination with the USFS and CDFW.

No adverse impacts to nesting migratory birds and raptors are anticipated with implementation of the following:

- SCE will continue to implement its Avian Protection Plan that includes employee training, reporting and compliance with federal and state laws protecting migratory birds.
- SCE will continue to implement its Nesting Bird Management Guidance for Small Projects
- Pre-activity nesting bird surveys during the recognized nesting season, adjusted for altitude across the Project.

4.5.5 References

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4.6 FLOODPLAINS, WETLANDS, RIPARIAN AND LITTORAL HABITAT [§ 5.6(D)(3)(VI)]

4.6.1 Wildlife Species including Invasive Species

This section describes the wildlife species within the Project vicinity that occur in the floodplain, wetland and riparian habitats. The floodplain, wetland and riparian wildlife resources described below are based on direct observation from past biological studies (Psomas 2004a, 2004b, 2005, 2006a, 2006b, 2007a, 2007b, 2008a, 2008b, 2010 and 2014). In addition, the following FERC documents resources were reviewed: Environmental Assessment, Bishop Creek Project and the Order Issuing New License for the Project (FERC 1991 and 1994), California Natural Diversity Database (CDFW 2018) was queried for special status wildlife species for the following USGS 7.5-minute topographic quadrangles: Coyote Flat, North Palisade, Tungsten Hills, Mt. Darwin, Mount Tom, Bishop, and Mt. Goddard, and USFWS IPaC website (UFWS 2018).

Floodplain, wetland, riparian and littoral habitats occur throughout the Project vicinity bordering the creeks, lakes and impoundments within the Project alignment. These habitats interdigitate with the surrounding upland pant communities described in Section 4.5.1. These habitats provide important habitat for various wildlife species, including many amphibian species dependent upon moisture and water. Wildlife species known or are anticipated to occur in these habitats include Sierra treefrog (*Pseudacris sierra*), Mt. Lyell salamander (*Hydromantes platycephalus*), Yosemite toad (*Anaxyrus canorus*), mountain yellow-legged frog (*Rana sierrae*), western terrestrial garter snakes (*Thamnophis elegans*), dipper (*Cinclus mexicanus*), Wilson's warbler (*Wilsonia pusilla*), belted kingfisher (*Megaceryle alcyon*), white-crowned sparrow (*Zonotrichia leucophrys*), willow flycatcher (*Empidonax traillii*), mountain bluebird (*Sialia currucoides*), yellow-rumped warbler (*Dendroica coronota*), American robin (*Turdus migratorius*), golden eagle (*Aquila chrysaetos*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), Northern goshawk (*Accipiter gentilis*), Belding's ground squirrel (*Urocitellus beldingi*), northern pocket gopher (*Thomomys talpoides*), and mule deer (*Odocoileus hemionus*).

Three species of invasive wildlife have been identified by the USFS as potential invasive species in the Inyo National Forest (USFS 2013) quagga mussel (*Dreissena bugensis*) and New Zealand mudsnail (*Potamopyrgus antipodarum*), and California slamanders imported for bait. The species of salamander was not specified in the report (USFS 2013). The New Zealand mudsnail is known to occur in the Owens River at the mouth of and below McLaughlin Creek, approximately 40 miles north of the Project area (USFS 2013). The presence of the other two species within the Project area is unknown.

Quagga and zebra mussels are freshwater bivalves native to Eastern Europe and Western Asia that made their way into the Great Lakes in the late 1980s. They have been highly successful invaders, reproducing and adapting quickly to hundreds of freshwater lakes and waterways in the midwestern and eastern United States. Scattered populations have been detected in southern California (SCE 2017). The mussels have significant adverse impacts to aquatic ecosystems and water delivery systems. The spread of these mussels is believed to be through infected watercraft.

SCE personnel have not reported any sightings or indications of quagga or zebra mussels, but the extensive network of waterways, reservoirs, multiple public access launch ramps and popular recreational sites, present a risk of these mussels being introduction to SCE’s managed water bodies. Therefore, SCE developed a quagga and zebra mussel prevention plan which assesses the vulnerability of invasion to SCE lakes, includes a monitoring program to detect the presence of adult and/or veliger dreissenid mussels, and includes long-term management steps to ensure continued recreational use of healthy SCE lakes including the educational outreach to inform the public about the biology and management of the mussels.

4.6.2 Plants and Weed Species, Including Invasives

This section is based on keys and descriptions from the USFS using the Calveg classification system[5]. This is the preferred key in use by the Inyo National Forest and is used here to be consistent with the Inyo National Forest Plan (USFS 2018). In this system, differences between community types (also referred to as alliances) are based on canopy cover as determined from aerial photography and satellite imagery. Maps are provided in Appendix E.

[5] https://www.fs.usda.gov/detail/r5/landmanagement/resourcemanagement/?cid=stelprdb5347192

For analysis purposes, map limits are 200 feet around Project facilities, creeks and lakes. Table 4-42 lists the community types and areas they represent, both in acres and as percentages of the total mapped area.

4.6.2.1 Riparian Mixed Hardwood

In this alliance, no native hardwood species or genus is dominant, but includes a mixture of two or more non-dominant hardwoods found in shaded drainages, riparian and seep sites. Elevations range from below 1000 feet to approximately 9600 feet, reflecting a variety of hardwoods such as mountain dogwood (*Cornus nuttallii*), Fremont cottonwood (*Populus fremontii*), and/or black cottonwood (*P. balsamifera ssp. trichocarpa*). Tree willows (*Salix* spp.), quaking aspen (*Populus tremuloides*), and water birch (*Betula occidentalis*) are also prevalent.

4.6.2.2 Quaking Aspen

With a canopy cover of at least 50 percent, quaking aspen (*Populus tremuloides*) forms clonal stands and dominates other hardwoods in this alliance. It generally occurs above an elevation of approximately 4600 feet in association with moist soil and freshwater seeps. At higher elevations and under exposed conditions, quaking aspen stands may maintain a shrub-like form and never reach tree size.

4.6.2.3 Water, Including Perennial Lakes and Ponds

Water is labeled in Calveg mapping in those cases in which permanent sources of surface water are identified within a landscape unit of sufficient size to be mapped. Within the Project area, the category includes lakes, streams and intakes. These areas generally have minimal vegetation cover except for Wet Meadow along the edges.

4.6.2.4 Wet Meadows

This community is partially composed of sedges (*Carex* spp.), rushes (*Juncus* spp.) and spikerushes (*Eleocharis* spp.) with a combined cover of at least 50 percent. Presence of this community indicates year-long water availability, as in lakeshore, stream bank, perched water tables and seep areas. Perennial forbs such as monkeyflower (*Mimulus primuloides*) and corn lily (*Veratrum californicum*), as well as woody species such as shrub willows (*Salix* spp.), mountain alder (*Alnus incana* ssp. *tenuifolia*) and lodgepole pine (*Pinus contorta* ssp. *murrayana*) are commonly associated with this montane alliance.

4.6.2.5 Willow (Tree)

With tree willows of any species having a canopy cover of at least 50 percent, this community occurs where stream or pond conditions provide sufficient moisture at low to moderate elevations, mostly from approximately 2600 feet to 7400 feet. Riparian hardwoods such as water birch (*Betula occidentalis*) and Fremont cottonwood (*Populus fremontii*) often occur in proximity to this community.

4.6.2.6 Willow (Shrub)

With a shrub willow cover of at least 50 percent, this community occupies low to high elevation streams, springs and seeps within a broad elevation range of 3000 feet to 12,000 feet. Depending on location and elevation, species may include Geyer's willow (*S. geyeriana*), gray-leaved Sierra willow (*S. orestera*), Lemmon's willow (*S. lemmonii*), narrow-leaved willow (*S. exigua*), shining willow (*S. lucida*), and/or yellow willow (*S. lutea*). As this community may occupy the wettest upland sites, the Wet Meadows Alliance is frequently associated with it, as are other riparian shrubs such as California blackberry (*Rubus ursinus*).

4.6.3 Maps

Maps depicting the floodplans, wetlands and riparian areas as well as the botanical resources associated with each are located in Appendix E.

4.6.4 Acreage of Plant Communities

TABLE 4-42 SUMMARY OF PLANT COMMUNITY TYPES AND ACREAGES

MAP LABEL AND NAME	TOTAL POLYGON COUNT	TOTAL ACRES	PERCENT OF MAPPED AREA
UPLAND COMMUNITIES			
AC - Alpine Grasses and Forbs	9	2.61	0.077%
AX - Alpine Mixed Scrub	2	6.80	0.201%
BA - Barren	38	45.15	1.338%
BB - Bitterbrush	64	242.04	7.171%
BC - Saltbush	1	6.49	0.192%
BM - Curlleaf Mountain Mahogany	43	101.19	2.998%
BQ - Great Basin Mixed Scrub	109	333.11	9.869%
BR - Rabbitbrush	1	2.44	0.072%
BS - Basin Sagebrush	125	342.04	10.134%
BZ - Great Basin - Desert Mixed Scrub	48	158.86	4.707%
DA - Blackbush	7	375.37	11.122%
EP - Eastside Pine	25	192.21	5.695%
HG - Annual Grasses and Forbs	1	1.68	0.050%
HM - Perennial Grasses and Forbs	1	0.06	0.002%
LP - Lodgepole Pine	31	136.55	4.046%
NQ - High Desert Mixed Scrub	18	226.09	6.698%
PJ - Singleleaf Pinyon Pine	55	121.91	3.612%
PL - Limber Pine	9	17.53	0.519%
QC - Canyon Live Oak	1	1.02	0.030%
SA - Subalpine Conifers	21	90.45	2.680%
WB - Whitebark Pine	11	11.30	0.335%
Subtotal, Upland Communities	*620*	*2414.91*	*71.036%*
FLOODPLAINS, WETLANDS, RIPARIAN AND LITTORAL COMMUNITIES			
HJ - Wet Meadows	9	14.68	0.435%
NR - Riparian Mixed Hardwood	6	29.48	0.874%
QO - Willow	2	8.24	0.244%
QQ - Quaking Aspen	68	484.69	14.360%
W2 - Perennial Lake or Pond	15	389.17	11.530%
WA - Water (General)	1	1.68	0.050%
WL - Willow (Shrub)	3	24.35	0.721%
Subtotal, Floodplains etc.	*104*	*952.30*	*28.012%*
OTHER			
IB - Urban-related Bare Soil	44	31.37	0.929%
IW - Urban or Industrial Impoundment	1	0.99	0.029%
Subtotal, Other	*45*	*32.35*	*0.952%*
Grand Total, All	**769**	**3399.56**	**100%**

Source: Summarized from Appendix E

4.6.5 Potential Adverse Effects and Issues

SCE's review of readily available information, and early consultation with interested parties have not identified upland wildlife and botanical resource issues associated with the Project. Most Project facilities are located on or adjacent to Inyo National Forest Lands; as required by the consultation requirements of Article 104, close coordination has taken place between SCE and the USFS relating to both ongoing O&M and minor construction activities. This close coordination has been the standard operating procedure between SCE and USFS, and has resulted in a high level of environmental protection built into the O&M procedures of the Project.

The Project has been in operation since the early 1900s and no major modifications are expected to be proposed under the new license. Therefore, Project-related activities would generally be limited to routine O&M. Sources of potential impacts to terrestrial wildlife and botanical resources associated with wetlands, riparian areas, shorelines and littoral activities would be from small construction activities outside of routine O&M of Project facilities.

These activities may include:

- Ground disturbing activities such as minor grading. This potential impact would normally be limited to small areas, typically a fraction of an acre in size.
- Impacts to obligate riparian bird species through the loss of small areas of riparian vegetation, typically a fraction of an acre in size.
- Noise and other construction related indirect disturbance to wildlife species.

Plant community composition changes gradually with elevation, but the various recognized plant communities interdigitate at all elevations, thus buffering any potential Project operational impact (e.g. altered stream flow) to any one plant community. For example, riparian habitat is present along the Project alignment at all elevations and mixes with the various upland plant communities at all elevations; either as an understory or as a canopy with an upland understory. Monitoring, consistent with Article 405, indicates that total riparian habitat has not been significantly reduced by Project operations, the total impact to floodplain, wetland, riparian or littoral habitats due to Project operation is not significant.

In reviewing existing information and data, the TWG and SCE have identified that invasive species in the Project area could be affected by Project O&M, and management of these species would continue to be a concern in the new license.

Another potential impact to floodplains, wetland, riparian or littoral habitats is a result of the recreational use of South Lake and Sabrina Lake by fisherman and boaters. These recreational uses have the potential to introduce the non-native invasive quagga mussel and the non-native invasive zebra mussel. Currently, there are no occurrences of quagga mussel or zebra mussel in South Lake or Sabrina Lake. SCE (2017) determined that both of these lakes have a low risk of introduction of these two invasive species and a low risk of establishment. The level of risk was determined by analyzing factors such as the number of boat launch facilities, water quality including calcium and pH level, and number of annual visitors.

4.6.6 Proposed Mitigation and Enhancement Measures

SCE anticipates continuing with the PME's identified above in the new license, although the frequency and extent of ongoing monitoring may be modified. No new additional mitigation or enhancement measures relating to upland botanical and wildlife are planned at this time. SCE plans to evaluate the issues identified above as part of the relicensing Study Plan, and in consultation with stakeholders. Should any major structural changes be planned for the Project, appropriate BMPs to minimalize effects on resources associated with wetlands, riparian areas, shorelines and littoral zones would be implemented; however, no structural changes are proposed at this time

4.6.7 References

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4.7 RARE, THREATENED AND ENDANGERED SPECIES [§ 5.6 (D)(3)(VII)]

This section describes species considered rare, threatened or endangered having the potential to occur in the Project vicinity. A review of the existing literature was conducted to determine the potential for rare, threatened or endangered plant and wildlife species to occur in the vicinity of the Project. This review included previous biological reports prepared for individual Projects prepared for SCE (Psomas 2004a, 2004b, 2005, 2006a, 2006b, 2007a, 2007b, 2008a, 2008b, 2010 and 2014) and the Environmental Assessment, Bishop Creek Project (FERC 1991). To obtain information on known rare, threatened, or endangered plant and wildlife species reported to occur in the Project vicinity, CDFW's CNDDB (CDFW 2018a) and the CNPS Inventory of Rare, Threatened and Endangered Plants (CNPS 2018) were queried for rare, threatened, or endangered plant and wildlife species for the following USGS 7.5-minute topographic quadrangles: Coyote Flat, North Palisade, Tungsten Hills, Mt. Darwin, Mount Tom, Bishop and Mt. Goddard. It should be noted that the distinction of rare only applies to plants. Because of the literature review and database search, it was determined that no plants listed as rare, threatened or endangered by either the USFWS or CDFW were found within the Project vicinity. Therefore, the remainder of this section discusses only wildlife.

Other sources of literature reviewed for known occurrences of threatened, or endangered wildlife included: eBird database for observations within the Project vicinity including South Lake, Lake Sabrina, North Lake, Intake No 2, Bishop Plant 4 and Aspendell; Sierra High Mountain Lakes Project Monitoring Units; Sierra Nevada yellow-legged frog (SNYLF) and mountain yellow-legged frog (MYLF) (northern distinct population segment [DPS]) Field Season 2017 (CDFW 2018b); 2014 Owens Basin southwestern willow flycatcher survey results (CDFW 2014; 2015 USFWS Report on willow flycatcher), yellow-billed cuckoo, and Bell's vireo surveys in Inyo and Mono counties (Greene 2015); USFWS IPaC website (USFWS 2018); USFWS Seven-Year Work Plan September 2016 Version (USFWS 2016a) and USFWS Unscheduled Listing Actions September 2016 version (USFWS 2016b); Sierra Nevada Yellow-legged Frog Critical Habitat Final Rule (USFWS 2016c); Sierra Nevada Bighorn Sheep Critical Habitat Final Rule (USFWS 2008); List of USFS Management Indictor Species (USFS 2018a); a list of potentially occurring threatened and endangered and other sensitive species potentially occurring in the Wildlife Study Plan Survey Area (USFS 2018b); March-June 2018 Sierra Nevada Bighorn Sheep Location

Maps (USFS 2018c, *personal communication*); the Butterfly Reference Document for the Inyo, Sequoia, and Sierra National Forests USFS Region 5 (USFS 2015); Verner (1980) for coniferous bird communities; and Morrison (2018), Anderson et al. (2018), Pierson and Rainey (1998) and Weller et al. (2018) for Townsend's big-eared bat.

4.7.1 Definitions

A federally endangered species is one facing extinction throughout all or a significant portion of its geographic range. A federally threatened species is one likely to become endangered within the foreseeable future throughout all or a significant portion of its range. The presence of any federally listed threatened or endangered species in a Project impact area generally imposes severe constraints on development, particularly if development should result in "take" of the species or its habitat. The term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in such conduct. "Harm" in this sense can include any disturbance of species' habitats during any portion of its life history.

Proposed species or candidate species are those officially proposed by the USFWS for addition to the federal threatened and endangered species list. Because proposed species may soon be listed as threatened or endangered, these species could become listed prior to or during implementation of a proposed Project. The presence of a proposed or candidate species within a Project impact area may impose constraints on development if they are listed prior to issuance of Project permits, particularly if the Project would result in "take" of the species or its habitat.

The state of California considers an endangered species to be one whose prospects of survival and reproduction are in immediate jeopardy, a threatened species as one present in such small numbers throughout its range that it is likely to become an endangered species in the near future in the absence of special protection or management, and a rare species as one present in such small numbers throughout its range that it may become endangered if its present environment worsens. Rare species applies only to California native plants. State-listed threatened and endangered species are protected against take unless an Incidental Take Permit (ITP) is obtained from the resource agencies.

4.7.2 Regulatory Setting

4.7.2.1 Federal Endangered Species Act

The federal Endangered Species Act (ESA) protects plants and animals listed as endangered or threatened by the USFWS. A federally listed species is protected from unauthorized take, which is defined in the ESA as acts to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct" (16 United States Code [USC] Sections 1532[19] and 1538[a]). In this definition, harm includes "any act which actually kills or injures fish or wildlife and emphasizes that such acts may include significant habitat modification or degradation that significantly impairs essential behavioral patterns of fish or wildlife" (50 Code of CFR, Title 50, Section 17.3). Unless performed for scientific or conservation purposes with the permission of the USFWS, take of listed species is only permissible if the USFWS issues an ITP. When issuing an ITP, all federal agencies, including the USFWS, must ensure that their activities are "not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species" (16 USC 1536[a]). Enforcement of the ESA is administered by the USFWS.

The ESA also provides for designation of critical habitat, defined as specific areas within the geographical range occupied by a species where physical or biological features "essential to the conservation of the species" are found and "which may require special management considerations or protection" (16 USC 1538[5][A]). Critical habitat may include areas outside the current geographical area occupied by the species that are nonetheless essential for the conservation of the species.

4.7.2.2 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 USC 668) provides for the protection of the bald eagle (*Haliaeetus leucocephalus*) and the golden eagle (*Aquila chrysaetos*) by prohibiting, except under certain specified conditions, the taking, possession, and commerce of such birds. The 1972 Amendments increased penalties for violating provisions of the Act and strengthened other enforcement measures. A 1978 Amendment authorizes the Secretary of the Interior to permit the taking of golden eagle nests that interfere with resource development or recovery operations. A 1994 Memorandum from President William Clinton to the heads of Executive Agencies and

Departments establishes the policy concerning collection and distribution of eagle feathers for Native American religious purposes.

4.7.2.3 California Endangered Species Act

The state of California implements the California Endangered Species Act (CESA) which is enforced by the CDFW. While the provisions of the CESA are similar to the ESA, CDFW maintains a list of California threatened and endangered species, independent of the ESA threatened and endangered species list. It lists species that are considered rare and candidates for listing, which also receive protection. The California list of endangered and threatened species is contained in Title 14, Sections 670.2 (plants) and 670.5 (animals) of the California Code of Regulations.

State-listed threatened and endangered species are protected under provisions of the CESA. Activities that may result in the take of individuals (defined in CESA as acts to “hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill”) are regulated by the CDFW. While habitat degradation or modification is not included in the definition of take under CESA, the CDFW has interpreted take to include the destruction of nesting, denning, or foraging habitat necessary to maintain a viable breeding population of protected species.

If it is determined that the take would not jeopardize the continued existence of the species, an ITP can be issued by CDFW per Section 2081 of the California Code of Regulations. If a state-listed species is also federally listed, and the USFWS has issued an ITP, the ITP issued by USFWS would satisfy CDFW’s requirements; CDFW may issue a consistency finding in accordance with Section 2080.1 of the California Fish and Game Code.

4.7.2.4 California Fully Protected Species

The state of California created the Fully Protected classification to identify and provide additional protection to those animals that are rare or that face possible extinction. Lists were created for fish, amphibians and reptiles, birds and mammals. Most of the species on these lists have subsequently been listed under the state and/or federal ESAs; however, some have not been formally listed.

Various sections of the California Fish and Game Code provide lists of fully protected reptile and amphibian (§ 5050), bird (§ 3511), and mammal (§ 4700) species that may not be taken or possessed at any time, except as provided in Sections 2081.7, 2081.9, or 2835. The CDFW is unable to authorize the issuance of permits or licenses to take these species, except for necessary scientific research.

4.7.3 Federal and State Listed Wildlife Species

As a result of the literature review, it was determined that three wildlife species designated as threatened or endangered by the USFWS or CDFW and one California Fully Protected Species, have the potential to occur within the Project vicinity, and three other wildlife species designated as threatened or endangered by the USFWS or CDFW were determined to may have the potential to occur within the Project vicinity. Five wildlife species designated as threatened or endangered by the USFWS or CDFW were determined unlikely to occur within the Project vicinity (Figure 4-24).

Table 4-43 lists each species and its potential to occur in the Project vicinity.

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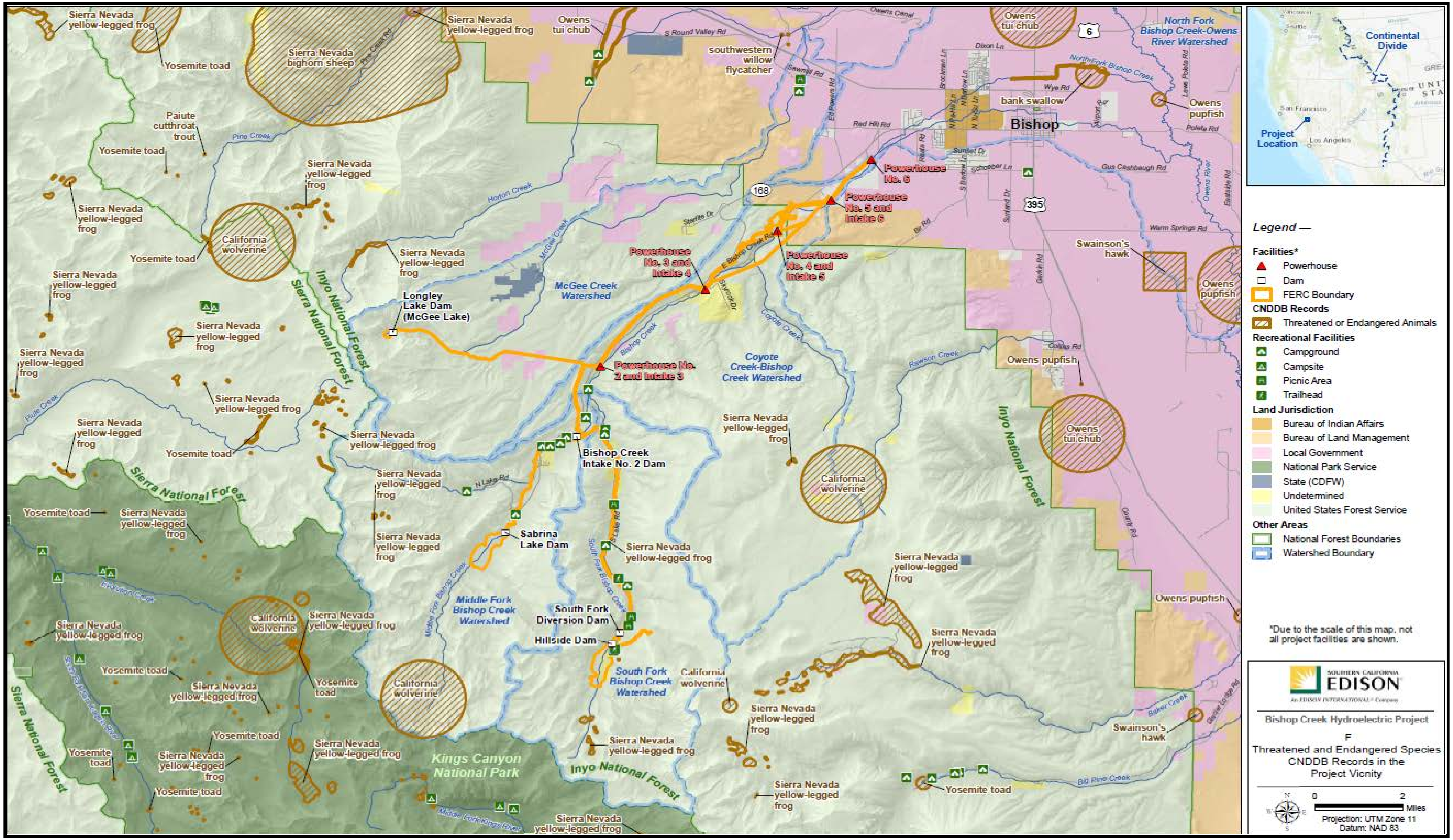

FIGURE 4-24 THREATENED AND ENDANGERED SPECIES RECORDED BY CNDDB IN THE PROJECT VICINITY

TABLE 4-43 ENDANGERED SPECIES POTENTIAL FOR OCCURRENCE

SCIENTIFIC/ COMMON NAME	FEDERAL STATUS	STATE STATUS	HABITAT	LIKELIHOOD FOR OCCURRENCE/ OCCURRENCE NOTES
KNOWN TO OCCUR IN THE PROJECT VICINITY				
Haliaeetus leucocephalus bald eagle	USFS_S	Endangered CDFW__FP	Requires large bodies of water, or free flowing rivers with abundant fish, and adjacent snags or other perches and nesting sites to support them. Perching sites need to be composed of large trees or snags with heavy limbs or broken tops. It roosts communally in winter in dense, sheltered, remote conifer stands. Breeding habitat in California is primarily in mountain and foothill forests and woodlands near reservoirs, lakes and rivers.	Expected to occur for foraging and wintering; mainly expected to occur as a vagrant but not expected to occur for nesting. eBird* reports a recent sighting (2018) at Lake Sabrina. No occurrences of bald eagle were documented in the CNDDB search for the Project vicinity.
Aquila chrysaetos golden eagle	--	CDFW__FP, CDFW__WL	Golden eagles occur locally in open country such as open coniferous forest, sage-juniper flats, desert and barren areas, especially in rolling foothills and mountainous regions. Within southern California, the species favors grasslands, brushlands, deserts, oak savannas, open coniferous forests and montane valleys. Nesting is primarily restricted to rugged, mountainous country. Cliff-walled canyons provide nesting habitat in most parts of range; also, large trees in open areas.	Expected to occur for foraging and wintering; mainly expected to occur as a vagrant but not expected to occur for nesting. eBird reports recent sightings (2018) at Aspendell, Intake No 2 and South Lake, North Lake, and Lake Sabrina. No occurrences of golden eagle were documented in the CNDDB search for the Project vicinity.
Empidonax traillii willow flycatcher	USFS_S	Endangered	In general, prefers moist, shrubby areas, often with standing or running water; e.g., in California, restricted to thickets of willows, whether along streams in broad valleys, in canyon bottoms, around mountain-side seepages, or at the margins of ponds and lakes. In the west, generally occurs in beaver meadows, along borders of clearings, in brushy lowlands, in mountain parks, or along watercourses to 7500 feet.	Expected to occur for foraging; mainly expected to occur as a migrant but not expected to occur for nesting. eBird reported observation at Aspendell, Lake Sabrina, South Lake, and North Lake; suitable habitat. Please note that eBird does not distinguish between northern subspecies of willow flycatcher and southwestern willow flycatcher.
Empidonax traillii extimus southwestern willow flycatcher	Endangered	Endangered	Occurs in riparian woodlands in Southern California. Willow-dominated riparian habitats that are similar to least Bell's vireo nesting habitats; shows a stronger preference for sites with surface water in the vicinity, such as along streams, on the margins of a pond or lake, and at wet mountain meadows.	Expected to occur for foraging; mainly expected to occur as a migrant but not expected to occur for nesting. eBird reported observation at Aspendell, Lake Sabrina, South Lake, and North Lake; suitable habitat. Please note that eBird does not distinguish between northern subspecies of willow flycatcher and southwestern willow flycatcher.
MAY POTENTIALLY OCCUR IN THE PROJECT VICINITY				
Siphateles bicolor snyderi Owens tui chub	Endangered	Endangered	Needs clear, clean water, adequate cover, and aquatic vegetation within a variety of habitats, including Great Basin flowing water and Great Basin standing water within the Owens River basin; at elevations above 4000 feet.	May potentially occur. Reported from 4.4 miles northeast of Powerhouse No. 6, located along North Fork Bishop Creek near Hwy 6 north of Bishop, northeast of the Project watershed northeastern most boundary.

Scientific/ Common Name	Federal Status	State Status	Habitat	Likelihood for Occurrence/ Occurrence Notes
Vulpes vulpes necator Sierra Nevada red fox	Candidate, USFS_S	Threatened	Uses dense vegetation and rocky areas for cover and den sites. Found in a variety of habitats, including alpine, alpine dwarf scrub, broadleaved upland forest, meadow and seep, riparian scrub, subalpine coniferous forest, upper montane coniferous forest, and wetland; at elevations above 2500 feet.	May potentially occur; reported from 3.8 miles northeast of Powerhouse No. 6, located in Bishop, northeast of the Project watershed northeastern most boundary; last seen in 1922.
Ovis canadensis sierrae Sierra Nevada bighorn sheep	Endangered	Endangered, CDFW__FP	Available water and steep, open terrain free of competition from other grazing ungulates within alpine, alpine dwarf scrub, chaparral, chenopod scrub, Great Basin scrub, Mojavean desert scrub, montane dwarf scrub, pinon and juniper woodlands, riparian woodland, and Sonoran Desert scrub habitats, from 5000 to 9000 feet during the winter and 10,000 to 14,000 feet during summer.	May potentially occur. Reported from 12.9 miles northwest of Powerhouse No. 6, located at Wheeler Crest (aka Wheeler Ridge), 10 miles northwest of Bishop, 12.9 miles northwest of the Project watershed northern boundary.
Unlikely to Occur In the Project Vicinity				
Oncorhynchus clarkii seleniris Paiute cutthroat trout	Threatened	–	Cannot tolerate presence of other salmonids. Requires clean gravel for spawning and cool, well-oxygenated waters in Great Basin flowing water habitat, at elevations up to 10,000 feet.	Unlikely to occur. Reported 6.2 miles northwest of Longley Lake Dam/McGee Lake, located in Birchim Lake in the headwaters of Pine Creek 5.4 miles northwest of the Project watershed northwestern boundary. Determined to be not true Paiute cutthroat trout by CDFW (CDFW 2018a).
Rana muscosa southern mountain yellow-legged frog	Endangered	Endangered	Highly aquatic and rarely found more than 3.3 feet from water. They can be found sitting on rocks along the shoreline where there may be little or no vegetation. These species historically inhabited lakes, ponds, marshes, meadows, and streams at elevations typically ranging from approximately 4500 to 12,000 feet.	Unlikely to occur. No recorded occurrences in Inyo County.
Rana sierrae Sierra Nevada yellow-legged frog	Endangered, USFS_S	Threatened, CDFW_ WL	Always encountered within a few feet of water. Tadpoles may require 2 to 4 years to complete their aquatic development. Found in streams, lakes, and ponds in montane riparian and a variety of other habitats from 4495 to 11,975 feet.	Unlikely to occur. Reported from South Fork Bishop Creek, 2.1 miles south of Bishop Creek South Fork Diversion Dam; Wonder Lake, 2.3 mi northwest of Sabrina Lake; Treasure Lakes 3,4,5,6, and 7; 1.6 miles west of north end of South Lake. Populations along Bishop Creek are considered extirpated by CDFW.
Anaxyrus canorus Yosemite toad	Threatened	CDFW _SSC	Primarily montane wet meadows; also, in seasonal ponds associated with lodgepole pine and subalpine conifer forest within meadow and seep, subalpine coniferous forest, and wetland habitat, from 6400 to 11,300 feet.	Unlikely to occur. Reported from 5.5 miles southwest of Sabrina Lake Dam, located 1.2 miles southwest of Project watershed western boundary.

SCIENTIFIC/ COMMON NAME	FEDERAL STATUS	STATE STATUS	HABITAT	LIKELIHOOD FOR OCCURRENCE/ OCCURRENCE NOTES
Gulo gulo California wolverine	Proposed Threatened, USFS_S	Threatened, CDFW__FP	Needs water source. Uses caves, logs, burrows for cover and den area. Hunts in more open areas. Can travel long distances. Found in the north coast mountains and the Sierra Nevada. Found in a wide variety of high elevation habitats, including alpine, meadow and seep, north coast coniferous forest, riparian forest, subalpine coniferous forest, upper montane coniferous forest, and wetland from 1640 to 4921 feet.	Unlikely to occur. Reported from 0.38 mile south of South Lake Dam, located along the east side of South Lake; however, it is considered extirpated from Project vicinity by CDFW 2018a.

* https://ebird.org/region/US-CA-027
USFWS: U.S. Fish and Wildlife Service; USFS: U.S. Forest Service; BLM: Bureau of Land Management; CDFW: California Department of Fish and Wildlife; CDF: California Department of Forestry and Fire Protection

LEGEND:

USFWS:
S: Sensitive
USFS
FFS Sensitive
BLM
S Sensitive
CDFW
FP Fully Protected
SSC Species of Special Concern
WL Watch List

Source: CDFW 2018a

4.7.4 Critical Habitat

On August 26, 2016, the USFWS published the current Final Rule designating 750,926 acres of land as critical habitat for the Yosemite toad and 1,082,147 acres of land as critical habitat for the Sierra Nevada yellow-legged frog in Alpine, Amador, Calaveras, El Dorado, Fresno, Inyo, Lassen, Madera, Mariposa, Mono, Nevada, Placer, Plumas, Sierra, Tulare, and Tuolumne counties, California (USFWS 2016c). On August 5, 2008, the USFWS published the current Final Rule designating approximately 417,577 acres of land as critical habitat for the Sierra Nevada bighorn sheep in Tuolumne, Mono, Fresno, Inyo, and Tulare counties, California (USFWS 2008).

USFWS-designated critical habitats for Sierra Nevada yellow-legged frog (*Rana sierrae*), and Sierra Nevada bighorn sheep (*Ovis canadensis sierrae*) occur and overlap a small portion of the Project boundaries (Figure 4-25) in the vicinity of the Project. Critical habitat for Yosemite toad (*Anaxyrus canorus*) does not overlap the Project boundary but does occur west of the Project (Figure 4-25).

There is overlap in the critical habitat designations for the Sierra Nevada yellow-legged frog and the Sierra Nevada yellow-legged frog. Critical habitat for the Sierra Nevada yellow-legged frog overlaps the Project boundary just south of South Lake (Figure 4-25). Critical habitat for Sierra Nevada bighorn sheep overlaps with the Project boundary east of Longley Lake.

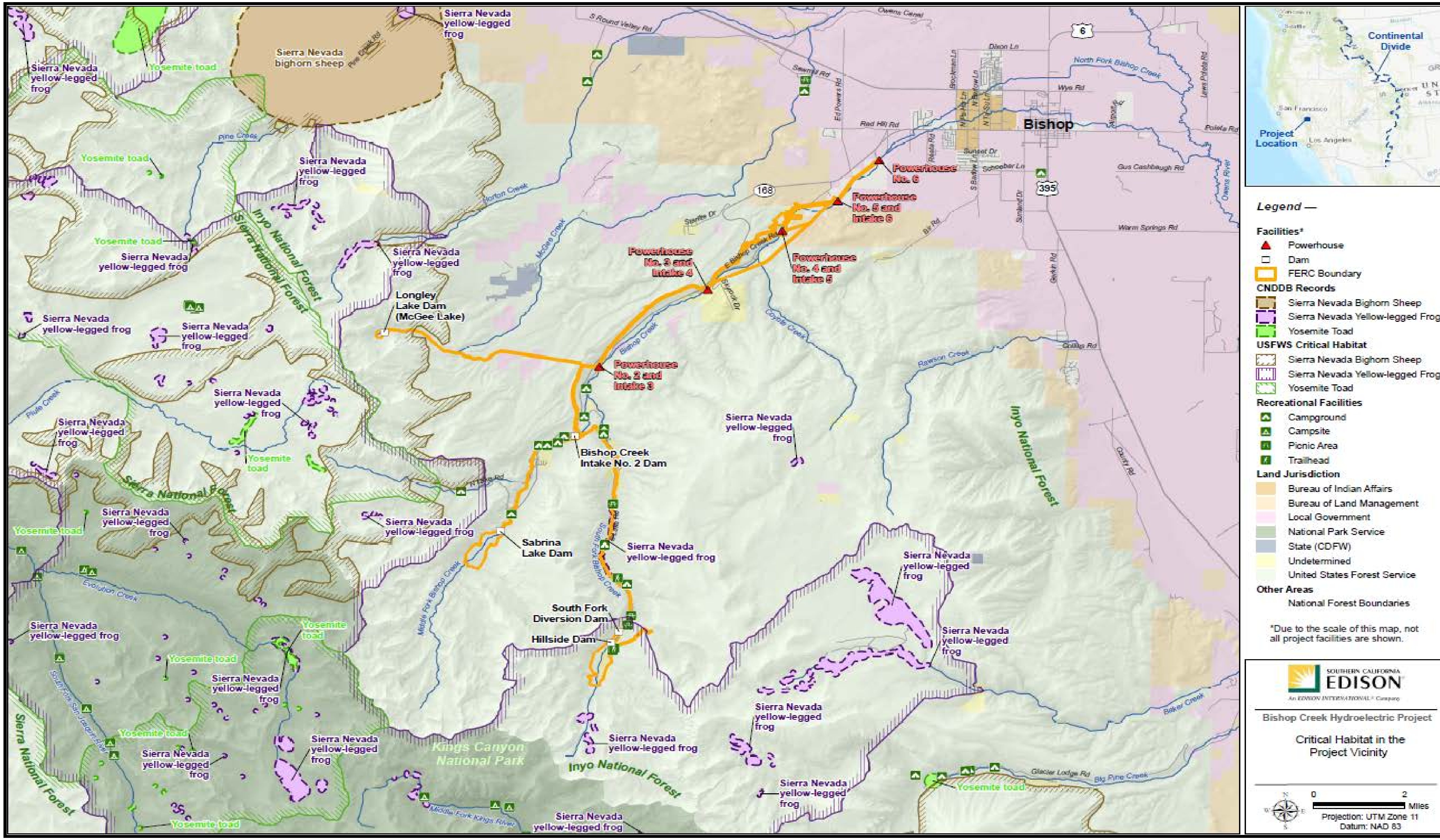

FIGURE 4-25 CRITICAL HABITAT IN THE PROJECT VICINITY

4.7.5 Potential Adverse Effects and Issues

SCE's review of readily available information, and early consultation with interested parties have not identified impacts to rare, threatened and endangered species associated with the Project. SCE currently mitigates for potential impacts through the Implementation Plan for Mitigation of Impacts to Sensitive or Endangered Plant and Animal Species as mandated by Article 113 of the Order Issuing the New License for the Project (FERC 1994) until a new plan is approved and in-place.

4.7.6 Proposed Mitigation and Enhancement Measures

SCE anticipates continuing with the PME's identified above in the new license. Although no additional mitigation or enhancement measures relating to rare, threatened or endangered species are planned at this time, SCE plans to evaluate the issues identified above as part of the licensing Study Plan, and in consultation with stakeholders. Should any major structural changes be planned for the Project, appropriate BMPs to minimalize effects on rare, threatened or endangered species would be implemented; however, no structural changes are proposed at this time.

SCE will continue to implement its current Implementation Plan for Mitigation of Impacts to Sensitive or Endangered Plant and Animal Species as mandated by Article 113 of the Order Issuing the New License for the Project until a new plan is approved and in-place. Should a new rare, threatened or endangered species be identified as part of the study program, new critical habitat designated, or new populations of known sensitive or endangered wildlife are discovered that may be impacted by Project operations, appropriate minimization and avoidance measures would be formulated and added to the Sensitive or Endangered Species Protection Plan and implemented with the appropriate resource agencies.

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4.8 RECREATION AND LAND USE [§ 5.6 (D)(3)(VIII)]

4.8.1 Recreation

4.8.1.1 Regional Recreation Areas

The Project lies generally in the central western portion of the Inyo National Forest, which stretches 165 miles north to south along the eastern Sierra Nevada Mountain Range, featuring over 2 million acres of pristine lakes, winding streams, rugged peaks, and arid Great Basin mountains (USFS 2018a). The Inyo National Forest features some of the world's oldest trees in Ancient Bristlecone Pine Forest in the White Mountains that mark the eastern boundary of Owens Valley, glaciers along the Sierra Nevada crest, and an elevational range from the tallest peak in the lower 48 states (Mt. Whitney at 14,494 feet) to semiarid deserts and valleys at 3900 feet. This wide range in landscape provides a considerable diversity of recreation opportunities year-round. A total of 129 campgrounds and more than 400 lakes and 1100 miles of streams that provide habitat for golden, brook, brown and rainbow trout and fishing attract thousands of visitors during the summer months. Sixty-five trailheads provide access to over 1200 miles of trail in the 1.2 million acres of wilderness for hikers seeking to escape into pristine areas. Many resort facilities and pack stations operate under special use permits from the forest to serve additional visitor needs. Off-highway connoisseurs can enjoy over 2200 miles of motorized routes. Mountain biking, climbing, nature viewing and photography are popular summer and fall activities. In winter, Inyo National Forest is a popular destination for snowshoeing, skiing, snowboarding and snowmobiling, featuring two ski areas, 25 miles of groomed Nordic ski trails, and 100 miles of groomed snowmobile trails (USFS 2018a).

The Inyo National Forest contains nine congressionally designated wilderness areas: Hoover, Ansel Adams, John Muir, Golden Trout, Inyo Mountains, Boundary Peak, South Sierra, White Mountain, and Owens River Headwaters wildernesses. Devils Postpile National Monument, administered by the National Park Service, is located within the Inyo National Forest in the Reds Meadow area west of Mammoth Lakes.

Just outside of the Inyo National Forest and in the Owens Valley below the Project, many other entities provide recreation opportunities along the Owens River and the valleys volcanic tablelands. Inyo County Parks and Recreation offer outdoor recreation by providing and maintaining 15 parks and campgrounds and seven-day-use parks for residents and visitors (IC 2018a). The City of Bishop offers the 44-acre Bishop City park, featuring a community garden, an arboretum, a pond, (2) gazebos and a dog park, (4) baseball fields, (2) children's play structures, (4) tennis courts, a public pool, an outdoor fitness center and a bocce court (City of Bishop 2018). The BLM provides multiple campground facilities and access to hiking trails, bouldering, fishing, all-terrain vehicle trails and viewing points within the Owens Valley (BLM 2018).

4.8.1.2 Existing Recreation Facilities and Opportunities

4.8.1.2.1 Recreation Facilities and Opportunities in the Project Vicinity

The Project area provides a broad range of recreation opportunities available to the public year-round. Primary recreational opportunities include fishing, boating, camping, hiking, climbing, sightseeing, picnicking, horseback riding, mountain biking, off-highway vehicle riding, and cross-country skiing. The Project boundary and adjacent lands are primarily within the Inyo National Forest, a portion of which is managed as a National Wilderness Area (John Muir Wilderness). Below are summaries of the major recreation facilities and opportunities found in the Project watershed.

Camping

The White Mountain Ranger District of the Inyo National Forest operates and maintains recreation facilities and opportunities within the Project watershed. The Inyo National Forest provides 12 campgrounds with 258 camping units in the Project watershed, two of which are group units accommodating up to 25 guests each (USFS 2018b). These sites range from 6800 feet msl (Bitterbrush Campground) to 9300 feet msl (North Lake Campground) in the upper Project area and provide a variety of amenities, as summarized in Table 4-44 and depicted in Figure 4-26.

TABLE 4-44 INYO NATIONAL FOREST CAMPING FACILITIES IN PROJECT WATERSHED

NAME	TYPE	AMENITIES	SITES	OPEN	ELEVATION (ft)
Big Trees Campground (CG)	Campground Camping	B/f	16	May-Oct	7,400
Bishop Park CG	Campground Camping	B/f	21	May-Oct	8,200
Bishop Park Group CG	Group Camping	No RV/B/R/f	1	May-Sep	8,200
Bitterbrush CG	Campground Camping	B/v	35	May-Oct*	6,800
Forks CG	Campground Camping	B/f	21	May-Oct	7,800
Four Jeffrey CG	Campground Camping	R/DS/f	104	May-Oct	8,100
Intake 2 CG	Campground Camping	B/f,v	16	May-Oct	8,200
Mountain Glen CG	Campground Camping	W/B/v	5	May-Sep	8,500
North Lake CG	Campground Camping	No RV/B/v	11	Jun-Sep	9,300
Sabrina CG	Campground Camping	B/v	19	May-Sep	8,900
Table Mountain Group CG	Group Camping	No RV/W/B/R/v	1	Jun-Sep	8,800
Willow CG	Campground Camping	B/v	8	May-Sep	9,000

Legend: R – Reservations B – Bear Boxes W - Walk-in DS – Dump Station
Restrooms f –flush; v –vault; p –portable/pit Natural water is untreated stream or lake source
Elev.– Elevation in feet. Group Sites (max group size) Limit– Maximum stay allowed
*camping allowed in winter; no water or trash service
Source: USFS 2017

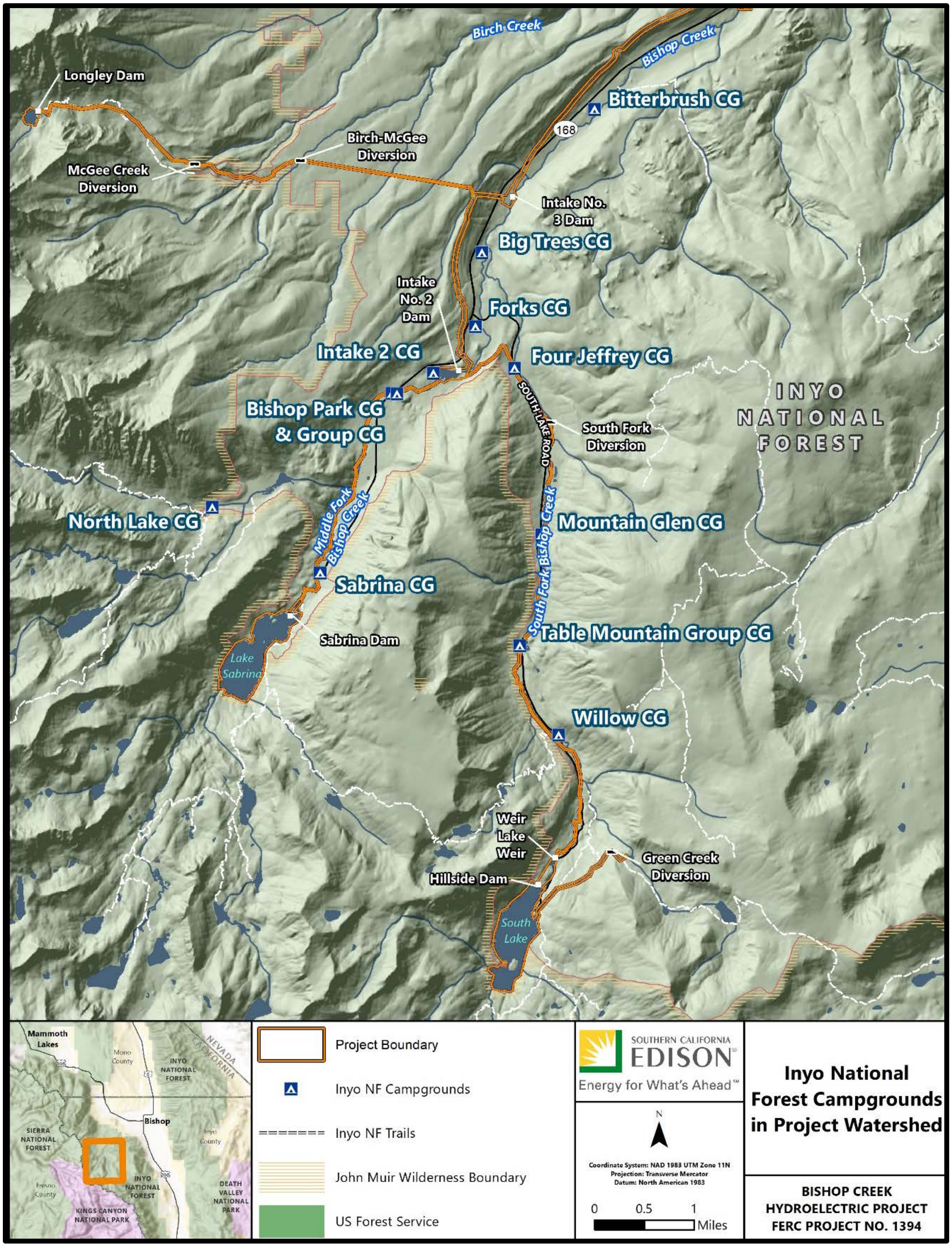

FIGURE 4-26 INYO NATIONAL FOREST CAMPGROUNDS IN PROJECT WATERSHED

Inyo National Forest enlists a concessionaire, Recreation Resource Management (RRM), to operate and maintain each campground. RRM collects visitation records which it provides to the Inyo National Forest in an annual report. Visitation reports have been collected from the Inyo National Forest to determine campground visitation and occupancy since 2012.

Trails

Within the Project watershed, there are approximately 87.5 miles of trails (8.5 miles minimally developed, 54.8 miles moderately developed, and 24.2 miles developed) maintained by the Inyo National Forest and within the immediate proximity of the Project (USFS 2018c). Many of these trails provide access for lake, pond or river fishing; horse riding; or backpacking opportunities in the John Muir Wilderness. During the winter season, many of these trails offer ideal snowshoeing, cross country skiing and back country skiing opportunities. Five trailheads are found either partially within or adjacent to the Project boundary; Lake Sabrina, South Lake, Tyee Lakes, Longley Lake and Little Egypt trailheads. Lake Sabrina and South Lake trailheads provide access to the John Muir Wilderness and nearly 40 miles of trails and over 300 mountain lakes of varying sizes within the Bishop Creek watershed alone. Some of these trails extend over the Sierra Nevada crest and into the Sequoia-Kings Canyon Wilderness, connecting to the John Muir Trail. The Tyee Lakes Trailhead is located along South Lake Road. The Tyee Lakes Trail traverses 3.1 miles to Tyee Lakes and continues around Table Mountain another 3.6 miles to eventually connect with Lake Sabrina and associated trails. The Longley Lake Trailhead is located just outside of the Project boundary near the McGee Creek Diversion and provides access to a trail leading 2.3 miles through the John Muir Wilderness to Longley Lake. The Little Egypt Trail leads to the Little Egypt climbing area and further to Little Egypt Creek for a total of 1.7 miles. Trail users currently use parking facilities at Plant 3 and access the trail by crossing a footbridge just downstream of the plant.

Overnight wilderness permits are available for overnight backpacking originating from the Inyo National Forest. Inyo National Forest maintains records by entry date, entry trailhead, and number of hikers (often capped by quota per day). Table 4-45 provides a summary of wilderness permit overnight use data for the period 2014 to 2018. While this is representative of overnight use in the forest, it must be noted that while many of the hikes originating from trailheads in the Project watershed are loops or long-distance hikes that will have hikers exit where they entered, use numbers do not account for hikers originating at a trailhead outside of the Project watershed and exiting in the Bishop Creek area.

TABLE 4-45 INYO NATIONAL FOREST WILDERNESS PERMIT USE

LOCATION	PERMITS ISSUED	2014	2015	2016	2017	2018
Bishop Pass	Private	3,135	2,806	3,197	2,596	2,292
	Commercial	331	279	235	118	139
	TOTAL	**3,466**	**3,085**	**3,432**	**2,714**	**2,431**
Tyee Lakes	Private	123	108	170	103	176
	Commercial	-	10	-	-	-
	TOTAL	**123**	**118**	**170**	**103**	**176**
Lake Sabrina	Private	1,708	1,734	1,820	1,625	1,325
	Commercial	116	99	132	138	113
	TOTAL	**1,824**	**1,833**	**1,952**	**1,763**	**1,438**
George Lake	Private	91	119	182	96	136
	Commercial	-	-	-	-	-
	TOTAL	**91**	**119**	**182**	**96**	**136**
Lamarck Lake	Private	678	618	718	457	429
	Commercial	19	7	8	-	-
	TOTAL	**697**	**625**	**726**	**457**	**429**
Piute Pass	Private	2,249	2,342	2,307	1,807	1,716
	Commercial	244	251	232	119	240
	TOTAL	**2,493**	**2,593**	**2,539**	**1,926**	**1,956**

Source: USFS 2018d

Wilderness permit data does not account for the amount of day use certain wilderness trails receive from other hikers and fishermen, so the Inyo National Forest conducts periodic day use counts, typically in August, at Treasure Lakes, Main Bishop Pass and Sabrina Basin trails. All counts are conducted in the wilderness outside of developed front country facilities. For 2018, the Inyo National Forest estimated 300-day use hikers per week on Treasure Lakes Trail, 700-day use hikers per week on Main Bishop Pass Trail, and 900-day use hikers per week on Sabrina Basin Trail.

Climbing

The Bishop area is home to many popular rock climbing and bouldering areas, including Owens River Gorge, Alabama Hills, Pine Creek Crags, Happy and Sad Boulders and Buttermilk Country. According to MountainProject.com (REI 2018), the Bishop area is host to approximately 345 trad, 786 sport, 23 top rope, and 1255 bouldering problems. Many climbing opportunities can be found adjacent to the Project as well. Little Egypt Trail provides access from Plant 3 to the Little Egypt climbing area, offering 24 trad, 24 sport, and 1 bouldering problem. Off Highway 168 and just below Lake Sabrina are Sheepherder Buttress (2 trad, 4 sport) and Cardinal Pinnacle (14 trad). Off South Lake Road and below South Lake are Parcher's Bluff (5 trad, 1 top rope), Bridge Crag (2 trad, 1 top rope), and Wild Rose Buttress (4 trad, 1 sport). The peaks north of Bishop Pass and south of Piute Pass form the Bishop (accessible from South Lake Trailhead) and Evolution (accessible from Lake Sabrina Trailhead) groups, feature 32 alpine, 30 trad, and 5 ice problems.

Fishing

The CDFW tracks approximately six backcountry fishing locations within the Project boundary and a total of 97 locations in the Project watershed (CDFW 2018a). Locations range from 7900 feet msl (Intake No. 2) to 12,219 feet msl (Thompson Lake) along numerous stream and lake habitat, filled with a variety of fish species (brook trout, rainbow trout, brown trout, golden trout and hatchery trout). Many sites can be easily accessed by vehicle and have additional amenities such as restrooms, boat ramps and or wheelchair accessibility. Additionally, the opportunity for more remote, backcountry fishing is plentiful, and a large majority of these fishing locations can be accessed by the approximately 87.5 miles of trails maintained by the Inyo National Forest within the Project watershed (USFS 2018c).

Of the six backcountry fishing locations tracked by the CDFW within the Project boundary, four are located on Project reservoirs (South Lake, Lake Sabrina, Intake No. 2, Longley Lake) and two are along the free-flowing portions of the Middle Fork (between Lake Sabrina and Intake No. 2) and South Fork (between South Lake and South Fork Diversion) of Bishop Creek. CDFW actively stocks hatchery trout at five of these six Project locations, excluding only Longley Lake (CDFW 2018a). Additionally, the Inyo National Forest operates boating sites at Lake Sabrina and South Lake, both of which offer a launching ramp, marina, boat rental service, restroom and tackle shop. Table 4-46 provides a summary of CDFW's fishing location data, and Figure 4-27 shows both fishing and stocking locations as well as Inyo National Forest access trails to those sites.

TABLE 4-46 CDFW FISHING LOCATION DATA IN PROJECT WATERSHED

MAP ID[1]	LOCATION	LAST STOCKED	SPECIES PRESENT	SIZE	ELEVATION (FEET MSL)
1	Lake Sabrina	2018	HT	186 Acres	9,000
2	South Lake	2017	HT	180 Acres	9,750
3	North Lake	2017	HT	20 Acres	9,255
4	Intake 2	2018	HT	15 Acres	7,900
5	Longley Lake	n/a	BT	10.23 Acres	10,693
6	South Fork Bishop Creek	2018	HT	5 Miles	8-9,000
7	Middle Fork Bishop Creek	2018	HT	4 Miles	8-9,000
8	Unnamed Lake #19629	n/a	BT	0.91 Acres	10,653
9	Rocky Bottom Lake	2016	RT	7.57 Acres	10,373
10	Funnel Lake	2016	HT	6.34 Acres	10,385
11	Green Lake	2016	RT	16.77 Acres	11,050
12	Brown Lake	2016	RT	2.85 Acres	10,696
13	Bluff Lake	n/a	RT	1.6 Acres	10,522
14	Marie Louise Lake, Upper	n/a	BT	0.69 Acres	10,617
15	Marie Louise Lake, Lower	n/a	BT	1.83 Acres	10,598
16	Inconsolable Lake	n/a	BT	0.78 Acres	10,958
17	Hurd Lake	n/a	BT,RT	2.49 Acres	10,319
18	Bull Lake	n/a	BT,RT	9.08 Acres	10,778
19	Chocolate Lake #1	n/a	BT	1.3 Acres	10,998
20	Chocolate Lake #2	n/a	BT	4.09 Acres	11,057
21	Chocolate Lake #3	n/a	BT	7.4 Acres	11,057
22	Long Lake	n/a	BT,RT,BrT	34.66 Acres	10,752
23	Ruwau Lake	n/a	BT,RT	25.74 Acres	11,040
24	Spearhead Lake	n/a	BT,BrT	2.11 Acres	10,978
25	Unnamed Lake #20826	n/a	BT	0.94 Acres	10,824
26	Margaret Lake (3rd)	n/a	BT	2.67 Acres	10,949
27	Unnamed Lake #20849	n/a	BT	0.11 Acres	11,070
28	Timberline Tarn #2	n/a	BT,RT	1.96 Acres	11,070
29	Timberline Tarn #1	n/a	BT,RT	2.49 Acres	11,047
30	Ledge (Phyllis) Lake	n/a	BT,RT	1.78 Acres	11,178
31	Saddlerock Lake	2016	BT	32.92 Acres	11,126
32	Unnamed Lake #20922	n/a	BT	0.09 Acres	11,218
33	Bishop Lake	n/a	BT	17.62 Acres	11,247
34	Treasure Lakes	n/a	GT	4.83 Acres	10,667
35	Treasure Lake #1	n/a	GT	12.13 Acres	10,667
36	Tyee Lakes	n/a	BT,RT	3.86 Acres	10,319

Map ID[1]	Location	Last Stocked	Species Present	Size	Elevation (Feet MSL)
37	Tyee Lakes	n/a	BT	1.81 Acres	10,598
38	Tyee Lakes	n/a	BT,RT	0.33 Acres	10,916
39	Tyee Lake #4	n/a	BT,RT	11.56 Acres	10,876
40	Tyee Lakes	n/a	BT,RT	11.91 Acres	11,011
41	Tyee Lakes	n/a	RT	3.14 Acres	11,027
42	Unnamed Lake #20444	n/a	BT	0.88 Acres	10,712
43	George Lake	n/a	BT	10.76 Acres	10,712
44	Blue Lake	n/a	BT,RT	30 Acres	10,398
45	Unnamed Lake #20547	n/a	BT	0.59 Acres	10,447
46	Donkey Lake	n/a	BT	7.81 Acres	10,598
47	Thompson Lake	n/a	BT	9.63 Acres	12,129
48	Sunset Lake	n/a	BT	24.77 Acres	11,460
49	Baboon Lakes	n/a	BT,RT	2.59 Acres	11,018
50	Baboon Lakes	n/a	BT,RT	0.43 Acres	10,998
51	Baboon Lake, Middle	n/a	BT	4.09 Acres	10,975
52	Baboon Lakes	n/a	BT	0.79 Acres	10,978
53	Baboon Lake, Lower	n/a	BT,RT	14.48 Acres	10,975
54	Echo Lake	2016	RT	46.29 Acres	11,607
55	Hungry Packer Lake	n/a	BT,RT	43.91 Acres	11,067
56	Moonlight Lake	n/a	BT	26.61 Acres	11,050
57	Sailor Lake	n/a	BT	1.41 Acres	10,998
58	Unnamed Lake #20600	n/a	BT	1.5 Acres	10,496
59	Midnight Lake	n/a	BT	17.75 Acres	10,985
60	Blue Heaven Lake	n/a	BT	19.19 Acres	11,818
61	Hell Diver Lakes	n/a	BT	2.2 Acres	11,756
62	Hell Diver Lakes	n/a	BT	1 Acre	11,336
63	Hell Diver Lakes	n/a	BT	2.91 Acres	11,359
64	Topsy Turvy Lake	n/a	BT,RT	7.26 Acres	10,798
65	Unnamed Lake #20570	n/a	BT	0.09 Acres	10,817
66	Unnamed Lake #20565	n/a	BT	0.28 Acres	11,018
67	Pee Wee Lake	n/a	BT	0.93 Acres	10,978
68	Emerald Lakes	n/a	BT,RT	2.66 Acres	10,398
69	Emerald Lake #2	n/a	BT,RT	2.63 Acres	10,398
70	Emerald Lakes	n/a	RT	0.26 Acres	10,447
71	Emerald Lakes	n/a	RT	1.62 Acres	10,398
72	Emerald Lakes	n/a	RT	0.66 Acres	10,398
73	Dingleberry Lake	n/a	BT,BrT	5.09 Acres	10,486

Map ID[1]	Location	Last Stocked	Species Present	Size	Elevation (Feet MSL)
74	Schober Holes	n/a	BT,GT	3.91 Acres	11,847
75	Schober Holes	n/a	BT	3.45 Acres	11,647
76	Bottleneck Lake	n/a	BT	10.73 Acres	11,119
77	Fishgut Lake #3	n/a	BT	4.16 Acres	10,998
78	Fishgut Lakes	n/a	BT	9.33 Acres	11,008
79	Fishgut Lakes	n/a	BT	1.49 Acres	10,896
80	Granite Lake	n/a	BT,RT	8.35 Acres	11,798
81	Grass Lake	n/a	BT	1.87 Acres	9,833
82	Lower Lamarck Lake	n/a	BT	15.57 Acres	10,657
83	Upper Lamarck Lake	n/a	BT,RT	39.88 Acres	10,913
84	Wonder Lake #1	n/a	BT	0.98 Acres	11,713
85	Wonder Lakes	n/a	BT	5.24 Acres	10,893
86	Wonder Lakes	n/a	BT	0.59 Acres	11,054
87	Wonder Lakes	n/a	BT	0.79 Acres	11,054
88	Wonder Lakes	n/a	BT	3.29 Acres	11,054
89	Unnamed Lake #20138	n/a	BT,RT	0.31 Acres	10,693
90	Loch Leven Lake	n/a	BT,RT,BrT	10.85 Acres	10,739
91	Unnamed Lake #20119	n/a	BT,RT	0.46 Acres	10,775
92	Unnamed Lake #20103	n/a	BT,RT	3.1 Acres	10,775
93	Unnamed Lake #20095	n/a	BT,RT	0.5 Acres	10,775
94	Unnamed Lake #20084	n/a	BT,RT	1.41 Acres	10,893
95	Unnamed Lake #20086	n/a	BT,RT	0.22 Acres	10,936
96	Piute Lake	n/a	BT,RT	21.58 Acres	10,952
97	Emerson Lake	n/a	BT	6.51 Acres	11,214

Source: CDFW 2018a

[1]Note that the Map ID listed in Table 4-46 corresponds to the label for each site on Figure 4-27
BT = Brook Trout, BrT = Brown Trout, GT = Golden Trout, HT = Hatchery Trout, RT = Rainbow Trout

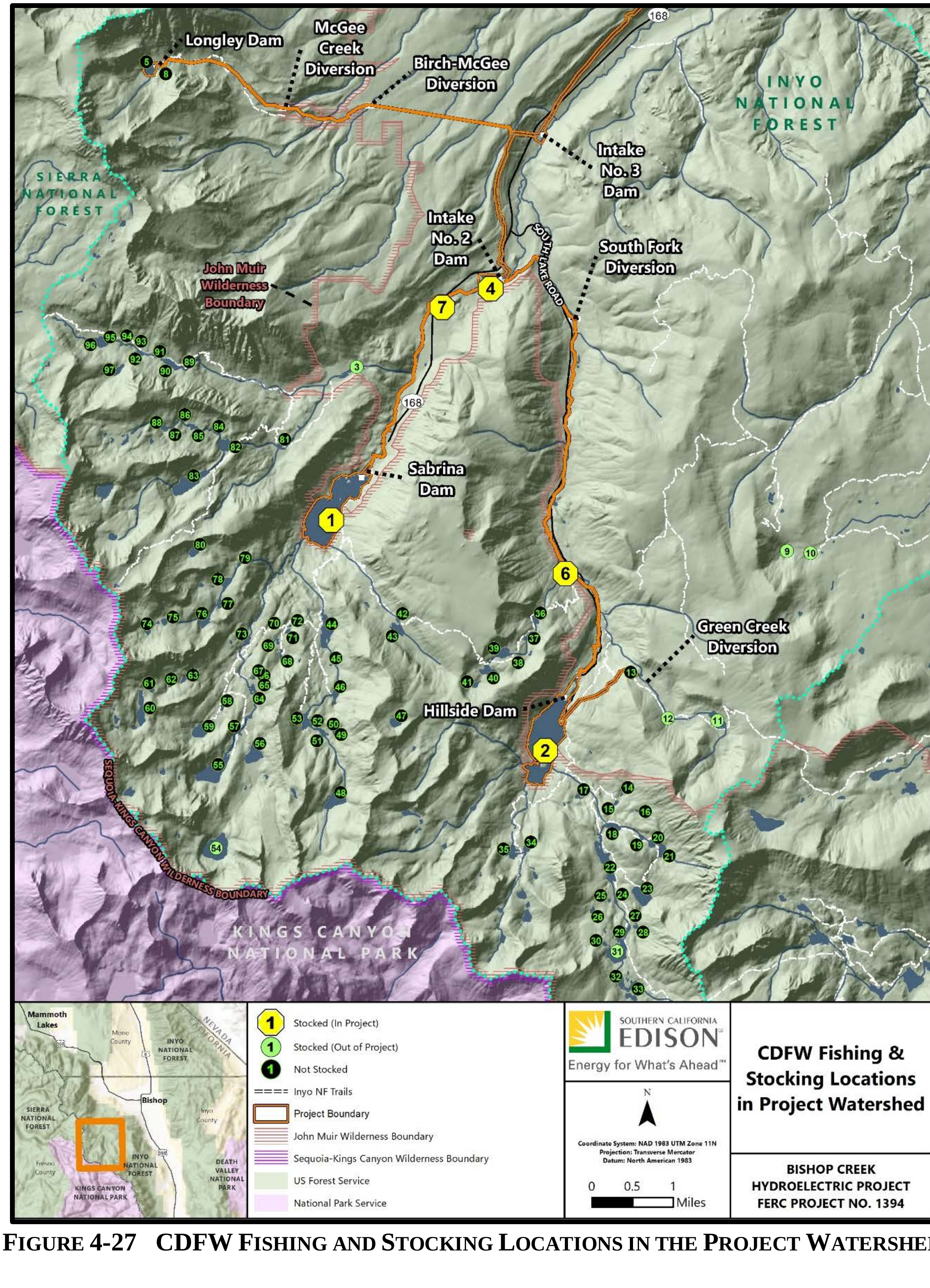

FIGURE 4-27 CDFW FISHING AND STOCKING LOCATIONS IN THE PROJECT WATERSHED

4.8.1.2.2 Project Vicinity Recreation Opportunities

The Project consists of five developments: Bishop Creek 2, Bishop Creek 3, Bishop Creek 4, Bishop Creek 5 and Bishop Creek 6. However, only one of these developments, Bishop Creek 2, includes Project recreation facilities within the Project boundary. These existing facilities are located at Intake No. 2 Reservoir, Lake Sabrina and South Lake, and are operated by the Inyo National Forest or its concessionaires.

Intake No. 2

Intake No. 2 is located at approximately 8100 feet above msl and has a surface area of approximately 15 acres. Developed recreation facilities within the Project boundary at Lake Sabrina include two fishing platforms; one on the northern shore and another on the southern shore of the reservoir. Intake No. 2 facilities are located approximately 12 miles west of Bishop along Highway 168. The site is open seasonally and no use fees are collected by the Inyo National Forest to access the fishing piers. Additionally, the Inyo National Forest's Intake 2, Bishop Park, Bishop Park Group, Four Jeffrey, Forks and Big Trees campgrounds are all located outside of the Project boundary and less than 2 miles from Intake No. 2 reservoir.

Lake Sabrina

Lake Sabrina is located at approximately 9100 feet msl and has a surface area of approximately 195 acres. The developed recreation facility within the Project boundary at Lake Sabrina is a single-lane boat launch in the northeastern corner of the lake and adjacent to Lake Sabrina Dam. Lake Sabrina facilities are located approximately 18 miles west of Bishop at the end of Highway 168. The site is closed seasonally (weather dependent) and no use fees are collected by the Inyo National Forest for boat launching (USFS 2018b). As discussed above, non-Project lands adjacent to Lake Sabrina include access to a marina and tackle shop, boat rental, restrooms and roadside parking for trailhead access, all maintained by the Inyo National Forest or its concessionaire.

South Lake

South Lake is located at approximately 9800 feet msl and has a surface area of approximately 109 acres. The developed recreation facility within the Project boundary at South Lake is a single-lane boat launch in the northeastern corner of the lake. South Lake facilities are located approximately 21 miles west of Bishop along Highway 168 and South Lake Road. The site is open June-October and use fees are collected by the Inyo National Forest as donations only (USFS 2018b). As discussed above, non-Project lands adjacent to South Lake include access to a marina and tackle shop, boat rental, restrooms, picnic/day use areas, and parking for multiple trailheads, all maintained by the Inyo National Forest or its concessionaire.

4.8.1.3 Existing Project Recreation Opportunities and Use

4.8.1.3.1 FERC Form No.80 Reports

The most recent recreational use information for the Project is provided in the Licensed Hydropower Development Recreation Report, FERC Form No. 80 (Form 80). Until recently, licensees were are required to file Form 80 reports for each Project development every six years, unless the licensee obtained an exemption from FERC. The information provided by the licensee is used to document overall recreation use of Project lands and waters at each development, as well as recreation use at all publicly available recreation amenities within the Project boundary, whether required by a Project license or not. In 2014, SCE collected recreational use data at recreation facilities within the Project boundary to estimate annual use, peak season use, peak weekend use, and capacity utilization of each amenity within the Project boundary. SCE filed its most recent Form 80 Report on March 26, 2015, reporting recreational use data for the 2014 calendar year at Intake No. 2, Lake Sabrina, and South Lake[6] (SCE 2015).

In its 2015 Form 80 Report, SCE identified three publicly available recreation amenities within the Project boundary: access point at Intake No. 2, boat launch area at Lake Sabrina, and a boat launch area at South Lake. Form 80 defines access points as sites that are well-used (not

[6] The Bishop Creek Project has five developments (Bishop Creek 2, 3, 4, 5, and 6). However, only Bishop Creek 2 (Intake No. 2, Lake Sabrina, and South Lake) contain Project recreation facilities within the Project boundary. For the remaining developments, SCE filed Form 80 reports documenting no recreation use every six years until FERC eliminated the requirement to file Form 80 in 2018.

accounted for elsewhere on this form) for visitors entering Project lands or waters, without trespassing, for recreational purposes (may have limited development such as parking, restrooms, signage) and boat launch areas as improved areas having one or more boat launch lanes…[that] are usually marked with signs, have hardened surfaces, and typically have adjacent parking (SCE 2015).

SCE's 2015 Form 80 Report estimated that, in 2014, total annual recreation use at the three amenities was 24,057 recreation days[7]. Most of the use occurred at facilities associated with the Intake No. 2 access point, followed by Lake Sabrina's boat launch area, and South Lake's boat launch area. It was determined that all three facilities were well within facility capacity during non-peak periods with the highest capacity usage occurring at Intake No. 2. Table 4-47 provides a summary of each amenity surveyed in that report.

TABLE 4-47 SUMMARY OF EACH PROJECT AMENITY SURVEYED

DEVELOPMENT	AMENITY	SURVEY LOCATION(S)	FACILITY CAPACITY[8]	TOTAL PEAK SEASON USE (RDs)	AVERAGE PEAK WEEKEND USE (RDs)	TOTAL ANNUAL USE (RDs)
Bishop Creek 2 – Intake No. 2	Access Point	Picnic Area/Day Use Parking and Roadside Parking between Hwy 168 and Intake No. 2	34%	11,094	663	14,422
Bishop Creek 2 – Lake Sabrina	Boat Launch Area	Lake Sabrina Boat Ramp and Marina Parking	27%	6,476	453	8,419
Bishop Creek 2 – South Lake	Boat Launch Area	South Lake Boat Ramp Parking	24%	935	252	1,216

Source: SCE 2015

In addition to amenities within the Project boundary, SCE surveyed peak usage at certain sites within the vicinity of each development that provides access to dispersed recreation opportunities. Table 4-48 provides a summary of that data:

[7] A recreation day is defined as a visit by a person to a development for recreational purposes during any portion of a 24-hour period.
[8] Consistent with FERC guidance, this calculation does not consider peak weekend use, only average weekend use.

TABLE 4-48 PEAK WEEKEND DAYTIME USAGE AT PROJECT VICINITY RECREATION

DEVELOPMENT	AMENITY FOR WHICH COUNT WAS USED	SURVEY LOCATION(S)	TOTAL PEAK SEASON RDS BY SURVEY LOCATION
Bishop Creek 2 – Intake No. 2	Access Point	Picnic Area / Day-Use Parking	3,458
		Roadside Parking between Hwy 168 and Intake Reservoir	7,636
	Not used in calculation	Intake Reservoir No. 2 Fishing Access Platforms	2,020
		Intake Reservoir No. 2 Access Area	257
Bishop Creek 2 – Lake Sabrina	Boat Launch Area	Lake Sabrina Boat Ramp and Marina Parking	6,476
	Not used in calculation	Roadside Pullouts below Dam (cars/SUV/truck)	5,613
		Roadside Pullouts below Dam (motorcycle)	5
Bishop Creek 2 – South Lake	Boat Launch Area	South Lake Boat Ramp Parking	935
	Not used in calculation	Lower Day-Use Parking near Vault Toilet	1,106
	Not used in calculation	Wilderness Parking Area	14,698
	Not used in calculation	Day-Use Parking	16,785
	Not used in calculation	La Hup Picnic Area	359
	Not used in calculation	Roadside Parking on Road to Marina	2,160

Source: SCE 2015

4.8.1.4 National Wild and Scenic River System, Wild and Scenic Study Rivers

None of the rivers in the Project watershed are included in nor designated for study or inclusion in the National Wild and Scenic River System. The nearest designated river to the Project, is the North and South forks of the Kings Wild and Scenic River, located on the western slopes of the Sierra Nevada and designated for its remarkable geologic, recreation, scenic and wildlife values (IWSRCC 2018).

4.8.1.5 National Wild and Scenic River System or State-Protected River Segment

No rivers in the Project watershed are designated as California Wild or Heritage Trout Waters. On the western and opposite side of the Sierra Nevada crest from the Project, the Paiute Creek drainage system, a tributary to the South Fork San Joaquin River, is designated as Wild Trout Waters. Northeast of the Project, an approximate 13-mile portion of the Owens River, from Five Bridges crossing upstream to Pleasant Valley Dam, excluding tributaries, is designated as Wild Trout Waters (CDFW 2018b).

No rivers are designated as part of the National Wild and Scenic River System in the Project watershed; however, Congress designated three wild and scenic rivers that are at least partially within other portions of the Inyo National Forest: the north and south forks of the Kern Wild and Scenic River, Cottonwood Creek Wild and Scenic River, and the Owens River Headwaters Wild and Scenic River.

Two river segments within the Project watershed have been recently listed as eligible wild and scenic rivers in the draft 2018 Land Management Plan (LMP) for the Inyo National Forest (2018 LMP): Middle Fork Bishop Creek (eligible – wild) from its headwaters to approximately Sabrina Dam; and South Fork Bishop Creek (eligible – recreational) from its headwaters to approximately South Fork Diversion (USFS 2018a). The 2018 LMP lists a desired condition (MA-EWSR-DC-01) for eligible or recommended wild and scenic rivers to retain their free-flowing condition, water quality and specific outstandingly remarkable values. The 2018 LMP also recommends that preliminary classifications remain intact until further study is conducted or until designated by Congress. Interim protection measures for USFS-identified eligible or recommended suitable rivers are identified in USFS Handbook 1909.12, Section 84.3.

No rivers in the Project watershed are within the California Wild and Scenic River System (CDOT 2018).

4.8.1.6 National Trail System or Wilderness Area Designation

The National Trails System is composed of more than 55,000 miles of scenic, historic and recreation trails that traverse wilderness, rural, suburban and urban areas in 49 states (USFS 2016). The nearest national trail to the Project is the Pacific Crest National Scenic Trail (PCT), which traverses along the western side of the Sierra Nevada crest in the Kings Canyon National Park and Sequoia-Kings Canyon Wilderness. The PCT extends approximately 2650 miles from the Canadian border through Washington, Oregon and California until reaching the border of Mexico. The PCT is one of eleven national scenic trails and is considered one of the most remote, long-distance trails with over 54 percent of its path in designated wilderness (USFS 2016). The Inyo National Forest actively manages 86 miles of the PCT, but contains 1378 miles of the PCT, 787 miles of which are located within designated wilderness (USFS 2016).

A portion of the Project boundary, including Longley Lake and the free-flowing portion of McGee Creek upstream of the McGee Creek Diversion, is designated as John Muir Wilderness; Lake Sabrina and South Lake and much of the Project boundary either directly abut or are within proximity of the John Muir Wilderness boundary. The John Muir Wilderness encompasses 651,992 acres and is jointly administered by the Inyo National Forest (299,235 acres) and the Sierra National Forest (352,757 acres) (USFS 2016). It is contiguous with the Ansel Adams Wilderness along its northern boundary, the Dinkey Lakes and Sequoia-Kings Canyon Wildernesses along its western boundary, and the Golden Trout and Monarch Wildernesses along its southern boundary (USFS 2016). On the eastern side of Owens Valley from the Project are the White Mountains Wilderness, Piper Mountain Wilderness, Sylvania Mountains Wilderness, Death Valley Wilderness and Inyo Mountains Wilderness.

4.8.1.7 Recreation Needs Identified in Management Plans

4.8.1.7.1 2015 California Statewide Comprehensive Outdoor Recreation Plan and Related Reports

According to the CDPR, the California Statewide Comprehensive Outdoor Recreation Plan (SCORP) “provides a strategy for statewide outdoor recreation leadership and action to meet the state’s identified outdoor recreation needs” (CDPR 2015). While the 2015 California SCORP does not offer specific data regarding current and future recreation needs, the following two reports are essential elements used in its development that provide information relevant to the Bishop Creek area:

- 2012 Survey on Public Opinions and Attitudes on Outdoor Recreation in California Complete Findings (CDPR 2014)
- Outdoor Recreation in California's Regions 2013 (CDPR 2013)

The reports divide California into seven geographic regions; the Project is found in the CDPR's Sierra Planning Area, which includes Alpine, Amador, Calaveras, El Dorado, Inyo, Mariposa, Mono, Nevada, Placer, and Tuolumne counties. The following general findings may be important in addressing current and future recreation needs in the Sierra Planning Area (CDPR 2013):

- The region is mostly rural, heavily forested and mountainous, with its lakes and rivers providing much of California's water supply.
- The region is second lowest in population density (35 people per square mile), and percentage growth in population by 2060 is estimated at 55 percent, greater than the state average of 41 percent.
- 2010 census data shows that the region's residents were mostly White (approximately 75 percent), with Hispanics as the lowest percentage of population of any region at 12.5 percent. By 2060, the White population is expected to decrease to 65.1 percent and the Hispanic population to increase to 20.9 percent.
- By 2060, the region is expected to have the second lowest percentage of residents ages 5 to 17 and the second highest percentage of residents aged 65 and over.
- Recreational facilities such as day use areas (picnic/BBQ) are generally proportional to region population.
- The region had the highest total employment (33 jobs per 1000 residents) related to outdoor recreation among all regions.
- The region had the highest total annual gross sales ($3.23 per 1000 residents) related to outdoor recreation among all regions.

Based upon its research, the CDPR (2013) identifies five major outdoor recreation issues for California:

1 Economic challenges,
2 Serving residents' needs,
3 Improving access to recreation,
4 Funding challenges, and
5 Ensuring that recreation Projects conform to mandated plans.

Specific strategies and action priorities related to these issues were developed and ranked by region. The Sierra Planning Area was listed as the top priority for the following four actions (CDPR 2013):

- Fund Projects that support or create outdoor recreation; related jobs in the region. (Issue One, Action 3.1)
- Fund Projects and that support outdoor recreation; related sales and expenditures in the region. (Issue One, Action 2.2)
- Fund Land and Water Conservation Fund (LWCF) Projects to provide an equal amount of LWCF per capita grant funding across the regions. (Issue Four, Action 1.1)
- Provide LWCF technical assistance to increase and improve LWCF Project submissions. (Issue Four, Action 1.2)

4.8.1.7.2 Inyo National Forest – National Visitor Use Monitoring Report (FY 2016 Data)

The National Visitor Use Monitoring Program (NVUM) has two goals: 1) to produce estimates of the volume of recreation visitation to national forests and grasslands, and 2) to produce descriptive information about that visitation, including activity participation, demographics, visit duration, measures of satisfaction, and trip spending connected to the visit (USFS 2018e). The most recent visitor use report for the Inyo National Forest was updated on January 21, 2018, and summarizes data collected during fiscal year 2016. The following is a summary of results of that report.

Total visits to the Inyo National Forest[9] in fiscal year 2016 are estimated at 2,309,000 individuals. Many people frequent more than one site during their visit, so estimates are further broken down by site visits, totaling 4,624,000 visits[10]. The most commonly frequented site or area associated with the Inyo National Forest is Day Use Developed (2,608,000 visits), followed by Overnight Use Developed (876,000 visits), General Forest Area (850,000 visits), and Designated Wilderness (290,000 visits). Site visits are further broken down by each activity in which the individual participated during that visit. The most common activities selected by

[9] The 2018 NVUM Report defines a National Forest Visit as the entry of one person upon a national forest to participate in recreation activities for an unspecified period of time. A national forest visit can be composed of multiple site visits. The visit ends when the person leaves the national forest to spend the night somewhere else.
[10] The 2018 NVUM Report defines a Site Visit as the entry of one person onto a National Forest site or area to participate in recreation activities for an unspecified period of time. The site visit ends when the person leaves the site or area for the last time on that day.

survey participants were viewing natural features, hiking/walking, relaxing, downhill skiing, viewing wildlife, and driving for pleasure. The most commonly chosen main activity by survey participants was downhill skiing, followed by hiking/walking, viewing natural features and bicycling. A complete list of activity participation results is found in Table 4-49.

Demographic results estimate that 89.3 percent of visitors are White, followed Hispanic/Latino (9.5 percent), Asian (9.1 percent), Black/African American (2.6 percent), American Indian/Alaska Native (2.5 percent), and Hawaiian/Pacific Islander (1.7 percent). Age distribution estimates 17 percent of visitors are children under the age of 16, and 23 percent are over the age of 60. Most visitors, an estimated 74.4 percent, live more than 200 miles from the forest, and only 18 percent live within a 50-mile proximity.

TABLE 4-49 ACTIVITY PARTICIPATION RESULTS

ACTIVITY	% PARTICIPATION	% MAIN ACTIVITY
Viewing Natural Features	45.3	8.5
Hiking / Walking	44.2	16.3
Relaxing	34.8	4.6
Downhill Skiing	34.1	32.3
Viewing Wildlife	30.3	0.6
Driving for Pleasure	23.6	1.8
Bicycling	11.9	8.2
Visiting Historic Sites	11.7	0.6
Developed Camping	11.6	3.6
Nature Center Activities	11.2	0.7
Fishing	11	5.8
Picnicking	8.6	0.4
Nature Study	7.8	0.3
Resort Use	7.8	0
Cross-country Skiing	6.8	5.5
Some Other Activity	6.6	4.9
Backpacking	4.9	2.2
Other Non-motorized	3.8	0.3
OHV Use	2.9	0.4
Primitive Camping	2.9	0.2
Motorized Trail Activity	2.7	0.4
Non-motorized Water	2.1	0.5
Gathering Forest Products	1.7	0
Other Motorized Activity	1	0.8
Hunting	0.6	0.5
Horseback Riding	0.6	0.2
Motorized Water Activities	0.4	0.1
No Activity Reported	0.3	0.6
Snowmobiling	0.3	0

Source: USFS 2018e

4.8.2 Land Use and Management of Project Lands

The Project is situated within the South Fork Bishop Creek (HUC 180901020601), Middle Fork Bishop Creek (HUC 180901020602), Coyote Creek-Bishop Creek (HUC 180901020603), and McGee Creek (HUC 180901020402) sub-watersheds, collectively the Project watershed, predominantly along the Middle and South forks of Bishop Creek as they drain into Owens

Valley. Land ownership within the Project boundary is predominantly composed of federal lands jointly administered by the Inyo National Forest and BLM; a small portion of Inyo National Forest lands within the Project boundary are managed as a National Wilderness Area (John Muir Wilderness). The remainder of lands are owned by either SCE, the LADWP or private landowners. On April 2, 2010, FERC approved SCE's revised Exhibit G drawings and associated federal acreage for the Project (FERC 2010). By letter dated May 5, 2010, SCE submitted GIS Project boundary data, as required by paragraph (c) of that Order. Table 4-50 summarizes land ownership within the Project boundary based on this approved data.

TABLE 4-50 LAND OWNERSHIP WITHIN THE PROJECT BOUNDARY

OWNERSHIP	ACREAGE	PERCENTAGE OF TOTAL
Forest Service	733.8	67.8%
Bureau of Land Management	47.6	4.4%
Non-federal	300.9	27.8%
Total Project Acreage	*1082.2*	

The Project boundary includes only lands necessary for Project O&M and for the conveyance of water throughout the Bishop Creek system. An analysis of Inyo County tax parcels and each parcel associated with the Inyo County General Plan land use classification shows that the most common underlying land use of Project lands is state and federal lands (77.1 percent), followed by rural protection (18.1 percent) (IC 2018b).

Table 4-51 and Figure 4-28 summarize Inyo County land use classifications within the Project boundary. Note that there are discrepancies between Project and Inyo County tax boundaries that skew the results of land use within the mostly narrow Project boundary. The numbers are still largely representative of use within and immediately adjacent to the Project boundary.

TABLE 4-51 INYO COUNTY DESIGNATED LAND USE WITHIN THE PROJECT BOUNDARY

LAND USE LABEL	LAND USE DESIGNATION	ACREAGE	PERCENTAGE
CR	County Roads	13.8	1.3%
MULTI	Multi-Use	13.7	1.3%
NH	Natural Hazards	7.1	0.7%
NR	Natural Resources	11.6	1.1%
OSR	Open Space and Recreation	0.3	0.0%
REC	Resort/Recreational	1.8	0.2%
RL	Residential Low Density	2.1	0.2%
RP	Rural Protection	195.3	18.1%
RR	Residential Ranch	0.9	0.1%
RVL	Residential Very Low Density	0.4	0.0%
SFL	State and Federal Lands	832.9	77.1%

Source: IC 2018b

Note: Inyo County tax data does not include county road rights-of-way, and this classification was added to show the area in entirety.

An analysis of the Multi-Resolution Land Characteristics Consortium's 2011 National Land Cover Database (NLCD) provides further information on land use by generalizing land cover within the area (MRLCC 2014). As summarized in Table 4-52, predominant land use within the Project boundary is shrub/scrub, followed by open water, and evergreen forest (MRLCC 2014).

TABLE 4-52 NLCD LAND COVER WITHIN THE PROJECT BOUNDARY

GRIDCODE	ACRES	PERCENTAGE	LAND CLASS
11	349.9	32.3%	Open Water
21	30.8	2.8%	Developed, Open Space
22	8.1	0.7%	Developed, Low Intensity
31	14.8	1.4%	Barren Land (Rock/Sand/Clay)
41	5.7	0.5%	Deciduous Forest
42	85.0	7.9%	Evergreen Forest
52	523.0	48.3%	Shrub/Scrub
71	45.5	4.2%	Grassland/Herbaceous
90	19.5	1.8%	Woody Wetlands

Source: MRLCC 2014

Due to the narrow nature of the Project boundary, a better representation of the land use in the area can be derived by analyzing the Project watershed. The Project watershed is mostly composed of rural, federally protected lands, resulting in lands that sparsely populated and highly restricted in allowed use. Of the approximately 88,756.5 acres within the Project watershed, 92.4 percent of those lands are designated as state and federal lands; the next highest classification is natural resources, followed by rural protection and multi-use (IC 2018b). The upper Project watershed is dominated by Inyo National Forest lands, though residents do live in two small residential communities, Aspendall and Mountain View, located in the general vicinity of Intake No. 2 off State Highway 168 and South Lake Road, respectively. The remainder of development in the upper reaches of the Project watershed are Inyo National Forest campgrounds and recreation use areas.

TABLE 4-53 INYO COUNTY DESIGNATED LAND USE WITHIN THE PROJECT WATERSHED

LAND USE LABEL	LAND USE DESIGNATION	ACREAGE	PERCENTAGE
CR	County Roads	164.2	0.2%
MULTI	Multi-Use	1,336.4	1.5%
NH	Natural Hazards	115.7	0.1%
NR	Natural Resources	3,478.4	3.9%
OSR	Open Space and Recreation	24.3	0.0%
PF	Public Service Facilities	1.6	0.0%
REC	Resort/Recreational	28.8	0.0%
RL	Residential Low Density	41.7	0.0%
RP	Rural Protection	1,356.7	1.5%
RR	Residential Ranch	38.9	0.0%
RRM	Residential Rural Medium Density	2.5	0.0%
RVL	Residential Very Low Density	191.9	0.2%
SFL	State and Federal Lands	81,975.5	92.4%

Source: IC 2018b

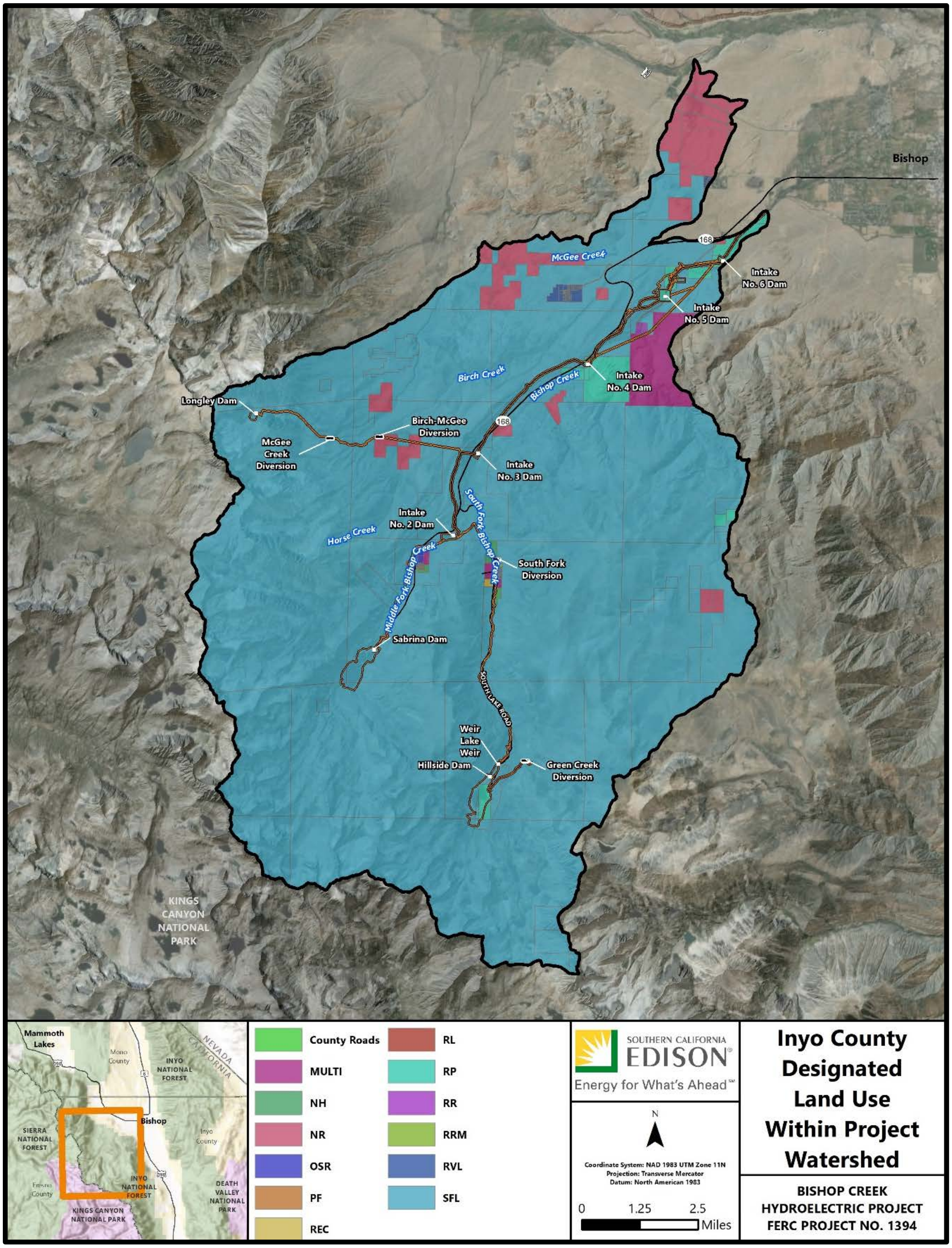

FIGURE 4-28 INYO COUNTY DESIGNATED LAND USE WITHIN PROJECT WATERSHED

An analysis of the Multi-Resolution Land Characteristics Consortium's 2011 NLCD on the Project watershed was conducted to generalize land cover within the area (MRLCC 2014). As summarized in Table 4-54, predominant land use within the Project watershed is shrub/scrub, followed by barren land, and evergreen forest (MRLCC 2014).

TABLE 4-54 NLCD LAND COVER WITHIN THE PROJECT WATERSHED

Gridcode	Acres	Percentage	Land Class
11	955.6	1.1%	Open Water
12	329.4	0.4%	Perennial Ice/Snow
21	463.8	0.5%	Developed, Open Space
22	94.3	0.1%	Developed, Low Intensity
23	2.0	0.0%	Developed, Medium Intensity
31	19,558.6	22.0%	Barren Land (Rock/Sand/Clay)
41	490.2	0.6%	Deciduous Forest
42	15,380.4	17.3%	Evergreen Forest
43	43.6	0.0%	Mixed Forest
52	43,526.1	49.0%	Shrub/Scrub
71	7,449.0	8.4%	Grassland/Herbaceous
81	101.4	0.1%	Pasture/Hay
82	47.6	0.1%	Cultivated Crops
90	324.0	0.4%	Woody Wetlands
95	64.2	0.1%	Emergent Herbaceous Wetlands

Source: IC 2018b

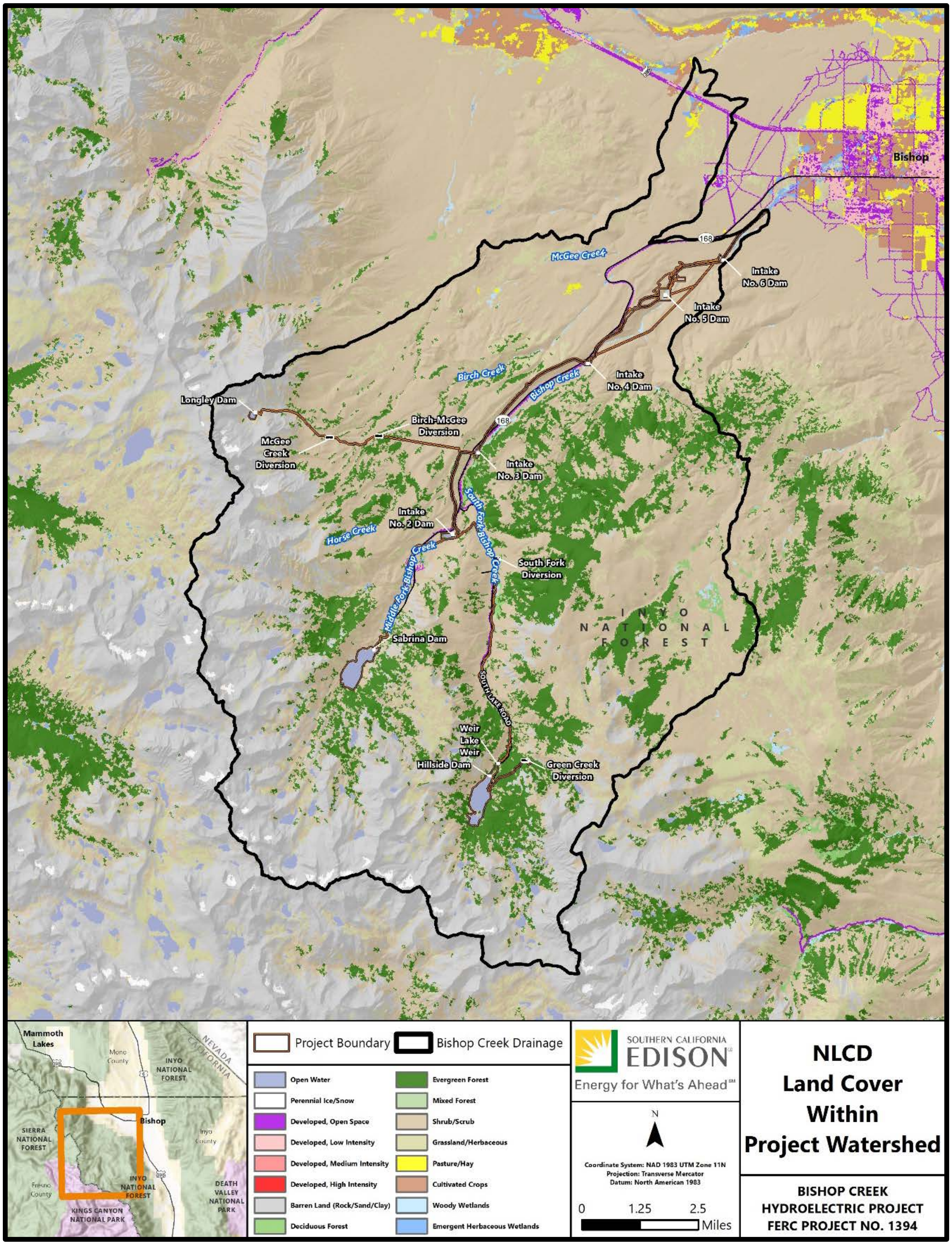

FIGURE 4-29 NLCD LAND COVER WITHIN PROJECT WATERSHED

4.8.2.1 Shoreline Buffer Zone and Management Plan

The shorelines of Lake Sabrina and Longley Lake are located wholly on Inyo National Forest lands, and portions of the shorelines at South Lake and Intake No. 2 Reservoir are owned by SCE, with the remainder on Inyo National Forest Lands. The Project boundary at each of these impoundments encompasses only the lands necessary for Project operations up to the reservoir elevation associated with the maximum operating capacity of each development. Generally, this boundary has been drawn through metes and bounds[11] to encompass those reservoir elevations with a slight buffer due to the accuracy of the metes and bounds survey.

Article 204 of the Project license provides SCE the means to authorize specific uses and occupancies of Project shorelines that are not related to hydroelectric power or other Project purposes. These uses are typically referred to as non-Project uses. Currently, all non-Project use within Project boundary is associated with recreational facilities managed by the Inyo National Forest on Lake Sabrina, South Lake and Intake No. 2 Reservoir. Because all shoreline property is owned by either Inyo National Forest or SCE, no formal permitting process, and therefore a Shoreline Management Plan is not required for this Project. SCE will continue to work with the Inyo National Forest on any activity associated with Project shorelines, and it is SCE's general land use policy to provide an effective shoreline buffer that protects and enhances the Project's scenic, recreational and other environmental values, while ensuring continued safe and reliable production of hydroelectric power.

4.8.2.2 Inyo County General Plan

State law requires each county and city to prepare and adopt a comprehensive and long-range general plan for its physical development (Government Code Section 65300). On December 11, 2001, the Inyo County Board of Supervisors approved the 2001 Inyo County General Plan Update (2001 Plan), a comprehensive general plan which provides Inyo County with a consistent framework for land use decision-making[12] (IC 2001). The land use sub-element of the 2001 Plan

[11] Metes and bounds, limits or boundaries of a tract of land as identified by natural landmarks, such as rivers, or by man-made structures, such as roads, or by stakes or other markers. https://www.britannica.com/topic/metes-and-bounds. Accessed July 2018.
[12] A draft update to the plan is under review and may be found at http://inyoplanning.org/Projects/GPandZoningUpdates.htm.

establishes goals and policies for residential, commercial, industrial, public services and utilities, and other land uses in Inyo County (IC 2001). Table 4-55 provides the specific goals of the 2001 Plan applicable to land use in the Project vicinity. Specific policies and implementation measures for each goal can be accessed on Inyo County's website at http://inyoplanning.org/general_plan/goals/ch4.pdf.

TABLE 4-55 SPECIFIC GOALS OF THE 2001 PLAN APPLICABLE TO LAND USE IN THE PROJECT VICINITY

GOAL LU-1	**GENERAL**	Create opportunities for the reasonable expansion of communities in a logical and contiguous manner that minimizes environmental impacts, minimizes public infrastructure and service costs, and furthers the countywide economic development goals. Guide high-density population growth to those areas where services (community water and sewer systems, schools, and commercial centers) are available or can be created through new land development, while providing and protecting open space areas.
GOAL LU-2	**RESIDENTIAL**	Assure that all residential development is well planned, adequately served by necessary public facilities and infrastructure, and directed towards existing developed areas.
GOAL LU-3	**COMMERCIAL**	Provide commercial land uses that adequately serve the existing and anticipated future needs of the community and surrounding environs.
GOAL LU-4	**INDUSTRIAL**	Provide appropriate types of industrial land uses that adequately serve the existing and/or future needs of the community and surrounding environs, and to promote and attract forms of non-polluting light industry.
GOAL LU-5	**OTHER**	Provide adequate public facilities and services for the existing and/or future needs of communities and their surrounding environs, and to conserve natural and managed resources.
GOAL PSU-1	**GENERAL**	Ensure the timely development of public facilities and the maintenance of adequate service levels for these facilities to meet the needs of existing and future county residents.
GOAL PSU-2	**FUNDING**	Ensure that adequate facility and service standards are achieved and maintained through use of equitable funding methods.
GOAL PSU-3	**WATER**	Ensure there will be a safe and reliable water supply sufficient to meet the future needs of the county.
GOAL PSU-4	**WASTEWATER**	Ensure adequate wastewater collection, treatment and disposal.
GOAL PSU-5	**STORMWATER DRAINAGE**	Collect and dispose of stormwater in a matter that minimizes inconvenience to the public, minimizes potential water-related damage, and enhances the environment.
GOAL PSU-6	**SOLID WASTE FACILITIES**	Ensure the safe and efficient disposal or recycling of solid waste generated in Inyo County.
GOAL PSU-7	**COMMUNICATION INFRASTRUCTURE**	Expand the use of information technology to improve personal convenience, reduce dependency on nonrenewable resources, take advantage of the ecological and financial efficiencies of new technologies, maintain the county’s economic competitiveness, and develop a better-informed citizenry.
GOAL PSU-8	**FIRE PROTECTION**	Protect the residents of and visitors to Inyo County from injury and loss of life and to protect property from fires.
GOAL PSU-9	**LAW ENFORCEMENT**	Provide adequate law enforcement services to deter crime and to meet the growing demand for services associated with increasing populations and commercial/industrial development in the county.
GOAL PSU-10	**GAS AND ELECTRICAL FACILITIES**	Provide efficient and cost-effective utilities that serves the existing and future needs of people in the unincorporated areas of the county.
GOAL PSU-11	**SCHOOLS**	Ensure that adequate school facilities are available and appropriately located to meet the needs of Inyo County residents.
GOAL PSU-12	**CHILD CARE**	Ensure that an adequate and diverse supply of child care facilities and services are available to parents who live and work in Inyo County.

Source: IC 2001

LU = Land Use PSU = Public Service Utilities

4.8.2.3 Inyo National Forest Land and Resource Management Plan

Land management activities within the boundaries of the Inyo National Forest are managed in accordance with the 1988 Inyo National Forest Land and Resource Management Plan (1988 Forest Plan). The 1988 Forest Plan provides direction for management activities within the forest and specific guidance on where and under what conditions an activity or Project on Inyo National Forest lands can generally proceed (USFS 1988). The 1988 Forest Plan has been amended several times, including the following which are still in effect:

- South Sierra Wilderness Management Plan
- Motor Vehicle Direction
- Wild and Scenic River Management Plan: North and South Forks of the Kern
- Forest-wide Range Utilization Standards
- Management Direction for the Ansel Adams, John Muir, and Dinky Lakes Wildernesses
- Sierra Nevada Forest Plan Amendment and Management Indicator Species Amendment

The Inyo National Forest is in the process of revising its Forest Plan. A draft plan and environmental impact statement were released in May 2016 and made available for comment. Based on public comment and Inyo National Forest analysis, the draft plan was revised, and a final environmental impact statement and draft record of decision was issued in August 2018 (USFS 2018f).

The draft 2018 Land Management Plan for the Inyo National Forest is intended to identify long-term or overall desired conditions and provide general direction for achieving those desired conditions (USFS 2018a). Table 4-56 provides a summary of forestwide desired conditions related to land use at the Project.

TABLE 4-56 INYO NATIONAL FOREST FORESTWIDE DESIRED CONDITIONS RELATED TO LAND USE AT THE PROJECT

LAND-FW-DC	**01**	Land ownership and access management support authorized activities and uses on National Forest System lands. Land exchanges promote improved management of National Forest System lands.
LAND-FW-DC	**02**	Coordination of land and resource planning efforts with other federal, state, Tribal, county, and local governments, and adjacent private landowners, promotes compatible relationships between activities and uses on National Forest System lands and adjacent lands of other ownership.
INFR-FW-DC	**01**	A minimum and efficient national forest transportation system, administrative sites, and other infrastructure and facilities are in place and maintained at least to the minimum standards appropriate for planned uses and the protection of resources.
INFR-FW-DC	**02**	Management operations on the Inyo National Forest are energy and water efficient.
INFR-FW-DC	**03**	Roads allow for safe and healthy wildlife movement in areas of human development. Vehicular collisions with animals are rare.
REC-FW-DC	**01**	The diverse landscapes of the Inyo National Forest offer a variety of recreation settings for a broad range of year-round, nature-based recreation opportunities. Management focuses on settings that enhance the national forest recreation program niche.
REC-FW-DC	**02**	The condition, function, and accessibility of recreation facilities accommodate diverse cultures with appropriate activities available to the public.
REC-FW-DC	**03**	Recreation opportunities provide a high level of visitor satisfaction. The range of recreation activities contribute to social and economic sustainability of local communities.
REC-FW-DC	**04**	Areas of the national forest provide for a variety of activities with minimal impact on sensitive environments and resources.
REC-FW-DC	**05**	Visitors can connect with nature, culture, and history through a range of sustainable outdoor recreation opportunities.
REC-FW-DC	**06**	The management and operation of facilities are place based, integrated, and responsive to changes that may limit or alter access.
REC-FW-DC	**07**	New developed recreation infrastructure is located in ecologically resilient landscapes, while being financially sustainable, and responsive to public needs.
REC-FW-DC	**08**	Summer dispersed recreation occurs in areas outside of high visitation, developed facilities, or communities, and does not adversely impact natural or cultural resources.
REC-FW-DC	**09**	Permitted recreation uses, such as recreation special events or guided activities, are consistent with recreation settings, protect natural and cultural resources, and contribute to the economic sustainability of local communities.
REC-FW-DC	**10**	Forest recreation information is current, connecting people to the national forest through contemporary means including social media and available technology. Diverse communities are aware of recreation opportunities on the Inyo National Forest.
REC-FW-DC	**11**	The Inyo National Forest provides a range of year-round developed and dispersed recreation settings that offer a variety of motorized and non-motorized opportunities and recreation experiences.
REC-FW-DC	**12**	Trails used in summer provide access to destinations, provide for opportunities that connect to a larger trail system, provide linkages from local communities to the national forest, and are compatible with other resources.
REC-FW-DC	**13**	Trails meet trail management objectives based on trail-class and designed use.

SCEN-FW-DC	**01**	The Inyo National Forest provides a variety of ecologically sound, resilient, and visually appealing forest landscapes that sustain scenic character, supporting the national forest recreation program niche in ways that contribute to visitors' sense of place and connection with nature.
SCEN-FW-DC	**02**	Scenic character is maintained and/or adapted to changing conditions to support ecological, social, and economic sustainability on the Inyo National Forest and in surrounding communities.
SCEN-FW-DC	**03**	Scenic integrity is maintained in places people visit for high quality viewing experiences.
SCEN-FW-DC	**04**	The Inyo National Forest's scenic resources complement the recreation settings and experiences, as described by the range of scenery integrity objectives, while reflecting healthy and sustainable ecosystem conditions.
SCEN-FW-DC	**05**	The built environment meets or exceeds scenic integrity objectives and contributes to scenic stability.

Source: USFS 2018g

4.8.2.4 Bureau of Land Management Plan – Resource Management Plan

Land management activities within the boundaries of BLM lands are managed in accordance with the 1993 Bishop Resource Management Plan Record of Decision (1993 Resource Plan). The 1993 Resource Plan records the BLM's final land use decisions for managing public lands administered by the Bishop Resource Area (BLM 1993). This includes policies, guidelines, valid existing management, standard operating procedures, and land use decisions applicable to the entire Bishop Resource Area, as well as decisions regarding livestock grazing in the area. Decisions focus on the following four major issues identified through public involvement early in the planning process (BLM 1993):

- Recreation - how to provide for a variety of recreational uses, meet increasing demand for recreation opportunities, and reduce potential conflicts with other uses or values;
- Wildlife - where and what management prescriptions are needed to enhance or maintain important wildlife habitats and populations;
- Minerals - how to meet the demand for mineral uses and reduce potential conflicts with other uses or values; and
- Land Ownership and Authorizations - where BLM should acquire or dispose of land, how and where public lands should be available for special or private uses, and how land use authorizations can be managed to reduce potential conflicts with other uses or values.

4.8.3 Potential Adverse Effects and Issues

SCE's review of readily available information, and early consultation with the TWG have not identified impacts to recreational resources and land-uses associated with the Project, most of which is located within the Inyo National Forest. The Forest Service has Federal Power Act Section 4(e) conditioning authority to prescribe conditions that may mitigate the impact of hydropower Projects on National Forest lands.

It is reasonable to assume that some recreation demand within or adjacent to the Project boundary, may have been induced or could be indirectly affected by the presence of the Project. Recreation at Project reservoirs (South Lake, Lake Sabrina, Intake No. 2 Reservoir) largely exists because of the presence of those impoundments. Public use of those sites may have reached its capacity and as a result, lead to overuse of existing sites or access to those sites, increased use of adjacent or nearby facilities not associated with the Project, or an increase in dispersed use activities in the area. Each of these actions has a cost of ongoing O&M and/or may have a detrimental effect on other environmental resources at those locations.

FERC requires in 18 CFR §4.41, that the Project boundary encompass all lands necessary for Project purposes, including the O&M of the Project over the term of the FERC license. Certain recreation sites adjacent to the Project boundary, such as those at South Lake, Lake Sabrina and Intake No. 2 Reservoir or informal uses may need to be evaluated against this standard; other features used in Project operations such as additional access roads and lay down areas that may not have been included in Project lands previously but have been used for Project purposes.

Under the current license term, the Forest Service provided 4(e) conditions that required funding and construction of two new access trails; funding and construction of 60 new overnight campground units, a new entrance station, and a buried power source to the new campground; and funding of some of the Forest Service's costs to annually operate and maintain existing Project-induced recreation facilities in the Bishop Creek drainage and those proposed for construction under the condition. These conditions were made part of the FERC license as Article 107, although they were appealed by SCE and revised on October 22, 1996, to only require SCE to pay half of the O&M costs generated by the day-use recreation at the South Lake and Sabrina reservoirs. After providing the Forest Service with funding for the campground construction requirements on November 20, 1997, SCE filed for amendment of its license to modify Article 107 accordingly. FERC's November 24, 1998 Order Amending License, revised Article 107 to remove all previous requirements and alter ongoing maintenance requirements to reimburse half the actual O&M costs generated by day-use recreation at South Lake and Sabrina Lake, following receipt of an annual statement from the Forest Service.

4.8.4 Proposed Mitigation and Enhancement Measures

SCE anticipates that, much like the current license, PME's would focus on the improvement or repair recreation and land use directly associated with Project features, such as South Lake, Lake Sabrina and Intake No. 2 Reservoir. Although no additional mitigation or enhancement measures relating to recreation and land use are planned at this time, SCE plans to evaluate the issues identified above as part of the relicensing Study Plan, and in consultation with stakeholders; it is likely that minor changes in the Project boundary may be proposed to fit the anticipated future O&M needs of the Project. If any major structural changes of the Project are planned, appropriate BMPs to minimalize effects on recreation and land use will be implemented; however, no structural changes are proposed at this time.

4.8.5 References

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4.9 AESTHETIC RESOURCES [§ 5.6 (D)(3)(VIII)]

4.9.1 Overview

The Project facilities are located in the Owens Valley and in areas of the eastern Sierra Nevada in the County of Inyo, southwest of the City of Bishop, California. The Project's facilities are sited along Bishop Creek and its tributaries including South Fork, Middle Fork, Green Creek, Birch Creek and McGee Creek. Bishop Creek is a tributary to the Owens River. The Project facilities are located within the Inyo National Forest, the John Muir Wilderness (both of which are managed by the USFS), lands managed by BLM, and on private lands.

Green Creek Diversion is earth and rockfill, located at 10,264-feet-elevation, approximately 51 feet along the crest and 9 feet above streambed, with a 12.5-foot-wide by 1-foot-deep spillway. The intake has a steel pipe with a slide gate and trash rack, and a concrete masonry intake chamber. A wooden head gate is approximately 80-feet-downstream from Bluff Lake on Green Creek.

South Fork Diversion is earth and rockfill with a crest elevation at 8211 feet, crest length of approximately 65 feet, and crest height of 10 feet above the streambed. The diversion has a 40-foot-wide by 6-foot-deep spillway, and the outlet consists of a steel pipe with a gate valve and trash rack. The steel pipe flowline extends from the South Fork diversion to Intake No. 2 reservoir.

Hillside Dam is an 81.5-foot-high rockfill timber face (covered with geomembrane) dam that enlarges an existing natural lake, South Lake. The crest is 645-feet-long and is at an elevation of 9757.6 feet. There is a 40-foot spillway and an unlined outlet tunnel that discharges into the South Fork of Bishop Creek 600-feet-downstream of the dam.

Weir Lake Weir (or South Lake Weir) is a concrete structure approximately 70-feet-long, located approximately 1800 feet below Hillside Dam that is used for flow monitoring. The weir is 25-feet-wide by 1-foot-high.

Sabrina Dam and associated facilities consist of a 70-foot by 900-foot timber face (covered with geomembrane) rockfill dam, an uncontrolled main spillway formed by an ogee crest, an uncontrolled auxiliary spillway formed by a concrete wall, and three low-level outlets. The dam forms Lake Sabrina, which is operated as a regulating reservoir for a series of hydroelectric powerhouses which include Bishop Creek Powerhouses 2 through 6.

Longley Dam is an earth and rockfill dam constructed with a reinforced concrete core wall. The dam has a crest elevation of 10,708 feet, crest length of 120 feet, and crest height of 27 feet above streambed. The spillway channel is excavated in 8-foot-wide solid rock. Water is diverted into McGee Creek.

Intake No. 2 Dam is a 41-foot-high, 443-feet-long, earthfill dam with a concrete core wall extending over approximately half its length. The concrete corewall is discontinued on the right side of the dam where the dam is less than 20-feet-high. There is a service spillway with an ogee crest and an auxiliary spillway with an ungated concrete ogee crest, two low-level outlet conduits, and one intake structure. Water is conveyed to Flowline/Penstock No. 2 through a steel pipe that passes under the dam near the left abutment. The steel pipe connects to a butterfly valve located in a small building at the downstream toe of the dam. A sand sluice pipe passes under the dam. A 20-inch fish water-release pipe branches off the sluice line directly above the valve house.

- Intake No. 3 Dam: 20-foot by 225-foot concrete arch with spillway, steel pipes and penstock
- Intake No. 4 Dam: 28-foot by 323-foot concrete arch with spillway, intake pipe, steel pipeline and two penstocks
- Intake No. 5 Dam: 20-foot by 275-foot concrete with spillway, steel pipes, concrete pipe and two penstocks
- Intake No. 6 Dam: 26-inch by 320-foot concrete dam with spillway, steel pipe and penstock
- Birch-McGee Diversion Pipe: A steel pipe that conveys water from Birch and McGee creeks to Flowline No. 2. The flowline collects water from the following:
    - Birch-McGee Diversion: a 6-foot by 22-foot stone and concrete diversion dam; a steel pipe connects to Penstock 2 above Powerhouse 2.
    - McGee Creek Diversion is a 6-foot by 22-foot concrete dam on McGee Creek, with a spillway. Water is diverted into a steel outlet pipe and into a flowline, which discharges into Birch Creek above the Birch-McGee Diversion.

4.9.2 Nearby Scenic Attractions

Within and adjacent to the Project boundary are federal lands, including Inyo National Forest lands, a small part of which is the John Muir Wilderness, a National Wilderness Area. Visitors come to these areas largely for their scenic value, and this tourism helps support the local economy.

The draft 2018 Land Management Plan for the Inyo National Forest addresses plans to improve the scenic integrity of the forest. The Inyo National Forest includes several scenic attractions, including Mt. Whitney, Mono Lake, Reds Meadow, Mammoth Lakes and the Ancient Bristlecone Pine Forest (https://www.fs.usda.gov/inyo). Three Wild and Scenic Rivers are partially within portions of the Inyo National Forest outside of the Project boundary: the north and south forks of the Kern Wild and Scenic River, Cottonwood Creek Wild and Scenic River, and the Owens River Headwaters Wild and Scenic River (IWSRCC 2018). The Inyo National Forest is comprised of over 1000 miles of the Pacific Crest Trail, a trail known for its scenic value and much of which is in designated wilderness.

Within the Project vicinity, there are multiple nationally and state designated scenic trails and byways. The PCT, which traverses along the western side of the Sierra Nevada crest in the Kings Canyon National Park and Sequoia-Kings Canyon Wilderness, offers outstanding scenic vistas and panoramic views. The PCT extends approximately 2650 miles from the Canadian border through Washington, Oregon and California until reaching the border of Mexico. The PCT is one of 11 national scenic trails and is considered one of the most remote, long-distance trails with over 54 percent of its path in designated wilderness (USFS 2016). In the John Muir and Ansel Adams Wilderness Areas, PCT visitors experience stunning vistas of glaciated landscapes, including sparkling blue lakes with a backdrop of high, rocky peaks on the Sierra Crest.

Approximately 15 miles south of Bishop, in Big Pine, California, is the beginning of the Ancient Bristlecone Scenic Byway that follows California State Route 168 and Forest Service Road 4S01 (White Mountain Road) from Owens Valley at 4000 feet in elevation approximately 34 miles into the White Mountains to Patriarch Grove at 11,200 feet in elevation. The byway climbs through pinyon-juniper woodlands to the world's oldest living trees located in the Ancient Bristlecone Pine Forest. The route was designated a National Forest Scenic Byway July 13, 1992. The Ancient Bristlecone Scenic Byway is eligible for State Scenic Highway Designation (SNGT 2018).

Running north-south along the eastern Sierra Nevada, sections of U.S. Route 395 has been designated a California Scenic Highway. The route extends 557 miles from northern Los Angeles to the Oregon border along the eastern range of the Sierra Nevada and Cascade mountain ranges, passing through Bishop and a host of breathtaking views of America's tallest mountains.

4.9.3 Visual Character of Project Lands and Waters

The Project is situated in the foothills and mountainous uplands of the eastern slope of the southern Sierra Nevada. Lake Sabrina (9100 feet msl), South Lake (9800 feet msl), and Longley Lake (10,708 feet msl) are located in the high, steep, rocky and rugged mountain valleys, typical of the eastern slopes of the Sierra Nevada. As Project creeks flow from each reservoir, the valleys gradually transition into the wide-open landscape of the Owens Valley. A wide ribbon of trees next to the streams contrast with the surrounding drier, grass and shrub covered valley slopes.

Project facilities are easily accessible by Highway 168 and South Lake Road, both are public roads used heavily by recreationists year-round. Highway 168 and South Lake Road generally parallel the Middle and South forks of Bishop Creek, respectively, providing ample opportunity for viewing the Project area and its associated facilities along those water sources. Project facilities were originally built in the early 20th Century with architecture that blends well with the landscape (FERC 1991). The linear flowlines and transmission lines are more obvious, though vegetation growth over the past century within rights-of-way has reduced the impact of visual contrast (FERC 1991).

The majority of land within and surrounding the Project is managed by the Inyo National Forest and subject to the desired conditions set forth in its draft 2018 Land Management Plan for the Inyo National Forest. A smaller portion of the Project is managed by BLM and surrounding lands are subject to the standards and goals of the 1993 Resource Plan (BLM 1993). The remainder of lands within the Project are owned by SCE, LADWP or private landowners, and are subject to the standards and goals set in Inyo County's 2001 Plan[13] (IC 2001). Figure 4-30 through Figure 4-51 below provide a representative view of major Project facilities and surrounding landscapes.

[13] Inyo County is currently working on an updated plan.

FIGURE 4-30 PLANT 6

FIGURE 4-31 PLANT 6 DOWNSTREAM

FIGURE 4-32 PLANT 5/INTAKE 6

FIGURE 4-33 PLANT 5 FACILITIES

FIGURE 4-34 PLANT 4/INTAKE 5

FIGURE 4-35 SCE OFFICE AT PLANT 4

FIGURE 4-36 PLANT 3/INTAKE 4 FACILITIES

FIGURE 4-37 PLANT 3 SPILLWAY

FIGURE 4-38 PLANT 2 FACILITIES

FIGURE 4-39 BISHOP CREEK BELOW PLANT 2

FIGURE 4-40 INTAKE NO. 2 RESERVOIR AND FACILITIES

FIGURE 4-41 INTAKE NO. 2 DAM

FIGURE 4-42 BIRCH-MCGEE DIVERSION

FIGURE 4-43 MCGEE CREEK DIVERSION

FIGURE 4-44 LONGLEY DAM AND LAKE

FIGURE 4-45 BELOW LONGLEY DAM

FIGURE 4-46 SOUTH LAKE

FIGURE 4-47 HILLSIDE DAM

FIGURE 4-48 LAKE SABRINA

FIGURE 4-49 LAKE SABRINA DAM

FIGURE 4-50 LAKE SABRINA LOW LEVEL OUTLET RELEASE TO MIDDLE FORK BISHOP CREEK

FIGURE 4-51 TYPICAL INYO NATIONAL FOREST SERVICE SIGNAGE AT PROJECT RECREATION[14]

[14] Photos for this section were provided by E. Read & Associates, 2018.

4.9.1 Visual Character of Project Vicinity

The Project's facilities are sited along Bishop Creek, which is a tributary to the Owens River, and its tributaries, including South Fork, Middle Fork, Green Creek, Birch Creek and McGee Creek, in the Owens Valley and in areas of the eastern Sierra Nevada. Bishop Creek is a 10.1-mile-long major stream in the eastern Sierra Nevada spanning two watersheds in Inyo County, California. The area is highly scenic and attracts hikers and visitors with its lakes, granite peaks and wildflowers. The Project is located in Inyo County and the nearest town is the City of Bishop, which is northeast of the Project area. The Project facilities are located within the Inyo National Forest, the John Muir Wilderness (both of which are managed by the USFS), lands managed by BLM, and on private lands.

The visual character of the Project vicinity is diverse and representative of the three major biological provinces within the area: Sierra Nevada, Great Basin and the Mojave Desert. Elevations ranging from 3900 feet to 14,494 feet shape the scenic character of the area and extreme topographic relief of up to 10,000-feet vertical gradients can be found along the Sierra Nevada, White and Inyo mountains. Opportunities for scenic overlooks are found throughout the area and allow visitors to experience the large expanses of undeveloped land; rare geologic formations like the Mono Craters and Obsidian Dome; wilderness areas such as the Ansel Adams and John Muir Wildernesses; and diverse ecosystems from alpine, mixed-conifer, Jeffrey pine, sagebrush steppe, to desert. Some of the most outstanding visual attractions include Mono Lake with geologic formations like tufa, and Mount Whitney, the highest peak in the continental United States at 14,494 feet in elevation (USFS 2016).

The most common developments on the Inyo National Forest that alter scenic integrity include powerlines, communication sites, substations, propane tanks, geothermal development, ski areas, hydropower facilities, reservoirs, recreation facilities, resorts and temporary conditions such as dust and smoke (USFS 2016).

4.9.2 Potential Adverse Effects and Issues

SCE's review of readily available information, and early consultation with interested parties identified no impacts to aesthetic resources associated with this Project. Consistent with Article 112, before starting land disturbing activities, SCE would submit a plan to USFS and FERC for approval for the design and construction of the Project facilities to preserve or enhance its visual character.

4.9.3 Proposed Mitigation and Enhancement Measures

SCE anticipates continuing with the PME's identified above in the new license. Although no additional mitigation or enhancement measures relating aesthetic resources are planned at this time, SCE plans to evaluate the issues identified above as part of the licensing Study Plan, and in consultation with stakeholders. If any major structural changes of the Project are planned, appropriate BMPs to minimalize effects on visual or aesthetic resources would be implemented; however, no structural changes are proposed at this time.

4.9.4 References

Bureau of Land Management (BLM). 1993. Bishop Resource Management Plan Record of Decision. Bakersfield District, Bishop, CA.

Federal Energy Regulatory Commission (FERC). 1991. Environmental Assessment for Hydropower License, Bishop Creek Project, FERC No. 1394-000, California. Issued January 30, 1991.

Interagency Wild and Scenic Rivers Coordinating Council (IWSRCC). 2018. National Wild and Scenic Rivers System: https://www.rivers.gov.

Inyo County (IC). 2001. Inyo County General Plan. Inyo County Planning Department, Bishop, CA.

Read, 2018. Edith Read and Associates Project Photos

Sierra Nevada GeoTourism (SNGT). 2018. Ancient Bristlecone Scenic Byway: https://www.sierranevadageotourism.org/content/ancient-bristlecone-scenic-byway/siecf19d51a2a5da8394

U.S. Forest Service (USFS). 2016. Draft Revised Land Management Plan for the Inyo National Forest: https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd589652.pdf.

4.10 CULTURAL RESOURCES [§ 5.6 (D)(3)(X)]

4.10.1 Overview

The cultural resource section provides: 1) a definition of the proposed area of potential effects (APE); 2) a broad overview of the prehistoric, Native American ethnographic, and historic settings for contextual purposes; 3) a description of the known cultural resources (archaeological and built environment) within the proposed APE and adjacent area, including identification of properties that are listed or eligible for listing in the NRHP and a discussion of ethnic or social groups that may attach religious or cultural significance to cultural resources within the APE and vicinity. The resource information presented in this section is based primarily on research and surveys conducted by SCE, INF and BLM.

4.10.2 Area of Potential Effects

A Project's APE is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist" [36 CFR § 800.16(d)]. SCE proposes that the APE for the Project include all lands within the Project boundary.

4.10.3 Information Sources

The study area for archaeological and architectural resources encompasses a 1-mile buffer around the proposed APE. The background research includes the study area to facilitate knowledge about past settlement and subsistence practices, as well as past land use. The cultural resources section of this PAD was developed using information obtained from the SCE archives, INF, BLM and the Eastern Information Center of the California Historical Resources Information Center at University of California, Riverside.

4.10.4 Environmental Setting

4.10.4.1 Physical Environment and Climate

The Project is located in a narrow canyon drained by the Middle Fork of Bishop Creek. Bishop Creek drains the east side of Sierra Nevada from Mount Humphrey to the north to Mount Agassiz to the south. The Middle Fork has carved a narrow canyon surrounded by lofty mountains, including Mount Emerson (elevation 13,225 feet) and Table Mountain (10,500 feet). Bishop Creek drops over 1100 feet in elevation between Lake Sabrina and its confluence with the South Fork of Bishop Creek.

The White Mountains east of Owens Valley are located at a junction between the temperate effects of the Pacific Ocean on the west and the more intense weather of the North American interior (Hall 1991). The Sierra Nevada block the onslaught of Pacific Ocean moisture, creating a rain shadow that extends across Owens Valley and into the White Mountains.

Seasonal temperatures in the Bishop area are highly variable, with summer highs averaging 98°F with an average low of 56°F. The winter high averages 54°F with an average low of 23°F.

Precipitation in the region is common throughout the year. At higher elevations, an average of 20 inches of precipitation accumulates throughout the year, mostly in the form of snow. Lower elevations receive less, an average of 4 to 6 inches of rainfall. Both snowstorms and thunderstorms are prevalent in the region. Thunderstorms are most common between June and September when cloudbursts can cause flash flooding in canyons and surrounding areas. Heavy winds are frequent during both the summer and winter, reaching speeds of up to 100 miles per hour.

4.10.4.2 Geomorphological Context

The Project boundary follows a series of linear corridors along Bishop Creek's mainstem drainage and tributaries emanating from glacial amphitheaters in the high central Sierra Nevada. The study corridor connecting Longley Reservoir to the Bishop Creek corridors is an exception, but it occupies a similar cirque and outwash setting as it traverses the mountain-front prior to joining the Bishop Creek system.

Project corridors originate at reservoirs, likely developed by augmenting tarns or glacial-fed lakes, within or below glacial cirques at the hydrographic and orographic boundary (the crest of the Sierra Nevada) separating California's Central Valley on the west from internally drained Great Basin on the east. The Project on the eastern boundary extends to the Late Pleistocene-Holocene-Bishop Creek alluvial fan where generally young land forms that extends toward the Owens River and the town of Bishop, California.

The Middle and South Forks of Bishop Creek, along with McGee Creek at Longley Reservoir, are underfit streams that occupy broad, U-shaped, glacCity glacially carved valleys confined by a deep series of glacial landforms and fractured uplifts of plutonic rocks. While the boulders and cliffs of Table Mountain, Buttermilk Area (Tungsten Hills), and Lookout Mountain rise along the margins of Bishop Creek and its tributaries, glacial landforms (lateral and medial moraines, ice-deposited till and fluvial outwash, and scoured bedrock ground mass) form the confined landscape within the Bishop Creek drainage network. The glacial system transported a voluminous amount of sediment, working away at the aretes and ridges that bound the dramatic amphitheaters. Only small remnants of ice and rock glaciers remain today, tucked away and slowly dissipating among the amphitheater highpoints of Mount Agassiz (13,891 feet), Mount Darwin (13,931 feet), and Mount Humphreys (13,968 feet).

Glacial landforms, especially the prominent lateral moraines, along the U-shaped valley of Bishop Creek formed during the latest Tioga phase or phases (from 28 to 14.5 ka) of Late Pleistocene glaciation (Phillips et al. 2009). The Tioga cycles (at least four) of advance least and retreat scoured and erased the earlier Tahoe phase traces. However, higher and older Tahoe deposits (at least 42 ka and probably older; Moore and Mack 2008) confined the Tioga glaciation and reworking to the canyons. The earlier Tahoe glaciation produced the end moraines, till and outwash deposits that extend valleyward in a broad, curving expanse of undulating ridges and swales.

The modern Bishop Creek system cuts into a floodplain of glacial till; where typically there is a single erosional floodplain terrace along the reaches the mainstem and tributary drainages. Massive till boulders, scoured from the plutonic bedrock, are piled as end moraines or as ground mass on and within the floodplain. These boulders may pile into late-dating, broken moraines or till deposits that can locally divert drainage patterns or block stream and groundwater flow to form ponds and wetlands along the floodplain. Intense floods occasionally rearrange the drainage pattern as evident by oxbows and abandoned scours and scrolls in the modern, confined floodplain.

Known archaeological sites within the APE generally occupy the inset, first floodplain of the modern stream, rest on colluvial aprons of moraine slopes, or are found on the medial segment of the Bishop Creek fan below the glacial moraines and outwash landforms. As it debouches from the mountain-front, Bishop Creek cuts a series of narrow floodplains in its active head-cut channel, prograding basinward in a series of berm-and-swale surfaces marked by multiple flood and outwash distributaries. The age of the deposits and surfaces along the incised fan varies greatly. Floodplain deposits below outwash features may be very young and have the potential to preserve buried archaeological assemblage or paleosurfaces. Where the corridor leaves the young, inset floodplains, the fan surfaces hold a shallow, active veneer of sheetwash and aeolian deposits. Assemblages may be buried on fan surfaces, but contexts will not be as deep.

4.10.4.3 Flora and Fauna

As described in Section 4.4, botanical resources consist of a canopy cover that includes canyon live oak, Jeffery pine, ponderosa pine, limber pine, lodgepole pine, single leaf pinyon, mountain hemlock, and whitebark pine. The understory is dominated by a long list of shrubs including but not limited to creambush ocenspray, Green’s goldenweed, mountain white heather, antelope bitter brush, desert bitter brush, black bush, Mormon tea, white bursage, salt bush, curlleaf mountain mahogany, sagebrush, mountain sagebrush, and snowberry. Grasses and forbs are also abundant and include phlox, oval-leaved buckwheat, knotweed, buttercup, mountain sorrel, Indian paint brush, wild oats, fiddleneck and stork’s bill.

Numerous species of fauna are present in the area. As described in Section 4.4 above. Large mammals in the area include mule deer and bighorn sheep while small mammals consist of several carnivores, such as badger, coyote, mountain lion and bobcat. Lagomorphs include American pika and jackrabbit (white and black tailed). Rodents include California ground squirrel, least chipmunk, valley pocket gopher, and several varieties of mice. Amphibians and reptiles are also present in large numbers. Snakes common to the area include the western rattlesnake, western terrestrial garter snake, gopher, and California king snake.

4.10.5 Cultural Setting of the Project and Vicinity

4.10.5.1 Precontact Period

- With a well-documented history of occupation dating back to the early Holocene and culminating in the incipient agricultural practices documented at historic contact, Owens

Valley has long been an area of interest of a school of archaeological research that focuses on changes in subsistence practices and settlement patterns in response to environmental challenges. This discussion provides a general review of the precontact history of the region. Following the original formulation by Bettinger and Taylor (1974) as modified by Basgall and Giambastiani (1995) and others, local prehistory is divided into five temporal intervals: Early Holocene (pre-8200 claibrated years before [cal BP]); Middle Holocene (8200–3400 cal BP); Newberry (3400–1300 cal BP); Haiwee (1300–600 cal BP); and Marana (600–150 cal BP). The first two intervals are general Holocene epoch subdivisions (Walker et al. 2012), while the last three intervals are culture-historical periods, defined by changes in material culture (Table 4-57). Most, if not all of these periods are likely represented in the precontact resources in the APE.

TABLE 4-57 PRECONTACT CHRONOLOGY OF OWENS VALLEY

TIME PERIOD	TIME RANGE (CAL BP)	DIAGNOSTIC ARTIFACTS	SUBSISTENCE/SETTLEMENT TRENDS
Early Holocene	pre-8200	Great Basin Concave Base, Great Basin Stemmed projectile points; crescents; formed flake tools	Very high residential mobility, emphasis on hunting
Middle Holocene	8200-3400	Pinto and Fish Slough series projectile points	Continued high residential mobility; minor increase in emphasis on plant foods
Newberry Period	3400-1300	Elko and Humboldt series projectile points	Lower residential mobility with systematized seasonal round, development of residential bases, increase in obsidian quarrying and development of exchange networks
Haiwee Period	1300-600	Rose Spring and Eastgate series projectile points	Continued decrease in settlement range and development of major residential bases; collapse of obsidian exchange networks; increasing intensification on lower-return resources
Marana Period	post-600	Cottonwood and Desert Side-notched projectile points; Owens Valley Brownware pottery	Still smaller settlement ranges; intensified use of ubiquitous, lower-return resources; incipient agriculture

Evidence of Early Holocene occupation in the Inyo-Mono area is relatively sparse, represented by a few widely scattered sites (Basgall 1987, 1988; Hall 1990). Most of these sites are marked by the presence of Great Basin Stemmed (Silver Lake, Lake Mohave) and Great Basin Concave Base projectile points. Bifurcate-base Pinto points, nominally a Middle Holocene marker, seem to make their initial appearance during this interval as well (Rosenthal and Ugan 2013). Other important artifact types include formalized flake tools (i.e., scrapers, gravers), crescents, and other bifaces, while milling equipment is quite rare. These assemblages reflect a very high degree of residential mobility, as indicated by geochemical studies showing a wide variety of distant source materials in lithic toolkits (Basgall 1989; Delacorte 1999); minimal use of seed resources, based on the near-absence of milling equipment; and an emphasis on hunting, with smaller game particularly prevalent in the more arid parts of the region (Hall 1990).

The Middle Holocene (8200 to 3400 cal BP) is marked by continued use of Pinto series points. In the northern Owens Valley, the Fish Slough Side-notched type is a locally important marker (Basgall and Giambastiani 1995). Middle Holocene assemblages are generally similar to those of the Early Holocene with respect to patterns of flaked stone material acquisition, settlement and subsistence. They differ by showing an increase in the frequency of milling equipment, a shift probably reflecting a broadening subsistence base in response to warmer and drier environmental conditions (Warren and Crabtree 1986). The Stahl site at Little Lake contains hearths, graves, possible residential structures, and a diverse assemblage of flaked and ground stone tools (Harrington 1957; Schroth 1994); all are attributes consistent with a repeatedly occupied residential base. While this site is located well south of the APE, such Middle Holocene sites are rare throughout Owens Valley, and in fact there is a noticeable gap in all site types dating to this interval is apparent in the region (Basgall 2009).

Markers of the Newberry Period (3400 to 1300 cal BP) include Humboldt and Elko series projectile points. During this interval, the precontact settlement system remained mobile but appears to have been less spatially expansive, with greater regularity in the direction and range of seasonal movements (Basgall and McGuire 1988; Bettinger 1989, 1999a, 1999b; Bettinger et al. 1984). Many researchers argue that Newberry Period Owens Valley groups moved in a seasonal round up and down the valley, establishing a series of repeatedly occupied residential bases (Basgall and Delacorte 2012). Others argue that these sites served as longer-term logistical bases and that evidence for such a seasonal round is unconvincing (King et al. 2001; McGuire and Hildebrandt 2005). Either way, these lowland sites appear to have been occupied and reoccupied for significant periods of time, judging from the presence of substantial residential structures, as well as a variety of resources from high-elevation habitats (e.g., pinyon pine, bighorn sheep, marmots). The latter probably reflects use of upland areas by task-specific groups.

Another important aspect of the Newberry Period is the trans-Sierran exchange of obsidian, which reached its peak during this interval. The expansion of this exchange network is indicated by an increase in quarry production and biface manufacture at several eastern California sources, as well as increases in the frequency of obsidian in sites west of the Sierra Nevada (Gilreath and Hildebrandt 2011; King et al. 2011). It has been argued that trade blossomed during this interval because the regularized settlement pattern allowed for more predictable interaction among neighboring populations.

The Haiwee Period (1300 to 600 cal BP) is marked by the introduction of the bow and arrow, represented by the Rose Spring and Eastgate projectile point types. In addition to this major technological change, it appears that a restructuring of local subsistence-settlement systems also occurred. Excavations throughout the region indicate the emergence of permanent or semi-permanent lowland villages, with residential structures, bedrock milling features, extensive assemblages of flaked and ground stone tools, and diverse floral and faunal remains. Such residences were probably supported by more temporary upland pinyon camps and centralized seed production stations in the valley bottoms (Basgall and McGuire 1988; Bettinger 1989). The relationship between these sites indicates that seasonal movements had become yet more spatially confined, resulting in more intensive use of local resources within progressively smaller foraging areas. Reduced residential mobility is also indicated by decreased flaked stone material diversity, and greater use of expedient milling equipment (Basgall 1989; Basgall and Giambastiani 1995; Basgall and McGuire 1988; Bettinger 1989, 1999a, 1999b).

Concurrent with the restructuring of lowland settlement, residential occupation of certain high-elevation areas began during the Haiwee Period. This includes the high-elevation “villages” of the White Mountains (Bettinger 1991), and similar, though smaller-scale, residential use of the Sierran alpine and subalpine zones (Roper Wickstrom 1993; Stevens 2005). During the Haiwee Period, production and exchange of eastern California obsidians essentially collapsed (Gilreath 2011; King et al. 2011). This has been attributed to a variety of factors, including increasing territoriality that disrupted long-distance exchange, and changes in flaked stone technology that reduced demand.

Key indicators of the Marana Period (post-600 cal BP) include Cottonwood and Desert Side-notched projectile points and Owens Valley Brownware pottery. Many of the trends established in the Haiwee Period continued during this interval, including still smaller settlement ranges, increased territoriality, and the even more intensive use of ubiquitous, locally available resources that often required more energy to harvest and prepare than ones available further afield; these included increased use of riparian and lacustrine resources in Owens Valley, pinyon in the intermediate zones, and root crops and small mammals in the alpine zones of the White Mountains and the Sierra Nevada. This adaptive trajectory toward intensification is reflected in the lifeways of the contact-period of the Owens Valley Paiute, including their use of ditch irrigation.

4.10.5.2 Ethnographic Period

Northern Owens Valley is considered to have been the exclusive territory of Paiute groups until the 1800s (Davis-King 2003). While other groups of Native Americans ventured into and inhabited parts of the valley during the nineteenth and twentieth centuries, all peoples in the valley spoke some form of Numic language, a subgroup of the Uto-Aztecan language family (Fowler and Liljeblad 1986). This grouping is further subdivided into two distinct languages: Northern Paiute and Mono (Fowler and Liljeblad 1986). According to Kroeber (1925) and Steward (1933), both languages were spoken by a population known as Northern Paiute who occupied portions of northern Nevada and Iahdo down through eastern California to the southern shore of Owens Lake. This expanse included groups living in the Mono Basin, Long Valley and Owens Valley. Steward (1933) also noted that the western front of the White Mountains was the territory of Paiute groups.

Most ethnographers' accounts place the northern boundary of Owens Valley Paiute territory just north of Bishop, at the edge of the Volcanic Tableland and at Round Valley.

The Owens Valley Paiute were characterized by greater sociopolitical complexity than elsewhere in the Great Basin. Bettinger's (1978) suggestion that the Owens Valley groups resided at lowland village sites for much of the year agreed with Steward's (1938) proposition that the abundance of natural resources in the valley allowed people to live in groups with multiple families, totaling between 25 and 250 people, and likely occupying villages of varied sizes. Each village was integrated within a larger district with band boundaries that extended through the Owens Valley (Steward 1938). Each district encompassed one to several villages, with hereditary headmen that controlled access to specific resource tracts such as pine nut groves and fishing areas (Steward 1933).

According to some sources (e.g., Bettinger 1982; Bouey 1979; Lawton et al. 1976; Steward 1933), Paiute groups in the Bishop area grew crops within irrigated plots that were "owned" by each district. Map 2 of Julian Steward's 1933 *Ethnography of the Owens Valley Paiute* depicts several places that were utilized within and near the proposed APE. Lawton et al. (1976) further confirmed this utilization and concluded that Owens Valley agriculture was complex, intimating that soil tilling and cultivation must have been involved, even if constructed earthworks were used simply to increase water flow to unmodified lands. How long irrigation occurred in the area is unknown; it is also uncertain whether or not Native Americans practiced irrigation prior to European contact.

While relations between the Owens Valley Paiute and the early European and American settlers were genernally less hostile than elsewhere in California, conflicts did occur. During the winter of 1861 to 1862, the Owens Valley Paiute began to raid Euroamerican cattle herds for food. Soon after, the American settlers retaliated, perpetrating a massacre on the Owens Valley Paiute. By 1863, whites had removed the surviving Owens Valley Paiute from their ancestral territory and forced them onto a reservation at Fort Tejon, California (Crist 1982a) or to Tule River. When the Owens Valley "war" was over, citizens of California came into the valley reaping the spoils. Inyo County was established, separated from the massive mother county of MariposaTulare and a small portion of Mono County. The first land patents were filed in 1866 (Inyo County Assessor's Office Official Records). Ranch lands were divided, and the Indians who had endured the horrible years of disease, starvation, murder, indentured servitude, and removal to reservations, now survived in part by attaching themselves to the workforce of the Anglo population, becoming cowboys, cooks, washers, woodcutters, maids, ranch hands, and laborers. Ironically, the impetus of the war in the first place, the bringing of cattle through Owens Valley to the mines, was now to be the source of their survival. Women became laundresses throughout the valley in the early years, being supplanted by the washing machine only after World War II. Many Native American sites have wash tub parts on the surface and small depressions that contained the fires used to heat the wash water. Men began working with cattle and riding horses. They delivered goods and mail, or cared for large bodies of grazing land. In spite of the attachment to Anglo families, native traditions, language, and culture survived. Pine nut harvests for example, took Native men and women from their employment, as all would gather in the hills to gather and store this important food.

Since the 1850s, there has been discussions about creating a large Owens Valley reservation, but this never happened. Fort Independence was established in 1902, Bishop and Big Pine in 1912, Lone Pine Reservation in the late 1930s, and Timbisha as recently as 1982. As the federal government constructed homes for the Native people, built irrigation and consumptive water systems, and undertook the construction of roads within the tribal land, people began moving onto trust lands, for protection and proximity to relatives and friends. Cultural continuity in language, dance and ceremony, food, some medicines, and general social patterns has continued and enriches tribal perspectives. It will be the task of the SCE to assist the Tribes in identifying and evaluating places of significance in their past.

4.10.5.3 Historic Period

Once the studies for the relicensing are in progress, the cultural resources identified within the proposed APE will be evaluated for the NRHP. To set up the historic contexts within which the Project was developed and within which some of these resources will be evaluated, the history of the proposed APE and surrounding area has been divided into the following main themes: early exploration, settlement, ranching, mining and hydroelectric development, and pack stations.

4.10.5.3.1 Early Exploration

The earliest non-native explorers of this area were trappers and those sent on military expeditions. The first signs of change came through the fur trade, headed by the Hudson’s Bay Company. Jedediah Strong Smith, was the first reported white man to cross the Great Basin in his search for beaver. His 1826 travels westerly lead him south of Owens Valley, through the Mojave Desert and into the Los Angeles basin. Soon the Mexican governor, José de Echeandia, deported Smith, extracting a promise that he would return the way he came. Smith instead traveled north, entering the San Joaquin Valley from the Tehachapi Pass, traveling up California’s fertile valley in search of beaver. Needing to rendezvous in Salt Lake City, Smith turned east to follow the Stanislaus River canyon, crossing the Sierra Nevada from west to east, again a recorded first, in 1827 (Farquhar 1965). The Smith’s return route likely bypassed the Owens Valley, but he inevitably traveled through Northern Paiute country to reach his Utah destination.

Peter Ogden also explored in present-day Inyo County, when he was an agent of the Hudson’s Bay Company from 1824 to 1830 (Cline 1963). Cline suggests that the geographical descriptions of his 1829 to 1830 trip from the Rivers Columbia to Colorado indicated he must have crossed the Owens Valley. Within the next two decades, thousands of immigrants would pass through Paiute and Shoshone territory on their way west.

About this same time, First Lieutenant Joseph Reddeford (sometimes spelled Ruddeford) Walker led a military expedition into California. Crossing the Great Basin in 1833 to 1834, he made the first Euro-American crossing of the Sierra Nevada from east to west. Based on descriptions assumed to be of Yosemite Valley, Walker's early route is thought to have followed the Walker River, perhaps up Virginia Canyon, crossing the Sierra in the vicinity of Mono or Tioga passes. Walker crossed the Sierra again in 1834 possibly through the pass that now bears his name and on into the Owens Valley. It is here that he followed the western edge of Owens Lake, at the foothills of the Sierra in May 1834.

These expeditions as well as others eventually lead to settlement and skirmishes between nonnatives and the Paiute. Known as the Indian Wars, the skirmishes were brought about due to the Paiute's need to protect their land (Davis-King 2003).

4.10.5.3.2 Early Settlement

The town of Bishop, California, is named after Samuel A. Bishop, who established a cattle-drive camp in San Francis Ranch approximately 3 miles west of the current town site. Samuel, his wife, her brother Sam Young, E. P. (Stock) Robinson, Pat Gallagher, and several Indian herders, left Fort Tejon (south of present-day Bakersfield) in July 1861, driving approximately 500 to 600 head of cattle and 50 horses to the Owens Valley with the plan of selling the stock to miners residing there in mining camps. Samuel Bishop resided at San Francis Ranch for only a few years before leaving, after which time the ranch was renamed Bishop Creek (Long and Sprengeler 2009; Chalfant 1933).

Near this time, in 1863, W. P. George and associates established a truck farm west of the present-day town of Bishop. The area was considered good for farming due to the low flat floodplain that could be irrigated using water from Bishop Creek as well as other sources. Farming quickly became a successful endeavor in the area; according to Inyo historian Arthur Chalfant. By 1879, there were 34 farm claimants drawing water from Bishop Creek (Chalfant 1933).

The first structure in the then town of Bishop Creek was a blacksmith shop John Clark purchased from the Consort Mining Company around 1864 and placed south of West Line Street, near

Main Street. At this time, the population of Bishop Creek began to expand due to an influx of people from the mining camp of Owensville, which was located near what is currently the town of Laws, California. In 1903, the town of Bishop Creek voted to incorporate and change its name to Bishop (Chalfant 1933; Walton 1992).

4.10.5.3.3 Ranching

Samuel Bishop was quickly followed by other settlers interested in cattle ranching in the area. About the same time Bishop arrived in the Owens Valley, Mr. and Mrs. Alney T. McGee and Mr. and Mrs. J. N. Summers and their families completed their own large-scale cattle drive, which had begun in Tulare Valley and headed for Monoville (a settlement approximately 12 miles southeast of present-day Bridgeport) via Walker's Pass (Chalfant 1933).

Other cattlemen soon arrived in the area and decided to winter their herds on the rich grazing lands of Owens Valley. The winter of 1861 to 1862 was extremely harsh, and the cattle consumed many of the plants that the Paiute relied upon for sustenance. As a result, starvation forced the Paiute to kill the cattle for food, which in turn created tension with the ranchers. Whites attempted to defuse the situation by calling a meeting that ended in the negotiation of a treaty that agreed to allow the Paiute to continue their food-gathering pursuits in exchange for not driving off or killing cattle in the valley. In a glaring omission, the treaty ignored the problem of the cattle consuming the Paiute's food and an intermittent state of war broke out between the Paiute and settlers lasting until the Paiute were forced from their ancestral land to a reservation at Fort Tejon in 1863. When hostilities ceased, settlers started entering the valley to set up farms and ranches, both of which proved profitable until the land-grabbing and water-diversion activities of the LADWP in the early part of the twentieth century (Chalfant 1933; Walton 1992).

After the LADWP diverted large amounts of water and left the Owens Valley with insufficient water to irrigate crops, commercial agriculture in Owens Valley ended. Cattle ranching, which was less dependent on irrigation, survived and grew to become an important economic activity in the area. After acquiring all the agricultural bottomland, the City of Los Angeles began to offer land leases for stock grazing, with strong restrictions on water use. Cattle still graze today on lands located east and west of the Owens River and all along the margins of Bishop Creek.

4.10.5.3.4 Mining and Hydroelectric Development

Although mining was not a large part of the economy in the Bishop Creek area it was the initial reason for the development of the Project. The first hydroelectric power generation along Bishop Creek was a small plant operated by the Bishop Light and Power Company that generated power for local use. Discovery of economic minerals in the Tonopah and Goldfield areas of Nevada generated additional needs for electricity to run the mining operations, thus providing the impetus for further hydroelectric development along Bishop Creek (Clerico and Koval 1986; Hill 1994).

When Loren B. Curtis and Charles M. Hobbs arrived in the Tonopah and Goldfield areas in 1904, they immediately recognized that a reliable and inexpensive source of power would be necessary to efficiently run the mining operations and capitalize on the economic potential of the area's resources. Curtis, an engineer, decided that Bishop Creek was the best location to produce hydroelectric power for the mines. Hobbs, a banker and financier, secured financial backing for the Project. The partners incorporated as the Nevada Power, Mining, and Milling Company (NPM&M) on December 24, 1904. Construction commenced in January 1905 on the first generating plant (Power Plant No. 4); in September 1905, electricity was delivered to the Goldfield substation. Since NPM&M had secured contracts for power delivery to the mining companies in Goldfield and Tonopah, there was a ready market for Bishop Creek electricity. The power from Bishop Creek made it possible to mine economically, producing a new mining boom and prosperity in Nevada (Clerico and Koval 1986; Elliott 1984; Hill 1994).

On January 5, 1907, the Nevada-California Power Company (NCP) was incorporated as the successor to NPM&M. That same year, NCP expanded Power Plant No. 4, and purchased the capital stock of Hillside Water Company, which facilitated construction of additional plants along Bishop Creek. In 1908, a fifth operating unit was installed at Power Plant No. 4 and construction of Power Plant No. 2 finished. Power Plant No. 5 was constructed in 1909, and South Lake was enlarged. This expansion allowed the Bishop Creek facilities to produce more power than the mining operations alone required (Clerico and Koval 1986; Hill 1994).

To expand the market for the excess Bishop Creek power, NCP incorporated the Southern Sierra Power Company (SSP) as a subsidiary in 1911 to service the power needs of southeast

California. Shortly after incorporation, construction began on a transmission line to San Bernardino where a steam plant was built. Power Plant No. 3 was completed in 1912, and in 1913, it was expanded substantially, with the Project’s capacity increasing to 24,350 kW, when Power Plant No. 6 was completed. This essentially completed what is currently known as the Project (Clerico and Koval 1986; Hill 1994).

NCP and SSP developed and operated the Bishop Creek plants as two separate but associated power companies. NCP operated Plants 2, 3 and 4, which serviced the Nevada mining districts, while SSP operated Plants 5 and 6, which produced power that was delivered to southern California. Building 102 control station was built in 1916 as part of the control station for the SSP Plants 5 and 6. The control station regulated the distribution from this part of the Project. In 1918, a new, larger control station, was built near Plant 5 so the two systems developed at Bishop Creek could be permanently interconnected. After the new control station was completed, Building 102 was used solely as a residence (Hill 1994).

During the 1920s, the power-generating system was fine-tuned to extract as much power as possible from the existing plants. Much of the company's resources at this time were used to market energy at the far reaches of the distribution network and to purchase other power companies. During the 1930s, the Great Depression limited development in Bishop Creek, and increased competition from rival companies producing cheaper energy on the Colorado River forced the Bishop Creek Company to withdraw from the Imperial and Coachella Valley markets. The Nevada-California Electric Corporation (NCE), formed as a holding company in 1914 for companies associated with SSP, became an operating company in 1936 when the subsidiary companies were dissolved, and the operating properties transferred to the parent company. In 1941, the company changed its name to California Electric Power Company (later known as Calectric). The properties of Calectric were acquired by SCE in 1964 through a merger. SCE is the present operator of the Project. Since 1964, SCE's consolidation of operations and automation of the power plant equipment has resulted in the elimination of many on-site employees. During the 1970s, all the housing units at Plants 2, 3, and 5 were demolished, leaving structures only at Plants 4, 6, and the control station (near Plant No. 5) (Hill 1994).

4.10.5.3.5 Pack Stations

The Sierra Nevada have long been a home to the packing of goods and people on mules and horses. Native Americans traversed the mountains on foot for centuries, leaving well-developed trails over major mountain passes (Woolfenden et al. 2007). Later, mule pack trains served as the primary means of carrying goods under the Spanish and Mexican administrations in what is now the American Southwest (Woolfenden et al. 2007) until the mid-1800s, when non-Hispanic Euroamericans began to take over packing operations.

Throughout the nineteenth century, increasing numbers of settlers either crossed the area to areas farther west or settled in the Owens Valley. Those who stayed in the area worked as cattle ranchers, farmers, miners, and later, public land managers. Pack trains during this period were used by the U.S. Army, immigrants, miners, representatives of such federal agencies as the USGS, commercial enterprises, and recreationists (Woolfenden et al. 2007).

Recreational packing gained steam during the last decades of the nineteenth century when residents began taking trips to explore their mountainous surroundings. The rise of mountaineering as a recreational activity further fueled local interest in exploration, and ranchers and farmers in the areas began to rent their pack animals and themselves, as guides. By the 1920s, packing had become a profitable business, as ever-increasing numbers of people with automobiles could reach the Sierra Nevada and pursue recreation activities such as fishing, hunting, camping and skiing (Woolfenden et al. 2007). Pack stations continued in popularity throughout the middle of the twentieth century but began to decline after the 1960s as government contracts ended and people relied on cars and airplanes to get them to their destinations. Additionally, regulations passed in the 1960s limited the number of livestock to 50 that each pack station could run in the Inyo National Forest, which led to a consolidation of pack stations and decrease in operations. By 1990, there were fewer than 50 pack stations operating in the Sierra Nevada, more than an 80 percent reduction from historic highs earlier in the century (Woolfenden et al. 2007).

4.10.6 Previous Cultural Resource Studies

One hundred twenty-one previous cultural resource investigations were identified within the study area (Table 4-58). Approximately 90 percent of the studies within the proposed APE occurred more than ten-years ago, provide insufficient information in the reports to determine the adequacy of the survey coverage, or otherwise did not fully cover the areas included in the proposed APE. Thus, portions of the proposed APE will need to be resurveyed to current professional standards. Maps of these previous studies are located in Appendix F.

4.10.7 Known Cultural Resources

The results of the 2018 records search of all information sources indicate that more than 200 cultural resources have been recorded within a 1-mile-radius of the proposed APE. They are composed of prehistoric and historic-period archaeological sites as well as historic-period buildings, structures and objects. Due to the voluminous amount of cultural resources, and because all the cultural resource types identified within the 1-mile-radius study area are also represented within the proposed APE, discussion is limited to what is located within the proposed APE (Appendix G).

4.10.8 Previously Recorded Archaeological Sites

Archival research conducted to date indicates that there are 52 prehistoric, 30 multi-component (prehistoric and historic), and 76 historic-period previously recorded archaeological sites within the study area. The diverse types of sites and their NRHP eligibility are listed in Table 4-58. Prehistoric sites primarily include bedrock milling stations, lithic scatters, and midden deposits. Multi-component sites include lithic and debris scatters and historic debris (e.g., can scatters, domestic debris scatters). Historic-period sites include historic debris and the remains of buildings or structures. Many of these historic period sites may be refugee camps, and many are likely related to Native American reoccupation on their older sites. Most archaeological sites within the proposed APE and study area have not been evaluated for their eligibility for listing in the NRHP. The locations of these sites are depicted on maps located in the Confidential Volume IV.

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TABLE 4-58 PREVIOUSLY CONDUCTED CULTURAL RESOURCE STUDIES LOCATED WITHIN THE AREA

IC NUMBER	NADB NUMBER	USFS NUMBER	BLM REPORT NUMBER	AUTHOR(S)/YEAR	REPORT TITLE
IN-000026	1080265			King, Thomas F. 1973	*Archaeological Impact Evaluation: Control-Casa Diablo Transmission Line, Southern California Edison Company, Phases I & II*
IN-000113	1083235			Clay, Vicky L., and M. C. Hall 1988	*Results of the 1987 Field Season Cultural Resources Survey for the Historic and Archaeological Preservation Plan for the Lee Vining Creek Hydroelectric Project (FERC #1388) and the Rush Creek Hydroelectric Project (FERC #1389)*
IN-000114	1082268			Stornetta, S. 1984	*An Intensive Archaeological Survey of a Proposed 115-kV Transmission Line, Dixie Valley, Nevada to Bishop, California*
IN-000183	1081933			Crist, Michael K. 1982a	*A Cultural Resource Reconnaissance of the Rancho Riata Hydroelectric Project, Inyo County, California*
IN-000250	1082572	ARR #05-04-351		Hall, M. C. 1986	*Report on a Cultural Resources Survey of Proposed Electrical Interconnection Routes, Inyo and Mono Counties, California: United States Bureau of Land Management, Los Angeles Department of Water and Power, and Southern California Edison Company Properties*
IN-000265	1082743			Macko, M. E. 1986	*Results of the 1986 Field Season, Cultural Resources Survey for the Historic and Archaeological Preservation Plan for the Bishop Creek Hydroelectric Project; Part I: Reservoirs, Powerhouses, Transmission Lines and Miscellaneous Facilities*
IN-000266	1083231			White, David R. M. 1988a	*An Evaluation of Significance for Archaeological Sites Discovered during the 1986 Field Season, Historic and Archaeological Preservation Plan for the Bishop Creek Hydroelectric Project (FERC Project 1394), Inyo County, California*
IN-000267	1083252			York, A. 1988	*Final Report: An Evaluation of Fifteen Archaeological Sites on the Bishop Creek Hydroelectric Project, Inyo County, California*
IN-000278	1082794			Diamond, Valerie H., Stephen G. Hemlich, and Robert A. Hicks 1988	*Evaluation of the Historic Resources of the Bishop Creek Hydroelectric System*
IN-000279	1083232			Clerico, Robert, and Ana Beth Koval 1986	*An Architectural and Historical Evaluation Of Structures Associated With The Bishop Creek Hydroelectric Power System, Inyo County, California*
IN-000305	1083254			Burton, Jeffery F. 1990	*An Archaeological Survey of the Contel Mammoth to Bishop Fiber Optics Line, Mono and Inyo Counties, California*

IC Number	NADB Number	USFS Number	BLM Report Number	Author(s)/Year	Report Title
IN-000388	1084268			White, David R. M. 1992a	*Results of Archaeological Survey for Groundwater and Riparian Vegetation Studies in Connection with the Lundy and Bishop Creek Hydroelectric Projects, Mono and Inyo Counties, California*
IN-000389	1084269			White, David R. M. 1992b	*Results of Subsurface Testing at CA-INY-4500, A Sparse Lithic Scatter Located along Bishop Creek, Inyo County, California*
IN-000442	1084586			Burton, Jeffery F. 1994	*An Archaeological Survey of the Eastern Sierra College Center, Inyo County, California*
IN-000624				Jordan, Stacey C. 2006	*Archaeological Survey Report for the Southern California Edison Company Tap Control--Inyo Fiber Optic Cable Project Inyo County, California (WO#8458-0461)*
IN-000842				White, David R. M. 1989	*Management Plan for Historic and Archaeological Resources Associated with the Historic and Archaeological Preservation Plan for the Bishop Creek Hydroelectric Project (FERC Project 1394), Inyo County, California*
IN-000859			BLM-C-S9	Hemphill, M. L. 1987	*Report on a Cultural Resources Survey of Proposed Electrical Interconnection Routes, Inyo and Mono Counties, California: United States Bureau of Land Management, Los Angeles Department of Water and Power, and Southern California Edison Company Properties*
IN-000884				Manske, K., and M. A. Giambastiani 2007	*Class III Cultural Resource Inventory for the Replacement of One Utility Pole on the Southern California Edison Control-Mt. Tom 55-kV Line, Inyo County, California*
IN-000912				Pollock, Katherine H. 2008a	*Archaeological Assessment Report Bishop Creek Hydroelectric Project (FERC Project No. 1394), Intake 3, 4, 5, and 6 AVM Replacements, Inyo National Forest, Inyo County, California*
IN-00099	1081091	ARR #05-04-0081		Miller, Brian 1980a	*Archaeological Reconnaissance of Starlite Estates Water Diversion*
IN-00102				Miller, Brian 1980b	*Archaeological Reconnaissance Report - Sabrina Campground Rehabilitation*
IN-00123	1083557			Cutts, Janette S. 1989	*An Archaeological Reconnaissance Report: High Desert Off Highway Vehicle (OHV) Inyo and Mono Counties, California*
IN-00125	1081364	ARR #05-04-0115		Faust, Nicholas 1980b	*Archaeological Reconnaissance Report - Bishop Creek Canyon Recreation Development Project*
IN-00129	1081380	ARR #05-04-0040		Miller, Brian C. 1976	*Archaeological Reconnaissance Report: South Lake Road Construction*
IN-00141	1081571			Faust, Nicholas 1980a	*Archaeological Reconnaissance Report - Coyote Creek Unmanned Entrance Station*

IC Number	NADB Number	USFS Number	BLM Report Number	Author(s)/Year	Report Title
IN-00144	1081581	ARR #05-04-0220		Taylor, W. 1981	*Archaeological Reconnaissance Report - Winter Parking, CA (Highway) 168*
IN-00147	1081608	R1979050400088		Miller, Brian C. 1979	*Archaeological Reconnaissance Report: North Lake Campground Well*
IN-00148	1081609	ARR #05-04-0083		Miller, Brian 1981	*Archaeological Reconnaissance Report - Willows Campground Waterline and Well/Spring*
IN-00149	1085132	HRR #05-04-83-1		Sawinski, Tamara 1997	*Heritage Resources Report - Willow Campground Trail*
IN-00169	1081707	ARR #05-04-0257		Crist, Michael K. 1982	*A Cultural Reconnaissance of the Horton Creek Hydroelectric Project, Inyo County, California*
IN-00191	1081996			Firby, Valerie 1982	*A Historic Overview of the Wilshire-Bishop Creek (Cardinal) Mine*
IN-00192	1081997			Zeier, Charles D., Valerie Firby, and Jane Russell Armstrong 1982	*An Intensive Archaeological Reconnaissance of the Bishop Creek Powerhouse No. 1 Project Area, Inyo County, California*
IN-00203	1081769	ARR #05-04-0243		Farrell, Mary 1982	*Archaeological Reconnaissance Report - Cataract Road Relocation*
IN-00222	1082195	ARR #05-04-0278		Miller, Brian 1983	*Archaeological Reconnaissance Report - Bishop Creek Road Realignment (Flood Damage)*
IN-00230	1082265	R1984050400318		Snyder, Toni 1984	*Archaeological Reconnaissance Report: Sabrina and South Lake Boating Facilities*
IN-00235	1082354			Weaver, R. A. 1985	*Archaeological Reconnaissance Report: Saga Mineral Exploration*
IN-00243	1082425			Macko, Michael E., and Jill Weisbord 1985	*Sylmar Expansion Project: Cultural Resources Inventory and Significance Evaluation - Final Report--Cultural Resource Use Permit No. 16053*
IN-00247	1082482	ARR #05-04-0331		Miller, Brian 1986	*Archaeological Reconnaissance Report - Parcher's Resort Rehabilitation*
IN-00251	1084231			Hall, M. C. 1987	*Recommendations Regarding the National Register Eligibility of Cultural Resources Sites on a Proposed Electrical Interconnection Route, Inyo and Mono Counties: US BLM Lands*
IN-00252	1084253			Hall, M. C. 1990	*The Oxbow Archaeological Incident Investigations at Twenty-Three Locations between Owens Valley, Eastern California and Walker Basin, Southwestern Nevada*
IN-00264	1082599			White, David R. M. 1986	*Results of the 1986 Field Season, Cultural Resources Survey for the Historic and Archaeological Preservation Plan for the Bishop Creek Hydroelectric Project (FERC Project 1394), Inyo County, California; Part II, South Fork Diversion*

IC NUMBER	NADB NUMBER	USFS NUMBER	BLM REPORT NUMBER	AUTHOR(S)/YEAR	REPORT TITLE
IN-00290	1082840			Miller, Brian 1987	*Archaeological Reconnaissance Report: Starlight Well and Grazing Stations*
IN-00292	1082842			Maple, Tim 1987	*Archaeological Reconnaissance Report: Buttermilk Meadows Rehabilitation Project*
IN-00295	1082957			White, David R. M. 1988b	*Cultural Resources Inventory for Proposed Modification of the Spillway on Intake Number Two Dam, Bishop Creek Hydroelectric Project (FERC Project 1394) Inyo County, California*
IN-00325	1083301	ARR #05-04-474		Reynolds, Linda A. 1988	*Archaeological Reconnaissance Report: Big Trees Campground Test Drill Holes/SCE*
IN-00393	1084307	CRR #05-04-588		McLean, Vernon 1992	*Cultural Resources Report #05-04-588, White Mountain Spring Developments*
IN-00408	1084391	HRR NO.05-04-593		Reynolds, Linda A. 1993	*Cultural Resources Report, Parson's Small Tract Act/Starlight*
IN-00423	1084513			Valdez, Sharynn-Marie, and Nelson Siefkin 1993	*Archaeological Survey Report of Bishop Creek No. 3 Flowline Replacement Project, Inyo County, California*
IN-00450	1084623	HRR #05-04-639		Cutts, Janette, and Linda Reynolds 1994	*Heritage Resources Report: Campground Accessibility Upgrades 1994*
IN-00453	1084653	HRR #05-04-642		Cutts, Janette S. 1994	*Heritage Resources Report: Hornick-Cutts Wedding Special Use Permit*
IN-00458	1084669			Hall, M. C. 1994	*Cultural Resources Survey of a Proposed Fence Line around Department of Fish and Game Land in the Buttermilk Country, Eastern Sierra Nevada, Inyo County, California*
IN-00473	1084838	HRR #05-04-670		Klein, Bruce A. 1995	*Heritgate Resources Report: Bishop Creek Sewer Ponds*
IN-00475	1084878	HRR #05-04-651		Reynolds, Linda A. 1994	*Heritage Resources Report: Piute Pass Capital Improvement Project, Inyo County, California*
IN-00533	1085099			Burton, Jeffery F. 1997	*An Archaeological Survey of the Coyote Valley Road Aggregate Site Near Bishop, Inyo County, California*
IN-00536	1085139	HRR #. 05-04-643		Reynolds, Linda, and Marilyn Loughrey 1998	*Heritage Resources Report: Climbing Shoe Demo Day; Recreation Event*
IN-00539	1085145	R1997050400749		Loughrey, Marilyn 1998	*Heritage Resources Report: Bishop Creek Rec. Residence Septic Tank Installation*
IN-00574	1085603	HRR #05-04-766		Faust, Nicholas 1999	*Heritage Resources Report Bishop Creek Recreation Enhancement*
IN-00591	1082208	ARR #05-04-0319		Teixeira, Serna S. 1984	*Archaeological Reconnaissance Report: Bishop Creek Treatment Plant Fence*

IC Number	NADB Number	USFS Number	BLM Report Number	Author(s)/Year	Report Title
IN-00623			BLM - CA-170-05-11	McCormick, Erica D. 2004	*Cultural Resources Inventory Report (Yaney Mine Closures)*
IN-00684		HRR No. 05-04-660		Cutts, Janette S. 1995	*Heritage Resources Report (Sabrina Trail Maintenance and Reconstruction)*
IN-00696				Jordan, Stacey C., and K. Ross Way 2004	*FINAL: Archaeological Survey Report Southern California Edison, Bishop Plant 2 New Circuit Installation, Tungsten Hills Area, Inyo National Forest, Inyo County, California*
IN-00698		HRR No. 2004-05-04-00802		Hilton, Michael R. 2005a	*Heritage Resources Report (White Caps Mill Site CERCLA Response Action)*
IN-00699		HRR No. 2004-05-04-01076		Hilton, Michael R. 2005b	*Heritage Resources Report (Buttermilk Mountains Common Garden)*
IN-00700		R2004050400984		Faust, Nicholas 2005	*Heritage Resources Report: Horse Creek Prescribed Fire Project*
IN-00792				Hilton, Michael R. 2007a	*HRR No. 2007-05-04-01261, Heritage Resources Report, Rainbow Pack Station Spring Box Replacement*
IN-00828				Hilton, Michael R. 2007b	*HRR: No. 2008-05-04-01193, Heritage Resources Report*
IN-00858		HRR No. 2004-05-04-01073(b)		Hilton, Michael R. 2005c	*Heritage Resources Report: Off-Highway Vehicle (OHV) Route Designation Strategy*
IN-00861		R2002050400897		Mountain Heritage Associates 2003	*Archaeological Survey of Recreation Residence Tracts in the Inyo National Forest*
IN-00864		HRR No. 2004-05-04-01073		Hilton, Michael R. 2005d	*Heritage Resources Report: Off-Highway Vehicle (OHV) Route Designation Strategy*
IN-00888		R2010050401450		Catacora, Andrea 2008a	*Letter Report: Negative Cultural Resources Inventory Letter Report for Work Order 4770-0346 and 4703-0401*
IN-00892				Catacora, Andrea 2008b	*Letter Report: Southern California Edison Monitoring Work, W.O. 4770-0081, J.O. 2090*
IN-00895				Schmidt, James J. 2009	*Letter Report: Forks Fire Emergency Monitor/Survey Program, Inyo National Forest, Bishop and Horse Creek Areas, Inyo County, California*
IN-00911		R2008050401320		Pollock, Katherine H. 2008c	*Archaeological Assessment Report Bishop Creek Hydroelectric Project Green Creek Diversion Dam and Flowline Retirement, Inyo National Forest, Inyo County, California*
IN-00928				Leach-Palm, Laura, Paul Brandy, Jay King, Pat Mikkelsen, Libby Seil, Lindsay Hartman, Jill Braden, Bryan Larson,	*Cultural Resources Inventory of Caltrans District 9 Rural Conventional Highways in Inyo, Eastern Kern, Mono, and Northern San Bernardino Counties, Summary of Methods and Findings*

IC NUMBER	NADB NUMBER	USFS NUMBER	BLM REPORT NUMBER	AUTHOR(S)/YEAR	REPORT TITLE
				and Joseph Freeman 2010	
IN-00935				Switalski, Hubert, and Andrea Bardsley 2011	*Heritage Resources Inventory Report for the Southern California Edison Company's Replacement of Four Deteriorated H-Frame Structures on the Casa Diablo-Control 115-kV Transmission Line (4750-1613) and One Deteriorated Pole Structure on the Sabrina 12-kV Distribution Circuit (6085-4800, 0-4828), Inyo National Forest, Bishop Creek and Lake Crowley, Inyo and Mono Counties, California*
IN-00948				Switalski, Hubert 2009	*Archaeological Survey Report for the SCE Co's Replacement of 17 Deteriorate Power Poles*
IN-00964				Sibley, Kristin I., and Mark A. Giambastiani 2011	*Final Report: An Archaeological Survey for the Sabrina Bridge Replacement Project, Northern Inyo County, California*
IN-01001				O'Neil, Laura 2013	*Historic American Engineering Record, Bishop Creek Hydroelectric System, Hillside Dam*
IN-01019				Basgall, Mark E., and Michael G. Delacorte 2012	*Middle Archaic Cultural Adaptations in the Eastern Sierra Nevada, Data Recovery Excavations at CA-INY-1384/H, INY-6249/H, INY-6250, and INY-6251/H*
IN-01020				Pollock, Katherine H. 2006	*Archaeological Assessment Report Bishop Creek Intake 2 AVM and Pipe Installation Inyo National Forest, Inyo County, California*
IN-01043				Hoornbeek, Paul 2013	*Cultural Resources Report: Recording Three Department of Water Resources Snow Survey Shelters (CRR No. R2013050401831)*
IN-01051				Ugan, Andrew, and Jeffrey Rosenthal 2013	*Archaeological Survey of 12,457 Acres of the Naval Air Weapons Station China Lake North and South Ranges, Inyo, Kern, and San Bernardino Counties, California*
IN-01063				Brodie, Natalie 2014	*Archaeological Survey Report for the Southern California Edison Company Replacement of One Deteriorated Power Pole on the Sabrina 12-kV Circuit (TD902324), Inyo National Forest, Inyo County, California*
IN-01069				Morgan, Christopher, Jacqueline Hall, and Roderic McLean 2014	*Archaeological Survey Report for the Southern California Edison Company Replacement of Sixteen Deteriorated Power Poles on an Unnamed Circuit (TD712048, TD712051, and TD831459), Inyo National Forest, Inyo County, California*
IN-01155	1043463			Mortland, Carol 1974	*PRELIMINARY CASE REPORT: No. 2 Control-Casa Diablo 115-kV Transmission Line*
				Beidl, Jacqueline 2015	*SCE Sabrina 12-kV Deteriorated Pole Replacement Equipment Access (TD432148)*

IC Number	NADB Number	USFS Number	BLM Report Number	Author(s)/Year	Report Title
				Beidl, Jacqueline 2016	*Braveheart Trails LLC Cardinal Mine Trail Ford Reroute*
				Beidl, Jacqueline 2018	*CalTrans Bishop Creek Camp Road Emergency Culvert Repair*
				Blythe, Ashley A. 2017	*Bishop Pass Trail CMLG*
				Duran, Christopher A. 2013	*Bishop Creek 1,362 Acre Cultural Resources Survey, Inyo National Forest, Inyo County, California*
				Hall, J., and N. Brodie 2016	*Archaeological Survey Report for the Southern California Edison Company Grid Reliability and Maintenance Program for the Sabrina 12-kV Preventative Maintenance Project, TD1144535, Inyo National Forest, Inyo County, California*
				Hall, Jacqueline, and Natalie Brodie 2017	*Archaeological Survey Report for the Southern California Edison Company Grid Reliability and Maintenance Program for the Control-Plant 2, Carrier Solutions Fiber Optic Cable Install, SAP 801416782, Inyo National Forest, Inyo County, California*
				Heidelberg, Kurt 2014	*Archaeological Survey Report for Southern California Edison's Replacement of Twenty-Eight Deteriorated Power Poles on the Sabrina 12-kV (TD712035, TD712055, TD712061, TD750069 AND TD759728), Control-Silver Peak 55-kV (TD681877, TD682236, TD681942 T/L, D682030 T/L, TD712988 T/L,), and Other Unnamed Circuit (TD750072), in Inyo National Forest near Bishop, Inyo County, California*
				Heidelberg, Kurt 2016	*Archaeological Survey Report for Southern California Edison's Removal of Fourteen Power Poles, Replacement of One Deteriorated Power Pole, and Installation of Fourteen Power Poles on the Sabrina 12-kV (TD1044613) Circuit, in Inyo National Forest near Aspendell, Inyo County, California*
				Heidelberg, Kurt, and Gabrielle Duff 2015	*Archaeological Survey Report for Southern California Edison's Replacement of Three Deteriorated Power Poles on the Sabrina 12-kV Circuit (TD801675), in Inyo National Forest, Inyo County, California*
				Heidelberg, Kurt, and Ronald Norton 2015	*Archaeological Survey Report for Southern California Edison's Grid Reliability and Maintenance Project on the Sabrina 12-kV Circuit (TD801675), in Inyo National Forest near Aspendell, Inyo County, California*
				Hilton, Michael R. 2006	*Heritage Resources Report: Off-Highway Vehicle (OHV) Route Designation Strategy*
				Hilton, Michael R. 2008	*Heritage Resources Report: Rainbow Pack Station Spring Box Replacement*

IC NUMBER	NADB NUMBER	USFS NUMBER	BLM REPORT NUMBER	AUTHOR(S)/YEAR	REPORT TITLE
				Hilton, Michael R. 2009	*Heritage Resources Report: UNAVCO Plate Boundary Observation Table Mountain Amendment*
				Hornick, Martin 2000	*Bishop Pass Trail Complex - CIP2003*
				Jacobs Engineering Group 2016	*South Lake Road Cultural Resources Assessment*
				Lee, Mary 2011	*Upper Owens Bishop Creek Restoration OHV Planning South Zone*
				Long, Montana, and Kari Sprengeler 2009	*Class III Cultural Resource Inventory for the Replacement of One Utility Pole on the Control-Morgan-Plant 2 55-kV Line and One Utility Pole on the Control-Silver Peak "A" 55-kV Line, Inyo County, California*
				Maple, Timothy E. 1987	*Archaeological Reconnaissance Report: Buttermilk Meadows Rehabilitation Project*
				Miller, Brian C. 1986	*Parcher's Resort*
				Millington, Chris, Laura Hoffman, and Sara Dietler 2015	*Cultural Resources Survey for the Southern California Edison Control-Plant 5-Plant 6, 55-kV Reconductor Project (IO329583), Inyo County, California*
				Newcomb, A. 2016	*Cultural Resources Survey Report for Southern California Edison's Proposed Replacement of Six Deteriorated Poles (TD1122646) Located in the White Mountain Ranger District within the Inyo National Forest, Inyo County, California*
				Newcomb, Alyssa 2016b	*Archaeological Survey Report for Southern California Edison's Infrastructure Replacement Project (TD1018871) on the Birchim 12-kV Circuit on Private Land, Inyo County, California*
				Nicholas, Colleen 2013	*Upper Owens Bishop Creek Phase I Restoration South Zone*
				Parr, Robert E. 2015	*Archaeological Site Monitoring Report for the Southern California Edison Company Bishop Creek Hydroelectric Project (FERC Project No. 1394), Inyo National Forest, Inyo County, California*
				Switalski, Hubert, and Timothy Kelly 2008	*A Heritage Resource Inventory for the Southern California Edison Company's Replacement of 19 Deteriorated Power Poles, Inyo National Forest, Inyo and Mono Counties, California*
				Pollock, Katherine H. 2008b	*Archaeological Assessment Report Bishop Creek Hydroelectric Project (FERC Project N. 1394) Southfork Flowline Replacement, Inyo National Forest, Inyo County, California*
				Wisniewski, Peter 2015	*FY 15 SZ OHV Ground Operations*

IC NUMBER	NADB NUMBER	USFS NUMBER	BLM REPORT NUMBER	AUTHOR(S)/YEAR	REPORT TITLE
				Wisniewski, Peter, and Jacqueline Beidl 2015	*Lamarck Trails and Watershed Project*
				Millington, Chris, and Alyssa Newcomb 2015	*Cultural Resources Construction Monitoring Report for the Southern California Edison Bishop Creek Hydroelectric Control-Plant 5-Plant 6 55-kV Reconductor and Equipment Yard Expansion Project, Inyo County, California*
				Switalski, Hubert, and Sonia Hutmacher 2010	*Heritage Resources Inventory Report for the Southern California Edison Company's Replacement of Two Deteriorated Pole Structures on the Control-Morgan-Plant 2 55-kV Transmission Line (4770-0355) and Two H-Frame Structures on the Lee Vining-Poole 115-kV Transmission Line (4750-1597), Inyo National Forest, Between Bishop and Lee Vining Creek, Inyo and Mono Counties, California*
				White, R. M. 1985	*Results of the 1984 Field Season, Cultural Resources Survey for the Historic and Archaeological Preservation Plan for Eastern Sierra Hydroelectric Projects in Mono and Inyo Counties, California: Lundy (FERC Project 1390), Lee Vining Creek (FERC Project 1388), Rush Creek (FERC Project 1389), and Bishop Creek (FERC Project 1394)*
				White, R. M. 1992c	*An Evaluation of Effects on Historic Properties Resulting from Replacement of the Bishop Creek Plant No. 5 Flowline, Bishop Creek Hydro Project (FERC Project 1394), Inyo County, California*
				White, R. M. 1992	*1989-1991 Monitoring of Cultural Resources Associated with the Bishop Creek Hydroelectric Project (FERC Project 1394), Inyo County, California*

Source: SCE, INF, BLM and IC-Riverside

TABLE 4-59 PREVIOUSLY RECORDED ARCHAEOLOGICAL RESOURCES WITHIN THE PROJECT STUDY AREA

PRIMARY NUMBER	TRINOMIAL	USFS NUMBER	BLM NUMBER	SITE TYPE	COMPOSITION OF SITE	NRHP ELIGIBILITY	IN PROPOSED APE	IN STUDY AREA	PROPERTY OWNER
P-14-000469	CA-INY-000468/469/H	05-04-53-000084/85		P/H	Obsidian and Chert Lithics, ground stone, BRM, rock wall, Historic Debris	Eligible		X	USFS
P-14-002529	CA-INY-002529H	05-04-53-000010		H	Remains of Historic Mine and Associated Village	Unknown	X	X	USFS
P-14-002769	CA-INY-002769	05-04-53-000126		P	House Ring, Milling Slick, BRM, Obsidian Lithics	Unknown	X	X	USFS
P-14-002770	CA-INY-002770/H	05-04-53-000127		P/H (Mostly H) Field Check if in APE	Poss. Pit Toilets, Hunting Blind (recent?), Historic Debris	Unknown		X	USFS
P-14-002791	CA-INY-002791			P	Obsidian and Chert Lithics	Unknown		X	Unknown
P-14-003282	CA-INY-003282/H		BLM-C-S1	P/H	Obsidian and Cryptocrystalline Lithics, Historic Debris	Unknown		X	BLM
P-14-003448	CA-INY-003448	05-04-53-000181		P	Obsidian, Chalcedony, and Quartzite Lithics, Flow Line and Valve House Associated with SCE S. Fork Diversion and Reservoir 2	Unknown	X	X	USFS
P-14-003449	CA-INY-003449H	05-04-53-000182		H	Domestic Debris	Unknown	X	X	USFS
P-14-003450	CA-INY-003450	05-04-53-000184		P	Grayware Sherds, Obsidian Lithics	Code 2-Eligible (Record does not indicate if it has actually been tested)	X	X	USFS
P-14-003457	CA-INY-003457/H	05-04-53-000154		P/H	Obsidian Lithics, Granite Mano, Historic Debris	Unknown	X	X	USFS

Primary Number	Trinomial	USFS Number	BLM Number	Site Type	Composition of Site	NRHP Eligibility	In Proposed APE	In Study Area	Property Owner
P-14-003458	CA-INY-003458	05-04-53-000155		P	Obsidian Lithics, 2 Metates	Code 2-Eligible (Record notes previous testing and recommendation but not sure if concurrence was received)	X	X	USFS
P-14-003459	CA-INY-003459/H	05-04-53-000156		P/H	Obsidian and Chert Lithics, Historic Debris, Hearth (maybe Prehistoric)	Unknown	X	X	USFS
P-14-003460	CA-INY-003460H	05-04-53-000157		H	Donkey Engine, Rock-lined Pit, Penstock Section, Historic Debris	Unknown	X	X	USFS
P-14-003461	CA-INY-003461/H	05-04-53-000158		P/H	BRM, Obsidian Lithics, Mixed Historic Period Debris	Eligible	X	X	USFS
P-14-003462	CA-INY-003462/H	05-04-53-000159		P/H	Obsidian and Basalt Lithics, Post-1950 Cans	Eligible		X	USFS
P-14-003463	CA-INY-003463	05-04-53-000161		P	Obsidian, Chert, Calcedony, MetaV Lithics, Portable Milling Slicks, Rock Wall	Eligible		X	USFS
P-14-003464	CA-INY-003464	05-04-53-000162		P	Obsidian Lithics, Rock Shelter, BRM, Portable Milling Slick	Eligible		X	USFS
P-14-003465	CA-INY-003465	05-04-53-000160		P	Obsidian Flakes	Unknown	X	X	USFS
P-14-003466	CA-INY-003466/H	05-04-53-000163		P/H	Obsidian Flakes, Hexagonal Bead, Historic Debris	Unknown		X	BLM and USFS
P-14-003467	CA-INY-003467/H	05-04-53-000164		P/H	Grinding Slick, Historic Debris	Unknown	X	X	BLM and USFS
P-14-003468	CA-INY-003468/H	05-04-53-000165		P/H	Obsidian and Chert Lithics, Grinding Slicks, Rock Wall, Historic Debris	Unknown	X	X	USFS
P-14-003469	CA-INY-003469H	05-04-53-000167		H	Historic Debris, Remains of Cottage 39	Unknown		X	USFS
P-14-003470	CA-INY-003470	05-04-53-000168		P	Obsidian and Jasper Lithics (unable to relocate in 2006)	Unknown		X	Unknown

PRIMARY NUMBER	TRINOMIAL	USFS NUMBER	BLM NUMBER	SITE TYPE	COMPOSITION OF SITE	NRHP ELIGIBILITY	IN PROPOSED APE	IN STUDY AREA	PROPERTY OWNER
P-14-003471	CA-INY-003471	05-04-53-000169		P	Obsidian and Chert Lithics, Rock Carin, Grinding Slick	Unknown		X	USFS
P-14-003472	CA-INY-003472	05-04-53-000170		P	Obsidian, Basalt, and Chert Lithics	Unknown	X	X	USFS
P-14-003473	CA-INY-003473/H	05-04-53-000172		P/H	Obsidian Lithics, Historic Debris and Features Related to Cashbaugh and Kilpatrick Occupations	Eligible	X	X	USFS
P-14-003474	CA-INY-003474	05-04-53-000173		P	Obsidian Lithics	Unknown	X	X	USFS or BLM
P-14-003475	CA-INY-003475	05-04-53-000175		P	Obsidian Lithics, Grinding Slick	Unknown	X	X	USFS
P-14-003686	CA-INY-003686H	05-04-53-000343		H	Collapsed Mine Shaft and Associated Features	Unknown		X	USFS
P-14-003687	CA-INY-003687H	05-04-53-000344		H	Bishop Crk. PH-1 (failed attempt at construction)	Unknown		X	USFS
P-14-003705	CA-INY-003705			P	Obsidian Lithics, BRM	Unknown		X	
P-14-003936	CA-INY-003936	05-04-53-000530		P	Obsidian Lithics, Mano, Owens Valley Brownware Sherds, BRM	Unknown		X	USFS
P-14-004499	CA-INY-004499	05-04-53-000582		P	Obsidian and Basalt Lithics, Milling Slicks	Unknown	X	X	USFS
P-14-004500	CA-INY-004500	05-04-53-000584		P	Obsidian Lithics	Unknown		X	Unknown
P-14-004501	CA-INY-004501H	05-04-53-001377		H	Non-Diagnostic Historic Trash	Unknown		X	USFS
P-14-004505	CA-INY-004505	05-04-53-000581, 05-05-53-001378		P	Obsidian Lithics	Unknown		X	USFS
P-14-004506	CA-INY-004506	05-04-53-00585		P	Obsidian Lithics	Unknown		X	USFS
P-14-004507	CA-INY-004507H	05-04-53-00589		H	Historic Trash	Unknown		X	USFS
P-14-004700	CA-INY-004700			P	Obsidian and Basalt Lithics	Unknown		X	Unknown
P-14-004701	CA-INY-004701	05-04-53-001370		P	Obsidian Lithics	Unknown		X	USFS
P-14-004702	CA-INY-004702	05-04-53-001372		P	Obsidian Lithics	Unknown		X	USFS
P-14-004703	CA-INY-004703H	Record notes it is on USFS Land		H	Historic Debris	Unknown		X	Unknown

PRIMARY NUMBER	TRINOMIAL	USFS NUMBER	BLM NUMBER	SITE TYPE	COMPOSITION OF SITE	NRHP ELIGIBILITY	IN PROPOSED APE	IN STUDY AREA	PROPERTY OWNER
P-14-004704	CA-INY-004704H	05-04-53-001374		H	Historic Debris	Unknown	X	X	USFS
P-14-004705	CA-INY-004705	Record Notes it is on USFS Land		P	Obsidian Lithics, BRM, Rock Wall, Possible Midden	Unknown		X	USFS
P-14-004706	CA-INY-004706H	05-04-53-001376		H	2- ½ Mile Portions of Bishop Creek Road	Unknown	X	X	USFS
P-14-004723	CA-INY-004723/H	Record Notes it is on USFS Land		P/H	Obsidian Lithics, Historic Debris	Unknown		X	USFS
P-14-004767	CA-INY-004767/H			P/H	Obsidian and Basalt Lithics, Historic Debris	Unknown	X	X	Unknown
P-14-004768	CA-INY-004768H			H	Historic Debris	Unknown		X	Unknown
P-14-004769	CA-INY-004769H			H	Historic Debris	Unknown		X	Unknown
P-14-005185	CA-INY-005185	05-04-53-001383		P	Obsidian Lithics, Bed Rock Mortar, Milling Slick, Rock Ring	Unknown		X	USFS
P-14-005187	CA-INY-005025	05-04-53-001384		P	Obsidian and Quartzite Lithics	Unknown		X	USFS
P-14-005443	CA-INY-005192H			H	Ditch and Historic Debris	Unknown		X	Unknown
P-14-005444	CA-INY-005193H			H	Concrete and Rock Foundation, Domestic Historic Debris	Unknown		X	Unknown
P-14-005445	CA-INY-005194H			H	Historic Debris	Unknown		X	Unknown
P-14-005448	CA-INY-005197H			H	Historic Debris	Unknown		X	Unknown
P-14-005449	CA-INY-005198H			H	Historic Debris	Unknown		X	Unknown
P-14-005450	CA-INY-005199/H			P/H	Obsidian Flake, Historic Debris	Unknown		X	Unknown
P-14-005451	CA-INY-005200H			H	Historic Debris	Unknown		X	Unknown
P-14-005452	CA-INY-005201H			H	Historic Debris	Unknown		X	Unknown
P-14-005453	CA-INY-005202H			H	Historic Debris	Unknown		X	Unknown

Primary Number	Trinomial	USFS Number	BLM Number	Site Type	Composition of Site	NRHP Eligibility	In Proposed APE	In Study Area	Property Owner
P-14-005454	CA-INY-005203H			H	Historic Debris	Unknown		X	Unknown
P-14-005455	CA-INY-005204H			H	Historic Debris	Unknown		X	Unknown
P-14-005456	CA-INY-005205H			H	Historic Debris	Unknown		X	Unknown
P-14-005457	CA-INY-005026H			H	Historic Debris	Unknown		X	Unknown
P-14-005585	CA-INY-005241/H			P/H	Obsidian Lithics, Milling Station, Milling Equipment, Historic Debris	Unknown		X	Unknown
P-14-005586	CA-INY-005242/H			P/H	Obsidian and Cryptocrystalline Lithics, Historic Debris	Unknown		X	Unknown
P-14-005587	CA-INY-005243			P	Obsidian and Cryptocrystalline Lithics	Unknown		X	Unknown
P-14-005588	CA-INY-005244			P	Obsidian Lithics	Unknown		X	Unknown
P-14-005590	CA-INY-005246/H			P/H	Obsidian Lithics, Historic Debris	Unknown		X	USFS
P-14-005591	CA-INY-005247			P	Obsidian and Cryptocrystalline Lithics	Unknown		X	Unknown
P-14-005592	CA-INY-005248/H			P/H	Obsidian and Cryptocrystalline Lithics, Ground stone, Bedrock Mortar, Historic Debris	Unknown		X	Unknown
P-14-005596	CA-INY-005252H			H	Historic Debris, Rock Alignment, Road, Ditch	Unknown		X	Unknown
P-14-005597	CA-INY-005253H			H	Historic Debris	Unknown		X	Unknown
P-14-005599	CA-INY-005255/H			P/H	Obsidian, Basalt, and Cryptocrystalline Lithics, Midden, Milling Equipment, Historic Debris	Unknown		X	Unknown
P-14-005661	CA-INY-005308	05-04-53-001379		P	Obsidian Lithics, Pictograph	Unknown		X	USFS
P-14-006761	CA-INY-005788	05-04-53-001449		P	Obsidian Lithics, BRM	Unknown		X	USFS
P-14-006901	CA-INY-005789	05-04-53-001450		P	Obsidian Lithics, Bedrock Milling Station	Unknown		X	USFS
P-14-006940	CA-INY-005924H	05-04-53-001502		H	Milling and Mining Related Debris and Buildings	Unknown		X	USFS

PRIMARY NUMBER	TRINOMIAL	USFS NUMBER	BLM NUMBER	SITE TYPE	COMPOSITION OF SITE	NRHP ELIGIBILITY	IN PROPOSED APE	IN STUDY AREA	PROPERTY OWNER
P-14-007088	CA-INY-006023H			H	Owens River Canal (Abandoned)	Undetermined		X	Unknown
P-14-007089	CA-INY-006024H			H	Road F55	Unknown		X	Unknown
P-14-007090	CA-INY-006025H			H	Road F57	Unknown		X	
P-14-007416	CA-INY-006292H	05-04-53-007721		H	Mining Debris, Cabins, Mining Related Structures	Unknown		X	USFS
P-14-007849	CA-INY-006510H			H	Historic Domestic Debris	Unknown		X	Unknown
P-14-007850				H	Historic Debris	Unknown		X	Unknown
P-14-008304	CA-INY-006615	05-04-53-001778		P?	Three Rock Rings	Undetermined		X	USFS
P-14-008317	CA-INY-006626	05-04-53-001782		P	Obsidian Lithics	Undetermined		X	USFS
P-14-008318	CA-INY-006627	05-04-53-001783		P	Obsidian Lithics	Undetermined		X	USFS
P-14-008326	CA-INY-006634	05-04-53-001791		P	Obsidian Lithics	Undetermined		X	USFS
P-14-008328	CA-INY-006637	05-04-53-001793		P	Lithics and Rock Ring	Undetermined		X	USFS
P-14-008329	CA-INY-006638	05-04-53-001794		P	Obsidian and Basalt Lithics	Undetermined		X	USFS
P-14-008331	CA-INY-006640H	05-04-53-001797		H	Historic Mining Features	Undetermined		X	USFS
P-14-008600	CA-INY-006758H	05-04-53-001900		H	Historic Fire Pits	Unknown		X	USFS
P-14-008601	CA-INY-006759	05-04-53-001901		P	Obsidian Lithics	Unknown		X	USFS
P-14-008602	CA-INY-006760H	05-04-53-001902		H	Historic Camp and Arboroglyphs	Unknown		X	USFS
P-14-008603	CA-INY-006761H	05-04-53-001903		H	Historic Debris	Unknown		X	USFS
P-14-008604	CA-INY-006762	05-04-53-001904		P	Lithics, Milling Equipment, Milling Slick	Unknown		X	USFS
P-14-009029	CA-INY-007095H	05-04-53-001993		H	Historic Debris	Unknown		X	USFS
P-14-009030	CA-INY-007096H	05-04-53-002024		H	Historic Debris	Unknown		X	USFS
P-14-0010146				H	Rock Structure and Historic Debris	Unknown		X	Unknown
P-14-010525		05-04-53-000176		H	Remains of First Bishop Creek PH	Unknown		X	USFS

Primary Number	Trinomial	USFS Number	BLM Number	Site Type	Composition of Site	NRHP Eligibility	In Proposed APE	In Study Area	Property Owner
P-14-010526		05-04-53-000177		H	Remains of Plant 3 Cottages	Unknown	X	X	USFS
P-14-010527		05-04-53-000178		H	Remains of Plant 3 Apartments	Unknown	X	X	USFS
P-14-010529		05-04-53-000171		H	Rock Terraces for Chicken Coops associated with Cottage 4 of Unknown Power Plant	Unknown	X	X	USFS
P-14-010534	CA-INY-008001	05-04-53-002308		P	Obsidian Lithics	Unknown	X	X	USFS
P-14-010606	CA-INY-008063H	05-04-53-002226		H	Domestic Debris	Unknown		X	USFS
P-14-011340	CA-INY-008770	05-04-23-002210		P	Milling Station, Mano	Unknown		X	USFS
P-14-011451		05-04-53-002211		P	Rock Shelter, Pictographs, Milling, Lithic Scatter	Unknown		X	USFS
P-14-011452		05-04-53-002213		H	Rock Alignment (Road?)	Unknown		X	USFS
P-14-011718	CA-INY-009014H			H	Historic Debris	Unknown		X	Unknown
P-14-011719	CA-INY-009015H			H	Historic Debris, Irrigation Ditch	Unknown		X	Unknown
P-14-011722	CA-INY-009016H	05-04-53-002349		H	Historic Debris	Unknown			USFS
P-14-011723	CA-INY-009017H	05-04-53-002346		H	Domestic Debris	Unknown		X	USFS
P-14-011724	CA-INY-009018H	05-04-53-002344		H	Historic Debris	Unknown	X	X	USFS
P-14-011725	CA-INY-009019	05-04-53-002293		H	Domestic Debris	Unknown	X	X	USFS
P-14-012257				H	Ed Powers Road	Not Eligible		X	Unknown
P-14-012258	CA-INY-009423H			H	Historic Debris	Unknown		X	Unknown
P-14-012259	CA-INY-009424H			H	Historic Debris	Unknown		X	Unknown
P-14-012260	CA-INY-009425H			H	Historic Debris	Unknown		X	Unknown
P-14-012269	CA-INY-009434H			H	Historic Debris	Unknown		X	Unknown
P-14-012270	CA-INY-009435H			H	Historic Debris	Unknown		X	Unknown
P-14-012707	CA-INY-009620	05-04-53-002270		H	Concrete Pad, Can Scatter	Unknown		X	USFS

Primary Number	Trinomial	USFS Number	BLM Number	Site Type	Composition of Site	NRHP Eligibility	In Proposed APE	In Study Area	Property Owner
P-14-012777	CA-INY-009677/H			P/H	Obsidian Lithics, Historic Debris	Unknown		X	Unknown
P-14-012778	CA-INY-009678/H			P/H	Obsidian Lithics, Water Conveyance, Historic Debris	Unknown	X	X	Unknown
P-14-012779	CA-INY-009679H			H	Historic Debris	Unknown	X	X	Unknown
P-14-012780	CA-INY-009680H			H	Historic Debris	Unknown	X	X	Unknown
P-14-012781	CA-INY-009681/H			P/H	Obsidian Lithics, Historic Debris	Unknown		X	Unknown
P-14-012782	CA-INY-009682/H			P/H	Obsidian Lithics, Historic Debris	Unknown		X	Unknown
P-14-012783	CA-INY-009683H			H	Historic Debris	Unknown		X	Unknown
P-14-012784	CA-INY-009684H			H	Historic Debris	Unknown		X	Unknown
P-14-012785	CA-INY-009685/H			P/H	Obsidian Lithics, Historic Debris	Unknown		X	Unknown
P-14-012790	CA-INY-009689H			H	Historic Debris	Unknown		X	Unknown
P-14-012791	CA-INY-009690/H			P/H	Paiute Ditch, Historic Ditch	Unknown	X	X	Unknown
P-14-012828	CA-INY-009722H			H	Historic Debris	Unknown		X	BLM
P-14-012850	CA-INY-009741	Record Notes on USFS Land		H	Domestic Debris	Unknown		X	USFS
P-14-013136	CA-INY-009987	05-04-53-002309		P	Obsidian Lithics	Unknown		X	USFS
	CA-INY-001001	05-04-53-000157			Need Record		X	X	USFS
	CA-INY-004503	05-04-53-000587		P	Obsidian Lithics	Unknown			USFS
	CA-INY-002528	05-04-53-000122		P	Obsidian Lithics	Unknown	X	X	USFS
	CA-INY-005245				Need Record	Unknown	X	X	USFS
		05-04-53-000126		P	House Ring, Bedrock Mortar, Grinding Slick, Obsidian Lithics	Unknown		X	USFS
		05-04-53-000174		H	Clay Pigeon Fragments, Shooting Blind	Unknown		X	USFS

PRIMARY NUMBER	TRINOMIAL	USFS NUMBER	BLM NUMBER	SITE TYPE	COMPOSITION OF SITE	NRHP ELIGIBILITY	IN PROPOSED APE	IN STUDY AREA	PROPERTY OWNER
		05-04-03-000179			Need Record			X	USFS
		05-04-53-000183		H	Remains of Watchman's Cabin Associated with Bishop Creek Hydroelectric Project	Unknown		X	USFS
		05-04-53-000345		H	3 Concrete and Stone Features, Water Pipe	Unknown		X	USFS
		05-04-53-001371		P/H	Obsidian Lithics, Historic Debris	Unknown			USFS
		05-04-53-001373		H	Historic Debris	Unknown		X	USFS
		05-04-53-001374		H	Historic Debris	Unknown		X	USFS
		05-04-54-001375		P	Milling Feature, Unmortared Rock Wall, Possible Midden, Obsidian Lithics	Unknown		X	USFS
		05-04-53-001376		H	Two 1/2 Mile Segments of Bishop Creek Road	Unknown		X	USFS
		05-04-53-001450		P	Obsidian Lithics, Portable Milling Feature	Unknown		X	USFS
		05-04-53-001723			Need Record		X	X	USFS
		05-04-53-001755		P	Obsidian Lithics and Tools	Unknown		X	USFS
		05-04-53-001756		P	Obsidian and Cryptocrystalline Lithics, Obsidian Tools	Unknown		X	USFS
		05-04-53-001757		P/H	Obsidian Flakes and Tools, Granite Handstone, Historic Debris	Unknown		X	USFS
		05-04-53-001758		P/H	Obsidian Flakes, Midden, Ground stone, Historic Debris	Unknown		X	USFS
		05-04-53-001759		P	Obsidian Flakes and Tools	Unknown		X	USFS
		05-04-53-001760		P/H	Obsidian and Cryptocrystalline Flakes, Bedrock Milling Station, Ground stone, Historic Debris	Unknown		X	USFS
		05-04-53-002153		P	Obsidian Lithic Scatter	Unknown		X	USFS
		05-04-53-002171		H	Rock Ring Structural Base, Historic Debris	Unknown	X	X	USFS

PRIMARY NUMBER	TRINOMIAL	USFS NUMBER	BLM NUMBER	SITE TYPE	COMPOSITION OF SITE	NRHP ELIGIBILITY	IN PROPOSED APE	IN STUDY AREA	PROPERTY OWNER
		05-04-53-002279			Need Record	Unknown	X		USFS
		05-04-53-002280			Need Record	Unknown		X	USFS
		05-04-03-002281			Need Record	Unknown	X		USFS
		05-04-03-002282			Need Record	Unknown	X		USFS
		05-04-53-002292		H	Collapsed Retaining Wall	Unknown	X		USFS

Source: SCE, INF, BLM and IC-Riverside

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4.10.9 Previously Recorded Built Environment Resources

4.10.9.1 Hydroelectric-Related Facilities

There are 68 known/recorded built environment resources and many others located within the proposed APE. They consist of the facilities that make up the Project, recreational facilities, mining-related resources, and resources related to other historical land uses, such as pack trains. Many in the recreational and mining-related categories have not been formally mapped as part of past studies; completion of those efforts will occur as part of the studies during the relicensing process. Known architectural resources (unless associated with archaeological remains) are depicted on maps located in Appendix G. Architectural resources associated with archaeological remains are depicted on the maps contained in Volume IV of this PAD; these archaeological sites are considered confidential and therefore are filed separately.

During the previous relicensing effort, SCE evaluated the Project for its NRHP eligibility. The Project consists of five powerhouses each containing a set of independent, high-head, impulse water wheel, and electrical power-generating sub-systems established at various elevations along Bishop Creek on the eastern slope of the Sierra Nevada. The Project is significant for its position in the expansion of hydroelectric generation technology, its role in the development of eastern California, and the development of transmission electrical power across long distances. The Project is intact and is an early example of a high-head, impulse water wheel, and high-voltage electric generation Project. The Project was determined eligible (by consensus) for listing in the NRHP under Criteria A and C, with a period of significance of 1905 to 1938; the California SHPO concurred in a letter dated September 7, 1988 (White 1989). The historic district is recorded as P-14-004812, with 68 contributing elements. The known historic properties and previously determined not eligible resources within the Project are listed in Table 4-60.

TABLE 4-60 BISHOP CREEK HYDROELECTRIC PROJECT HISTORIC DISTRICT

PRIMARY NUMBER	NRHP STATUS	RELATED PLANT	DESCRIPTION
14-004825	Eligible Historic District	Hydroelectric Project	Bishop Creek Hydroelectric Project
14-005741	Contributing Element	Birch Creek East	Flowline
14-005742	Contributing Element	Birch Creek East	Intake, Diversion
14-005743	Contributing Element	Birch Creek West	Flowline
14-005744	Contributing Element	Birch Creek West	Intake, Diversion
14-005750	Contributing Element	Green Creek Diversion	Flowline
14-005751	Contributing Element	Green Creek Diversion	Intake, Diversion
14-005753	Contributing Element	Lake Sabrina	Dam
14-005754	Contributing Element	Lake Sabrina	Weir, Gauging Station
14-005755	Contributing Element	Lake Sabrina	Valve House: Building 103
14-005756	Contributing Element	Longley Lake	Dam
14-005757	Contributing Element	McGee Creek	Flowline
14-005758	Contributing Element	McGee Creek	Intake, Diversion
14-005800	Contributing Element	South Lake	Dam
14-005798	Contributing Element	Southfork Diversion	Dam, Intake, Flowline
14-005799	Contributing Element	Southfork Diversion	Weir Lake Flow Monitoring Dam
14-005752	Contributing Element	Plant 2	Intake No. 2
14-005760	Contributing Element	Plant 2	Penstock No. 2
14-005761	Contributing Element	Plant 2	Flowline No. 2
14-005768	Contributing Element	Plant 2	Powerhouse No. 2
14-005769	Contributing Element	Plant 2	Transformer House
14-005777	Contributing Element	Plant 2	Shed: Building 107
14-005736	Contributing Element	Plant 3	Flowline No. 3
14-005762	Contributing Element	Plant 3	Penstock No. 3
14-005767	Contributing Element	Plant 3	Intake No. 3
14-005772	Contributing Element	Plant 3	Powerhouse No. 3
14-005773	Contributing Element	Plant 3	Battery House
14-005735	Contributing Element	Plant 4	Cottage: Building 102
14-005737	Contributing Element	Plant 4	Flowline No. 4
14-005759	Contributing Element	Plant 4	Cottage: Building 103
14-005763	Contributing Element	Plant 4	Penstock No. 1 and 2
14-005770	Contributing Element	Plant 4	Intake No. 4

PRIMARY NUMBER	NRHP STATUS	RELATED PLANT	DESCRIPTION
14-005771	Contributing Element	Plant 4	Steam Gaging Station
14-005774	Contributing Element	Plant 4	Cottage: Building 114
14-005775	Contributing Element	Plant 4	Cottage: Building 115
14-005778	Contributing Element	Plant 4	Cottage: Building 117
14-005779	Contributing Element	Plant 4	Cottage: Building 116
14-005779	Contributing Element	Plant 4	Cottage: Building 121
14-005780	Contributing Element	Plant 4	Cottage: Building 122
14-005781	Contributing Element	Plant 4	Vault: Building 125
14-005782	Contributing Element	Plant 4	Meter House: Building 126
14-005783	Contributing Element	Plant 4	Valve House: Building 127
14-005784	Contributing Element	Plant 4	Fire House: Building 128
14-005785	Contributing Element	Plant 4	Garage: Building 130
14-005786	Contributing Element	Plant 4	Shed: Building 135
14-005787	Contributing Element	Plant 4	Landscape Feature
14-005789	Contributing Element	Plant 4	Powerhouse No. 4
14-005790	Contributing Element	Plant 4	Cottage: Building 104
14-005791	Contributing Element	Plant 4	Cottage: Building 105
14-005792	Contributing Element	Plant 4	Cottage: Building 106
14-005793	Contributing Element	Plant 4	Recreation Hall: Building 109
14-005794	Contributing Element	Plant 4	Cottage: Building 113
14-005739	Contributing Element	Plant 5	Powerhouse No. 5
14-005764	Contributing Element	Plant 5	Penstock No. 5
14-005788	Contributing Element	Plant 5	Intake No. 5
14-005801	Contributing Element	Plant 5	Flowline No. 5
14-005738	Contributing Element	Plant 6	Transformer Building between Powerhouse No. 5 and 6
14-005740	Contributing Element	Plant 6	Flowline No. 6
14-005765	Contributing Element	Plant 6	Penstock No. 6
14-005766	Contributing Element	Plant 6	Intake No. 6
14-005795	Contributing Element	Plant 6	Powerhouse No. 6
14-005796	Contributing Element	Plant 6	Cahbaugh Resident
14-005797	Contributing Element	Plant 6	Utility Building
14-005734	Contributing Element	Control Station	Cottage: Building 102
14-005746	Contributing Element	Control Station	Cottage: Building 103
14-005747	Contributing Element	Control Station	Control Station: Building 101
14-005747	Contributing Element	Control Station	Cottage: Building 106
14-005748	Contributing Element	Control Station	Cottage: Building 108

PRIMARY NUMBER	NRHP STATUS	RELATED PLANT	DESCRIPTION
14-005749	Contributing Element	Control Station	Cottage: Building 111

Source: Diamond, Helmich and Hicks 1988

Hydroelectric-related resources not included in the historic district have been recorded in other surveys (Table 4-61). For example, the valve house and flow line recorded in 2010 (P-14-003448) and original intake dam for the Nevada Power, Mining and Milling Company (now SCE Plant 4) recorded in 1986 (P-14-010528). Additional such resources likely exist throughout the proposed APE.

4.10.9.2 Recreational Facilities

Also located within the proposed APE, mostly along the creek and impoundments related to the Project, are several historic-period recreation-related facilities (Table 4-61). Bishop Pack Outfitters (P-14-013394) and Rainbow Pack Outfitters (USFS 05-04-53-01843[15]), for example, were both recorded in 2004 as part of a larger thematic evaluation of pack stations operating within the Inyo and Sierra National Forests in the Eastern Sierra (Woolfenden et al. 2007). Other recreation-related resources recorded in the proposed APE include residences/cabins associated with the Utter Tract (USFS 05-04-53-01727), South Fork Bishop Tract (USFS 05-04-53-01726, eligible), and Lake Sabrina Tract (USFS 05-04-53-01723), all of which were recorded as part of a larger study of recreational tracts done in 2003 by Mountain Heritage Associates. Additionally, unrecorded docks and boat houses, concessions, restrooms, campgrounds and associated buildings and structures abound within the proposed APE.

4.10.9.3 Mining Resources

In addition to the Project and recreational facilities within the proposed APE are several mining-related buildings and structures (both in ruins and extant) (Table 4-61). Located near Camp Sabrina, the Wilshire-Bishop Creek (Cardinal) Gold Mine was recorded as archaeological site CA-INY-25294 in 1982 (P-14-002529). Mostly in ruins at that time, the site record noted the presence of several buildings and structures associated with the gold-mining operation that dated

[15] Note: USFS numbers or trinomials are given when primary number is unknown.

from 1906 to 1938. Included in the inventory were foundations, buildings (in various stages of disintegration), a mill, a headframe, adits, tunnels, a possible flume and flume box, piping, a dam, roads and bridges, and various dumps and artifact scatters. Commonly referred to at the time of recordation as the Cardinal Resort, the site is described as in fair condition and listed as "threatened . . . possibly by SCE's Project." Another mining site located within the study area is the Whitecaps Mill Site (P-14-006940) recorded in 2000.

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TABLE 4-61 PREVIOUSLY RECORDED BUILT ENVIRONMENT RESOURCES WITHIN THE STUDY AREA

PRIMARY NUMBER	TRINOMIAL	USFS NUMBER	BLM NUMBER	HISTORIC NAME / CURRENT NAME (IF DIFFERENT)	RESOURCE TYPE	DATE OF CONSTRUCTION/PERIOD OF SIGNIFICANCE	NRHP ELIGIBILITY	IN PROPOSED APE	IN STUDY AREA	PROPERTY OWNER
P-14-004825 (and other associated P numbers)		05-04-53-002311		Bishop Creek Hydroelectric System Historic District	See Table 4-60 for list of contributing resources	1905-1938	Eligible	X	X	SCE
P-14-010528		05-04-53-000179		Nevada Power, Mining & Milling Company Dam	Concrete and timber dam	1905	Unknown	X	X	?
P-14-003448	CA-INY-003448/H	05-04-53-000181			Flow Line and Valve House Associated with SCE S. Fork Diversion and Reservoir 2		Unknown	X	X	USFS
P-14-002529	CA-INY-002529/H	05-04-53-000010		Wilshire-Bishop Creek (Cardinal) Gold Mine	Remains of gold mine and associated buildings and structures		Unknown	X	X	USFS
P-14-006940	CA-INY-005924/H	05-04-53-001502		Whitecaps Mill Site	Milling and Mining Related Debris and Buildings	c. 1916-1918 through 1960-1970	Unknown	?	X	USFS
		05-04-53-001727		Utter Recreation Residence Tract	Residential cabins (4) and associated structures	1923-1959	Unknown	X	X	USFS
		05-04-53-001723		Lake Sabrina Recreation	Residential cabins (8) and associated structures	1923-1959	Unknown	X	X	USFS

PRIMARY NUMBER	TRINOMIAL	USFS NUMBER	BLM NUMBER	HISTORIC NAME / CURRENT NAME (IF DIFFERENT)	RESOURCE TYPE	DATE OF CONSTRUCTION/PERIOD OF SIGNIFICANCE	NRHP ELIGIBILITY	IN PROPOSED APE	IN STUDY AREA	PROPERTY OWNER
				Residence Tract						
		05-04-53-001726		South Fork Bishop Tract	Residential cabins (10) and associated structures	1923-1959	Unknown	X	X	USFS
P-14-13394		05-04-53-01842		Bishop Pack Outfitters (North Lake)	Ancillary buildings, commercial building, gates/fences+F36	POS for thematic study is 1920-1941 (one building in this complex was original schoolhouse from Cardinal Mine, c. 1906)	Unknown	?	X	USFS
		05-04-53-01843		Rainbow Pack Outfitters	Ancillary buildings, commercial building, gates/fences	POS for thematic study is 1920-1941 / Rainbow Pack Station built c. 1924	Unknown	?	X	USFS

4.10.10 Traditional Cultural Properties

SCE, INF, BLM, EIC and NAHC have no information about TCPs located within the proposed APE. To date the Bishop Creek Paiute have participated in one TWG meeting, but none of the Tribes contacted have provided any information about TCPs within the study area. Additionally, TCPs that may be related to other communities, such as the Basque, recreationists, or ranchers have not yet been identified. SCE will conduct interviews and other investigations to identify potential Native and non-native TCPs and other tribal resources that may be in the APE.

4.10.11 Current Cultural Resource Management

SCE prepared a Cultural Resources Management Plan (CRMP) for the Project (White 1989). The plan identified specific measures undertaken by SCE to avoid adverse impacts to the NRHP eligible properties located within the Project boundary and various programmatic measures that SCE is required to implement. Resource monitoring and documentation of the NRHP properties within the Project boundary is required to occur in three five-year increments to determine the success of current measures and to evaluate the need for additional treatment.

4.10.12 Potential Adverse Effects and Issues

SCE anticipates continuing with the PME's identified above in the new license. Although no additional mitigation or enhancement measures relating to historic properties or resources are planned at this time, SCE plans to evaluate the issues identified as part of the licensing Study Plan, and in consultation with stakeholders. Should any major changes be planned for the Project, appropriate BMPs to minimalize effects on historic properties would be implemented; no cultural changes are proposed at this time.

4.10.13 Proposed Mitigation and Enhancement Measures

SCE anticipates continuing with the PME's identified above in the new license. Although no additional mitigation or enhancement measures relating to historic properties are planned at this time, SCE plans to evaluate the issues identified above as part of the relicensing Study Plan, and in consultation with stakeholders. SCE expects to develop an updated Historic Properties Management Plan (HPMP) of cultural resources in the new license term. Should any major changes be planned for the Project, appropriate BMPs to minimalize effects on historic properties would be implemented; however, no cultural changes are proposed.

4.10.14 References

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TABLE 4-62 PREVIOUSLY RECORDED ARCHITECTURAL RESOURCES WITHIN THE PROJECT STUDY AREA

PRIMARY NUMBER	TRINOMIAL	USFS NUMBER	BLM NUMBER	HISTORIC NAME / CURRENT NAME (IF DIFFERENT)	RESOURCE TYPE	DATE OF CONSTRUCTION/ PERIOD OF SIGNIFICANCE	NRHP ELIGIBILITY	IN PROPOSED APE	IN STUDY AREA	PROPERTY OWNER
P-14-004825 (and other associated P numbers)		05-04-53-002311		Bishop Creek Hydroelectric System Historic District	See Table 4-60 for list of contributing resources	1905-1938	Eligible	X	X	SCE
P-14-010528		05-04-53-000179		Nevada Power, Mining & Milling Company Dam	Concrete and timber dam	1905	Unknown	X	X	?
P-14-003448	CA-INY-003448/H	05-04-53-000181			Flow Line and Valve House Associated with SCE S. Fork Diversion and Reservoir 2		Unknown	X	X	USFS
P-14-002529	CA-INY-002529/H	05-04-53-000010		Wilshire-Bishop Creek (Cardinal) Gold Mine	Remains of gold mine and associated buildings and structures		Unknown	X	X	USFS
P-14-006940	CA-INY-005924/H	05-04-53-001502		Whitecaps Mill Site	Milling and Mining Related Debris and Buildings	c. 1916-1918 through 1960-1970	Unknown	?	X	USFS
		05-04-53-001727		Utter Recreation Residence Tract	Residential cabins (4) and associated structures	1923-1959	Unknown	X	X	USFS
		05-04-53-001723		Lake Sabrina Recreation Residence Tract	Residential cabins (8) and associated structures	1923-1959	Unknown	X	X	USFS
		05-04-53-001726		South Fork Bishop Tract	Residential cabins (10) and associated structures	1923-1959	Unknown	X	X	USFS
P-14-13394		05-04-53-01842		Bishop Pack Outfitters (North Lake)	Ancillary buildings, commercial building, gates/fences+F36	POS for thematic study is 1920-1941 (one building in this complex was original	Unknown	?	X	USFS

PRIMARY NUMBER	TRINOMIAL	USFS NUMBER	BLM NUMBER	HISTORIC NAME / CURRENT NAME (IF DIFFERENT)	RESOURCE TYPE	DATE OF CONSTRUCTION/ PERIOD OF SIGNIFICANCE	NRHP ELIGIBILITY	IN PROPOSED APE	IN STUDY AREA	PROPERTY OWNER
						schoolhouse from Cardinal Mine, c. 1906)				
		05-04-53-01843		Rainbow Pack Outfitters	Ancillary buildings, commercial building, gates/fences	POS for thematic study is 1920-1941 / Rainbow Pack Station built c. 1924	Unknown	?	X	USFS

4.11 SOCIOECONOMIC RESOURCES [§ 5.6 (D)(3)(XI)]

The Project area is located with Inyo County, California; the City of Bishop is the largest incorporated city in Inyo County. Bishop is a small city with a total area of 1.91-square-miles, located at elevation 4150 feet. The following is a summary of socioeconomic data for this city and county, including population patterns, average household income, and employment sectors.

4.11.1 General Land Use Patterns

Although the County contains a large land area, only about 1.9 percent of the land is held in private ownership. Federal agencies hold approximately 91 percent of the land, the State of California owns 3.5 percent, the City of Los Angeles Department of Water and Power (LADWP) owns 2.7 percent with over 300,000 acres of land. As described by Inyo County (2014) this ownership encompasses a large proportion of the Valley floor, and Inyo County and other local agencies (including tribal entities) own the remaining 0.3 percent. Outside of the City of Bishop and the unincorporated communities of Big Pine, Independence, Lone Pine, and Aberdeen, the primary land use in the Owens Valley is open space devoted to agriculture (generally grazing), outdoor recreation, and resource conservation.

4.11.2 Population Patterns

Table 4-63 summarizes the population estimates for the City of Bishop, the county in which the Project lands are located, and for the state of California as reported in the 2000 and 2010 Census, and as estimated by the U.S. Census Bureau for the 2016. Inyo County experienced a slight decrease in population between 2010 and 2016, however, the City of Bishop and state of California both experienced population increases consistently since 2000. The next largest towns to Bishop, California are Big Pine, Mammoth Lakes and Mono Hot Springs.

TABLE 4-63 ESTIMATED POPULATION OF BISHOP CITY, INYO COUNTY AND THE STATE OF CALIFORNIA

CITY/COUNTY/STATE	2000 CENSUS	2010 CENSUS		% CHANGE 2000-2010	2016 ESTIMATES	% CHANGE 2010-2016
Bishop	3,575	3,879		+8.5%	3,832	+1.36%
Inyo	17,945	18,546		+3.5%	18,326	-1.19%
California	33,871,648	37,253,956		+9.98%	38,654,206	+3.76%

Source: U.S. Census Bureau 2000, 2010 and 2016

Based on population data from 2010 to 2016, Inyo County has a population density of 1.80 people per square mile, which is significantly lower than the state average density of 232.55 people per square mile (USA.com 2018).

4.11.3 Households/Family Distribution and Income

Table 4-64 provides the household and family distribution and income for Inyo County.

TABLE 4-64 HOUSEHOLD AND FAMILY DISTRIBUTION AND INCOME FOR INYO COUNTY

Inyo County	
2010 Households	1,748
2010 Percentage of Population in Civilian Workforce	58.7%
Median Household Income	$40,182
Unemployment Rate	3.0%
Average Household Size	2.16

Source: Census Bureau 2010

4.11.4 Project Vicinity Employment Sources

Inyo County is within California's Eastern Sierra Economic Sub-Market region as defined by the State of California Employment Development Department. The top five industry clusters in this market by number of employment projections are:

1. hospitality and tourism,
2. retail,
3. health care services,
4. construction materials and services, and
5. education and training (EDD 2015).

4.11.5 Potential Adverse Effects and Issues

SCE's review of readily available information, and early consultation with interested parties have not identified socioeconomic impacts of continued operation of the Project. The presence of the reservoirs and associated recreation facilities provides ongoing economic opportunities to concessionaires and SCE's continued funding of the put-take fishery (Article 114) enhances the local economy through fishing opportunities. As recreational use in the area continues to expand, Project-related facilities may exceed current capacity in the next license term.

4.11.6 Proposed Mitigation and Enhancement Measures

SCE anticipates continuing with the PME's identified above in the new license. Although no additional mitigation or enhancement measures relating to socioeconomic resources are planned at this time, SCE plans to evaluate the issues identified above as part of the relicensing Study Plan, and in consultation with stakeholders. Should any major socioeconomic changes be planned as part of the Project, appropriate BMPs to minimize effects on socioeconomic resources will be implemented; however, no changes are proposed at this time.

4.11.7 References

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4.12 TRIBAL RESOURCES [§ 5.6 (D)(3)(XII)]

Information about Tribal Resources and Native American tribes known to have cultural interests in the vicinity of the Project, FERC Project No. 1394, are presented in this section. There is also a discussion about Tribal lands and/or resources that could be affected by operation and maintenance of the Project, including Native American TCPs, which are discussed later in this document. FERC's content requirements for this section are specified in Title 18 of the CFR §5.6(d)(3)(xii):

> (A) Identification of how existing Project construction and operations, and their affects (on water resources, fish and aquatic resources, wildlife and botanical resources, wetland, rare species, recreation and land use, aesthetic resources, cultural resources and socioeconomic resources) may impact tribal cultural or economic interests
>
> (B) Identify other impacts of existing projects on Indian tribes

Information presented in this section was collected from ethnographic and other data and represents the type of resources that may be important to local Tribes. Tribal consultation, background research, and ethnographic interviews will be used to provide information and ensure all Tribal interests and concerns are identified and addressed.

4.12.1 Overview

The Project is located within the far northern portion of Owens Valley and the eastern edge of the central Sierra Nevada, near Bishop, in Inyo County, California. This area is claimed by two related but different groups: the Numu, or Northern Paiute, whose territory extends southerly to Round Valley near Bishop, and the Owens Valley Paiute whose territory begins near the headwaters of and spans the Owens River extending into Mono County to Owens Lake in the south. Both groups speak a version of Western Numic and share strong genealogical and cultural traits with western Sierra Nevada Native Americans (Fowler and Liljeblad 1986; Liljeblad and Fowler 1986).

The Bishop area today is an arid environment with characteristic hot summers, cold and windy winters and relatively low rainfall, but the Project area is significantly cooler, with greater precipitation as a result of the rain-shadow effect caused by the Sierra Nevada. Snow in the area is common during the winter months which generally span October to April. There is some precipitation in the summer as a result of afternoon and evening thunderstorms. Prior to contact more than 200 years ago, some believe this area was culturally modified by Native Americans to divert water from the melting snowcapped mountains to the valley floor. Water was channeled and manipulated through a series of ditched dams that led to wild seed plots, especially in Owens Valley proper. Irrigation of these natural resources alternated between northern and southern plots every other year to conserve soil fertility. Water, and the ability to irrigate these natural resources, were and are currently an important aspect in the Native American life styles (Kroeber 1908; Steward 1933).

Native Americans in the Project region lived in semi-permanent seasonal villages. After a long winter, forays into the Volcanic Tablelands north of Bishop occurred when the critically-important geophytes (plants with an underground storage organ) emerged. As the snow melted and plants manifest themselves, people from the valley would venture into the foothills of the eastern Sierra to gather and hunt. During the summer, the elderly and children often remained in valley villages, while others traveled to various surrounding locations in search of medicine plants, seeds, game, kutsavi, salt, raw materials, and numerous other resources. In fall, pinyon pine nuts and jackrabbits were harvested by large groups of people, while others gathered taboose (ground nut, *Cyperus esculentus*) that had been irrigated. Often such locations would have specific camps for the summer activities. People relied upon stored taboose, pine nuts and acorns in particular during the winter. Pine nuts were often stored in granaries built in colder locations, so the nuts would not mold or decay.

Owens Valley was geographically organized into communally-owned cultural districts, with three districts relevant to this Project: *pitana patü*, with a territory up to the Owens River and Volcanic Tableland and including Bishop Creek; the *ütü'ütü witü*, who may have had hunting rights in the area, and the *kwina pati*, whose hunting area may also have extended towards the Project (Steward 1933). A large wild seed land (*wai*) was located near Fish Slough in the Volcanic Tableland and was apparently “owned” by the *pitana patü*; several pictographs also have been located there (Steward 1933). Numerous Native Americans in the area still gather at the wild seed land, and have identified that as an important locale.

Anthropologist Julian Steward (1933) created a map with the location of several ethnographically-important places in Owens Valley. The map categorized places and resources into ten groups: village or camps, irrigation ditches used to move water, irrigated land used to cultivate natural resources, trails, wild seed lands, hunting territories, marshes, cemeteries, springs, and salt flats. On his map, Steward indicates two named places near the Project area: a campsite at North Lake, and a place name for the first night's camp on the journey across the Sierra. These two places provide a glimpse into the types of resources that may be found in the Project area; camps and trails. Nearby, recorded in at least two ancestral stories, is the birth location of the Northern Paiute (Herbert et al. 2015), and there are references to Bishop Creek refugee camps found on pre-contact village sites. A number of gathering and hunting locales are in the area, and these, along with the places discussed above will be investigated and considered sensitive.

4.12.2 Tribal lands and Interests

No Tribal trust lands are located within the Project boundary, but the Bishop Paiute Reservation is located approximately two miles northwest of the eastern extent of the Project. To date, no interviews or specific resources of Tribal interest have been identified within the Project boundary. Previous research by Davis-King (2006, 2010; Herbert et al. 2015) suggests that there are a number of places anticipated in or near the Project boundary/study area, including numerous prehistoric and historic archaeological sites. Tribes are of aware resources, some of which are currently employed such as gathering areas, and others which remain part of the tribal story. Archaeological sites identified along Bishop Creek and nearby consist of a variety of features, including bedrock milling stations and grinding slicks, rock circles and cairns, seasonal camps, and rock shelters. A complete list of Tribal concerns or interests will be generated during Tribal outreach and interviews.

4.12.3 Tribal Groups

Initial investigations regarding Native American tribes that may have an interest in the Project study area indicate nine federally-recognized Native American tribes and at least two federally unrecognized groups. All of the groups identified to date will be contacted during the Project.

Federally Recognized Groups

- Big Pine Paiute Tribe of Owens Valley
- Bishop Paiute Tribe
- Bridgeport Paiute Indian Colony
- Fort Independence Community of Paiute Indians
- Lone Pine Paiute-Shoshone Tribe
- Timbisha Shoshone Tribe
- Twenty Nine Palms Band of Mission Indians
- Utu Utu Gwaitu Paiute Tribe of the Benton Paiute Reservation
- Walker River Paiute Tribe

Other Native American Groups

- Kern Valley Indian Community
- Mono Lake Kutzadika'a Paiute Indian Community

4.12.4 Cultural Resource Management

During the previous relicensing effort, SCE prepared a CRMP for the Project (White 1989), although no ethnographic research or tribal outreach appears to have been part of that earlier effort. Investigation of background materials at SCE has not revealed a Native American background investigation or overview, or any specific tribal concerns. The CRMP identifies specific measures undertaken by SCE to avoid adverse impacts to the NRHP-eligible properties located within the Project boundary and various programmatic measures that SCE is required to implement. This is described in the Cultural Resources section of the PAD. One measure requires SCE to conduct resource monitoring and documentation of the nine eligible archaeological sites within the Project boundary in three to five year increments to determine the success of protective measures and to evaluate the need for additional treatments to protect the NRHP-eligible properties (CA-INY-468/469/H, P-14-003448, P-14-003450, P-14---3458, P-14-003461, CA-INY-3462/H, CAINY-3463, CA-INY-3464, and P-14-003473). Monitoring has been conducted according to plan with the site records updated to reflect their current condition. Several other projects have been conducted within the APE as the result of a need to conduct cultural resource inventories and/or evaluations as a result of activities related to O&M activities within the Project APE. These studies are listed in Table 4-59.

4.12.5 Potential Adverse Effects and Issues

SCE's review of readily available information has not identified impacts to Tribal resources in the Project area as no specific Tribal resources have yet been identified. The Bishop Paiute Tribe identified a concern regarding cumulative impacts of development and water management in Owens Valley on harvesting of traditional plants, but there appears to be no direct impacts from the Project.

4.12.6 Proposed Mitigation and Enhancement Measures

No additional mitigation or enhancement measures relating Tribal resources are planned at this time. SCE plans to evaluate this issue as part of the relicensing Study Plan, and in consultation with stakeholders. Should any major changes be planned for the Project, appropriate BMPs to minimalize effects on Tribal resources would be implemented.

4.12.7 References

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