3.2.9 Cultural Resources

The section discusses cultural resources potentially affected by the Project. Known cultural resources are discussed in Section 3.2.9.1.1, based on the results of YCWA's records search with the North Central Information Center (NCIC) and surveys within the FERC Project Boundary. Section 3.2.9.1.2 provides an overview of the prehistoric, ethno-historic/ethnographic, and historic settings for the Project that have been developed from YCWA's background research.

3.2.9.1 Affected Environment

3.2.9.1.1 Known Cultural Resources

YCWA requested the records search from the NCIC on April 24, 2020. The records search included the 2.92-ac FERC Project Boundary and 0.25-mile wide buffer around the FERC Project Boundary to provide a broad understanding of the historic context (i.e., the prehistory and history of the area) of the area within the FERC Project Boundary. Together, these areas are referred to as the "Initial Cultural Data Gathering Area." The record search included a review of cultural resources records, previously conducted cultural resources investigations, historic maps, the National Register of Historic Places (NRHP), the California Register of Historical Resources (CRHR), *California State Historic Landmarks* (CDPR 1996), *California Inventory of Historic Resources* (CDPR 1976), the California Points of Historic Interest listing (http://ohp.parks.ca.gov/listedresources/), the Directory of Properties in the Historic Property Data File (OHP current computer list dated March 20, 2014), and the Archaeological Determinations of Eligibility (ADOE) (OHP current computer list dated April 4, 2012), and other pertinent historic data available at the NCIC for Nevada County. The results of the records search were provided by the NCIC on May 5, 2020, and are summarized below, inclusive of any NRHP or CRHR eligibility determinations that may have been completed, and historic-period features that have been identified on historic maps that could still be present with in the FERC Project Boundary.

Previous Cultural Resources Investigations

The record search identified one previous cultural resources investigation that extended to the FERC Project Boundary and eight previous investigations in surrounding 0.25-mile wide buffer area (Table 3.2.9-1). The previous investigations occurred between 1978 and 2019, and were conducted for a variety of different undertakings, include FERC relicensing efforts for the nearby Yuba River Development Project, hydroelectric proposal efforts, and prescribed burning.

Table 3.2.9-1. Previous cultural resources investigations within the Initial Cultural Data Gathering Area.

Year	Author	NCIC Report #	Report Title	Study Type	Within FERC Project Boundary	Within 0.25-mile Buffer Area
1978	Johnson, Jerald J. and Dorothea J. Theodoratus	000048	*Cultural Resources of the Marysville Lake, California Project (Parks Bar Site), Yuba and Nevada Counties, California.*	Ethnohistory, Archaeological Survey	No	Yes

Table 3.2.9-1. (continued)

Year	Author	NCIC Report #	Report Title	Study Type	Within FERC Project Boundary	Within 0.25-mile Buffer Area
1989	Johnson, Jerald Jay	000048B	*Evaluation of Various Yuba River Reservoir Alternatives in regards to Prehistoric Cultural Resources.*	Archaeological Study	No	Yes
1989	Wickstrom, C. Kristina Roer, Clinton M. Blount, Thomas L. Jackson, Dian E. Self, and Dorothea J. Theodoratus.	000048A	*Historical Overview Yuba River Basin Project Alternatives.*	Archaeological Study, Historic Architectural Study	No	Yes
2001	Keenan, Kelly C.	002756	*U.S. Field Station Vegetation Management Plan.*	Archaeological Survey	No	Yes
2007	Compas, Lynn and April Van Wyke	008665	*Cultural Resources Inventory and National Register Evaluation of the Narrows Substation Transformer Bank Installation Narrows Hydroelectric System (FERC No. 1403), Nevada County, California.*	Archaeological Survey, NRHP Evaluation	No	Yes
2012	Grijalva, Daniel	11306	*Cultural Resources Inventory Report Project Number: 749104124XN.*	Archaeological Survey	No	Yes
2014	Ramsey Ford, Dawn, Kevin (Lex) Palmer, Koren Tippett, Sandy S. Flint, Michael Madson, Scott Baxter, Kathy Anderson, Clinton Blount, and Thomas Greenhouse	11567	*Cultural Resources Inventory, National Register of Historic Places Evaluations, and Finding of Effect for the Yuba River Development Project Relicensing, Nevada, Yuba, and Sierra Counties, California (FERC No. 2246).*	Archaeological Survey, Historic Architectural Study, NRHP Evaluations, Finding of Effects	No	Yes
2018	Blount, Clinton	12612	*Supplement to the Ethnographic, Ethnohistoric, and Traditional Cultural Property Study for the Yuba River Development Project Relicensing FERC No. 2246.*	Traditional Cultural Properties Study	No	Yes
2019	Kraus, Geneva	12882	*Englebright Lake, Yuba and Nevada Counties, California, Section 110 Cultural Resources Inventory.*	Archaeological Survey, Historic Architectural Study	Yes	No

Previously Recorded Cultural Resources

Within the FERC Project Boundary, the records search identified no known archaeological sites and one historical built-environment resource, the Narrows 1 Powerhouse and associated features (P-29-000250). Within the 0.25-mile buffer are eight previously documented cultural resources, including two prehistoric archaeological sites, five historic-era built-environment resources, and one historic district comprised of built-environment resources. The prehistoric resources contain bedrock milling features, one of which (P-58-000425) could not be relocated during a 2018 survey. Neither of the archaeological sites has been evaluated for the NRHP. The five historic-period built-environment resources identified in the records search are associated with the Yuba River Development Project, and resources associated with Englebright Dam (Englebright Dam and Englebright Park Office). One built-environment resource have been evaluated as NRHP-eligible, the Englebright Dam (P-29-4559/P-58-0711), and four others have been evaluated as not NRHP eligible (P-29-002988/CA-NEV-1814H; P-29-004797, P-58-002705, P-58-003308, and P-58-003309). Two historical built-environment resources have not been evaluated for their potential listing on the NRHP. All of the cultural resources identified in the records search are shown in Table 3.2.9-2.

Table 3.2.9-2. Previously recorded cultural resources within the Initial Cultural Data Gathering Area.

Site Number (Primary No. / Trinomial)	Recorder And Year	Description	NRHP Status	Within FERC Project Boundary	Within 0.25-Mile Buffer Area
ARCHAEOLOGICAL SITES					
P-29-000189/ CA-NEV-0131	Smith, Givens, and Storm 1974	Prehistoric: Bedrock mortar site, two cups	Unevaluated	No	Yes
P-58-000425/ CA-YUB-0407	Kraus 2018	Prehistoric: Bedrock mortar site, one cup. Originally recorded 1975, not relocated in 2018	Unevaluated	No	Yes
HISTORICAL BUILT-ENVIRONMENT RESOURCES					
P-29-000250/ CA-NEV-0192H	Darcangelo and Smirnoff 2016	Narrows 1 Powerhouse, constructed by PG&E between 1942 and 1945	Unevaluated	Yes	No
P-29-002988/ CA-NEV-1814H	Van Wyke, Texier, and McCarthy-Reid 2007	Historic construction/ maintenance camp associated with Narrows 1 Powerhouse (P-29-0250)	Ineligible	No	Yes
P-29-004559 / P-58-000711 / CA-YUB-0693H	Ivie 2018	Englebright Dam, constructed by the USACE[1] between 1938 and 1941	Eligible	No	Yes
P-29-004797	Ivie 2018	Englebright Park Office, constructed circa 1957	Ineligible	No	Yes
P-58-002705	Baxter 2011	Narrows 2 Powerhouse, constructed by YCWA in 1970.	Unevaluated	No	Yes
P-58-003308	Gratreak 2019	Narrows 2 Penstock/ Power Tunnel, constructed between 1968 and 1969	Ineligible	No	Yes
P-58-003309	Gratreak 2019	Yuba River Development Project Historic District	Ineligible	No	Yes

[1] USACE - United States Army Corp of Engineers

Potential Historic-Era Resources Identified on Historic-Period Maps

Historic-period USGS topographic quadrangles and General Land Office (GLO) plats were reviewed during the records search to identify locations of potential historic-era sites and features that may still be present within the Initial Data Gathering Area (Table 3.2.9-3). The only features identified on the historic maps are the Project features, consisting of the Narrows 1 Powerhouse, tram, and two structures. The earliest these features show up on the maps is 1949.

Table 3.2.9-3. Historic-period maps reviewed within the Initial Cultural Data Gathering Area.

USGS Quadrangle Map	Map Date	Within FERC Project Boundary[1]	Within 0.25-Mile Buffer Area
Smartville, CA, 7.5-minute USGS Quadrangle	1949	Powerhouse, "Tramline", one structure (presumably the tramhouse)	Englebright Dam, Englebright Reservoir, gaging station, transmission line, two structures, one improved road
Wheatland, CA, 15-minute USGS Quadrangle	1949	Powerhouse, tramline, two structures	Englebright Dam, Englebright Reservoir, spillway, transmission line, two structures, one improved road, one unimproved road
Township 16N, Range 6E GLO Plat	1867	No features	No features
County Map of Nevada, CA	1909	No features	No features

[1] Some features are referenced on multiple maps.

YCWA's Recent Cultural Surveys Within the FERC Project Boundary

Archeological Survey

YCWA completed a field archeological inventory within the FERC Project Boundary on May 21, 2020. The field survey was completed by HDR Archaeologist, Kamil Rochon, B.S. Anthropology, under the direction of HDR Cultural Resources Manager, Sandy Flint, M.A., Anthropology, a Secretary of the Interior (SOI) qualified archaeologist. The survey included all accessible lands within the FERC Project Boundary; however, some of the lands could not be accessed safely due to steep slopes and unstable rock and, were therefore, not included in the field survey. Lands within the FERC Project Boundary that were safely accessible extended from the Project tramline, around the powerhouse below, and around the standpipe near the powerhouse. No archaeological sites are located within the FERC Project Boundary. (Flint, Gratreak, Rochon, and Schwartz 2020.)

Historical Built-Environment Survey

YCWA completed a field survey for the built-environment resources within the FERC Project Boundary on August 12 and 13, 2020. The field survey was completed by HDR Architectural Historian, Leesa Gratreak, M.S., Historic Preservation, who meets the SOI Professional Qualification Standards in architectural history. The survey included an in-person review of all built-environment resources located within the FERC Project Boundary, including the tramway and hoist house, penstock, tunnel connection point with the penstock (only above-ground portion visible), and the powerhouse.

The fieldwork recordation included all resources (e.g., buildings and structures) 45 years of age or older located within the FERC Project Boundary that are covered under the FERC license for the facility. Identified resources were recorded or re-recorded to meet current OHP standards for documentation (OHP 1995). Digital color photography and sketch maps were used to document individual features that show the relationship between buildings and structures. The resources identified within the FERC Project Boundary were assessed for their potential eligibility for listing in the NRHP individually as well as for their eligibility as contributing properties to a potential NRHP-eligible historic district.

Archival research was used to prepare the resources-specific historic context by which evaluations for eligibility to the NRHP were completed for the historical built-environment resources. Archival research was conducted at the YCWA main office at the Colgate Powerplant on August 12, 2020. At that time, HDR staff reviewed all available historical documentation regarding the construction and development of the Project and all alterations documented over the life of the Project. Additional research was conducted electronically, including historic aerials, historic maps, a review of previous cultural resources documentation within the vicinity, and a thorough review of California newspaper sources (CaliforniaNewspapers.com).

Four historical built-environment resources were identified and recorded within the FERC Project Boundary. Each of the four individual components of the Project is listed below in Table 3.2.9-4, including its recommended NRHP eligibility. (Flint, Gratreak, Rochon, and Schwartz 2020.)

Table 3.2.9-4. Summary of eligibility of Narrows Hydroelectric Project historical built-environment resources within FERC Project Boundary.

Building / Structure Field Designation	Site Number (Primary No. / Trinomial)	NRHP Eligibility[1]
Narrows 1 Powerhouse	P-29-000250/ CA-NEV-0192H	Not Eligible
Narrows 1 Tramway and Hoist House	P-29-000250/ CA-NEV-0192H	Not Eligible
Narrows 1 Penstock	P-29-000250/ CA-NEV-0192H	Not Eligible
Narrows 1 Tunnel	P-29-000250/ CA-NEV-0192H	Not Eligible

[1] Note: Pending consultation and SHPO concurrence

As a result of the analysis, it is recommended that all four of the Project facilities are ineligible for listing in the NRHP individually due to a lack of sufficient significance and/or integrity. Those include the Narrows 1 Powerhouse, the Narrows 1 Tramway and Hoist House, the Narrows 1 Penstock, and the Narrows 1 Tunnel. Pending SHPO concurrence, these four resources require no further consideration during relicensing because they do not meet the NRHP criteria as historic properties.

The Project as a whole, and all four resources evaluated collectively as part of it, were also reviewed for potential national historic district eligibility. Due to a lack of sufficient significance, the Project facilities as a whole are also recommended ineligible for listing as a potential NRHP Historic District. As above, pending SHPO concurrence, these four resources considered as an historic district require no further consideration during relicensing.

Three historical built environment resources located within the FERC Project Boundary were not considered under YCWA's investigation because they are: 1) not part of the Project; 2) owned, maintained, and operated by organizations other than YCWA; and 3) do not support the Project operations in any way, and are not affected by Project activities. Thus, those facilities were not documented on DPR inventory forms, and were not assessed for their historic significance or integrity. Table 3.2.9-5 lists these features.

Table 3.2.9-5. Built-Environment Resources Not Considered in the Study

Facility Name	Description
Non-Project Communication Line	Communication line running between the Narrows 1 Powerhouse, the non-project substation (not located in APE), and the Englebright Dam headworks (non-project and not located in APE).
Non-Project 11kV Transmission Line	11 kV transmission line running between the Narrows 1 Powerhouse and the non-project substation (not located in APE).
Non-Project Narrows-Smartsville 60kV Transmission Line	60kV transmission line that crosses above the Narrows Tunnel (while underground) and connects to the Narrows 2 Powerhouse (non-project and not located in APE).

3.2.9.1.2 Prehistoric, Ethnographic/Ethnohistoric and Historic Settings

The prehistoric and historic context was developed primarily from existing, relevant, and readily available information found in YCWA's library for work conducted on the Yuba River Development Project, which is located immediately upstream of the Project (Blount et al. 2013 and Ramsey Ford et al. 2014). Other references are cited throughout the historic context.

Prehistory

The Project is located in the Sierra Nevada mountain range in California, an area located at the interface between the Great Basin and Great Valley cultural areas. Several cultural chronologies have been developed for pre-contact archaeological sites for this region (including, but not limited to Humphreys 1969; Jackson and Ballard 1999; Jones 1982; Moratto 2004; and Rosenthal *et al*. 2002), but few have been developed for the western slopes of the Sierra Nevada. The existing cultural chronologies were assessed by Rosenthal (2002 and 2008), who found that, to a great extent, the existing cultural chronologies for the Sierra continue to be tied to typological chronologies established for the Great Basin and the Central Valley of California, despite growing criticism of the results, which are often less than fully satisfactory. For purposes of this discussion, the prehistoric context related to the Project relies on the cultural chronology presented by Ford *et al*. (2014), as developed by Jackson and Ballard (1999) and Rosenthal *et al*. (2002), which considers data sources for the Sierra Nevada. This chronology divides the prehistoric cultural sequence into six periods, as discussed below.

<u>Late Pleistocene/Younger Dryas/Recess Peak Advance – Paleoindian (15,000 to 10,000 B.P.)</u>
The Clovis culture currently is identified in North America as occurring between approximately 13,500 to 13,000 years ago. The acquisition of date ranges for Clovis culture from current literature is fraught with confusion due to a plethora of alternative dating schemes and dating methods. The cultural pattern is distinguished by "fluted" projectile points, percussion blades, and other distinctive artifact. Very few Clovis sites have been identified in North America. The Clovis culture, which is the earliest well documented cultural expression in the Americas, is linked to the medial part of this time period, circa (ca.) 13,500 to 13,000 B.P. No diagnostic Clovis artifacts, which are distinguished by "fluting" of the proximal portion of both faces of projectile points and possible other tools, have been found in the Initial Cultural Data Gathering Area. However, a fluted point was found at Lake Almanor, located approximately 100 miles north of Plumas County (Kowta 1988). Fluted point fragments and complete specimens, typically isolated, are known from scattered locations throughout much of the Sierra Nevada (Rondeau and Dougherty 2009). Unfortunately, few are from dated contexts.

<u>Terminal Pleistocene/Initial Holocene (ca. 10,000 B.P.)</u>
The transition between the Pleistocene and Holocene occurred 10,000 years ago during a climatic warming period that peaked 9,000 years ago. The Holocene represents the latest interglacial event, marked by the retreat of Pleistocene glaciers (West *et al*. 2007). Complete glacial retreat had likely occurred in the Sierra Nevada by 12,000 to 13,000 years ago, leading to increased aridity and lower lake levels. Climatic conditions led to a change in the vegetative composition of the area, with incense cedar and oak specimens dominating the forests previously composed of pines (West *et al*. 2007). Cultural evidence from this era in the Sierra Nevada is scant, but comparatively well established. Lindstrom *et al*. (2007) note that the Pre-Archaic/Tahoe Reach phase marked by large stemmed points resembling weapons from the Great Basin form this era occurred in the Truckee vicinity. Recently obtained obsidian hydration readings from throughout the Truckee vicinity provide evidence of human occupation during the Late Pleistocene to Early Holocene (Waechter and Bloomer 2009).

Early Holocene – Late Paleoindian (ca. 10,000 to 1,000 B.P.)

By the Early Holocene, evidence from numerous archaeological sites throughout the state show that California was fully explored by this time and supported a significant population. The regional climate was distinguished by a steady warming and drying trend, or a period of "relative warming…" (c.f. Lindstrom *et al*. 2007). In the Truckee area, the Alder Hill basalt quarry was actively used to procure toolstone. McGuire *et al*. (2006) recovered Great Basin stemmed points, datable carbon, and obsidian that indicate the Alder Hill Quarry was being visited by the Early Holocene for the procurement of toolstone. Lindstrom *et al*. (2007) also note that at site CA-ELD180, Great Basin stemmed points were recovered, some of which likely had their origins in the western Sierra foothills, which had been manufactured from a broad range of materials, indicating considerable mobility or at least portions of the human population. In yet other areas, such as the western Sierra foothills in Calaveras County, there is evidence of extremely stable land use. For example, evidence shows continued use of the Skyrocket site over a span of approximately 2,500 years during the Early Holocene (Fagan 2003).

Middle Holocene – Early Archaic (ca. 8,000 to 5,000 B.P.)

The Middle Holocene is poorly represented archaeologically throughout California. Lindstrom *et al*. (2007) remark on this issue, speculating that several factors may obscure Middle Holocene contexts. Warming conditions arising during the early Holocene evidently continued into the Middle Holocene. In the Tahoe region, Lindstrom *et al*. (2007) cite an extensive list of studies, all of which have concluded that the Middle Holocene was the warmest period in recent geological history and one of the driest periods, at least in North America. Levels in Lake Tahoe may at times have fallen sufficiently low to isolate the lake from the Truckee River. Lindstrom *et al*. (2007) note evidence of a drought period estimated to have lasted approximately 250 years between about 6,300 and 4,850 B.P. Effects of these changes farther west are not well documented. Again, at the Skyrocket site in Calaveras County, evidence of occupation diminishes but is never fully interrupted (Fagan 2003). McGuire (2007) notes that Early Archaic deposits may be more difficult to recognize due to a large degree of variability in local traits and the lack of a single projectile point chronology that can be used to identify temporally diagnostic artifacts.

Late Holocene – Middle Archaic (5,000 to 2,000 B.P.)

The beginning of the Late Holocene is marked by climatic shifts towards a more temperate regime and the first well documented archaeological cultures in central and northern California. In the Sacramento-San Joaquin Delta region, the Windmiller culture emerged with unique traits, including an unusual mortuary pattern marked by prone internments with crania oriented in a westerly direction (Morrato 2004). In the Truckee vicinity and portions of the neighboring western High Sierra, the Martis Complex – marked by typological affiliations with the Great Basin and a preference for locally abundant basalt – was identified by Heizer and Elsasser (1953), Elsasser (1960), and Moratto (2004). The Martis complex is visible primarily through a proliferation of large basalt biface tools, as well as a large distribution of lithic reduction debris (Kowta 1988; McGuire 2007). Sierran basalt was also being used further west in the Central Valley, suggesting an east-west oriented settlement system that took advantage of lowland and upland resources (McGuire 2007). Less prolifically utilized materials include local metamorphic rock, chert, slate, and schist. Several Sierran sites have also yielded obsidian materials that have been sourced to a wide range of areas including North Coast Range and Bodie Hills obsidians

(Justice 2002). The Martis complex is well-represented near the Project at sites such as CA-NEV-15, CA-NEV-67, CA-PLA-6, and CA-SIE-20 (Elsasser 1960).

To the west and north of the Project, the Messilla Complex was defined at three sites in Butte County (Moratto 2004). Following arguments of earlier investigators (Elsasser 1978; Ritter 1970a.b: Ritter 1970c) including studies for the proposed Auburn Dam and Bullards Bar reservoirs, Moratto (2004) suggests that Martis may reflect ancestral Maiduan prehistory. A three-stage Bullards Bar cultural complex was identified by Humphreys (1969) that appears to follow the same typological progression as the Martis to Kings Beach and Mesilla to Sweetwater cultural phases from Lake Tahoe and Lake Oroville respectively. The Bullards Bar I-III phases are characterized by a shift from large to small projectile points (Moratto 2004). Based on obsidian hydration analysis, the earliest period, Bullards Bar I, dates from approximately 5,275 (+/-342) B.P. to 3041 (+/-170) B.P. (Humphreys 1969). This period is represented primarily by use of handstones and milling slabs and a large number of projectile points and scarpers. Obsidian, basalt, chert, and petrified wood were the primary stones used for tool manufacture, with basalt the dominant material find in this period. Ochre is also prominent at this time. A portion of the Bullards Bar II period defined by Humphreys (1969) also occurs at this time, based on obsidian hydration dates of 2,400 B.P. Bullards Bar II is expressed by the introduction of steatite artifacts into the archaeological records and a sparse number of projectile points, including Gunther series points, dominated by chert toolstone (Humphreys 1969). Ochre was still used, but to a lesser degree than encountered during the Bullards Bar I period (Humphreys 1969).

What is evident from the available archaeological information is that the Middle Archaic people of the Sierra Nevada show clear influences from both the Great Basin and central California. However, the archaeological remains cannot as yet be reliably attributed to historically-encountered ethnographic groups.

<u>Late Holocene – Late Archaic and Emergent (2,000 to 200 B.P.)</u>

With the Late Archaic, the lack of discernable relationships between archaeological complexes and the known material cultures of ethnographic Californian populations end. In the High Sierra, the Martis Complex gives way to the Kings Beach Complex; in the west, analogous changes occur as the Middle Horizon is replaced by early Augustine Pattern settlements. In the west, important subsistence changes take place, as the acorn emerges as a clearly important staple; a process marked by a proliferation of the use of bedrock mortars. The bow appears as the preeminent weapon, marked archaeologically by an abrupt reduction in projectile point size and a significant increase in the number of point in use. In the High Sierra, the bow also appears in the Kings Beach Complex, and preferred materials for weapon tips change from basalt to microcrystalline silicate materials, typically taking the form of Rose Springs and Gunther barbed arrow points (McGuire 2007; Moratto 2004). The Sierra Contracting Stem cluster is another Martis Complex point variation that emerges in the Late Archaic. This type is typically formed of local basalt sources, with a wide distribution throughout central California that is concentrated in the Sierras around Lake Tahoe (Justice 2002).

Typologically, the projectile points of the western slopes differentiate themselves from the east. To the west, the arrow tip is characteristically dominated by a small contracting-stemmed or corner-notched point, manufactured of local materials and harking typologically back in time to Martis contracting-stemmed points and perhaps west and north of the Gunther Series points of northwest California (Dougherty 1990; Jackson and Ballard 1999; Ritter 1970a). In contrast, the functionally equivalent chipped stone artifacts of the Kings Beach Complex associate typologically with Great Basin forms, including Eastgate and Rose Springs (Moratto 2004).

A portion of the Bullards Bar II period occurs at this time and is dated to 1,000 B.P. and 434 B.P (Humphreys 1969). Projectile points are represented by Desert Side-Notched and triangular series manufactured from cherts and petrified wood (Humphreys 1969). Scrapers are also a common flaked stone tool at this time and bedrock mortar technology is common (Humphreys 1969).

Ethnography and Ethnohistory

<u>Language, Geography and Demography</u>
The Project is within the territory of the Nisenan, otherwise known as the Southern Maidu or Valley Maidu. Together with the northeastern Maidu and Konkow, they formed one of the three principal branches of the Maiduan linguistic group, which is part of the larger Penutian language family. The Nisenan spoke the southernmost branch of the Maiduan language.

According to Kroeber (1925:393), these three languages (Nisenan, Maidu and Konkow) were of sufficient divergence as to constitute three separate languages, though languages sharing many word similarities. Nisenan was further subdivided into a number of dialects. Wilson and Towne (1978:387), apparently quoting Kroeber (1925:393), put the number at three: Northern Hill Nisenan, Southern Hill Nisenan and Valley Nisenan. However, a careful reading of Kroeber puts Wilson and Towne’s interpretation in doubt. Contrary to Wilson and Towne, Kroeber (1925:393) is not specific on the number of Nisenan dialects, noting:

> In this vast tract there are almost certain to have been divergences of idiom between the north and south, as well as between those divisions living actually on the Sacramento and those at the upper limit of habitation in the mountains. The available vocabularies indicate that these presumptive differences must have been actual; but again the data on which it is possible to build are too unsystematic to allow of either classification or mapping.

It is not entirely clear where in Kroeber (1925) Wilson and Town received their information for three distinct Nisenan dialects. The above passage seems to imply at least four dialects in Nisenan territory, though Kroeber makes it clear that even this conclusion is based on too few data, and at the very least should be looked upon with caution. Nor in Kroeber’s later work, the Valley Nisenan (1929), does he specify any dialects, though he does distinguish between what he calls a hill Nisenan and valley Nisenan (Kroeber 1929).

Beals (1933), by contrast, who produced the most comprehensive ethnography on the Nisenan, mentions at least four dialectic divisions, writing:

> Viewed from the standpoint of linguistic differences there were probably four main groupings although apparently every political unit showed slight dialectic differences. The valley people again should be set apart, while the hill and mountain people were separated into three groups by two east-west lines indicating sharper breaks than existed between political groupings. One of these was somewhere in the neighborhood of the Bear River [sic]. Another must have been approximately along the middle fork of the American River [sic]. It is impossible to locate them exactly as the people in many of the intervening regions have vanished. This division is based largely on the statements of surviving Indians at such places as Nevada City, Auburn, Colfax, and Placerville.

In still another interpretation of the Nisenan language and its various dialects, linguist Andrew Eatough (1999) argues for a total of at least five different dialects, though he is uncertain about the exact number during pre-contact times. He writes:

> There were clearly a number of quite distinct Nisenan dialects. Precisely how many once existed is not known, but at the very least we can distinguish Northern Hill…North Central Hill or Nevada City Nisenan…Central Hill or Auburn Nisenan…Southern Hill…and Valley Nisenan.

These contradictory interpretations regarding dialects underscore the near total disintegration of the Nisenan, as a result of contact with Euro-Americans beginning in the early- and mid-1800s.

At the time of the earliest historic contact, the Nisenan occupied a portion of northeastern California that since Euro-American times has traditionally been known as the "Gold Country," an area bordering the Sacramento River to the west and the Sierra Nevada mountain range to the east. The region includes parts of the modern counties of Yuba, Nevada, Placer, Sacramento, and El Dorado. From north to south, their territory encompassed an area from either the North Yuba River or the southern fork of the Feather River down to the Cosumnes River (Wilson and Towne 1978; Littlejohn 1928). The northern boundary has traditionally been difficult to define as it appears to have been a zone where the Nisenan's northern neighbors, the Konkow, mingled linguistically and culturally with the Nisenan. On the southern bank of the Cosumnes River lived the eastern branch of the Miwok, while just to the west were the Patwin. Ecologically, Nisenan territory encompassed a region characterized by flat river bottomland along the Sacramento River to the Sierra Nevada divide (10,000-foot and 12,000-foot elevation, respectively). Between these two extremes were the gradually ascending Sierra foothills, an environment consisting of, among other species, scattered oaks (especially interior live oak and blue oak and California buckeye. These species were eventually superseded by gray pine and Ceanothus (*Ceanothus spp.*) in the higher elevations. At even higher elevations, sugar pines (*Pinus lambertiana*) and Ponderosa pine (*Pinus ponderosa*) are the dominant hardwood species. This region experienced dramatic fluctuations in climate and temperature. Summer months along the Sacramento River, for example, routinely reached into the high 90° and even 100°F, while the winter months in the high elevations experience snow, frost, and below-freezing temperatures.

Estimates of pre-contact Nisenan population size have been notoriously difficult to define (Beals 1933; Kroeber 1925), as much of their population had been decimated prior to the twentieth century. Kroeber (1925) argues for a total pre-contact Maidu population of 9,000, though he admitted the figure was decidedly liberal. However, by the time Kroeber and other ethnographers began to study the Nisenan in the early twentieth century, there were only a reported 1,100 Nisenan and those of mixed-Nisenan heritage. This dramatic decline in population was largely the result of events unleashed primarily by the California Gold Rush. The discovery of gold in the lands of the Nisenan and the subsequent contact between whites and Indians, much of which was of a violent nature, played a significant role not only in reducing overall Nisenan population numbers but also destroying the Nisenan as a viable culture. By the latter half of the nineteenth century, Nisenan population numbers were in dramatic decline, so much so that Powers (1877) observed:

> They [the Nisenan] had the misfortune to occupy the heart of the Sierra mining region, in consequence of which they have been miserably corrupted and destroyed. Indians in the mining districts, for reasons not necessary to specify, are always worse debauched than those in the agricultural regions.

<u>Subsistence</u>

The primary ethnographic sources on the Nisenan include Powers (1877), Faye (1923), Kroeber (1925, 1929), Littlejohn (1928), Gifford (1927), Beals (1933), Voegelin (1942), Uldall and Shipley (1966), Merriam (1967), and Wilson (1972). Collectively, these writers describe a hunter-gatherer society organized into the characteristic Californian “tribelet” (sensu Kroeber 1925) and living in small, semi-permanent villages within a more or less specified geographic territory. Like many native Californian groups, the Nisenan engaged in a seasonal round of food gathering, which included the exploitation of a wide range of natural occurring plants and animals. Edible resources were abundant in Nisenan territory year-round, though some (e.g., acorns and certain other plants) were acquired primarily during specific seasons. Beals (1933) notes that the Nisenan were exceedingly catholic in their choice of food, with very few edible resources avoided.

> Nearly all available foods were eaten. No insect or invertebrate is mentioned as having been avoided; or any edible plant. The Nisenan did specifically avoid eating the dog and the grizzly bear, possibly also the wolf, coyote, and reptiles. Birds known not to have been eaten were the buzzard, eagle, and northern pileated woodpecker.

In general, the division of labor in Nisenan society followed a pattern whereby men hunted and fished and women gathered, though both sexes were apparently involved in acorn and pine nut gathering. Terrestrial game such as deer, elk, antelope, bear, wildcat, rabbit and a wide variety of small and medium animals were consumed. Deer was a major staple for the Nisenan, usually stalked individually or in communal hunts (Beals 1933), the latter frequently involving the participation of several villages. Individual hunters stalked deer with bows and arrows, sometimes using deer-head decoys. Dogs frequently assisted this endeavor, and were greatly prized for their assistance in hunting. Bows were typically between 2 and 3 feet long, sinewbacked, and made of yew, while arrows were tipped with obsidian, basalt, or chalcedony points. A communal hunt, by contrast, was the primary way to acquire deer (Beals 1933). This activity usually involved several hunters driving the deer into enclosed areas where the animals were dispatched by the most skilled marksmen. Other times, especially during the fall, deer drives involved the use of fire. Brush was set alight and deer were driven into the center where they were killed. Occasionally, deer were also caught in snares. Once a deer was killed, it was butchered and the meat was stripped from the carcass. Usually long thin strips of meat were taken, though sometimes thin, flat pieces were cut from the strips. Individual pieces of meat were laid on willow stick racks to dry. In warm weather, it took about 24 hours for meat to dry (Wilson 1972). Deer hides were used for blankets or clothing or were sometimes used as mats on the floors of houses.

Bears were also hunted, an activity that usually occurred in the mountains. Bears were often taken while hibernating. Some bears were shot in their lairs while others were flushed out using burning oak logs and shot or speared to death. Grizzly bears, however, were greatly feared and strictly avoided.

Rabbits were typically hunted in large drives that took place in the spring. A 100-yard long net made of milkweed (Asclepias spp.) fiber or hemp was stretched across a specified area (Beals 1933). Sometimes several nets were joined together to form a barrier a mile long. During the drive, rabbits and other small game were driven into the net, entangled, and clubbed to death. A successful drive netted hundreds of rabbits. Rabbits were also hunted individually; they were driven out of burrows and were shot with arrows or beaten to death with sticks.

A variety of birds were hunted including quail, grouse, ducks, geese, and even blue jays, among others. Quail were especially prized; some men specialized in the hunting of quail almost to the exclusion of other activities. The birds were hunted using quail fences, which were low barriers between 8 and 9 inches in height and stretched diagonally up open hill slopes. The birds were flushed into the barrier, usually at night, with torches and dispatched. Women’s hair was also used for quail snares (Beals 1933; Faye 1923). Quail meat was either roasted or dried.

Fish formed a substantial part of the Nisenan diet, especially for those populations living along rivers and streams. They were acquired in a variety of ways – from hook and line to the use of natural poisons. Fishhooks were bi-pointed and typically made from the bones of rodents (Wilson 1972). Caught fish were gutted, the entrails discarded and then split down the back and laid open so the meat would not get spoiled. Trout were either eaten as soon as they were caught or dried. Women pounded the dried fish into a meal that was stored in baskets. Perhaps one of the most common ways of obtaining large catches of fish was through the use of poison. Soaproot (*Chlorogalum pomeridianum*) was pounded into a gelatinous mass and tossed into streams or pools. The men then waded into the water and stirred the soaproot so that it permeated the entire pool. Once the stunned fish floated to the surface, the men gathered them with their hands and tossed them to the women who stood on the bank (Wilson 1972). Fish were also taken with bone-pointed spears, dip nets, and weirs.

Insects such as grasshoppers, larvae, pupae, and ants were also eaten. Grasshoppers were considered a particular delicacy among the Nisenan (Wilson 1972), and, like rabbits, were obtained in large communal drives. These were gathered primarily in the summer when they were particularly abundant in meadows or similar areas with flat ground. To collect grasshoppers, a number of conically-shaped pits were excavated to a depth of about 3 feet. Several men and women formed a line or semi-circle and beat the grass with sticks, herding the insects before them and into the pits. Immediately the pits were covered with hide and a smoke bundle tossed under the hide and into the pit in order to kill the creatures. After a time, the grasshoppers were gathered, soaked, and cooked in earth ovens specially built for the occasion. The cooking process usually took several hours and grasshoppers were considered done when they were dry and crisp. The cooked grasshoppers were then crushed with handstones and milling slabs, winnowed in trays to remove the wings, and stored in baskets. Vegetal foods provided the most important sources of calories and carbohydrates for the Nisenan. Various nuts, seeds, roots, tubers, bulbs, acorns, berries, wild grapes, and other greens were gathered. However, the most important vegetal foods were acorns (Beals 1933; Wilson 1972). According to Beals (1933), between six or seven varieties of acorns were recognized by the Nisenan as suitable for consumption. The most prized acorn, however, belonged to the black oak. Acorn harvesting typically occurred during the fall when the acorns were ripe and the trees heavily laden. Trees that were known to provide lots of acorns were frequented over and over again and may have been owned by particular families (Beals 1933; Wilson 1972). Men climbed the trees and shook the branches, thereby dropping the acorns to the ground. The women gathered them up and put them in baskets. The acorns were shelled and then ground into a flour, the latter process facilitated by the use of either bedrock or portable mortars and pestles. The flour was winnowed in trays with the finer flour segregated from the coarser. After being ground and winnowed, the flour was leached with warm water to remove the toxic tannic acid. The meal was then stored in baskets, and eventually made into soup or bread. When a crop was particularly abundant, the acorns were stockpiled in a granary and occasionally traded with other groups.

Social and Political Organization

Like many native groups in California, the Nisenan were organized into what has been termed the "tribelet." The term and concept were derived from the writings of A.L. Kroeber, who in 1932 observed that the dizzying array of different social and political groupings in native California was far different from other parts of North America. The concept of the tribe, used with ubiquity elsewhere in North America, was simply not an adequate description of the many and varied social groupings in California. As a result, Kroeber coined the term "tribelet" to explain the basic social and political organization of a majority of California's native peoples, including the Nisenan. The tribelet was defined as a social aggregation consisting of one or more household groups that included immediate family members (parents and children) and any associated relatives (either collateral, lineal, or affinal) living together in a village or community. Sometimes, however, the tribelet included two or more villages. These households were gathered together on the basis of a shared language, culture, and identity. Typically, tribelets defined communal territorial boundaries and engaged in regularized intergroup relations such as hunting and gathering and ritual observances. The tribelet, moreover, was autonomous, self-governing, and independent.

The Nisenan conformed to this pattern quite well. Littlejohn (1928:17) describes Nisenan thusly:

> The Nisenan were not a tribe in the strict sense of the term. The unit was the local group which occupied a single village site or two or more adjacent sites. Political unity was, however, only nominal. The chief unifying factor was the language which, aside from slight dialectic differences, was the same throughout the entire area. There was a general cultural pattern but there were decided distinctions between the cultural traits of the Indians living in the valley and those who occupied the hills and mountains. These distinctions were particularly evident in traits which were related to sustenance and to habitation; traits, in other words, which were determined by the physiography of the territory.

In the mountains and foothills, villages were generally located on a knoll or bench on high ground between rivers. In the valleys, villages were built on low, natural rises along streams or rivers. Small villages contained between 15 to 25 people, while large villages could contain over 500 people (Kroeber 1925). Dwellings were dome-shaped and made of brush or bark lashed over an oak pole frame. They were between 10 and 15 feet in diameter, and a village might contain between 7 or 50 houses. The floors of the dwelling were sunk a few feet into the ground and covered with pine needles or leaves. Hearths were situated in the center of the room. In larger villages, Nisenan constructed dance houses (k'um) and acorn granaries. The former were relatively elaborate, semi-subterranean structures built with heavy beams and between two or four main posts depending on the size of the house. These houses were used for ceremonies, gatherings, feasts, and various assemblies (Beals 1933).

Relations between villages were usually friendly, though sometimes disputes would erupt over such things as trespass, hunting rights, ceremonial obligations, or accusations of sorcery. If these disputes were not resolved, feuds could easily erupt between villages. Surprise attacks and organized raids were the most common types of warfare (Beals 1933), though occasionally pitched battles took place. Weapons included bows and arrows, spears, clubs, and slings. Usually, however, these battles did not result in many casualties.

Beals (1933) characterizes chiefs, or headmen, in Nisenan society (called a huk) as possessing "little direct authority, but often possessing much influence, depending on their support by public opinion." Chieftainship was hereditary in certain lineages but always subject to the approbation of villagers. If an heir proved incapable of fulfilling the duties of a huk, a new headman was elected by the older men and women of the community (Littlejohn 1928). Traits most important for chiefs to possess included the ability to persuade and settle disputes. A "good" chief, according to one of Beals' informants, had to possess a number of characteristics.

> [A] good chief advises his people, restrains them from trespass, takes initiative in holding "big times," tells people when to begin gathering acorns, make fire drives, other large community activities, arbitrates disputes, [and] sees generally to their welfare [sic] (Beals 1933:360).

One of the chief duties of the headman was organizing people for the dances that played such an important role in Nisenan society. Among the Nisenan inhabiting the valley, dances were held seasonally and usually coincided with the ripening of a particular economically important plant food or the arrival in the area of abundant game. The most important dances, however, were called "big times" (lu'mai), and were usually held in the large dance houses. These dances were occasions for multi-group gatherings and much merrymaking. Often different villages, some located many miles away, came together to participate. The headman was responsible for summoning the dancers, a task which was usually accomplished by a runner sent to different villages. He carried a string with several knots that signified how many days until the dance was to be held. Dancers were almost always men (Kroeber 1929), though women were allowed to dance during certain ceremonies. Dance regalia were elaborate and varied, and included headdresses, feathers, stick rattles, and other paraphernalia. The Kuksu religion and its associated dances also made a late entry into Nisenan territory.

The chief was nearly always a wealthy man who possessed a large personal cache of items, such as bows and arrows, shells, baskets, and animal hides, among others. He also frequently possessed more than one wife (Beals 1933). Most of his food was supplied to him by others, and he was required to act generously and distribute supplies during lean times. A chief could be deposed for a number of reasons, not least of which was his inability to act and deal with people benevolently. A chief was also responsible for organizing people during war and planning raiding forays.

<u>Religious Beliefs</u>

Although Beals (1933) stressed a certain lack of uniformity in the religious beliefs of his Nisenan informants, they were nonetheless united in their belief that there existed a supernatural realm peopled by spiritual beings, some of whom possessed great powers. They also believed that all natural objects were endowed with supernatural powers. Beals writes:

> To the Nisenan the world is a place where every object is endowed with potential supernatural powers. These powers may sometimes be taken advantage of or propitiated to bring "luck," or the possession of "medicines" may enable an individual to have "luck," which amounts to giving him more than natural powers in certain pursuits. (Beals 2933)

Like other native Californian groups, the Nisenan placed great importance on shamans. There were two main types of shamans in Nisenan society: those that were specialists in native medicine and curing, and those who had direct contact with the supernatural realm. The first of these were called *yo'muse*, and were called upon to relieve illness and disease. They worked with a number of different shamanistic items to bring about cures, such as charm stones, roots, seeds, leaves, and various herbs. Many shamans were skilled in sucking foreign objects out of a patient's body; such obstructions were believed to be the primary cause of illnesses. Some shamans, however, were greatly feared because of their poisoning skills. Poisoning was a major concern in Nisenan society, and one that was painstakingly guarded against. A *yo'muse* could be either a man or woman. The second type of shaman, always a man, was called an *oshpe*, and acted as an intermediary between the natural and spiritual worlds. He had the ability to conjure spirits and was the repository of ancient lore.

Like a number of tribelets in central and northern California, the Kuksu cult played an important role in Nisenan society. However, only the valley Nisenan was involved in the cult; the hill Nisenan apparently did not practice Kuksu (Kroeber 1929). The cult was expressed among the valley Nisenan by the existence of two separate organizations. The first of these, called Akit, allowed only men, while the second, called Teme'ya, allowed a limited number of men and women. The first organization was a general dancing society where initiates, mostly boys or young men, were taught specific dances over a period of time. The second organization involved dances where the performers impersonated spirits and wore elaborate costumes, especially the very large headdress characteristic of Kuksu performers.

Historic-era Context

Although Spain claimed Alta California as part of its New World possessions, the area north of what today is the Bay Area witnessed little overt Spanish influence. The 21 missions, which were intended to demonstrate the claim of the Spanish empire to what is now modern-day California, only extended as far north as modern Sonoma County. Spain only had a tenuous hold on northern California, though at least a few researchers have surmised that some native inhabitants of the region, including some Nisenan, were likely forced into the Spanish mission system (Angel 1882; Forbes 1969; Wilson and Towne 1978). The three colonialist nations, Russia, Great Britain, and the United States, vied with Spain and each other over possession of the region. Fort Ross, in modern-day Mendocino County, for example, was established by the Russians in 1812 and was considered its farthest-flung New World outpost.

One of the few Spanish expeditions into the region was led by Gabriel Moraga, who in 1808 marched north from Mission San Jose in order to scout locations for possible mission sites. He reportedly located 12 Indian villages along the Cosumnes River, 11 Nisenan villages along the American River, and 7 Nisenan villages along the Feather River (Peterson 1977). Fray Narcisco Duran led a later Spanish expedition into Nisenan territory in 1817. The expedition traveled up the Sacramento River and encountered numerous Native Californians, several groups of which were hostile (Peterson 1977).

When Alta California was ceded to Mexico in 1822, the far northern half of California remained in dispute. Although technically a possession of Mexico, it soon bore witness to the intrusions of many different foreign expeditions, including British and American fur trappers. These forays were done often without the knowledge or approval of the Mexican authorities. American fur trapper Jedediah Smith led an expedition into the northern Sacramento Valley and Nisenan territory in 1828. He kept a diary during the expedition, in which he recorded numerous encounters with the region's native inhabitants. John Work, a trapper working for the Hudson Bay Company, also visited the area a few years later in 1833.

As a consequence of these and other expeditions, virulent epidemics were unleashed among the native populations of the region. Perhaps the most devastating of these occurred in 1833 and was apparently a result of either smallpox or malaria (Cook 1955; Peterson 1977). By one estimate, this epidemic wiped out perhaps as much as 75 percent of the valley Nisenan population (Cook 1976). Several explorers of the time recorded the devastation these diseases wrought on the natives and their villages (Peterson 1977). Work (1945) recorded one such event:

> The villages which were so populous and swarming with inhabitants when we passed that way in January now seem almost deserted and have a desolate appearance. The few Indians who remain…are lying apparently scarcely able to move. It is not starvation as they have considerable quantities of their winter stock of acorns still remaining.

The first Euro-American immigrant to settle in Nisenan territory was John Sutter, who had been granted permission by the Mexican Governor Juan Bautista Alvarado. Sutter established a fort, ranch, and mill near present-day Sacramento. He recruited numerous Nisenan in his enterprises and used them as laborers on many projects. His relations with the Nisenan, as well as other native groups, were complex; while he could at times be generous and benevolent, he could also be harsh and brutal (Peterson 1977).

The annexation of California by the United States in 1849 to 1850 resulted in continued woes for the Nisenan and neighboring groups. The ensuing years were tumultuous for the Indians of the region. Not only did disease take a massive toll on population, but the violence unleashed by miners and settlers who entered their territory in the 1840s and 1850s also had a significant and devastating effect on their population. Initially, following the discovery of gold at Sutter's Mill in 1848, Indians became laborers working the gold field of the Sierras (Chamberlain and Wells 1879). Prior to the miner rush between 1848 and 1849, Indians were the only ready source of labor and often served as guides to the best gold-bearing gravels along the rivers, including the Yuba River (Chamberlain and Wells 1879). However, by the end of 1849 miners and settlers flooded into northern California, gradually expropriating native lands. Many of the streams and creeks that the various Indian groups had used and relied upon for generations became polluted and befouled as the prospectors overran the area in their search to find the elusive mineral. This prompted angry responses from the region's native inhabitants, and hostilities between the two groups became commonplace. Many miners viewed the Indians as little better than wild beasts, calling them "Diggers", and thus dealt with them harshly. There were numerous violent incidents – raids, retaliatory killings, rapes, and outright massacres – between the two opposing groups during this time.

Despite resistance on the part of the Nisenan, the eventual outcome of this clash between European and native culture was inevitable. The Nisenan were simply no match for the superior numbers, technology, and organization of the American invaders. During the latter half of the nineteenth century, the native groups that had occupied the area were gradually and inexorably displaced, killed off by disease or violence or forced into hiding and seclusion. As whites settled on their lands, the few surviving Nisenan were gradually pushed to the margins of society, where many of them were eventually absorbed into the dominant economic system. Many Nisenan found work in agriculture, logging, ranching, and domestic pursuits (Wilson and Towne 1978).

The issue of landless Indians (i.e., those not living on reservations) in California soon became a problem that aroused the interest of the Federal Government at the turn-of-the-century. In order to ascertain the number of Native Americans living outside the reservation system, a San Jose attorney named Charles E. Kelsey was appointed by the Bureau of Indian Affairs to conduct a comprehensive survey. He was tasked with enumerating the numbers of landless Indians in California and investigating their need for land. Between 1905 and 1906, Kelsey traveled throughout California, gathering a long list of names, ages, and locations or residences of living Native Californians (Kelsey 1971). Kelsey's work in Yuba County yielded a depressingly small number of Native Californians living in the region. Altogether, he counted a total of 50 landless Indians and three mixed-blood Indians (Kelsey 1971).

Ethnographic Place Names in the Project Vicinity

Along with Paul-Louis Faye (1923), Hugh Littlejohn (1928) was one of the first to conduct ethnographic work among the surviving Nisenan. A graduate student in anthropology at Berkeley during the 1920s, he was a student of Edward Gifford and A.L. Kroeber's. According to notes associated with his Berkeley archived work, Littlejohn conducted his field work in July and August 1928, when he worked with a number of Nisenan informants. His monograph, *Nisenan Geography*, was published in 1928 as part of the ethnological documents for the Museum of Anthropology at the University of California, Berkeley. Littlejohn compiled a list of Nisenan village and place names for several different areas, including Pleasant Valley and Placerville in El Dorado County, the Auburn-Colfax area in Placer County, Nevada City in Nevada County, and in Yuba and Sierra counties.

Littlejohn's Nisenan informant for the Yuba County area was a man named Henry Thompson, who lived at Stanfield Hill (Littlejohn 1928). Stanfield Hill is just west of Collins Lake in Yuba County approximately 3 miles south-southwest of Oregon House, California. According to Littlejohn, Thompson was a "full-blooded Indian," who claimed affiliation, at least linguistically, with Indians living around Nevada City, Colfax, and Auburn. According to Thompson, there were four large village sites with ceremonial round houses (*kum*) in the vicinity of Stanfield Hill (Littlejohn 1928). One of these was located on the informant's property and was called *Kalo'ma*, a village with a round house situated on a knoll. At the time Littlejohn recorded this locale, traces of the *kum* were still visible (Littlejohn 1928). To the east of Stanfield Hill was the village site of *Mom'inku*. Southwest of Dry Creek was the village site of *Pol'omyan*. The headman of *Pol'omyan* and *Mom'inku*, according to Thompson, was a man named *Wu'pus* or "Ned." The village of *T!uhu'*, near Dry Creek, was at a site that at the time was part of Virginia Ranch (Virginia Ranch is currently inundated by Collins Lake). The headman of this village was a man named Captain Sam (Littlejohn 1928).

West of Stanfield Hill were three named sites: *O'nehu'yan*, *Chichim'bupu*, and *Men'oma*. The first site, *O'nehu'yan*, was located on the fork of an unnamed creek in Butte County. It was located north of Bangor and, according to Littlejohn's informant, it was a village where the inhabitants spoke a mixed language. The headman was called Captain Edgar by the Nisenan and *Salai'yu* by the Maidu. *Chichim'bupu* was also located on Honcut Creek and like *O'nehu'yan*, a mixed language was spoken there. *Men'oma* was located southeast of *Chichim'bupu* along Honcut Creek.

Southeast of Stanfield Hill were several named Indian settlements. Northeast of the town of Bridgeport, for instance, was the village of *Sel'ewa*, situated on a creek between the South and Middle forks of the Yuba River. The village of *Kai'empa'kan*, which had a large and important round house, was near Squirrel Creek and reportedly had a good spring. West of Rough and Ready, and south of the Yuba River, were five Indian settlements: *On'opoma*, *Pu'dadom*, *Pam'pakan*, *Ko'kokchar*, and *Cham'pak*a. *On'opoma* had a large round house reputed as 200 feet in diameter (Littlejohn 1928). There was very little information regarding the remaining sites. North of Smartsville, across the Yuba River was the Indian camp of *Wi'lili*.

In the vicinity of Grass Valley there were three sites: *Yol'losyan*, *Si'pony*, and *Dap'imluk*. *Si'pony* was reputed to have a large round house and a graveyard. North of Grass Valley in the vicinity of Nevada City were four sites: *Yu'lichar*, *Wau'kaulo*, *Wau'kaudok*, and *Te'tema*. The headman at *Wau'kaulo* was Captain John; when he died, he was replaced by a man named Ben Wilson. *Wau'kaudok* was located near Deer Creek. The headman of this village was a man named Old Sam. When Old Sam died, he was replaced by his cousin Long Charlie. The village of *Te'tema* was located up Deer Creek from *Wau'kaudok*. Relations between *Te'tema* and *Wau'kaudok* were good, though the two villages had different headmen. To the east of Nevada City, in the vicinity of Banner Hill, was the village of *Pa'puk*, which was reputed to be a large Indian settlement. It was abandoned soon after the arrival of the Whites. The fifth native locale in the vicinity of Nevada City was *Ok'paimpa'kan*, though its exact location was not known. (Littlejohn 1928)

West of Grass Valley, in the Penn Valley area, there were several native locales, including *Hum'huminkum*, *Uku'koyu*, and *Ka'paui*. Little information was gathered about the first two, though the latter village had a headman named Captain Tom (Littlejohn 1928).

Southeast of Grass Valley, in the vicinity of the modern Rollins Reservoir, were a cluster of native villages. About a mile west of the Greenhorn River was the large settlement of *Tu'yi*, which reportedly had a large round house. Three other villages were located near *Tu'yi*, including *Hoy'dok*, *Yol'sian*, and *Torn'imkum*, the largest of which was *Yol'sian*.

In northeastern Yuba County near the Challenge-Brownsville area was the village of *Pan'koyo*, which was reputed to be a large settlement. East of that, in eastern Yuba County, was the village of *Nak'nak* in the vicinity of Camptonville along Willow Creek.

Littlejohn (1928) mentions that there were several temporary Indian camps in the vicinity of Oregon House, Kentucky Ranch, Dobbins, Indian Ranch, Frenchtown, Maple Grove Ranch, Brownsville, Sicard Flat, and Sucker Flat in Yuba County, but his informant was not able to remember the names for these.

Present Day Native American Communities

The late nineteenth and early twentieth centuries proved to be an extremely difficult period for California's Native American communities. The unratified treaties of the early 1850s left virtually the entire Native population without a land base, forcing surviving tribes into refuge enclaves, often living as laborers on ranches or in other rural settings. The Dawes, or General Allotment Act, of 1887 began the long process of forced self-sufficiency and acculturation that was to become the overriding Federal Government policy well into the 1950s. The Dawes Act provided homestead-like land allotments to Native Americans, without the trust relationship with the Federal Government common to treaty-based reservations. The Dawes Act is seen generally as a failure; by the early twentieth century, the "plight of the landless Indian" had become a moral crisis. The Federal Government and charitable organizations began to examine the situation with an eye to providing some form of land base through which the surviving tribes could sustain themselves. This effort led to the establishment of some 50 rancherias in California, usually small tracts of land, often lacking resources and employment or agricultural opportunities. Some rancheria communities maintained their populations, although many saw a decline as residents were forced to move away to earn livings in urban environments.

The Federal Government maintained an active legislative program of acculturation during the first half of the twentieth century. Indian schools, such as those at Carson City, Nevada, and Riverside, California, trained children in domestic service and trades, usually separating them from their tribes and natal families for the majority of their childhood years. The drive to acculturate Native Americans and end their trust relationship with the Federal Government came to a head in California with the California Rancheria Termination Act of 1958. Rancheria lands were offered to residents in privately owned parcels, while at the same time the government terminated any trust responsibilities to the rancherias, including assistance with health care, education, or subsistence. The Act was seen as a failure largely because the rancheria communities were unprepared for the change. Privately-owned parcels were quickly lost due to unpaid taxes and sales to non-Indians. Many rancherias fought the Act and many were able to “un-terminate” their rancherias, and reestablish trust status with the Federal Government. Of particular importance was the judgment rendered in the Tillie Hardwick class action suit begun in 1978, which held that 17 rancherias had been wrongfully terminated. Many of the rancherias in the case remained in terminated status, often because there were no longer tribal members living on private parcels on the former rancheria lands.

The result of this tangled history is that many tribal communities have maintained or reclaimed their lands under trust status with the Federal Government and many have not. Those tribes that are “federally recognized” have access to the benefits of that trust status, including opportunities for economic improvement, in some cases gaming. So-called “unrecognized tribes” have taken many paths to reclaim or establish their status with the Federal Government, although the various processes may take years, with questionable chances of success. The economic disparity between recognized and unrecognized has become stark as recognized tribes realize the rewards of casino gaming and its associated opportunities for education and health care as well as economic and political influence.

History

Principal historical themes applicable to the Project vicinity include: early European settlement of California, mining development, settlement of the Project area, hydroelectric development and water control, transportation, and development of agriculture, cattle ranching, and public land use. Each of these themes is discussed below.

<u>Early Regional History</u>
Prior to 1848 and the discovery of gold in California, the central Sierra Nevada remained largely unpopulated and unexplored by Euro-Americans. Beginning in 1769, the Spanish settled along the California coast and established a chain of 21 missions between San Diego and Sonoma; however, they rarely ventured into the interior except to pursue runaway Mission Indians or escaped livestock, or to scout for future mission sites.

Hudson's Bay Company trappers began taking beaver in the local rivers during the 1820s. After Mexico won its independence from Spain in 1822, the mission lands and other territories in California were divided into large privately owned ranches, and sheep and cattle ranching became the primary economic activities. In 1839, the first large landholdings in the region were granted to John Marsh near Mt. Diablo and John Sutter at the confluence of the American and Sacramento rivers (Jackson *et al*. 1982; Pittman 1995).

Soon, American explorers and traders were probing the Sierran interior, discovering passes and routes across the mountains that are still used today. In 1841, Lieutenant Charles Wilkes led the first explorers into the region from the Pacific Northwest. A group of Wilkes' men journeyed down the Sacramento River to the San Francisco Bay. In 1844, the Stevens-Townsend Party ascended the Truckee River from the Nevada desert, came over Donner Pass, and camped at Cold Creek, south of Donner Lake. In 1845 to 1846 on his first of four ventures into the Sierra, Charles Fremont followed the same path as the Stevens-Townsend Party. Subsequent forays into the region discovered additional routes that facilitated the movement of a steady stream of settlers into the area (Jackson *et al*. 1982).

Conflicts between American settlers and the central government in Mexico City led to a series of uprisings culminating in the Bear Flag Revolt of June 1846. In November of 1846, Juan Bautista Alvarado named himself Provisional Governor and declared Alta California an independent state until Mexico restored the principles of federalism. However, Mexican control of California had effectively ended the year before when the *Californios* expelled Manuel Micheltorena, the last Mexican governor.

As Jedediah Smith, John C. Fremont, and other American trappers and explorers brought news of California's favorable climate and bountiful natural resources eastward, the American government began to view California as part of its Manifest Destiny. Although the Mexican government decreed that Californios could not trade with foreigners, a thriving trade had developed between the California ranchos and New England; California sent tallow, hides, furs, and other local goods eastward in exchange for the manufactured wares of the east. The Mexican government was in a state of almost perpetual civil war and was powerless to stop the steady stream of immigrants from the east. Embroiled in the war for Texan independence, Mexico was in no position to defend California (Pittman 1995).

In the east, President Polk and the American newspapers saw this as an opportune time to take control of California. Polk's attempt to purchase the territory was unsuccessful; therefore, he was ultimately forced to declare war with Mexico. With the signing of the Treaty of Guadalupe Hidalgo on February 2, 1848, California formally became an American territory. On September 9, 1850, California became the 31st state in the Union.

<u>Transportation</u>

Toll roads, ferries, and other transportation systems were developed to facilitate the movement of people and products during early settlement of the Sierra Nevada foothills in the second half of the nineteenth century and the first half of the twentieth century. During the initial settlement of the region, transportation needs were provided by mule trains. Most of these mule trains were based in Marysville, from which they brought supplies to more remote mining regions.

Chamberlain and Wells (1879) estimate that over 4,000 mules and 400 hundred wagons were owned in Marysville for the purpose of transporting people and supplies to the mines. There were numerous pack teams in operation at any time, including John Seaward's team, which ran from Downieville to Foster Bar in 1850, and W.H. Parks' team, which ran from Marysville to Foster Bar in 1849 to 1850. Stage lines were also established in the area around 1850. The Excelsior Line and Buckingham & Adriance used routes between Marysville and Parks Bar. The California Stage Co. also ran lines from Marysville to the mining districts (Chamberlain and Wells 1879).

Within Yuba County and the Sierra Nevada foothills, the pattern of roads leading to fords, then ferries and successive bridge crossings existed through the nineteenth and twentieth centuries. With roads came other new developments, such as hotels. Many houses built along the transportation routes were also used as hotels.

Agriculture, Ranching, and Public Land Use

Ranching and crop production took place in the Project area by the 1860s. Following the initial gold boom, entrepreneurs, disillusioned miners, and other settlers turned to agriculture as a means of providing a livelihood, profiting from the need for fresh produce by the burgeoning mining settlements in the foothills.

From the second half of the nineteenth century through the first half of the twentieth century, limited farming and ranching continued. Chamberlain and Wells (1879) note that cattle and sheep ranching was popular in the Long Bar Township, which includes Browns Valley. The small valleys in the area were also popular hiding spots for stolen livestock. The significant crops were grain, hay, grapes, strawberries, and vegetables (Chamberlain and Wells 1879).

Garden Valley along Willow Creek was the location of Garden Valley Ranch. Garden Valley was originally settled by David Scott "and two others" (Chamberlain and Wells 1879), and was then purchased by the Atchison brothers, who opened the hotel called the Garden Valley Ranch. The Atchisons cut a road through Garden Valley that traveled from Foster Bar to Camptonville. They also built other roads and bridges in the region. John Clay also established a ranch along the west side of Willow Creek in 1853. He initially farmed potatoes before planting a successful fruit orchard. In 1867, Clay built dams across two ravines and stocked the resulting ponds with trout. In 1855, Clay and John Atchison built a schoolhouse near Willow Creek that was also used for church services (Chamberlain and Wells 1879).

Federal agency regulation and oversight of public lands in California developed in the late nineteenth century, largely in response to unchecked grazing, extensive clear cutting of forests, and other destructive land use practices. Additional pressure was brought to bear because of sheep herders burning grazing lands to maintain open pastures as they followed huge flocks of sheep down the mountains after the summer grazing months at higher elevation. This practice was widely criticized by various parties, including loggers and local residents, prior to the formation of the Forest Reserves under the Forest Reserve Act of 1891 (Jackson *et al*. 1982). The Forest Reserves system was developed to help manage grazing, logging, water use, and other activities on public lands and to ensure sustainable development for the future.

During the first decade of the twentieth century, the Forest Reserves were placed under the management of the federal Department of Agriculture. By 1906, the Plumas National Forest and the Tahoe National Forest had been created. During the early years, rangers mapped the new forest territories and implemented land management plans and other forest programs. Power development, balanced handling of timber sales, and mineral exploration were the key developments from 1906 to the 1940s and through to today (Jackson *et al*. 1982).

Mining

In January of 1848, James Marshall discovered gold at Sutter's Mill near the Nisenan village of Colluma (present day Coloma southeast of the Project study area), which triggered the California Gold Rush. By the end of 1848, four-fifths of California's able-bodied men were mining gold fields (Robinson 1948). Initially, placer gold, the type of gold that is mined along stream beds or alluvial deposits, could be extracted by individual miners or small groups using simple hand techniques. Within a few short years, the easily mined placer deposits were depleted and more complex, mechanized methods came into use.

The Gold Rush was in full swing along the Yuba River and other rivers in the region by 1849 (Kyle 1990). The outlying areas felt the impacts of the estimated 90,000 individuals who had made their way to the California mines by the end of 1849 (Holliday 1981). Streams flowing into the Sacramento River from the northern Sierra attracted hundreds of gold seekers. Additionally, many miners who failed to locate productive claims or who chose to enter the trades supplying materials and provisions were attracted to the area's many other resources. Agriculture, ranching, and logging industries soon developed. Dry farming methods were used to grow wheat, and cattle grazed the open range.

Following the discovery of gold on the Yuba River at Rose's Bar in June 1848, small communities like Fosters Bar and Bullards Bar began to line the Yuba drainage (Nadeau 1965). Most of the towns were established along streams and rivers where gold could be mined in the river gravel bars that built up at creek confluences, trapping placer gold. Settlements also occurred at river crossings where high waters required the construction of ferries to carry passengers, livestock, and freight. These communities provided lodging, sustenance, and services to travelers.

Early miners panned for gold in stream beds; within decades, large-scale mining operations were organized. In 1853, hydraulic mining[1] was introduced to California (Greenland 2001; Kelley 1959, 1989; May 1970), and rapid advances in technology provided greater flexibility and movement of hoses and efficiency for displacing dirt. Hydraulic mining became more common by the 1860s. After extracting gold from long wooden sluices, miners dumped remaining gravel and debris into the mountain valleys. The Yuba and other northern rivers and streams carried the resulting flood of sediment (slickens) down into the Sacramento Valley.

In total, 685 million cubic feet of debris was deposited in the Yuba River; mine waste raised the riverbed to 100 feet in some areas (Gilbert 1917). This raised the Feather and Yuba river

[1] Hydraulic mining is process whereby water is delivered to a site through a high pressure hose and sprayed onto hillsides, washing away tons of boulders, gravel, dirt, and ounces of gold.

riverbeds so that by 1874, at a point 12 miles above the city of Marysville, the Yuba River was reportedly flowing 60 feet above its original bed. Resultant floods buried farms near Marysville under gravel and mud. Lawsuits curtailed large-scale hydraulic mining in 1884 with the Sawyer Decision, considered a seminal U.S. environmental law (Baumgart 2002; Greenland 2001; Kelley 1959, 1989; Mount 1995). However, U.S. Congress enacted the Caminetti Act in 1893, which allowed hydraulic mining to continue if mine operators constructed debris dams regulated under the newly formed California Debris Commission.

Though large-scale hydraulic mining in the Sierra Nevada was severely curtailed in 1884, it resumed on a limited basis until the 1930s.

Daguerre Point Dam was constructed by the California Debris Commission in 1906; it is located along the Yuba River approximately 9 miles northwest of Marysville, California (Gilbert 1917). The dam was rebuilt in 1964 following flood damage to prevent hydraulic mining debris from the Yuba River watershed from flowing into the Feather and Sacramento rivers.

During the 1920s, the California Debris Commission undertook studies that determined the best locations to construct well-placed debris dams. The Yuba, American, and Bear rivers were identified as locations where these debris dams could be constructed. In 1923 to 1924, the Yuba Development Company built the Bullards Bar Dam (175 feet high with a debris capacity of 40,000,000 cubic yards), which was backed by private investors (Delay 1924). The dam was initially built for debris storage on the site of an inadequate debris dam (Pagenhart 1969). A 7,000-kilowatt capacity powerplant was also built and leased to PG&E (Pagenhart 1969). By 1928, both the dam and power plant were sold to PG&E. When the New Bullards Bar Dam was built in the 1960s just downstream from the older dam, the older system was abandoned.

The Englebright Dam (Narrows) on the Yuba River was constructed from 1935 to 1941 at a cost of $7 million by the USACE (Greenland 2001; JRP and Caltrans 2000; Kelley 1959). The purpose of the dam was to entrap debris introduced into the river by hydraulic mining activities upstream. This action was seen as necessary for both flood prevention, and as a debris dam to allow the reintroduction of hydraulic mining in the area. After the price of gold was frozen by President Roosevelt in 1934 as part of the Gold Reserve Act, mining companies eventually concluded it was no longer economically advantageous to continue with regional hydraulic mining. As such, the dam's use and purpose soon shifted to power generation once the majority of remaining mining debris had been captured (Johnson and Theodoratus 1978).

O'Brien (1952) listed 18 gold mining operations present in the region in 1950. Among these were six placer mines (the Cleveland, Forbes, Industry Bar, Landers Bar, Montclair, and Race Track Placers), all of which were idle. The Payne Placer produced a small amount of gold in 1950. The Deer Creek and Joubert Mines were old idle hydraulic operations, dating to the 1850s. Gold Dredges, Inc., which worked Green Valley closed in July 1930. The Nevada dragline operation was idle. The Bullards Bar (15 foot shaft, 150 foot tunnel), Conwell, Hillside (60 foot incline shaft), Spotted Cow (30 foot drift), and Summit Hill (260 foot shaft), all hard rock mining operations, were idle. The Bright Star claim was in the Yuba River bed, and Joe Losey held a patent on 40 acres located on terraces above the Yuba River.

Development of the Yuba River Levee System

The following is an overview of the history of flood control development in northern California's Central Valley (the Valley), with a focus on the development of the Yuba River levee system. This information is summarized from the USACE history and overview of the Valley flood control efforts that were conducted over several decades, as described in Table 3.2.9-6 (USACE 2002).

Table 3.2.9-6. A chronological history of flooding and flood protection development in California's Central Valley

Development Period	Major Developments
1850-1879	The piecemeal construction of levees was the most common type of development during this period, in response to natural flooding and hydraulic mining affecting local communities and economies.
1880-1909	The California Debris Commission (CDC) was formed at this time in response to the flooding problems imposed by hydraulic mining, with major floods in 1907 and 1909 causing millions of dollars of damage. The CDC drafted the Jackson Plan that served as the template for developing the Sacramento River Flood Control Project that would implement procedures to overcome weak efforts at land control, uncoordinated levee construction, and ineffective flood management practices. Congress also authorized the Yuba River control works in 1893 that was reauthorized in 1896.
1910-1939	The Jackson Plan was approved in the 1917 Flood Control Act and implemented in 1918 through the Sacramento River Flood Control Project, which begin the construction of local interest levees, weirs, and bypasses that were later updated by the USACE. Levees were constructed along the Yuba River at this time, as part of this project.
1940-1969	During this time, construction began on the Central Valley Project, State Water Project, private developments, and several federal flood management projects for the development of major levees, bypasses, and dams with storage capabilities inclusive of flood management needs, within the San Joaquin Valley.
1970-1999	The response to extensive flood damage that occurred during this timeframe focused on levee repairs and rehabilitation, with mitigation for environmental impacts as required for compliance with federal and state legislation. Legislation compliance limited new flood and multipurpose protection projects by the need to address environmental impacts and the extensive measures necessary to mitigate impacts.

Source: USACE (2002: 2-13).

Flooding within the Valley was common and widespread throughout its natural history. Expansive and damaging floods were described by Indigenous peoples and non-Native settlers prior to the Gold Rush era. By 1856, however, billions of tons of additional debris from hydraulic mining activities washed down from the Sierras and into the river systems that flowed into the Valley. Hydraulic mining was first developed on the headwaters of the Yuba and Bear rivers, which were both the most productive and environmentally damaging location where this activity occurred. The outflow of the mining material resulted in an increase of flooding along the lower-lying areas in the Valley. This repeated damage of major flooding events was recorded in the 1860s for the Sacramento and San Joaquin river systems.

At the same time flooding increased due to mining activities, other settlers increasingly developed the Valley for agricultural purposes. Private, piecemeal levee systems were first constructed by individuals or small communities, but no coordinated regional systems were developed. The effect of this was that landowners competed to build levees that would protect their own holdings, at the expense of flooding another's. These systems proved inadequate on a regional scale against the increasing influx of mining waste.

In 1881, the Yuba River had risen higher than it was ever known to do previously. Flooding became so intense during this time period that agricultural interests in the Valley sued the mining interests. In response for the need to address the flooding, the California Debris Commission (CDC) was formed in 1893, after a series of legal battles, and Congress authorized the Yuba

River control works the same year; the control works were reauthorized in 1896. The original purpose of the CDC was to control waste from hydraulic mining operations. Over the course of the next 20 years, the CDC developed the Jackson Plan, authorized in the 1917 Flood Control Act, as the template for designing the construction of the Sacramento River Flood Control Project, which was first implemented in 1918 and developed over the course of the next several decades. The Sacramento River Flood Control Project included the construction of levees along the Yuba River.

However, floods (and the risk of floods) continued to haunt the Yuba River and Central Valley throughout the twentieth century and into the present day, especially as economic use and development in the Valley increased exponentially after the 1940s. The Sacramento River Major and Minor Tributaries Project was authorized under the 1944 Flood Control Act (1950, as amended) which begun further protection measures to the Sacramento River and its tributaries, while privately directed flood control projects occurred simultaneously. After flooding occurred locally in 1986, the USACE developed plans to restore damaged or failing levees, including the levees along the Yuba River at Linda (south levee) and at Marysville (north levee), as well as for the levees along the Feather and Sacramento rivers. Further flood control work was also authorized in the USACE Sacramento District under Public Law 84-99 in response to flooding in 1997 and 1998 that included over 600 requests from local interests for levee repairs.

Early Hydroelectric Development

Mining and hydroelectric power generation in California has had a symbiotic relationship from the beginning of the historic period. During the Gold Rush, California placer miners harnessed water power to turn large water wheels used for washing river gravels. As California mining shifted from placer to hard rock gold mining at the end of the nineteenth century, engineers searched for new sources of water power to hoist elevators and drive machinery. In the Sierra Nevada foothills, where water flowed in a number of larger rivers and tributaries, water power was a lower-cost energy source than coal and fire wood. Among other water power innovations was Lester Pelton's split-cup water wheel. Designed by Pelton in 1879 at Camptonville, a Yuba County Gold Rush town east of the Project (JRP and Caltrans 2000), the split-cup water wheel design proved to be the most efficient for California's hydrology and was soon adopted not only across California gold fields but internationally. Kraft and Samay (2004) wrote:

> The Pelton remained the dominant [water] wheel in Northern California and this engineering breakthrough was exported worldwide… the Pelton company, in later years, directed its production to hydroelectric installations.

The Pelton wheel is a simple design comprised of dual-hemisphere cups surrounding a rotating wheel. After traveling through the penstock, a spigot directs water at the wheel, which is attached to a generator. This design was employed at numerous powerhouses. The Pelton wheel was one of several different types utilized in California, where low-head turbines were not practical because they operated on high volumes of water. Due to California's hydrographic setting, the high volumes of water necessary to operate low-head turbines were not present (JRP and Caltrans 2000:51). One benefit of the Pelton wheel design is its wide range of applications, as the wheels can be made in any size to generate power through the application of very small to very large amounts of water (Hubbard 2007).

Following his initial invention of the wheel, Pelton soon began production of his water wheel at the Miners' Foundry in Nevada City; by 1888, the Pelton Water Wheel Company operated out of San Francisco, a more suitable location for shipping the company's product. The Risdon Iron Works and Joshua Hendy Iron Works, both of San Francisco, also made Pelton wheels in the early twentieth century and produced their own refined versions. Today, the Pelton water wheel is considered one of the most important technological developments in the history of California and hydroelectric power generation, one that was employed on an international basis and is reflected in the massive Pelton wheels installed in the New Colgate Powerhouse on the Yuba River. Pelton received posthumous awards for his design from the American Society of Civil Engineers in 1929 and the California Inventors Hall of Fame in 1983. The American Society of Mechanical Engineers (ASME) designated the North Star Mine Pelton wheel in Grass Valley as an international engineering landmark in 1991. The most recent and largest example of Pelton technology is in the Valais Canton in Switzerland. The Bieudron Power Station in the Cleuson-Dixence power complex has the highest output Pelton turbines in the world, constructed between 1993 and 1998. The plant has three Pelton wheels that generate 1,269 MW, a world record (Grande Dixence SA 2020).

The Yuba River has historically been utilized for multiple purposes, including, but not limited to: hydraulic mining, irrigation, hydroelectric power generation, and flood control. In many ways, the development of the Englebright Dam and powerhouses, also known as the "Narrows" due to its location in the steep Yuba River gorge, was completed in 1941 for most of these purposes and later became an early example of hydroelectric development, mirroring development of other hydroelectric facilities in the Sierra Nevada range. Hydroelectric facilities on the Yuba River consist of the Narrows 1 and 2 powerhouses associated with Englebright Dam and reservoir and New Colgate Powerhouse and the Fish Release Powerhouse, which are both associated with New Bullards Bar Dam, located upriver from the Project (RMT 2017).

Following the discovery of gold in the Sierras, which resulted in the first large-scale influx of Euro-Americans to the area, the Yuba River water was utilized for industrial-scale mining operations. After the decline of mining in the first half of the twentieth century, many of the ditches and flumes originally built for the mining industry were reused in the burgeoning field of hydroelectricity with early developers of hydroelectric powerplants purchasing the ditches and water rights to supply water to their power plants (Ramsey Ford *et al*. 2012). The new industry utilized water power technology honed by the California miners, who adapted to the seasonal water flows germane to the Sierra Nevada watershed. Furthermore, the parallel development of long-distance electrical transmission lines allowed such plants to be erected miles from the cities that demanded electricity (Ramsey Ford *et al*. 2012), resulting in "extremely high heads, remote powerhouse locations, and sophisticated point-to-point transmission" (Hay 1991). The facilities comprising the New Bullards Bar system reflect these characteristics.

<u>Yuba River Disturbance</u>
The Yuba River is one of the most severely disturbed rivers in the U.S. Between 1852 and 1906, an estimated 366,500,000 cubic yards of hydraulic mining debris moved downstream from the

upland mining areas of the greater Yuba River watershed and were deposited in the Yuba River downstream of Englebright Dam causing aggradation on the order of 26 to 85 ft (Adler 1980). This massive sedimentation in the channel and floodplains transformed the river into a braided, unstable stream system, though Mendell (1881) stated that most of the sediment was not exported from near-mine locations until the floods of 1861. Even prior to mining, the river had already been highly altered by sedimentation, agriculture, and engineering projects (James 2013). Pre-European, the riparian zone near Marysville had been described as covered by tall trees, brush and vines, with a low floodplain in places with a dark soil developing; an older terrace rose above the floodplain further from the channel that was capped with a soil that supported fewer trees. Adler (1980) states that by 1906, the supply of hydraulic mining debris from upland areas was mostly depleted and degradation became the dominant process along the Yuba River. Based upon historical channel cross-section data collected along the Yuba River during the late 1800s and early 1900s and updated in 1979, Adler concluded that the river channel had attained equilibrium by 1940 to a channel morphology similar to its pre-1849 channel configuration (i.e., single stable channel, similar channel elevation), except the stream channel is now bordered by large cobble training walls that constrain the channel width in many sections (Adler 1980). The study further concluded that since 1940, almost 90 percent of the hydraulic mining debris deposited in the Yuba River downstream of Englebright Dam remains today as quasi-permanent deposits in the floodplains. The cobble training walls, along with the massive deposit of hydraulic mining debris behind the training walls, are now a stable, generally immobile part of the lower Yuba River system.

The effects of hydraulic mining are particularly significant where the Feather and Yuba rivers converge near Marysville (EDAW 2006). At the mouth of the Yuba River at the south edge of Marysville, 70 ft or more of sediment eventually filled the river channel. Upstream of Marysville, entire communities were buried under more than 40 feet of silt and gravel (Hoover et al. 1990). Sacramento River Flood Control Project levees were constructed along the Feather and Yuba rivers and their tributaries to prevent flooding of valley communities. The levees prevented communities from becoming buried under the sediments that were washed down from the mountains. The levees were built even higher and designed to confine the floodwaters to a relatively narrow channel that would maintain sufficiently high velocities to efficiently convey sediment through the system, reducing the amount of dredging necessary to maintain navigation. As a result of the levees, Marysville, Olivehurst, and Linda are now many feet below the floodwater levels of the Feather and Yuba rivers. James (2013) has constructed a more detailed history of the Yuba River downstream of Englebright Dam.

More recently, studies by the Three Rivers Levee Improvement Authority broadly state that as hydraulic mining sediment supplies decline, the rivers again will adjust to a new equilibrium. Ultimately, hundreds to thousands of years in the future, it is likely that the river channels will cut down to their pre-mining elevations and begin migrating laterally (TRLIA 2006).

Development of the Yuba County Water Agency and Yuba River Development Project

As detailed in the USACE's *Commitment to Excellence, History of the Sacramento District U.S. Army Corps of Engineers, 1929-1973* (USACE 1976), Englebright Dam was constructed as part of the Sacramento River and Tributaries Project, which was authorized by the Rivers and Harbors Act of 1935. Under the direction of the California Debris Commission and the USACE, construction of the Englebright Dam began in 1935 and was completed in 1941 at a cost of $7 million. The dam is a concrete arch structure measuring 1,142 feet wide and 260 feet long holding back a 9-mile-long reservoir with a surface area of 815 acres. Its original purpose was to keep upstream hydraulic gold mining debris out of the lower reaches of the Yuba River, although by the 1940s hydraulic mining was coming to an end in the Sierra Nevada. The dam was also constructed for the purpose of debris storage with no controlled outlet.

The 1950s witnessed the culmination of earlier efforts to establish multi-purpose water systems in California. Dams no longer were only for supplying agricultural and domestic water – they became part of an integrated system. They embraced the earlier Progressive Era's (1890-1913) multiple use ethic embodied by the Hetch Hetchy Project approach of "the greatest good for the greatest number." Dams and watershed management evolved to provide flood control, irrigation and potable water; help reclaim swampy land; deliver recreational opportunities; and generate hydroelectric power. The Central Valley Project, initiated by the U.S. Department of the Interior, Bureau of Reclamation, in 1951, focused on the Shasta and Friant dams, with their associated Delta-Mendota and Friant-Kern canals. The subsequent State Water Project (1957) included the California Aqueduct and Feather River Project (JRP and Caltrans 2000).

In December 1955, excessive winter rain and snow in northern California resulted in devastating floods in the Central Valley that overpowered local levees and other flood control systems. Flooding inundated over 100,000 acres, resulted in 40 deaths, and cost millions of dollars in property damage. This resulted in both state and local initiatives to better manage flood control, resulting in the construction of numerous levees, canals, and reservoirs throughout the state, as discussed above.

In December 1951, the Yuba County Council created the Yuba County Water Resources Board. The board had been able to do little more than evolve preliminary plans, locate water rights, and help the component water districts until after the 1955 flood. The first solution to the problem was the creation of an effective water agency that could take firm action to develop the Yuba River Project. Over a 3-year period, a community battle raged over how to create the agency and how it should be governed (YCWA n.d.). During this time, the Yuba County Council began discussion for proposed expansion of the reservoir and hydroelectric facilities at Bullards Bar. In addition to flood control, an expanded reservoir was viewed as a means of increasing water availability for irrigation within Yuba and Sutter counties, providing electric power to the growing local population, and subsequently encouraging development within the area (Yuba County 1956). In November 1957, the Yuba County Council unanimously voted for the construction of a new dam at Bullards Bar to meet county flood control and water storage needs (Yuba County 1957).

Following the vote, Yuba County went to the State Legislature through Assemblyman Harold T. Sedgwick with a bill to create the YCWA, which was almost lost in committee. Then it was debated on the Assembly floor for longer than the state bond bill authorizing Governor Brown's big dream: the California Water Project. A similar battle took place in the Senate. Lobbying against the bill went on in the governor's office right up until the time Brown signed it on June 1, 1959 (YCWA n.d.).

The council just needed to appropriate the funds to pay for the new construction and subsequently put the issue into the hands of voters with a bonds initiative. In May 1961, Yuba County voters approved (by an 11-1 margin) $185 million in revenue bonds needed to fund the Yuba River Development Project. This system would replace the Old Colgate facilities and construct additional hydroelectric powerhouses along the river, including Narrows 2.

Development of the Drum-Spaulding Hydroelectric Project

The Drum-Spaulding Project occurs upstream from the Narrows Hydroelectric Project. The following discussion on the development of the Drum-Spaulding Hydroelectric Project is taken from Baker and Maniery 2011, who wrote:

> By the end of the nineteenth century, the project area was covered with a grid of water delivery systems consisting of ditches, flumes, tunnels and small dams. More profitable water companies gradually absorbed the smaller operations, abandoning certain sections as their systems were merged. By 1870 the South Yuba Canal Company was a major player in the area, deriving its chief water supply from Meadow Lake, and building a dam to form Lake Spaulding to the south. Water from the Meadow Lake drainage was carried to Spaulding using existing creek beds, tunnels, and flumes. By 1890, it had grown again and was reorganized as the South Yuba Water Company. In 1893, this company acquired the Fall Creek Water Company system. Using a subsidiary company, the Central California Electric Company, they built three powerhouses in the area; Newcastle (1896), Auburn (1898) and Alta (1902). The South Yuba Water Company was later absorbed by PG&E, which continues to operate the Alta Powerhouse today (Coleman 1952:98-101).
>
> The Drum-Spaulding Project was the first major hydroelectric project of PG&E. The site selected was on the Bear River in Placer County where the water resources of the old South Yuba Water Company awaited development for a new purpose - generation of power. Engineers Frank G. Baum and James H. Wise laid the plans for the Project in 1905 after surveying the new acquisition. Seven years later crews of men, machines and horses went to work. Their vision became a reality within a decade and continues today as a major component of PG&E's hydroelectric power Project (Coleman 1952:257).
>
> As soon as PG&E purchased the properties of the South Yuba system, engineers began focusing on hydroelectric development of its water rights from the South Yuba River, in addition to irrigation water. This water was captured at 12,000 feet amsl and, once development was complete, would pass through a series of canals, tunnels and reservoirs to power a series of powerhouses before reaching an elevation of less than 500 feet amsl (Sibley 1916:315, 316; Vensano 1913).
>
> By 1910, the South Yuba system consisted of 22 storage reservoirs, 458 miles of canals, and five small powerplants (Alta, Deer Creek, Rome [on

the South Yuba River in Nevada City], Auburn and Newcastle). There were two different sources for this water. One was the Towle system that diverted water from the north fork of the American River and ran it through 20 miles of conduits to its junction with the Boardman Ditch at the head of the Alta pipeline. It also included Lake Valley Reservoir, its primary storage facility. The other took water from the South Yuba River at Lake Spaulding (Downing 1917:2-10). The Boardman Canal and the Towle Ditch both drew on storage during the summer months, indicating that any increase in the amount of water supply must be made by developing additional storage above these canals or by adding diversions from other streams. Fordyce was the obvious and easiest choice to increase in size, with the construction of a new dam at Spaulding to follow soon after (White & Co. 1910:2-43).

In 1923, PG&E set about raising the dam 47 feet, creating a 47,000-acre-foot reservoir. Improvements were also made to the water transmission facilities between Lake Fordyce and Auburn, including the Drum and Bear River canals. Plans were also started that year to improve Drum Powerhouse with the addition of a second penstock. Another storage reservoir was also added half a mile below the Drum plant to regulate water during its peak operations, when more water flowed through the Project than was required or desired downstream *(Pacific Service Magazine 1923).*

In 1924, PG&E and the Nevada Irrigation District (NID) executed a cooperative agreement in which NID would deliver water to PG&E from its reservoirs in exchange for funding to construct improved storage and a conduit to interlink their system with PG&E's. Construction was underway by 1927. NID's two most important improvements were the enlargement of Bowman Reservoir and its dams, and a plan for constructing the Bowman-Spaulding Conduit. This conduit included a four-mile-long tunnel from the newly reconstructed Milton and Jackson reservoirs to Bowman Reservoir, and from there through another three miles of tunnel and nine miles of canal to the upper end of Lake Spaulding. Where the water entered the lake, a new powerhouse was planned. Known as Spaulding No.3, or Rim Powerhouse, the plant was designed by 48-foot by 70-foot reinforced concrete building with a steel frame. The majority of this water then ran through a tunnel and into the Drum Canal on its way to Drum Powerhouse. From Drum, it flowed into the Bear River to a diversion below the Bear River near Colfax and back into NID's facility. A smaller percentage of the water was diverted at the Spaulding No.2 powerhouse and into the old south Yuba flume, which carried it to PG&E's Deer Creek Powerhouse and then back into NID's district (Myrtle 1928:178, *Pacific Service Magazine* 1927a:342-347).

Development of the Nevada Irrigation District Hydroelectric Project

The following discussion about the development of the Yuba-Bear Hydroelectric Project is taken from Baker 2009, who wrote:

> Around 1917, agriculturalists in Nevada County organized the Nevada Irrigation District (NID) to create a reliable water source for their district using the water rights from the project area. Munson and Kate Church are credited with first envisioning the possibility for the district. They suggested the possibility to other county residents, including Aubrey Wisker, Herman Graser and Guy Robinson, Jr., and together set about promoting the idea to other residents (NID 2009).
>
> The NID was formed by these forward-thinking local farmers who recognized that the mining water system created during the 1800s could provide them with an ample supply of year-round irrigation water. The first founders met in 1917 and decided that if they did not secure the water rights to those mountain sources, someone else would and they would be paying them for their supplies. The San Juan Ridge area was dependent on water from the Bowman System on Canyon Creek for continuing irrigation service. At that time, farmers in the area were buying some water from the South Yuba Canal system owned by PG&E and knew the company was a growing concern (California, State of 1921).
>
> The farmers organized the Nevada County Farm Bureau Irrigation Committee to investigate the possibilities and conducted a survey of the watersheds of the South and Middle Forks of the Yuba River, along with a variety of tributaries in 1918. Soon thereafter, the committee filed a claim for water rights with the state of California. After gathering the signatures of 797 persons in favor of forming the irrigation district, they presented their petitions to the Nevada County Board of Supervisors on March 15, 1921. When an election to form the district came before the voters, they approved it 638 to 168 and, on August 15, 1921, the NID was officially formed (*The Union* 1981:2A, 23).
>
> The original board of directors included Willis Green, William G. Ullrich, M. B. Church, Guy Robinson and Theodore Schwartz. Their first meeting was held in the Farm Adviser's office in the Bret Harte Hotel in historic Grass Valley. These men were able to raise $7.25 million through a bond to purchase the needed storage and transmission facilities for their system. They negotiated for years with owners of old mining and water companies to secure the water and other rights they needed to ensure a future water supply and future development of the region. They also developed an agreement, formalized in 1924, to sell water from their new system for power generation to PG&E (*The Union* 1981:2B, 23).
>
> NID hired Fred H. Tibbetts as their consulting engineer in 1920. Fred Tibbets was a civil engineer who was active in the design of numerous irrigation districts in northern California. Tibbetts started his San

Francisco practice under his name in 1918. He served as chief engineer of the Colusa Basin projects, previously undertaken for Reclamation District No. 108, the Sacramento River West Side Levee District, and the Knights Landing Ridge Drainage District. These three districts, which overlapped in part, provided complete flood protection for more than 100,000 acres of land which had been subject to frequent flooding by both river overflow and foothill drainage. In addition, Reclamation District No. 108 provided a complete drainage system and five separate irrigation systems for its 58,000 acres (Society of Civil Engineers 1940).

In 1922, Tibbetts became the chief engineer of the system and remained associated as a consultant for the NID for the rest of his career. By 1926, NID's president was M. B. Church, Aubrey L. Wisker served as Secretary and William Durbrow was General Manager. These three men were greatly involved in overseeing the district over many years. They were key people making the most important decisions in NID's formative years (NID 1926b).

In 1927, the NID bought parts of the South Yuba Canal system, as well as those of the Northern Water and Power Company, North Bloomfield Water and Power Company, the Empire Mine Company, the Excelsior Water and Power Company, the New Blue Point Mine's Tarr Ditch and water rights to the Jackson Meadows, Bowman and Canyon Creek areas. In fact, their most important purchase was of Bowman Lake, which became the storage core of their system (NID 1926b; *The Union* 1981:2A-2B).

By the 1960s, NID water use had increased 50 percent in Nevada County and 100 percent in Placer County. The value of hydroelectric use had also grown (*The Union* 1981:23). In the early 1960s, NID began construction of its $65 million Yuba-Bear Power Project in cooperation with PG&E. Their contract provided security for the project's financial backing as well. PG&E agreed to pay NID $3,029,000 annually for 45 years for the added power and energy. With this completed, the Federal Energy Regulatory Commission issued a license to NID for the Yuba Bear Development. This four-year project doubled the water storage capacity of the district to 280,280-acre feet at no cost to the district water users. The first phase included two new hydroelectric power plants and construction of the 66,000-acre Rollins Reservoir (PG&E 1963; *The Union* 1981:23).

Development the Narrows Hydroelectric Project

Early Development

An 1895 USGS topographic maps shows a road to Bridgeport via Mooney Flat located approximately 0.25-mile east of the Project area. By 1942, the road had been improved and an unimproved branch extended northwest towards the Yuba River approximately 0.5-mile north of the Project area. No buildings or structures appear to have been built in the vicinity of the Project area prior to 1941 (Compac and Wyke 2007:11; USGS 2020).

Hydropower Development

In December of 1939, the Sacramento Valley Utility Company (SVUC) applied for licensing the Narrows Hydroelectric Project powerhouse (Camp Dresser and McKee 1997). The powerhouse had not yet been constructed. With the completion of Englebright Dam in 1940, PG&E applied in September of 1941 to have all rights to the Narrows Hydroelectric Project powerhouse license transferred, and began the design and construction of the powerhouse the same year. The powerhouse, which cost an estimated $1,000,000 to construct, began operating on December 29, 1942 (Camp Dresser and McKee 1997; *Sausalito News* 1941:3). In March 2020, YCWA purchased the Narrows 1 Powerhouse and associated facilities from PG&E.

As the facility is in a remote location, a work camp and early worker housing located in the vicinity of the tram house was constructed 1941–1942 and removed between 1958 and 1962. By 1962, no work camp-related buildings or structures remained. The area was last documented in 2007 as an archaeological site. No portion of the old work camp remains within the current FERC license boundary (Compac and Wyke 2007:11–12).

The Narrows Hydroelectric Project and was one of the PG&E's smallest facilities. PG&E generally purchased hydroelectric projects that had already been partially developed and then expanded upon them. The Narrows Hydroelectric Project was one of the last hydroelectric generation facilities constructed by PG&E.

News reports on the hydropower facility stated:

> Promptly on scheduled time, another new hydropower generating station was placed in operation last Tuesday by the Pacific Gas and Electric Company.
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> The new powerhouse, construction of which started in September, 1941, at the Narrows, on the Yuba River, will add 14,700 horsepower to the system's capacity to serve the war industries and the communities of Central and Northern California. It is situated below the Upper Narrows Debris dam where water power developed by the dam will be utilized for the generation of electricity.
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> The latest addition to the P.G and E. system is only one part of the company's long term building program planned in 1938 long before the nation's entry into global war was thought probable. Three other powerhouses will be completed and placed in operation within the next twelve months. With the Narrows plant they will add a total of 318,700 horsepower to the electrical resources of the system, bringing the grand total to 2,300,000 horsepower. (*Madera Tribune* 1942:5)

The above article was also published (identically) in the *Blue Lake Advocate* and the *Greysville Press* (*Blue Lake Advocate* 1943:4; *Geyserville Press* 1943:2). The Narrows Powerhouse was the smallest powerhouse that PG&E completed from its 1938 expansion plans.

Another article published in 1941 provides additional information regarding the building pf te Narrows Powerhouse in the early 1940s:

> These two projects [Narrows 1 and Oleum] are the seventh and eighth major items on a $60,000,000 building program undertaken by the P. G. and E. two years ago. The list includes four hydro plants and three steam stations, which will increase the Pacific Service facilities from 58 power houses with a total capacity of 1,758,800 horsepower to 65 power houses with a capacity of 2,272,300 horsepower." (*Organized Labor* 1941:3)

As evidenced in the historic record, the Narrows Hydroelectric Project demonstrates opportunistic development as the Englebright Dam was already completed for the purpose of debris containment, and the engineering required to harness power from Englebright Lake was fairly simple when compared to other PG&E hydroelectric projects being developed concurrently. In addition, the facility demonstrates an expansion of the existing PG&E grid and did not establish any new precedent of development or substantial power-generating capabilities or innovations.

Construction History

The Narrows 1 Powerhouse, including the penstock and power tunnel, was completed in 1942. The tramway and tramway hoist house were added to the facility in 1944. Remnants of concrete supports indicate a less-permanent stairway and/or chute may have been used to transport materials and personnel to the powerhouse prior to the addition of the tramway.

A review of as-built drawings and specifications dating from 1941 to 1944 provided information regarding the contractors and companies that worked on the powerhouse and related facilities.

The penstock and tunnel were designed in 1941 by PG&E's Department of Engineering, under the supervision of L. Sideman, and drawn by J. Cherno. The Narrows Powerhouse building was also designed by PG&E, under the supervision of L. Sideman, and drawn by G. A. Depierre. The control equipment for the tramway was designed and manufactured by PG&E and General Electric Company. Though much of that original mechanics associated with the tramway motor and cable system have been replaced, "GE" name plates are visible on machinery. The tramway hoist house and tramway car were designed in 1943-44 by PG&E's Department of Engineering, under the supervision of Frickstad-Kuhn and E. N. Murphy, and drawn by A. U, E. F. K, and T. N. Young.

The I. P. Morris Francis Turbine was designed and manufactured by the I. P. Morris Department, Baldwin-Southwark Division of the Baldwin Locomotive Works in Philadelphia, Pennsylvania. The turbine is equipped with a 100 percent relief valve and hydraulic controller manufactured by the Pelton Water Wheel Company of San Francisco, California. The designer for the hydraulic controller, and piston rod for the hydraulic controller, is listed as F. H. R. on 1941 plans.

The generator was manufactured by the Westinghouse Electric and Manufacturing Company. A "Larner-Johnson" needle valve, manufactured by the Larner-Johnson Company, is located on the penstock side of the penstock butterfly valve for the purpose of bypassing water to the Yuba River when the unit is shut down. The sump pump was manufactured by General Electric.

The Pacific Electric Manufacturing Corporation of San Francisco designed assembly mechanics, and many of the control and spring housings, rotary switches, and operating levers in the powerhouse. It also designed much of the wiring and layout for the control room. The lightning arrestors, which are attached to the southwest elevation of the powerhouse, were designed by the Bethlehem Steel Company, South San Francisco Plan Tower Department. Clamps, screws, and cables were manufactured by the Appleton Company and Bundy Engineering Company, and bolts and expansion joints were manufactured by the Phillips Drill Company.

Alterations

The following alterations were identified through in-field survey, as well as through a thorough review of YCWA-provided maintenance and administration records. There may be additional alterations that have occurred that are not included in this documentation; however, a culmination of documented alterations known at this time is presented here.

Powerplant

In 1973, the staircase and pedestrian bridge located on the southeast elevation of the powerhouse was replaced with a steel staircase and a steel catwalk with steel pipe railings. Remnants of concrete footings and a set of concrete stairs located below the current staircase and catwalk indicate the original configuration of the stairs and walkway. A review of design specifications shows the alteration used standard steel stairs, deck panels, and railings. Originally, the concrete walkway that borders the elevation was located level with the foundation of the powerhouse and did not have a landing. The replacement stairs and walkway added two small landings and raised both elements above the foundation and concrete walkway. This work was completed by PG&E, designed by A. Chou and supervised by B. O’Malley.

In 1974, the steel gantry crane was replaced with a “Cyclops” 65-ton crane manufactured by Robertson and Schwartz, Inc. of San Francisco. In 1986, the crane was electrified. Between 1974 and 1986, the crane was operated by manual chain drives.

In 1984, the turbine was re-wound by the General Electric Company, which increased the kilovolt-amperes (kVA) from 11,000 to 12,000. Additional small repairs include regular seal, fastener, fitting, bearing, and valve replacement and minor welding repairs to the turbine runner. The only additional alteration known to have occurred to the turbine includes replacement of piping related to the turbine shutoff valve (TSV) in 1999 and ca. 2000 plastic piping added at the turbine level for the scroll case vent discharge, which replaced earlier metal piping.

When the powerhouse was originally constructed, two amplidynes (or electromechanical amplifiers), were used in place of an exciter. The current exciter dates to 2017 and appears to have replaced an earlier exciter as the current exciter breaker and transformer date to ca. 1990. The amplidynes remain abandoned in place (disconnected) on the main floor adjacent to the battery room.

In 1998, a new battery charger was installed in the battery room and in 2011, the batteries were replaced.

During the 1980s, multiple generator connectors were replaced, which appears to have been an occasional occurrence over time. Within the past 30 years, the generator's hydraulic control received the addition of a nitrogen-propelled actuator. In 2010, the generator tachometer was replaced. In 2019, the generator received a new hydro controller pilot valve (PG&E 2019).

The control room was remodeled ca. 1974, with additional upgrades occurring through the 2000s. Panels and control equipment date from ca. 1974 – ca. 2010. Originally, the facility had a septic system that included on-site disposal. Currently, the facility does not have lavatory facilities or potable water, as those features have been disconnected.

Penstock

In 2000, the stairs located around the penstock were replaced with modern steel stairs, and repairs were made to the steel walkway located between the powerhouse and the penstock.

The standpipe connected to the penstock has been altered in recent years to allow for necessary repairs. In 2012, material repair occurred on the exterior of the standpipe, which also required a section of a concrete support pier to be replaced. In May 2016, a leak coming from the standpipe required immediate repair, including wrapping the pipe in a fiber wrap. In 2020, the standpipe requires additional repairs and it was determined that the best course of action would be to replace the current pipe with a modern standpipe. As of mid-August 2020, the standpipe was in the process of being replaced and anticipated to be entirely replaced in the immediate future.

In 2005 and 2017, the penstock flow meter was replaced. This is considered a minor and common upgrade.

Power Tunnel

No notable alteration appears to have occurred to the power tunnel.

Tramway

Equipment related to the tramway has had numerous repairs, replacement pieces, and upgrades over time, particularly within the past 20–30 years. The role of the structure in the safe and timely exiting of the powerplant, as well as established guidelines, require the tramway to be regularly inspected, repaired, and maintained as needed. Most of the mechanical hoist device that controls the tram has been replaced over time, though some of the mechanical housing within the tram building is original. All communication equipment related to the tramway appears non-historic and has been regularly updated as needed.

In 1980, a new Westinghouse magnetic brake was installed, as well as two new General Electric Company motors.

In 2005, some of the tramway rollers (unknown number), located along the length of the system to guide the cable system, were replaced with new steel tram rollers. In 2010, one additional roller was replaced and a second roller was re-welded and repaired. In 2014, 13 of the tramway rollers were replaced. In 2019, additional repair work occurred to multiple tramway rollers.
In 2007, the metal roofing of the tram car was replaced and repairs were made to the tram car frame. In 2010, the lock bar located on the tram car, which assisted in keeping occupants in the car during travel and had replaced the original metal folding gate, was replaced with two steel, locking chains.

Between 2016 and 2017, all of the wood rail ties and all of the wood support bents associated with the tramway were replaced with new timber members. The steel rails and concrete bents remain as originally constructed.

In 2017, the tramway hoist house received a new roof (including the eaves, fascia and barge boards), new exterior siding, a new window (single-pane fixed), as well as a new exterior single-leaf steel door. This replaced steel exterior roofing and paneling that had been installed by Cranston Steel Structures Inc. in 1991. Either during the 1991 or 2017 re-claddings, one multi-pane wood window was removed from the southwest elevation of the tram house, which is currently void of fenestration. The foundation of the hoist house, as indicated in original drawings, was originally set on reinforced concrete piers. Ca. 2017, the foundation was in-filled on the southwest elevation and is now a solid poured-concrete wall.