APPENDIX G-LU2
PUBLIC HEALTH AND SAFETY

G-LU2.1 METHODS USED TO ASSESS PUBLIC HEALTH AND SAFETY EFFECTS

G-LU2.1.1 Water Quality Effects on Human Health

The water quality of the project area has been affected by past activities, particularly past gold mining activities in the region. Effects on water quality will continue to occur with the continued operation of the Oroville Facilities. Recreational facilities and operations have the potential to introduce nutrients, bacterial contamination at swim areas, sewage and wastewater spills into surface waters in the project area, and contamination (such as petroleum hydrocarbons and additives like methyl tertiary butyl ether [MTBE]) from boat operations, maintenance, and cleaning operations.

Water quality studies currently under way by the California Department of Water Resources (DWR) were analyzed and appropriate information used concerning potential effects on public health and safety from contaminants found in Lake Oroville and the Feather River. Constituents exceeding specific thresholds as identified by the following standards are the focal point of the analysis of effects on public health and safety. These standards include but are not necessarily limited to:

- Drinking water standards and health advisories;
- Drinking water quality criteria;
- Agricultural water quality criteria;
- Bacterial limit guidelines; and
- Contaminant action levels as established by the U.S. Environmental Protection Agency (USEPA) and California Environmental Protection Agency (Cal/EPA).

Lake Oroville and the Feather River are considered in the Central Valley Regional Water Quality Control Board (RWQCB) Basin Plan to have beneficial use for municipal and domestic supply, agricultural supply, recreation use, and freshwater fish habitat. There are several lists of public health criteria for pollutant constituents and parameter levels in water with potential beneficial use for municipal and domestic supply. These lists have been compiled by the Central Valley RWQCB in its August 2003 *Compilation of Water Quality Goals* (Central Valley RWQCB 2003). The comprehensive list of Water Quality Limits for Constituents and Parameters forms the basis of the analysis of project effects on public health.

G-LU2.1.2 Accumulation of Contaminants through the Food Chain

Related to water quality above, contaminant accumulation in fish, sediment, and the aquatic food chain can ultimately adversely affect human health. Contamination of fish from mercury, other heavy metals, and bioaccumulative organic constituents such as polychlorinated biphenyls (PCBs) have been noted as a potential concern in the project area.

The specific thresholds for a potential contaminant of bioaccumulation concern were selected from a variety of sources, such as those contained in the Central Valley RWQCB list of Water Quality Limits for Constituents and Parameters (Central Valley RWQCB 2003). Contained within that list are human health criteria, such as those under the California and National Toxics Rules, that take into account the consumption of contaminated fish—the principal pathway of bioaccumulation of constituents of concern to human beings. Other potential thresholds of potential human health effects from bioaccumulation were examined, with consideration of U.S. Food and Drug Administration action levels and the median international standards for trace elements established by the Food and Agriculture Organization of the United Nations.

G-LU2.1.3 Wildfire Potential in the Project Area

There is stakeholder concern that historic fuel management and fire prevention and suppression activities have increased biomass fuel loads in the project area. An increased fuel load can lead to an increased risk of destructive wildfires and their concomitant effects on public health and safety, which is manifested in the potential loss of property and structures, injury, and even death.

To address this potential significant effect on public health and safety, information gathered and presented in SP-L5, *Fuel Load Management Evaluation*, was used.

G-LU2.2 PUBLIC HEALTH AND SAFETY

G-LU2.2.1 Fuel Loading

G-LU2.2.1.1 Overview

This appendix summarizes fuel load management in the project area. This summary is based on SP-L5, *Fuel Load Management Evaluation*, which contains detailed information pertinent to fuel loading issues in the project area. The definition of fuel loading varies among land management and fire prevention organizations. For this Preliminary Draft Environmental Assessment (PDEA), fuel loading refers to a buildup of fuels, particularly vegetation, that can burn and contribute to wildfires.

Buildup of vegetation (fuel loading) throughout California and the West is of great concern because of the potential for damage associated with wildfires. Fire is a natural evolutionary force that has influenced Sierra Nevada ecosystems for millennia. It has influenced biodiversity, plant reproduction, vegetation development, insect outbreak and disease cycles, wildlife habitat relationships, soil functions and nutrient cycling, gene flow, selection, and, ultimately, sustainability (SNEP 1996).

Changes in fire patterns over the last 100 years in the Sierra Nevada have led to larger and more severe fires than occurred historically. Many factors have influenced changes in fire patterns in the Sierra Nevada over the last century (McKelvey et al. 1996; Skinner and Chang 1996). These factors include population decline among native peoples (who ignited fires to improve hunting and gathering conditions), settlement by Euroamericans, grazing, mining, logging, recreation, and changes in fire management philosophy. The expansion of Euroamerican settlement in the Sierra Nevada since the mid-1800s initiated profound changes in the role of fire in Sierra Nevada ecosystems (SNEP 1996). Settlement in the Sierra Nevada resulted in an emphasis on extinguishing any and all fires to protect property, homes, and natural resources such as timber. Fire suppression activities together with the loss of ignitions by Native Americans significantly reduced the areas burned by wildfires during the last century (SNEP 1996).

The virtual exclusion of widespread low- to moderate-severity fires has affected the structure and composition of most Sierra Nevada vegetation, especially in low- to middle-elevation forests. Conifer stands generally have become denser and consist of mainly small and medium size classes of shade-tolerant and fire-sensitive tree species. In combination with the removal of large trees for timber, conditions have promoted the establishment of dense, young forests. As a result, stands in many areas have experienced increased mortality recently from the cumulative effects of competition (primarily for water and light), drought, insects, disease, and in some cases, air pollution (SNEP 1996). Dead, dying, and dry vegetative material accumulates on trees and falls to the ground surface. In addition, without regular fire events, understory vegetation is left to flourish and provides a connection between ground fuels and the canopy of trees. Because forests are denser, they have intertwined canopies, which allows fire to spread easily from one tree to the next. As a result of the accumulation of fuel and increase in stand density, today’s forest conditions more readily support severe fires than did historic conditions (McKelvey et al. 1996), and severe fires are more likely to be large in size because they are more difficult to suppress (SNEP 1996).

G-LU2.2.1.2 Fire History in the Project Area

As with most lands in and near the Sierra Nevada, the project area has a history of fire events. Information regarding the fire history of the project area is available from the California Department of Forestry and Fire Protection (CDF) and was used extensively for SP-L5 and this appendix. CDF maintains detailed and up-to-date Geographic Information Systems (GIS) databases for fire history, ignition locations, fuel type, and other information to allow for comprehensive analysis of fire hazards, assets at risk, and level of service and to develop fire management plans. Figure G-LU2.2-1 depicts the location and approximate configuration of large fires (more than 50 acres) that have occurred in the project area since the early 1900s. In recent years (between 1990 and June 2003), there have been 13 fires that have burned more than 50 acres within the FERC project boundary. These fires have been located in the northern portion of the Lake Oroville area (between the Upper North Fork and West Branch), the Middle Fork, Loafer Creek, Thermalito Forebay, and the Oroville Wildlife Area (OWA) (Table G-LU2.2-1). The size of these fires has ranged from 58 to 8,055 acres. These fires have been caused by lightning, equipment use, arson, power lines, debris burning, and unknown sources.

Table G-LU2.2-1. Size and cause of recent fires (since 1990) in the project area.

Fire Name	Location	Year	Acres Burned	Cause
Wild	OWA	1990	257	Equipment Use
Dry	West Branch	1992	820	Miscellaneous
Nelson	Thermalito Forebay	1993	743	Equipment Use
Union	Middle Fork	1999	736	Lightning
Bloomer	Northern Lake Oroville	1999	2,610	Lightning
South	Loafer Creek	1999	1,572	Lightning
Bean Creek	Middle Fork	1999	1,785	Lightning
Concow	Northern Lake Oroville	2000	1,835	Equipment Use
Larkin	OWA (two fires)	2001	487	Arson
Poe	Northern Lake Oroville	2001	8,333	Powerline
Larkin	OWA	2001	627	Unknown/Undetermined
Poe	West Branch–Upper North Fork	2001	8,055	Arson
Union	Middle Fork	2002	58	Debris Burning

Source: CDF 2002a

CDF has also kept records for all known “fire ignitions” in Butte County, regardless of size, since 1990. The locations of the ignitions are not recorded precisely but are plotted as the center of 160-acre quarter sections. The frequency of ignitions for each quarter section was calculated by CDF and the data classified into ranges. Figure G-LU2.2-2 displays the locations of fire ignitions in the general project area between 1990 and June 2003. Because almost every quarter section in the project area and beyond has experienced at least one ignition since 1990, the sections containing between one and six ignitions are not displayed in the figure; these data were excluded to highlight the areas with more frequent (greater than seven) ignitions. The most frequent ignitions have occurred in the urbanized areas around City of Oroville, Thermalito, other communities, in the Clay Pit State Vehicular Recreation Area (SVRA), and along roadways. Although not all of these areas are within the FERC project boundary, fires that start in the general project region could potentially move into the FERC project boundary and vice versa.

G-LU2.2.1.3 Fuel Hazard Ranking in the Project Area

The severity of a wildfire depends upon a number of factors such as available fuel to burn, vegetation types and conditions, topography, wind patterns, humidity, and moisture content. Fuel is one of the factors that can be measured and predicted in advance, so assessing fuel loading (the condition of fuels) is an important part of fire planning. CDF has developed a fuel assessment methodology that uses models to describe current fuel load conditions and rank fuel hazard situations. This information assists CDF and other entities in targeting critical areas for fuel treatment. The fuel ranking methodology assigns ranks based on current flammability of a particular fuel model and includes variables such as slope, ladder fuels (fuel that connects ground fire with tree crowns), and crown density. The models use GIS technology to build and analyze the data.

The first step in developing a fuel hazard ranking for an area is to determine fuel types. Grass, brush, and timber are the most common fuel types within the project area. Each has its own burning characteristics based on several factors, including moisture content, volume, live-to-dead vegetation ratio, size, structure, and inherent species characteristics such as volatility. For the CDF fuel hazard ranking methodology, fuel types are initially determined from aerial photograph interpretation and validated, where necessary, with on-the-ground assessments. The model takes into account vegetation type and other fuel characteristics. Fire history is added to the model to create a more accurate and current representation of fuel hazard. The fire history layer shows where vegetation has burned over a fire area, and computer modeling is used to predict the regrowth of native vegetation over the area based on principles of ecological succession. Once the fuel model is determined, one of the six slope classes along with indices for crown and ladder fuels is integrated into the model to arrive at a surface fuel hazard rank. Overall hazard scores of “Moderate,” “High,” or “Very High” are assigned to 450-acre “quads.” Figure G-LU2.2-3 shows the CDF fuel hazard ranking for all of Butte County using the 450-acre quads.

The results of the fuel hazard ranking model for lands in the project area are depicted in Figure G-LU2.2-4. Approximately 53 percent of the project area was classified with a hazard score of Moderate, 23 percent High, and 15 percent Very High (Table G-LU2.2-2). The highest concentration of lands classified as Very High is along the South Fork and Middle Fork, with other areas scattered along the Upper North Fork and West Branch.

G-LU2.2.1.4 Fuel Load Management Policies, Plans, Programs, and Organizations

Because wildfires are a concern in the project area, land management entities have developed policies, plans, and programs to address the threat of wildfire and deal with fuel loading. The U.S. Forest Service (USFS), U.S. Bureau of Land Management (BLM), CDF, and California Department of Parks and Recreation (DPR), along with Butte County and the City of Oroville, have developed policies, plans, and programs for fire management/suppression and/or for fuel loading. Table G-LU2.2-3 lists the policies and plans that were reviewed for SP-L5 (see SP-L5 for detailed descriptions of the policies, plans, and programs).

Table G-LU2.2-2. Fuel hazard ranking classification within the project area.

Area	Fuel Hazard Classification Approximate percent of area (acres)		
	Very High	**High**	**Moderate**
Lake Oroville and Thermalito Diversion Pool	15 (10,765)	32 (22,493)	22 (15,549)
Thermalito Forebay and Thermalito Afterbay	-	0 (4)	18 (12,744)
OWA	-	-	13 (8,977)
Total	**15 (10,765)**	**32 (22,497)**	**53 (37,270)**

Source: CDF 2002b

Table G-LU2.2-3. Relevant fire management policies and plans in the study area by agency.

	Document Title	Date
FEDERAL		
U.S. Department of Agriculture	Healthy Forest Initiative	2002
USFS	Sierra Nevada Forest Plan Amendment, Record of Decision (ROD)	2001
USFS	Plumas and Lassen National Forests, Proposed Administrative Study	2002
BLM	Redding Resource Management Plan	1993
STATE		
CDF and State Board of Forestry (SBF)	The California Fire Plan	1996
CDF	Butte Unit Fire Management Plan	2002
DPR	Wildfire Management Planning: Guidelines and Policy	2002
DPR	Loafer Creek Prescribed Fire Management Plan	1999
CDFG	Oroville Wildlife Area Management Plan	1978
LOCAL		
City of Oroville	General Plan	1995
Butte County	General Plan	1996

Source: Compiled by EDAW 2003

In addition to plans, policies, and programs that address fuel loading, the Butte County Fire Safe Council and the Oroville Community Association focus on wildfire-related issues. The main function of these organizations is to provide education to local residents relating to issues associated with wildfires such as reducing fuel loading. These organizations work closely with CDF's local unit, the Butte Unit, in outreach and educational programs.

G-LU2.2.1.5 Fuel Loading Reduction Measures

Many researchers and professionals have concluded that, overall, pretreatment and fuel load management reduce the intensity and severity of wildfires as well as reduce effects on private property and other resources. Benefits of fuel treatments are assessed by examining subsequent fire behavior, physical effects on resources, economic losses, enhanced forest health, and increased firefighter safety (FRAP Website). Numerous field accounts yield evidence that fires were reduced in severity when they burned into areas previously burned or treated (Agee et al. 2000; FRAP Website). CDF has compiled 26 reports documenting the benefits of the Vegetation Management Program (VMP) associated with reduced fire size and increased resource protection during wildfire events (FRAP Website).

There are a number of ways to reduce fuel loading. Some of the more common ones include prescribed burning, pile burning, mastication, thinning, chipping and multicutting, disking and mowing, grazing, and herbicide application. These techniques are described in SP-L5.

G-LU2.3 REFERENCES

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