# SACRAMENTO MUNICIPAL UTILITY DISTRICT
# UPPER AMERICAN RIVER PROJECT
# (FERC NO. 2101)

# MULE DEER
# TECHNICAL REPORT

**Prepared by:**

Devine Tarbell & Associates, Inc.
Sacramento, California

**Prepared for:**

Sacramento Municipal Utility District
Sacramento, California

## JULY 2004

# TABLE OF CONTENTS

**Section & Description** **Page**

# LIST OF TABLES

**Table No. & Description** **Page**

# LIST OF FIGURES

**Figure No. & Description** **Page**

# LIST OF APPENDICES

**Appendix & Description**

# LIST OF APPLICABLE STUDY PLANS

## Description

- Mule Deer Study Plan

## 6.8 Mule Deer Study Plan

### 6.8.1 Pertinent Issue Questions

The mule deer study addresses Terrestrial Resource Issue Questions:

2. How and where does SMUD's infrastructure and operations affect wildlife movement?
3. How does SMUD's infrastructure and operations affect deer movement?
7(d). What are the relevant and known factors (limiting and beneficial) affecting deer populations in the Project area and how/where are those factors influenced by Project operation and maintenance?
10. What is the extent of wildlife drowning in Gerle Creek Canal or in the ditch below the outlet of the Rubicon-Rockbound Tunnel?
13. What are the impacts on terrestrial resources due to secondary use of project access roads (e.g., OHV use)?
30. Relative to effects on wildlife, what is the use of off-road vehicles by season? By month?

### 6.8.2 Background

Mule deer inhabit roughly 64 million acres in California and in nearly all habitats. Suitable habitat includes four distinctly different elements: fawning, foraging, cover, and winter range (USDA 2001). The California Department of Fish and Game (CDFG) has delineated distinct deer herds throughout California. The deer in the vicinity of the Project are considered to be part of the Pacific Deer Herd, with the exception of those deer in the westernmost portion of the Project. The Pacific Deer Herd Management Plan (Hinz 1981) defines long-standing, albeit in some cases outdated, management goals and objectives for this herd.

The Pacific deer herd encompasses all of the Pacific Ranger District of the Eldorado National Forest (ENF), and portions of the herd extend into the Georgetown and Placerville Ranger Districts. The herd occupies approximately 353 square miles of public and private lands within El Dorado County and that portion of Placer County south of the Rubicon River. The majority of deer in the herd are migratory and occur west of the Sierra Nevada crest. The herd is defined by the Rubicon River on the north, the South Fork American River (SFAR) on the south, and roughly a north-south line above 2,500 feet elevation, paralleling Highway 49 between Placerville and Georgetown.

Based on the deer herd plan, approximately 72 percent of the summer range for this herd was within the ENF in 1981, with the remainder on privately-owned lands. Intermediate range ownership in 1981 was split about equally between the ENF and private interests. About 64 percent of the winter range was on ENF land in 1981.

The winter range lies mainly on south facing slopes between 2,000 and 4,500 feet elevation. Intermediate range generally extends from 4,000 to about 6,000 feet elevation, and is used primarily during spring and fall migration. Most of this intermediate range consists of east-west parallel ridges used as migration routes, especially Peavine, Poho, and Telephone ridges. The summer range lies mainly above 5,000 feet.

The mule deer in the central Sierra Nevada typically reside on their summer ranges until they are stimulated to move downslope to their wintering areas (Loft et al. 1989). Habitat quality and quantity, temperature, day length and weather conditions all play a part in determining when these deer initiate and complete their fall migrations. Generally, from mid-October, or later, any significant winter storm has the potential to cause some migratory deer to move from summer range to lower elevations. If those storms are mild, some deer may delay in intermediate habitat, seeking acorns, leaf mast and other available fall forage. If severe enough, a single storm may result in the migration of a large percentage of the animals from the higher elevations downslope to winter range habitat. In contrast, spring migration usually occurs as a gradual upward drift that may span two months as deer delay in holding areas where cover and forage are abundant (Loft et al. 1989).

A variety of factors have resulted in long-term declines in the Pacific deer herd, including: 1) direct loss of habitat by construction of home sites, reservoirs, roads, etc.; 2) grazing by livestock (Loft et al. 1991); 3) extensive logging; 4) fire suppression; 5) recreation; 6) both legal and illegal kill; 7) predation (especially by mountain lions); and 8) diseases and parasites (USDA 2001). Direct loss of habitat through home construction and urban expansion has had the greatest effect on winter range. At high elevations, construction of Union Valley, Wrights Lake (non-Project),

Loon Lake, Ice House, and Gerle Creek reservoirs was estimated to have eliminated 8.1 square miles of fawning habitat (Hinz 1981). However, this acreage may over-estimate the amount and quality of meadow fawning habitat that existed in areas now inundated by these reservoirs. Aerial photos held by the ENF that depict the pre-inundation condition at Project reservoirs do not appear to support the meadow acreage estimates provided in the Pacific deer herd plan, based solely on a simple visual inspection, but no quantitative information is available.

Open-water conveyances, such as the 9,987-foot Gerle Canal, have the potential to adversely affect deer through entrapment and drowning depending on design and location, relative to deer movements. However, Gerle Canal has limited potential to entrap deer because it has three bridge crossings, low-velocity areas, and mostly unlined, gently-sloped sides (FERC 1998). Similarly, above ground penstocks (steel pipe) also have the potential to adversely affect deer, depending on the design and location of the conduit, by altering deer movement patterns. The Project has approximately 3 miles of aboveground penstock as follows: 1) Robbs Peak Powerhouse Penstock - 2,235 feet; 2) Jones Fork Powerhouse Penstock - 8,190 feet; 3) Jaybird Powerhouse Penstock - 2,620 feet; 4) Camino Powerhouse Penstock - 1,110 feet; and 5) White Rock Penstock - 1,675 feet. Of these, the Jones Fork Penstock was identified prior to its construction as a potential impediment to deer migration (Ecological Analysts, Inc. 1980). As a result, the penstock was constructed on pedestals to allow for animals to cross beneath the pipe (FERC 1998). On other Project penstocks, SMUD has excavated soil beneath the pipe at various locations to allow for opportunistic passage of deer and other wildlife (pers. comm, Lonn Maier, SMUD, April 2001).

Based on information provided by the ENF, the location of delineated critical winter, summer, and intermediate range, as well as critical fawning habitat and holding areas was presented in the UARP Initial Information Package (SMUD 2001; Figure E5-6 in Appendix to Exhibit E, Section 5). Designated critical fawning habitat, holding areas, and critical summer range occur on the north side of Loon Lake Reservoir, and to the north and east of Union Valley and Ice House reservoirs. Critical winter range occurs along the north side of the SFAR from just above White Hall to the western boundary of the ENF.

### 6.8.3 Study Objectives

The objectives of this study are as follows: 1) determine the spatial relationship between Project features and designated critical fawning habitat, holding areas, critical summer range, critical winter range, and primary migration corridors; 2) determine the extent and significance of deer fatalities due to drowning in the Gerle Creek Canal and the ditch below the outlet of the Rubicon-Rockbound Tunnel; 3) determine the availability of suitable crossing points for deer along Project penstocks that bisect a primary movement corridor; and 4) determine the extent and timing of deer road kills along the following primary access roads to Project facilities that receive heavy traffic: Ice House Road from Highway 50 to Loon Lake Reservoir and the access road from Ice House Road to Ice House Reservoir.

### 6.8.4 Study Area and Sampling Sites

The study areas for each objective are as follows:

- Objective No. 1: Areas within 0.5-mile of all Project features and facilities
- Objective No. 2: Gerle Creek Canal and the ditch below the outlet of the Rubicon-Rockbound Tunnel
- Objective No. 3: Project penstocks - Robbs Peak, Jones For, Union Valley, Jaybird, Camino, White Rock
- Objective No. 4: Ice House Road from the intersection with Peavine Ridge Road to Loon Lake Reservoir; Wentworth Springs Road from Ice House Road to Gerle Creek Reservoir; Access road to Ice House Reservoir from Ice House Road to Strawberry Point Campground.

Field studies will be restricted to those lands where the Licensee has legal access (e.g., ownership/easement rights, public lands) and will not occur on private lands without prior permission from the landowner.

It is understood that additional study areas (e.g. the developed and dispersed recreation areas being identified by the Recreation TWG and the Project roads being identified through the Project Sources of Sediment Study in coordination with the Recreation and Aquatic TWGs) will be added to this study area where appropriate.

6.8.5 Information Needed From Other Studies

Information on the distribution of mule deer habitat will be derived in-part from the Vegetation Mapping Study. Important information on deer movement patterns and the location of critical habitat use areas will also be obtained from existing ENF and CDFG data. Information on deer drowning mortality in open water conveyances will be obtained from the Licensee's records. Information on deer road kills will be derived in-part from SMUD and ENF personnel who drive these roads on a regular basis.

6.8.6 Study Methods and Schedule

This study consists of four separate methodologies:

Habitat Mapping: A map will be prepared at a scale of 1:24000 (or at a scale determined by the Terrestrial Resources Technical Working Group (TWG) following initial data analysis) that shows the location of designated critical fawning habitat, holding areas, critical summer range, critical winter range, and primary migration corridors within 0.5-mile of Project features and facilities. The location of critical deer habitats and migration corridors will be obtained from existing CDFG and ENF records, and consultation with biologists with knowledge of the Pacific Deer Herd. This information will be plotted and overlaid with available recreation use information to determine if certain activity is affecting deer populations.

Canal Drowning: The extent of deer fatalities due to drowning in the Gerle Creek Canal and the ditch below the outlet of the Rubicon-Rockbound Tunnel will be determined from the Licensee's records of carcass removal from these features. In addition, a survey will be made of the length of these facilities to record: 1) existing crossing locations suitable for deer; 2) intersection of major deer trails with the canal; 3) location of escape points along the canal; and 4) topographic features that may contribute to deer entrapment. Operation patterns (e.g., flow) that may influence deer drowning potential will be determined from the Licensee's records. Crossing and potential escape points will be recorded using Global Positioning System (GPS) instrumentation and/or mapped on aerial photos or Project base maps.

Penstock Crossing: The availability of suitable crossing points for deer along Project penstocks will be determine from visual inspection of the selected penstocks along their entire length. Deer are reported to crawl under fences with as little as 16 inches of clearance (Yoakum et al. 1980). This study assumes that penstocks with 24 inches of clearance are adequate to allow crossing by mule deer and not impede migration or daily movements. Therefore, penstock locations with less than 24 inch clearance will be recorded using GPS and/or mapped on aerial photos or base maps.

Road Kills: Wildlife road kills are influenced by vehicle traffic volume, vehicle speed, weather, season, location of feeding areas, roadside habitat, road design, topography, and other factors (Downing 1980). Traffic associated with the Project and related recreation may contribute to road kill levels, and such traffic is assumed to be greatest on the roads described under Study Area (survey roads). The extent and timing of these kills will be determined using two methods: 1) SMUD workers, ENF staff, and road maintenance crews who regularly drive the survey roads will be interviewed to obtain qualitative, anecdotal information on the prevalence of road kills. A survey card will be prepared and distributed to USFS, CDFG and SMUD staff who may access the Project roads on a frequent basis. This card will be used by the staff who will record field mortality and provide the information to USFS. Information will be solicited on species, sex, age, and location of road kills. These individuals will be requested to submit all road kill observations over a 12-month study period. 2) Biologist(s) will conduct a focused survey of road kills once per week (usually on a Monday) from September to mid-November or until two weeks following the first major storm system. In general, these surveys would occur on Saturday and Monday mornings (or Tuesday following a Monday Holiday) based on the assumption that traffic is heaviest on weekends. In addition to deer, all other road-killed species will be recorded along with location, sex, and age where identifiable. Biologists will also record incidental observations of deer along these roads .

As information is gathered from this effort, a determination may be made by the Terrestrial Technical Working Group that additional study may be needed, which will be completed in the following year.

6.8.7 Analysis

Analysis will be conducted for each of the study components as follows:

Habitat Mapping: Maps of Project features relative to deer habitat will be reviewed to determine if substantial impacts to deer and sensitive habitats may be occurring as a result of ongoing Project operation and maintenance, proposed Project Improvements, or recreational developments associated with the Project. If substantial impacts are discovered, these maps will help in developing strategies for minimizing these impacts.

Canal Drowning: The extent of deer fatalities due to drowning in the Gerle Creek Canal and the ditch below the outlet of the Rubicon-Rockbound Tunnel will be analyzed to determine the significance of this loss relative to deer population estimates for the area as derived from CDFG. In addition, survey results will be reviewed to determine the need and potential for installing additional crossings and/or escape facilities along the length of the conveyance.

Penstock Crossing: The extent and distribution of penstock locations with adequate clearance to allow passage by deer will be evaluated to determine the need and potential for increasing the amount of crossings available for deer.

Road Kills: The extent, timing, and location of road kills will be evaluated with respect to deer population estimates for the area to determine the significance of this mortality. In addition, survey results will be reviewed to determine the need and potential for modifications (e.g., traffic pattern changes, habitat modification, etc.) that could reduce the risk to deer and other wildlife.

6.8.8 Study Output

Study results will be presented to the Terrestrial Resources TWG and Plenary Group toward the end of 2002. However, the ultimate study output will be a written report that includes the issues addressed, objectives, study area, methods, analysis, results, discussion, and conclusions. The reports will be prepared in a format that allows the information to be inserted directly into the Licensee-prepared Draft Environmental Assessment that will be submitted to FERC with the Licensee's application for a new license.

6.8.9 Preliminary Estimated Study Cost

SMUD's consultant estimates that this study will cost $34,000 ± 20 percent.

6.8.10 TWG and Plenary Group Endorsement

Terrestrial TWG representatives from the following agencies/organizations approved this study plan on December 21, 2001: California Department of Fish and Game, Eldorado National Forest, California Sport Fishing Alliance, and SMUD. The Plenary Group approved this study plan on February 6, 2002. The participants at the meeting who said they could "live with" the study plan were California Department of Fish and Game, California Native Plant Society, California Outdoors, California Sportsfishing Protection Alliance, El Dorado County, El Dorado County Citizens for Water, Friends of El Dorado County, National Parks Service, Placer County Water Agency, Sacramento Municipal Utility District, State Water Resources Control Board, Taxpayers or El Dorado County, U.S Bureau of Land Management and Eldorado National Forest. None of the participants at the meeting said they could not "live with" the study plan though PG&E abstained since this study plan does not apply to the Chili Bar Project.

6.8.11 Literature Cited

Downing, R.L. 1980. Vital statistics of animal populations. Chapter 15 (P. 247-267) *in* Wildlife Management Techniques Manual, Fourth Edition: Revised. Edited by S.D. Schemnitz. The Wildlife Society, Washington, D.C.

Ecological Analysts, Inc. 1980. Jones Fork Development: Exhibit E. Prepared for SMUD, Sacramento, CA.

FERC (Federal Energy Regulatory Commission). 1998. Environmental and public use inspection report for the Upper American River Project, No. 2101. June 1998. FERC, San Francisco, CA.

Hinz, D. 1981. The Pacific Deer Herd Management Plan. CDFG (in cooperation with ENF). July 1981.

Loft, E.R., R.C. Bertram, and D.L. Bowman. 1989. Migration patterns of mule deer in the central Sierra Nevada. *California Fish and Game* 75(1):11-19.

Loft, E.R., J.W. Menke, and J.G. Kie. 1991. Habitat shifts by mule deer: the influence of cattle grazing. Journal of Wildlife Management 55(1):16-26.

SMUD (Sacramento Municipal Utility District). 2001. Initial Information Package for Relicensing of the Upper American River Project (FERC Project No. 2101). Sacramento. July 2001.

USDA (United States Department of Agriculture, Forest Service). 2001.Sierra Nevada Forest Plan Amendment: Final Environmental Impact Statement Volumes 1-6 and Record of Decision. USDA, Pacific Southwest Region, San Francisco, CA. January 2001.

Yoakum, J., W.P. Dasmann, H.R. Sanderson, C.M. Nixon, H.S. Crawford. 1980. Habitat improvement techniques. Chapter 20 (P. 329-403) *in* Wildlife Management Techniques Manual, Fourth Edition: Revised. Edited by S.D. Schemnitz. The Wildlife Society, Washington, D.C.

# MULE DEER
# TECHNICAL REPORT

**SUMMARY**

This technical report provides the results of an evaluation of mule deer (*Odocoileus hemionus*) habitat, and potential impediments to deer migration and movements relative to the Sacramento Municipal Utility Districts Upper American River Project. The spatial relationship of UARP facilities and the summer range, winter range, fawning habitat, holding areas, and general migration corridors of the Pacific Deer Herd (Hinz 1981) were delineated on Geographic Information System maps. UARP penstocks were found to provide adequate clearance over most of their length for passage of deer based on a 24-inch minimum clearance standard established by the Terrestrial Resources Technical Working Group. Similarly, the Gerle Creek Canal and Rubicon-Rockbound Ditch provide reasonable opportunities for safe crossing, and entrapment of deer has not been recorded in either conveyance. Finally, road kill surveys documented only three deer fatalities due to vehicle collisions from September 2002 through September 2003.

## 1.0 INTRODUCTION

This technical report is one in a series of reports prepared by Devine Tarbell & Associates, Inc., (DTA) for the Sacramento Municipal Utility District (SMUD) as an appendix to SMUD's application to the Federal Energy Regulatory Commission (FERC) for a new license for the Upper American River Project (UARP or Project). The report addresses mule deer (*Odocoileus hemionus*), a USDA Forest Service, Region 5 Management Indicator Species (USDA 1989) and a legally hunted species (California Fish and Game Code), and its habitat within the UARP area and includes the following sections:

- **BACKGROUND** – Summarizes the applicable study plan approved by the UARP Relicensing Plenary Group; a brief description of the issue questions addressed, in part, by the study plan; the objectives of the study plan; the study area, and agency information requests. In addition, requests by resource agencies for additions to this technical report are described in this section.
- **RESULTS** – A description of the data obtained during the study.
- **ANALYSIS** – An analysis of the results, where appropriate.
- **LITERATURE CITED** – A listing of all literature cited in the report.

This technical report does not include a detailed description of the UARP Alternative Licensing Process (ALP) or of the UARP, which can be found in the following sections of SMUD's application for a new license: The UARP Relicensing Process, Exhibit A (Project Description), Exhibit B (Project Operations), and Exhibit C (Construction).

In addition, this technical report does not include a discussion regarding the effects of the UARP on mule deer and related environmental resources, nor does the report include a discussion of appropriate protection, mitigation and enhancement measures. An impacts discussion regarding the UARP is included in the applicant-prepared preliminary draft environmental assessment (PDEA) document, which is part of SMUD's application for a new license. Development of

resource measures will occur in settlement discussions, which will commence in early 2004, and will be reported on in the PDEA.

## 2.0 BACKGROUND

### 2.1 Mule Deer Study Plan

In response to the management emphasis for mule deer stated in the Eldorado National Forest (ENF) Land and Resource Management Plan (LRMP; USDA 1989) and the California Fish and Game Code, the UARP Terrestrial Resources Technical Working Group (TWG) developed the Mule Deer Study Plan, which was approved by the TWG on December 21, 2002, and by the UARP Relicensing Plenary Group on February 6, 2003.[1] The study plan was designed to address, in part, the following issues questions developed by the Plenary Group:

| | |
|---|---|
| Issue Question 2. | How and where does SMUD's infrastructure and operations affect wildlife movement? |
| Issue Question 3. | How does SMUD's infrastructure and operations affect deer movement? |
| Issue Question 7(d). | What are the relevant and known factors (limiting and beneficial) affecting deer populations in the Project area and how/where are those factors influenced by Project operation and maintenance? |
| Issue Question 10. | What is the extent of wildlife drowning in Gerle Creek Canal or in the ditch below the outlet of Rubicon-Rockbound Tunnel? |
| Issue Question 13. | What are the impacts on terrestrial resources due to secondary use of project access roads (e.g., OHV use)? |
| Issue Question 30. | Relative to effects on wildlife, what is the use of off-road vehicles by season? By month? |

Based on a review and discussion of the initial issue questions, the Terrestrial Resources TWG developed the following study objectives:

1. Determine the spatial relationship between UARP features and designated critical fawning habitat, holding areas, critical summer range, critical winter range, and primary migration corridors.

2. Determine the extent and significance of deer fatalities due to drowning in the Gerle Creek Canal and the ditch below the outlet of the Rubicon-Rockbound Tunnel.

[1] In a letter date January 3, 2002 SMUD requested the Mule Deer Foundation (Reno, NV) provide any input to development of the study plan process, however no information was received.

3. Determine the availability of suitable crossing points for deer along UARP penstocks that bisect a primary movement corridor.

4. Determine the extent and timing of deer road kills along the following primary access roads to UARP facilities that receive heavy traffic: Ice House Road from Highway 50 to Loon Lake Reservoir and the access road from Ice House Road to Ice House Reservoir.

A separate study area was defined for each of these objectives as follows:

1. Objective No. 1 Study Area: Areas within 0.5-mile of all UARP features and facilities.

2. Objective No. 2 Study Area: The Gerle Creek Canal from its origin at the Gerle Creek Reservoir outlet to its terminus at the Robbs Peak Reservoir. Additionally the 480-foot long ditch that connects the Rubicon-Rockbound Tunnel outlet with Rockbound Lake (a non-UARP facility).

3. Objective No. 3 Study Area: The following six UARP penstocks: 1) Robbs Peak Penstock, from Robbs Peak Tunnel to Robbs Peak Powerhouse; 2) Jones Fork Penstock, from Jones Fork Tunnel to Jones Fork Powerhouse; 3) Union Valley Penstock, from the outlet of the Union Valley Tunnel to the Union Valley Powerhouse; 4) Jaybird Penstock, from the Jaybird Tunnel to the Jaybird Powerhouse; 5) Camino Penstock, from the Camino Tunnel to the Camino Powerhouse; and 6) White Rock Penstock, from White Rock Tunnel to White Rock Powerhouse.

4. Objective No. 4 Study Area: Ice House Road from the intersection with Peavine Ridge Road to Loon Lake Reservoir; Wentworth Springs Road from Ice House Road to Gerle Creek Reservoir; the access road to Ice House Reservoir from Ice House Road to Strawberry Point Campground.

Field studies were restricted to those lands where SMUD has legal access (e.g., ownership/ easement rights, public lands).

## 2.2 Water Year Types

The information in this subsection is provided for informational purposes, as requested by agencies. The derivation of water year types is described in the *Water Quality Technical Report*. Table 2.2-1 presents water year types for the period that is pertinent to this *Mule Deer Technical Report*.

**Table 2.2-1. Water year types applied to individual months of years 2001-2003 (D=Dry; BN=Below Normal).**

| Year | Jan | Feb | Mar | Apr | May | June | July | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2002 | D | BN | BN | BN | BN | BN | BN | BN | BN | BN | BN | BN |
| 2003 | BN | BN | BN | BN | D | BN | BN | BN | BN | BN | BN | BN |

## 2.3 Agency Requested Information

In a letter dated December 17, 2003 to SMUD, the agencies identified, by study, information they believed they needed to begin settlement discussions, with the understanding that additional information might be requested. The agencies requests regarding mule deer are as follows:

- All studies will need GIS shape files showing habitat/vegetation types and spatial relationships with meta-data.
- Shape files will need to include survey locations and positive sightings/responses.
- Location of surveys along Gerle Canal/Icehouse Road.
- Dates of surveys.
- Photographs of ingress/egress points along Gerle Canal.
- Locations of deer/wildlife crossings/trails associated with ALL penstocks and canals.
- Copy of road kill survey questionnaire.
- Timing of road kills.
- Spatial relationships (GIS-delineated) for fawning, holding, critical summer and winter range, and primary migration corridors.

The location and dates of surveys along Gerle Canal and Icehouse Road are provided in Section 3.0, Methods. A GIS map that delineates known information on important deer habitats within the UARP area is provided in Figure 4.2-1, Appendix A. Survey locations and deer/wildlife crossings/trails along Gerle Canal and UARP penstocks are illustrated in Figure 4.3-1, Appendix B. Representative photographs of ingress/egress points along Gerle Canal are provided in Appendix C. A copy of the road kill survey questionnaire is provided in Figure 3.4-1. The results and analysis of the road kill element of the mule deer study are presented in Sections 4.5 and 5.4.

In a May 13, 2004 letter, the agencies stated in regards to the *Mule Deer Technical Report* (February 2004) the following:

- To address study objective 4 of the study plan, use of Project facilities and Project-related roads during deer hunting season needs to be evaluated in the Roads study.

Study objective 4 of the study plan pertains to the evaluation of road kills along designated primary access roads to UARP facilities that receive heavy traffic. This evaluation is addressed in Sections 4.5 and 5.4 of this technical report. In addition, SMUD assessed levels of use of primary access roads to UARP facilities as part of the UARP Roads study. The Terrestrial Resources TWG, during its initial meetings in 2001, discussed use of UARP facilities and UARP-related roads by hunters during deer hunting season and concluded that this issue was not significant in the context of relicensing and no study was developed. Key factors in making this determination were:

1. The California Department of Fish and Game (CDFG) has management responsibility for regulating deer harvest in the State;

2. CDFG assists hunters by identifying access availability for each of the Deer Management Zones within the State and directs them to sources for road maps and other access information; and

3. CDFG can restrict hunter access or take of deer in specific areas if necessary for the health of the deer population.

The Terrestrial Resources TWG met on June 21, 2004 to consider "conclusions" relative to mule deer and to develop recommendations for consideration by the Settlement Negotiation Group. The TWG agreed on the following general conclusions:

1. The Issue Questions and Objectives stated in the Mule Deer Study Plan are adequately addressed by the information provided in the *Mule Deer Technical Report*;

2. Methods employed were adequate to address Issue Questions and Objectives; and

3. Roads provide access for hunters as well as poachers. Future management plans need to address this relationship. [Note: SMUD assumes that this conclusion pertains to a future deer management plan (see following recommendation to Settlement Negotiations Group) and does not require further analysis in this technical report.

The TWG also developed the following recommendation for consideration by the Settlement Negotiation Group:

1. As part of a management plan for mule deer, any new facility developments need to be assessed for potential barriers to movement (e.g., roads, penstocks, canals) to mule deer.

## 3.0 METHODS

SMUD performed the Mule Deer Study in conformance with the methods described in the study plan.

### 3.1 Habitat Mapping

Habitat maps and available data concerning critical fawning, holding areas, critical summer range, critical winter range, and primary migration corridors for the Pacific Deer Herd (Hinz 1981, SMUD 2001) were gathered from the Eldorado National Forest (ENF) (D. Yasuda, District Biologist, Pacific Ranger District) and the California Department of Fish and Game (CDFG), (T. Weist, Associate Biologist, Sacramento Valley and Central Sierra Region). The data was digitized and integrated into GIS maps with additional data layers displaying reservoirs, roads, water conveyance systems (i.e., penstocks and canals), and developed recreation facilities.

### 3.2 Canal Drowning

Both the Gerle Creek Canal and the ditch below the Rubicon-Rockbound Tunnel were evaluated for the potential to entrap deer and cause mortality. The evaluation consisted of site visits, a

review of the UARP FERC Exhibit L drawings depicting engineering specifications of these canals, a review of canal operations, and consultation with SMUD's canal maintenance personnel regarding past observations of live animals or carcasses in Gerle Creek Canal.

Evaluations of the Gerle Creek Canal were performed on June 11, 2002 to assess the deer drowning potential of the canal, available crossings (e.g., bridges) for deer and other wildlife, and reasonable opportunities for escape along the canal (e.g., backwater areas at stream inflow points). Global Positioning System (GPS) (Garmin GPS III, GARMIN International Inc., Olathe, Kansas) was used to obtain Universal Trans Mercator (UTM) coordinates for the identified crossings and potential escape points. Design features of the canal of importance to animal ingress and egress (e.g., bank substrate and slope) were also documented. Photographs were also taken of canal design features, crossings, and potential escape sites.

The drowning hazard potential of the ditch below the Rubicon-Rockbound Tunnel was evaluated on June 25, 2002. Site conditions were recorded in field notes and photographed with emphasis given to the length of the canal, substrate, side slope, crossings, and flows.

## 3.3 Penstock Crossing

Aboveground UARP penstocks (Jones Fork Penstock Robbs Peak Penstock, Jaybird Penstock, Camino Penstock, and White Rock Penstock) were evaluated in order to identify locations that may impede mule deer movements, particularly during spring and fall migrations between summer and winter habitat. The Union Valley Penstock is located entirely underground, and therefore, was eliminated from further evaluation. Published reports suggest that a clearance of 19-20 inches is sufficient to allow passage by deer beneath fences and pipelines (Dalton 1986, Yoakum et al. 1980). This study used a 24-inch clearance standard as the height necessary for deer to pass unimpeded beneath UARP penstocks. Biologists surveyed the entire length of each penstock during May 2003 and January 2004, and used a Garmin GPS III instrument to record the location and extent of all penstock sections that met or exceeded the 24-inch clearance standard. Photographs were taken to document penstocks and representative crossings. Evidence of deer utilization of crossings (e.g., tracks, scat, direct observation of animals) was also noted.

## 3.4 Road Kills

Mule deer road kill mortality was evaluated using two methods:

1. Fifty survey cards (Figure 3.4-1) were distributed to SMUD staff, and an additional 50 to ENF personnel. The survey cards requested that individuals who observed road kill deer and other wildlife to provide information on the date, time, location, sex, and approximate age of each carcass found. Respondents were asked to complete one card for each observation and return the card to the Licensee via U.S. Mail (with pre-paid postage). The survey card information-gathering period covered a 12-month period (September 2002 through August 2003).

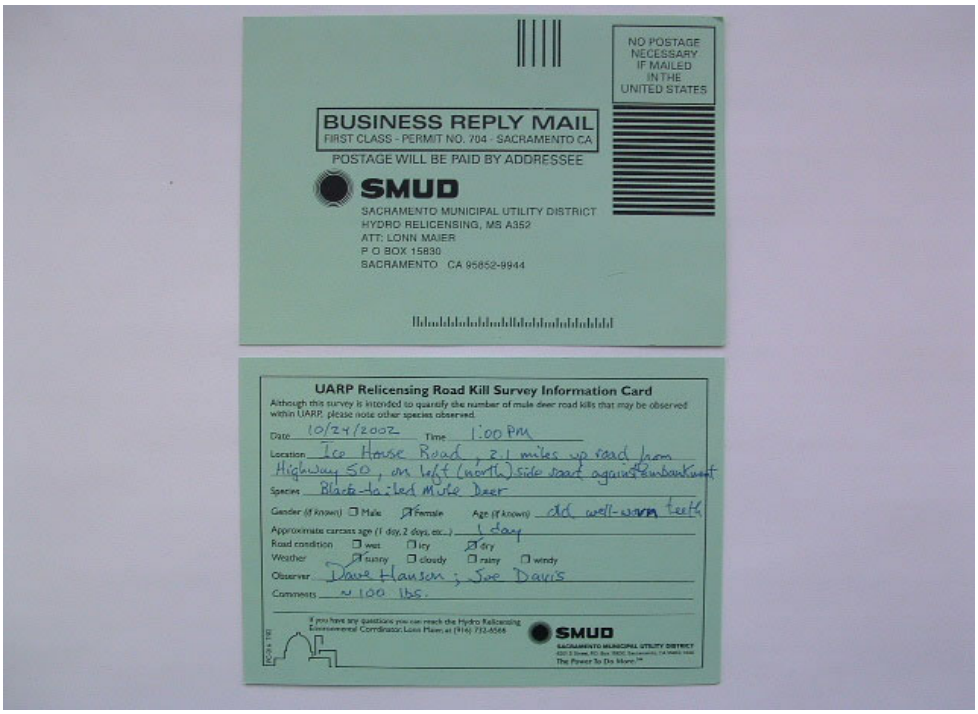



**Figure 3.4-1. Mule Deer Survey Card.**

2. Biologist(s) searched for deer fatalities by driving the roads identified for Study Objective No. 4 (Section 2.1) once each week from September 3, 2002 to November 18, 2002. Surveys were conducted on Mondays with the sole exception being the first survey on September 3, 2002, which was the first Tuesday following the three-day Memorial Day holiday weekend. The final survey on November 18th represented the second weekly survey following the first major storm of the season, which occurred on November 7, 2002. This survey period was chosen because it coincides with the period of peak migration of deer from higher elevation summer range to lower elevation winter range and presumably offers the greatest potential for deer/vehicle collisions.

## 3.5 Incidental Observations

Biologists also recorded incidental observations of wildlife to generate a comprehensive species list for the UARP area. Data recorded for each observation generally included: species, date of observation, location, and any remarkable behavior or activity exhibited by the animals observed.

# 4.0 RESULTS

## 4.1 Historical Information

The mule deer found in the UARP are part of the Pacific Deer Herd (Hinz 1981). This herd encompasses all of the Pacific Ranger District of the ENF, and portions of the herd extend into the Georgetown and Placerville ranger districts. The herd occupies approximately 353 square miles of public and private lands within El Dorado County (including the UARP) and a portion

of Placer County south of the Rubicon River. Most deer in the herd are presumed to be migratory and occur west of the Sierra Nevada crest. The boundaries of the herd are the Rubicon River on the north, the South Fork American River on the south, and roughly a north-south line above 2,500 feet elevation, paralleling Highway 49 between Placerville and Georgetown.

## 4.2 Habitat Mapping

The Pacific Deer Herd has four significant habitat designations: critical summer range, fawning habitat, holding areas, and winter range (Figure 4.2-1, Appendix A). Based on the existing information provided by CDFG and the ENF, the critical summer ranges, fawning habitat, and holding areas of the herd occur from the mid to upper elevations of the Crystal Basin within the ENF, usually above 4,000 feet in elevation. These critical areas are found east of Ice House Reservoir, north and east of Union Valley Reservoir and north of Loon Lake Reservoir. The known winter range of the herd lies mainly on south facing slopes between 2,000 and 4,500 feet elevation and between the South Fork American River and Peavine Ridge Road from the town of Kyburz and westward to Hwy 49. The Pacific Deer Herd utilizes the major east-west trending ridges (Poho, Telephone, and Peavine) of the ENF as primary migration corridors between high- and low-elevation habitats (Hinz 1981).

## 4.3 Canal Drowning

### 4.3.1 Gerle Creek Canal

SMUD records for the Operation and Maintenance (O&M) of the Gerle Creek Canal showed that no deer, alive or dead, have ever been recorded in the canal (personal communications, J. Hack, D. Newton, J. Noble and L. Maier, SMUD).

The FERC Exhibit L drawings for the Gerle Creek Canal show that the canal has varied widths and bank angles classified as either Type I or Type II (Figure: 4.3-1, Appendix B). The Type I classification consists of a left bank (i.e., facing downstream) slope of 1:1, a right bank slope of 2:1, and a bottom width of 22 feet. The Type II classification consists of a left bank slope of 1.5:1 a right bank angle of 2:1, and a bottom width of 19 feet. Overall the bank-to-bank width of the canal exceeds 50 feet. Steeper banks (1:1) are sealed with a vary course lining of gunnite, while the shallower banks (2:1) remain as native rock and soil from the hillside from which the canal was cut. A road roughly 12-feet in width is located on top of the right berm. The slope that abuts the left bank is fairly shallow and rarely exceeds an estimated angle of 20°. The Gerle Creek Canal is rated for a maximum flow of 1,120 cfs, but is typically operated at lower than maximum flows depending on generation at Loon Lake Powerhouse. Based on slope angle, substrate, and typical flows, numerous egress opportunities for deer exist along the entire length of the canal. In addition, at least five backwater sites along the canal offer easy egress opportunities under all flow conditions (Figure 4.3-1, Appendix B). Four of these backwater areas are associated with small drainages intersecting the left bank of the canal (Photographs 4.3.1 through 4.3-4, Appendix C). The fifth point is a small boat ramp located near the terminus of the canal at Robbs Peak Reservoir.

Opportunities for deer and other wildlife to cross the canal are afforded in part by three bridges located from 1.1 miles to 0.18-miles apart (Figure 4.3-1, Appendix B; Photographs 4.3-5 through 4.3-7, Appendix C). Tracks of mule deer, black bear, and coyote were observed on these bridges after a fresh snowfall on April 8, 2003, confirming that wildlife utilize bridges for crossing the canal when necessary. In addition, tracks of black bear and mule deer were observed entering the canal on the right bank and exiting on the left bank during a field visit on April 8, 2003.

### 4.3.2 Rubicon-Rockbound Ditch

The Rubicon-Rockbound Ditch is approximately 480 feet in length with bank slopes that vary from 1:1.5 to 1.5:1 on the right bank to 1.5:1 to 4:1 on the left bank. The ditch resembles a natural stream channel over most of its length with large granite outcroppings, boulder/cobble banks, and a bed comprised of small and medium sized cobble (Photograph 4.3-8, Appendix C). Adjacent to the canal, granitic cliffs/outcroppings, knobs, and small drainages dominate the surrounding topography.

From 1976 through 1998, flow through the Rubicon-Rockbound ditch averaged less than 50 cfs for the nine-month period from July through March. During the spring and early summer runoff period (April through July) flow through the ditch ranges from 100 cfs to 300 cfs (SMUD 2001). The lower flows measured between July and March overlap the typical migration period of the Pacific Deer Herd.

## 4.4 Penstock Crossing

### 4.4.1 Robbs Peak Penstock

The Robbs Peak Penstock (Figure 4.3-1, Appendix B) transports water from the Robbs Peak Tunnel to the Robbs Peak Powerhouse at the northeast corner of Union Valley Reservoir. The penstock is 2,235 feet in length. Approximately 86 percent of the penstock is elevated 24 inches or greater above ground (Photograph 4.4-1, Appendix C) with some segments elevated up to 10 feet above ground. Only two segments of the penstock are less than the 24-inch clearance criterion established in the study plan for reasonable passage of mule deer. These are: 1) The first 264 feet of the penstock as measured from the tunnel adit; and 2) the final 60 feet of the penstock prior to the point where the penstock goes underground to connect with Robbs Peak Powerhouse.

### 4.4.2 Jones Fork Penstock

The Jones Fork Penstock transports water 1.6 miles from the Jones Fork Tunnel to the Jones Fork Powerhouse on the southeast arm of Union Valley Reservoir (Figure 4.3-1, Appendix B). The penstock is above ground and supported by concrete pedestals, except where the penstock goes underground as it crosses Ice House Road. Approximately 7,650 feet (90 percent) of the penstock is elevated at least 24 inches above ground, the minimum clearance standard established by the TWG for reasonable deer passage (Photograph 4.4-2, Appendix C). The topography along the penstock is relatively flat. The section of the penstock between Ice House Reservoir and Ice House Road contains at least five locations that are elevated a minimum of 60

inches above the ground. The distance between these raised penstock segments ranges from 0.15 to 0.26 mile. The penstock section between Ice House Road and Jones Fork Penstock contains two raised segments that exceed 60 inches aboveground with one segment estimated to be over 40 feet above ground (Photograph 4.4-3, Appendix C). These two sections are located 0.27-mile apart. During the field investigation deer tracks were abundant in the vicinity of the penstock, including under all locations elevated above 60 inches above ground. Biologists also observed an adult male deer with antlers pass rapidly under a section of penstock just west of Ice House Road that was estimated to be approximately 24 inches above ground.

### 4.4.3 Union Valley Penstock

The Union Valley Penstock is located entirely underground, and therefore, was not surveyed during this study.

### 4.4.4 Jaybird Penstock

The Jaybird Penstock transports water 0.5-mile from Jaybird Tunnel at 4,300 feet elevation downhill to Jaybird Powerhouse at 2,950 feet elevation. The steepness of the slope (approximately 31°) combined with numerous vertical cliffs along the length of the penstock presents a potential topographical barrier to normal deer movements. Safety concerns precluded field personnel from measuring exact penstock aboveground clearances. However, visual observations from a distance indicate that the penstock exceeds the 24-inch clearance criterion over most of its length (Photograph 4.4-4, Appendix C).

### 4.4.5 Camino Penstock

The Camino Penstock transports water 1,560 feet from the Camino Tunnel to the Camino Powerhouse. As with the Jaybird Penstock, the Camino Penstock is located on a relatively steep slope with cliff banks and rock outcroppings, which present a topographical deterrent to normal deer movements (Photograph 4.4-5, Appendix C). Over 90 percent of the penstock is situated 24 inches or greater above ground (Photographs 4.4-6 and 4.4-7, Appendix C) with some sections as much as 15 feet above ground. About 75 feet of the penstock near its junction with the Camino Tunnel is elevated less than 24 inches above ground. Two “wildlife” trails were observed crossing under the penstock, with deer tracks prevalent on both trails (Photograph 4.4-7, Appendix C).

### 4.4.6 White Rock Penstock

The White Rock Penstock transports water 1,675 feet from the White Rock Tunnel to the White Rock Powerhouse. Canyon walls constrained satellite reception and use of GPS equipment for recording clearance points along the penstock. Field crews estimated that over 90 percent of the White Rock Penstock is elevated greater than 24 inches above ground (Photographs 4.4-8 and 4.4-9, Appendix C), and in several locations the penstock exceeds a height of 10 feet above ground (Photograph 4.4-9, Appendix C). Only the top 75 feet of the penstock near the junction with the White Rock Tunnel fails to exceed the 24-inch above ground clearance criterion.

## 4.5 Road Kills

Three deer fatalities due to vehicle collisions (i.e., road kills) were reported for the study area during the study period. The road kills were found on June 6, 2003, July 1, 2003, and July 17, 2003. The June 6 report involved a 1-2 year old female. The doe was found under the Jones Fork Silver Creek Bridge on Ice House Road. The carcass was estimated to be three days old. The July 1 road kill was discovered approximately 500 feet south of the turnoff to Fashoda/Sunset Campground on Ice House Road. This deer was identified as a 3-4 year old female and the carcass was estimated to be less than one day old. The July 17 report involved a young male approximately 1-2 years old discovered on Ice House Road approximately 1.4 miles northeast of the Ice House Road/ Peavine Ridge Road intersection. The carcass was estimated to be less than a day old. All three of the road kills were found on sunny days with dry road conditions. In addition to deer fatalities, deer were observed regularly crossing roads within the study area.

Biologists also recorded incidental observations of other road-killed animals during field surveys for mule deer fatalities. Throughout the survey period, small mammals such as Douglas squirrel (*Tamiasciurus douglasii*), western gray squirrel (*Sciurus griseus*), California ground squirrel (*Spermophilus beecheyi*), and various other ground squirrels (*Spermophilus* spp.) and chipmunks (*Tamias* sp.) were often found dead on Ice House Road as a result of traffic. Small mammals were observed most frequently (both dead and alive) in early summer with observations declining substantially in late fall with the onset of cooler weather as most small mammals retreated to winter shelter.

## 4.6 Other Incidental Observations

Biologists recorded 140 species of birds and mammals during UARP field studies including this Mule Deer Study. These incidental observations are provided in Appendix D of the *Waterfowl Nesting Habitat Technical Report*.

# 5.0 ANALYSIS

## 5.1 Mule Deer Migration Patterns

The mule deer in the central Sierra Nevada typically reside on their summer range until they are stimulated to move down slope to their wintering areas (Loft et al. 1989). Habitat quality and quantity, temperature, day length and weather conditions all play a part in determining when these deer initiate and complete their fall migrations. Generally, from mid-October, or later, any significant winter storm has the potential to cause some migratory deer to move from summer range to lower elevations. If those storms are mild, some deer may delay in intermediate habitat (between 4,000 and 6,000 feet elevation) seeking acorns, leaf mast and other available fall forage. Severe storms may trigger an en-masse migration of deer from higher elevations down slope to winter range habitat. In contrast, spring migration usually occurs as a gradual upward drift that may span two months as deer delay in holding areas where cover and forage are abundant (Loft et al. 1989).

## 5.2 Canal Drowning Potential

The potential for wildlife to become entrapped and drown in an open water conduit depends on such factors as canal dimensions, adjacent topography and substrate, and velocity of water. Deep canals with vertical walls, steep uphill slopes, and high water velocity generally pose the greatest threat to wildlife. In contrast, the Gerle Creek Canal, although relatively wide, has gradually-sloped walls composed of rough gunnite or natural rock substrate, and moderate flows. In addition, the canal design incorporates several shallow, backwater areas (corresponding with creek inlets along the canal) that function similarly to engineered escape ramps constructed on other open water conduits where entrapment is known to be a problem (e.g., conduits with vertical wall construction). These design and operational characteristics presumably mitigate the potential for wildlife mortality in Gerle Creek Canal.

## 5.3 Penstock Crossings

Linear facilities such as penstocks and other pipelines have the potential to impede deer movements when constructed without adequate clearance to allow animals to pass beneath them. Dalton (1985) and Yoakum et al. (1980) indicate that adequate clearance for deer exceeds 16 inches for fawns and approximately 20 inches for adult mule deer. UARP penstocks, however, provide clearance greater than 24 inches over most of their length and have numerous sections offering greater than 60 inches of aboveground clearance. As a result, these penstocks are not likely to be a significant impediment to deer passage.

## 5.4 Road Kills

Deer and other wildlife fatalities are consequence of vehicular travel that can sometimes be reduced but rarely eliminated. Ice House Road is the main thoroughfare for access to and from UARP facilities, recreation, and logging in the UARP and bisects all known migration routes of the Pacific Deer Herd. Ice House Road is classified by El Dorado County as a rural minor collector road, designed for moderate traffic (personal communication, J. Breesin, El Dorado County Department of Transportation 2004). In 2002, the El Dorado County Department of Transportation (DOT) conducted a vehicle count on Ice House Road that showed an average of 1,444 vehicles per day during the first week of July (the peak of summer recreation season). Assuming that traffic levels during the first week of July 2003 were comparable to the first week of July 2002, then over 10,000 cars traveled Ice House Road during a seven-day period when the road kill monitoring study was in effect (1,444 x 7 = 10,108). During that period, one vehicle-caused deer fatality was reported on Ice House Road (report from July 1, 2003). El Dorado County DOT has no equivalent traffic data from Ice House Road corresponding to the fall migration period for deer, but vehicle use declines significantly after the Labor Day weekend, which represents the end of the summer recreation season.

## 6.0 LITERATURE CITED

Dalton, L. B. 1985. Big game passages of large diameter overland conveyance systems. Issues of Technology in the Management of Impacted Western Wildlife. Proceedings of a National Symposium. February 1985. 232-234

Hinz, D. 1981. The Pacific deer herd management plan. CDFG (in cooperation with ENF). July 1981.

Loft, E. R., R. C. Bertram, and D. L. Bowman. 1989. Migration patterns of mule deer in the central Sierra Nevada. California Fish and Game 75(1):11-19.

SMUD (Sacramento Municipal Utility District). 2001. Initial Information Package for Relicensing of the Upper American River Project (FERC No. 2101). Sacramento. July 2001.

USDA (United States Department of Agriculture, Forest Service). 1989. Eldorado National Forest Land and Resource Management Plan. Environmental Impact Statement. January 1989.

Yoakum, J., W. P. Dasmann, H. R. Sanderson, C. M. Nixon, and H. S. Crawford. 1980. Habitat Improvement Techniques. Pp. 329-403 *in* S. D. Schemnitz, ed. Wildlife Management Techniques Manual, Fourth Edition: Revised. The Wildlife Society, Washington, D.C.

# APPENDIX A

# PACIFIC DEER HERD CRITICAL HABITAT AND GENERAL MIGRATION CORRIDORS

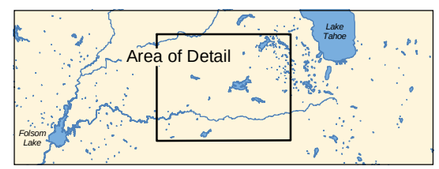
# Upper American River Project

SMUD

## Figure 4.2-1
## Pacific Deer Herd Critical Habitat and General Migration Corridors

**Range Type**

- Critical Fawning & Holding
- Critical Summer
- Critical Winter
- Migration Routes
- Canal
- Penstock
- Divided Highway
- County Roads
- Other Roads
- Dam
- Wilderness Boundary




N

SCALE 1:140,000

0 1 2 3 4 Miles

Prepared by VESTRA Resources, Inc., Redding. CA. Jan. 22, 2004

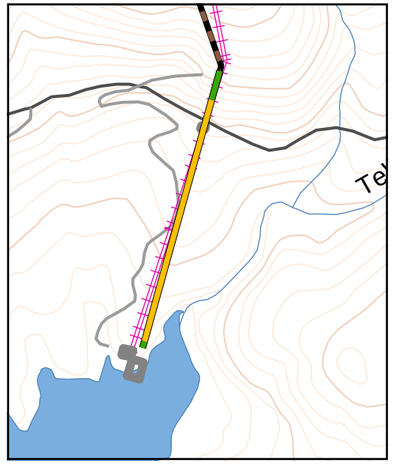
# APPENDIX B

# PENSTOCK AND CANAL FEATURES OF UARP

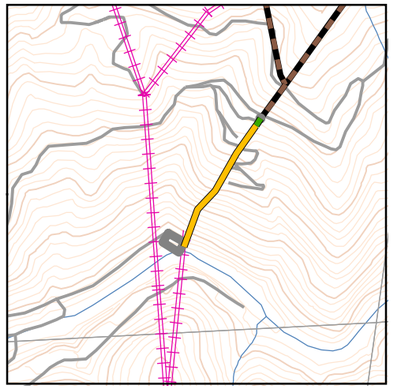
# Upper American River Project

SMUD

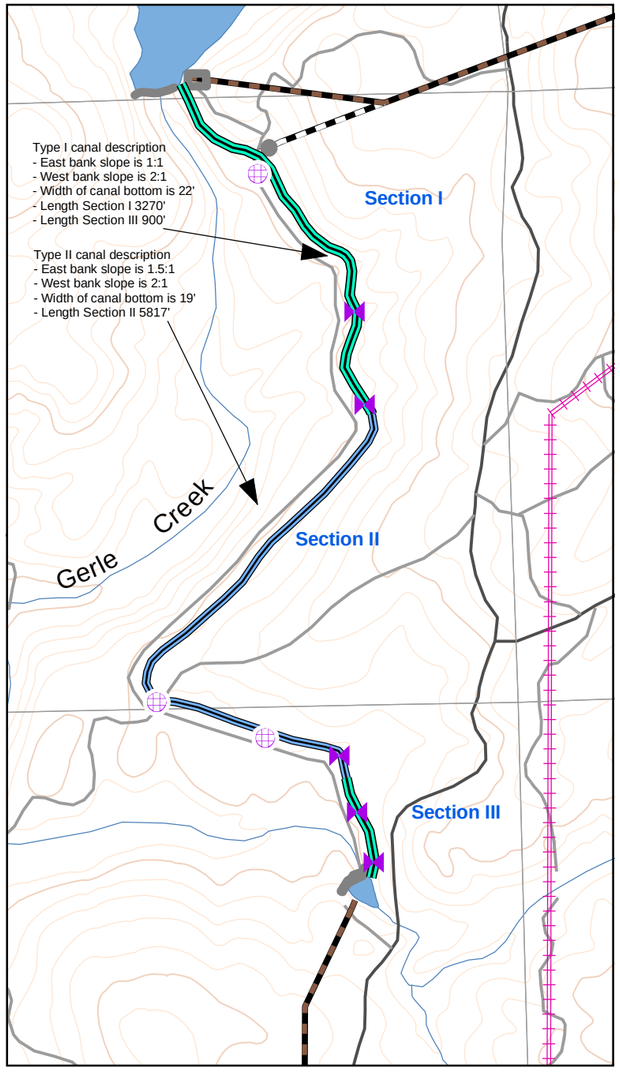
# Figure 4.3-1 Penstock and Canal Features of UARP



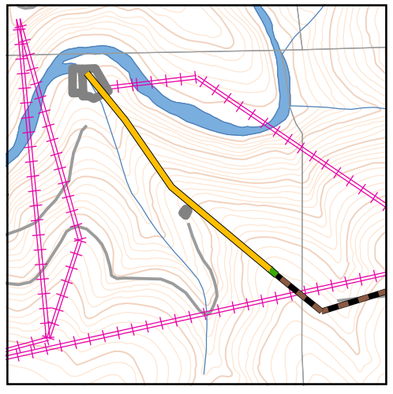
Robbs Peak Penstock



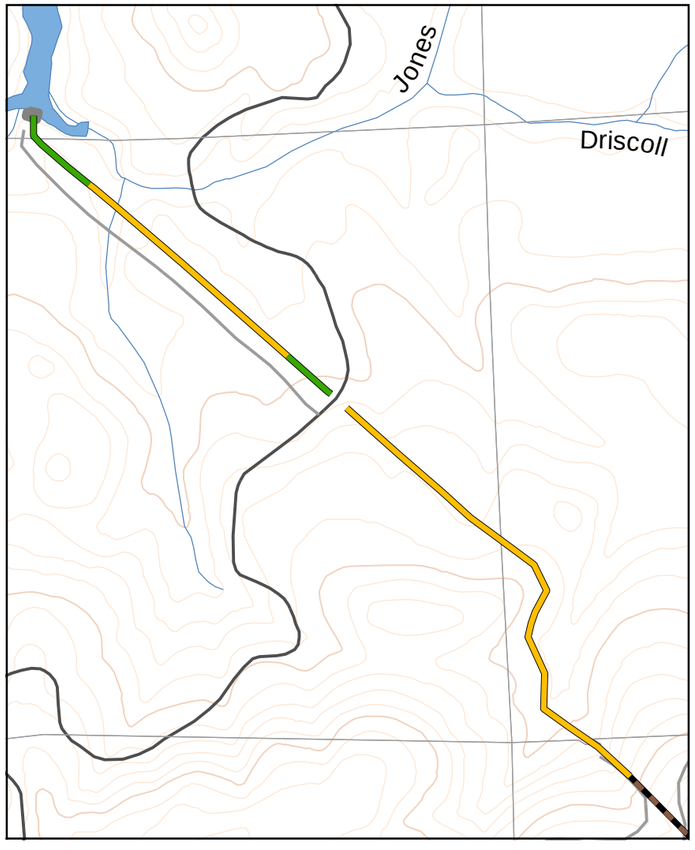
Camino Penstock



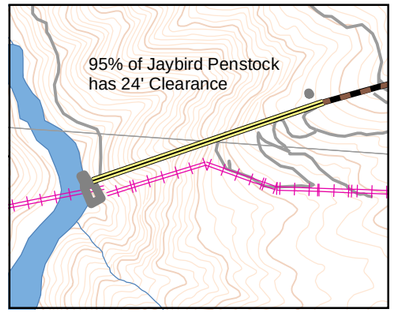

Gerle Canal



White Rock Penstock




Jones Fork Penstock




Jaybird Penstock

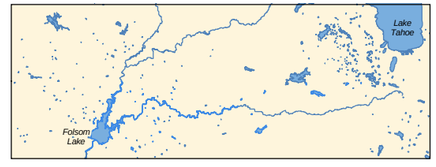
Adit
Channel
Tunnel
Dams
Transmission Lines
Bridge
Deer Escape Point

**Canal Type**

Type I
Type II

**Deer Barrier Clearance 24 Inch**

Jaybird Penstock
No
Yes




N

SCALE 1:15680

0 0.1 0.2 0.3 0.4 Miles

Prepared by VESTRA Resources, Inc., Redding. CA. Jan. 21, 2004

# APPENDIX C

# PHOTOGRAPHS OF STUDY AREA

- **Canal Drowning – Gerle Creek Canal**
  - **4.3-1 - Escape point along Gerle Creek Canal**
  - **4.3-2 - Escape point along Gerle Creek Canal**
  - **4.3-3 - Escape point along Gerle Creek Canal**
  - **4.3-4 - Escape point along Gerle Creek Canal**
- **Bridge Crossings**
  - **4.3-5 - Gerle Creek Bridge just downstream of Gerle Creek Dam**
  - **4.3-6 – Gerle Creek Bridge (middle bridge)**
  - **4.3-7 – Gerle Creek Bridge (south bridge)**
- **Rubicon-Rockbound Canal**
  - **4.3-8 – Rubicon-Rockbound Canal**
- **Penstock Photographs**
  - **4.4-1 – Robbs Peak Penstock**
  - **4.4-2 – Jones Fork Penstock**
  - **4.4-3 – Jones Fork Penstock**
  - **4.4-4 – Jaybird Penstock**
  - **4.4-5 – Camino Penstock**
  - **4.4-6 – Camino Penstock midpoint to powerhouse**
  - **4.4-7 – Trail at midpoint of Camino Penstock**
  - **4.4-8 – White Rock Penstock**
  - **4.4-9 – White Rock Penstock**

# Canal Drowning - Gerle Creek Canal

**4.3-1. Escape point along the Gerle Creek Canal**

**4.3-2. Escape point along Gerle Creek Canal**

**4.3-3. Escape point along Gerle Creek Canal**

**4.3-4. Escape Point along Gerle Creek Canal**

# Bridge Crossings

**4.3-5. Gerle Creek Bridge just downstream of Gerle Creek Dam**

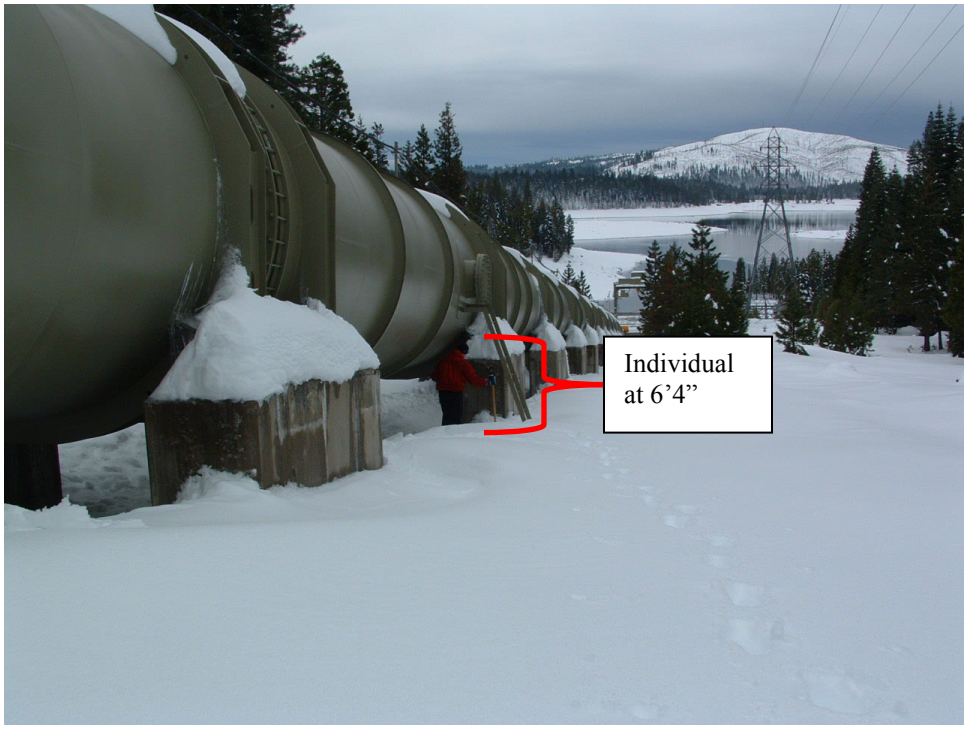
**4.3-6. Gerle Creek Bridge (middle bridge)**

**4.3-7. Gerle Creek Bridge (South Bridge)**

## Rubicon-Rockbound Canal

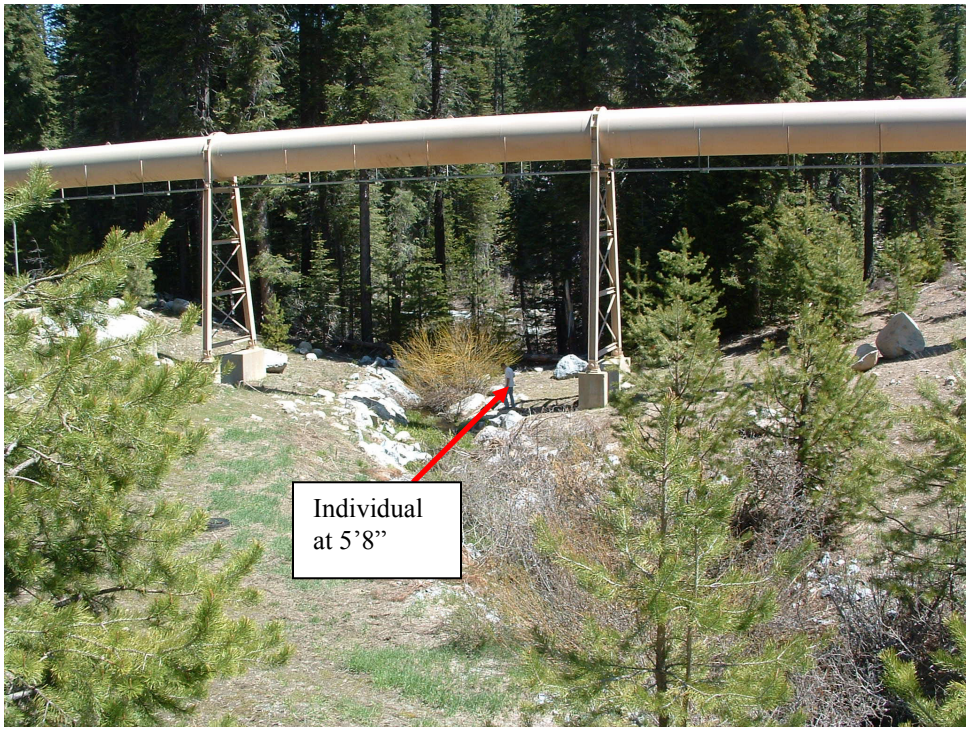
**4.3-8. Rubicon-Rockbound Canal**

# Penstock Photographs




**4.4-1. Robbs Peak Penstock**


**4.4-2. Jones Fork Penstock**




**4.4-3. Jones Fork Penstock**

**4.4-4. Jaybird Penstock**


**4.4-5. Camino Penstock**

**4.4-6. Camino Penstock midpoint to powerhouse**

**4.4-7. Trail at midpoint of Camino Penstock**


**4.4-8. White Rock Penstock**


**4.4-9. White Rock Penstock**