SACRAMENTO MUNICIPAL UTILITY DISTRICT
UPPER AMERICAN RIVER PROJECT
(FERC Project No. 2101)

and

PACIFIC GAS AND ELECTRIC COMPANY
CHILI BAR PROJECT
(FERC Project No. 2155)

PROJECT SOURCES OF SEDIMENT
TECHNICAL REPORT

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2.4 Project Sources of Sediment

This study is designed to provide information regarding the extent to which Sacramento Municipal Utility District's (SMUD) Upper American River Project (UARP) and Pacific Gas and Electric Company's Chili Bar Project features significantly contribute to the sediment load (e.g., elevated levels over that of background) entering the river. Under this study, all UARP and Chili Bar Project related facilities will be inspected to identify any obvious sources of significant amounts of sediment to the river. Where significant UARP and/or Chili Bar Project sources are identified, the amount of sediment entering the river will be quantified and/or appropriate control measures will be identified. (It may be more applicable to fix any observed problems areas immediately rather than conduct extensive studies to quantify sediment loading, and then fix the problem area.) In addition, as part of this study, readily available information regarding any non-projects sources of sediment (areas outside the FERC Project Boundaries where repeated slides or slope failures have occurred) will be presented.

2.4.1 Pertinent Issue Questions

This Project Sources of Sediment Study Plan addresses the following Aquatic/Water Issue Questions:

5. What effects do the Project features and operations have on fluvial geomorphology and stream habitat?
42. How do Project-related features affect sediment budgets?

Note that the Channel Morphology Study Plan addresses sediment once it enters the river and reservoirs (within the flood-prone area), and the Water Quality Study addresses turbidity. Also note that as part of the Reservoir Fish Habitat Study, any obvious areas of erosion along reservoir banks will be identified.

2.4.2 Background

This study examines whether UARP and/or Chili Bar features (other than project dams) significantly contribute to the sediment load entering the river. UARP and Chili Bar Project features include project roads, spoil areas, recreation areas and other hillslope project features where erosion or slope failure could lead to significant amounts of sediment entering the river. Under this study, all UARP and Chili Bar Project related facilities will be inspected to identify any obvious sources of significant amounts of sediment to the river. Where significant sources are identified, the amount of sediment entering the river will be quantified and/or appropriate resource measures will be identified. (It may be more applicable to fix any observed problems areas immediately rather than conduct extensive studies to quantify sediment loading, and then fix the problem area.)

2.4.3 Study Objectives

The objective of this study is to:

- determine if UARP and/or Chili Bar project features contribute significant amounts of sediment to streams
- if so, identify where and what measures are needed to reduce this sediment loading

2.4.4 Study Area

The study area will include all UARP and Chili Bar Project hill slope features, including project roads and UARP's spoil areas described in pages A-1 through A-53 of SMUD's Initial Information Package). As a first step in the study, a list of project roads will be developed in consultation with Rich Platt (USFS) for approval by the Aquatic TWG. The list will include roads that were constructed by SMUD and/or PG&E for operation of the UARP and/or Chili Bar Project and are currently maintained by SMUD or PG&E. Roads or facilities maintained by another party (such as a County road) and land management by another party (such as land owned and maintained by Sierra Pacific Industries) may/may not be included in the study area, however, if SMUD and/or PG&E are readily aware of any reoccurring sources of sediment in these areas, it will be noted.

2.4.5 Information Needed From Other Relicensing Studies

Information may be needed from the Channel Morphology Study Plan. Development of the list of roads to be included will be coordinated with appropriate TWGs (e.g., Terrestrial and Cultural) for consistency among studies. The location of reservoir banks that show obvious signs of erosion will be needed from the Reservoir Fish Habitat Study.

2.4.6 Study Methods And Schedule

The study methods will include

- Develop a list of the roads to be included in the study in consultation with Rich Platt (USFS) for approval by the Aquatic TWG.
- Review any pertinent agreements (such as road maintenance, recreation facility or spoil pile agreements) currently in effect for roads on the Aquatic TWG-approved list and other facilities within the study area and determine compliance with the terms and conditions of the agreements
- Identify standards applicable to project roads on the Aquatic TWG-approved list
- Conduct an inspection in the field of all roads to be sure each is maintained to applicable standards, and of all project hill slope facilities
- Document (including photographing, mapping, measuring and locating on a GIS or topographic map) any areas where applicable standards are not met, where erosion/sedimentation appears to be a significant problem (i.e., where erosion is obvious), or areas where the Channel Morphology Study has identified project reaches with significant sediment impacts.
- Interview SMUD and PG&E Operations staff to identify any recurring sources of sediment not associated with the projects.

The list of roads to be included in the study will be developed for consideration by the Aquatic TWG immediately upon approval of this study plan. Applicable agreements and maintenance levels will be identified and reviewed in early summer 2002. All UARP and Chili Bar project features will be inspected in the field in summer 2002. Interested Aquatic TWG and Plenary Group participants will be invited to participate in inspections. It is anticipated that a presentation will be made to the Aquatics TWG and Plenary Group in late 2002, and if any additional data gathering or analysis is identified to address problem areas, this study plan will be amended and the work will occur in 2003.

2.4.7 Analysis

Study analysis will include:

- Determining if the identified persistent erosion and landslides related to UARP and/or Chili Bar Project facilities could reasonably contribute significant amounts of sediment to channels in the projects area
- Recommending corrective measures, where needed.
- Information from this study may be useful in the Channel Morphology Study to identify project-related sources of sediment and to the Water Quality Study when assessing water quality effects. If any project sources of sediment are identified, as part of the Water Quality Plan, these areas will be monitored where they drain into the river/reservoir during runoff events to document the extent of sediment loading, or the area will be stabilized in compliance with all applicable permits/agreements/etc after discussion with the Plenary Group.

2.4.8 Study Output

The study output will be a written report that includes the issues addressed, objectives, study area including sampling locations, methods, analysis, results, discussion and conclusions. The report will be prepared in a format so that it can easily be incorporated into SMUD's draft environmental assessment that will be submitted to FERC with SMUD's application for a new license.

2.4.9 Preliminary Estimated Study Cost

A preliminary cost estimate for this study will be developed after approval by the Plenary Group.

2.4.10 Plenary Group Endorsement

The Aquatics TWG approved this plan on January 25 and February 28, 2002. The participants at the meetings who said they could "live with" this study plan were CDFG, USFS, PCWA, EDCWA, BLM, CSPA, SWRCB and SMUD. None of the participants at the meetings said they could not "live with" this study plan except for the PG&E participant who said PG&E would defer at this time since the plan did not include the Chili Bar Project and downstream. On April 3, the Plenary Group directed the TWG to include Chili Bar in the Study plan. This was done, and the Aquatic TWG approved this plan on April 25, 2002. The participants a the meeting who said they could "live with" this study plan were PCWA, El Dorado County, BLM, CDFG, USFS, CSPA, USFWS, SMUD, SWRCB and PG&E. None of the participants at the meeting said they could not "live with" this study plan. The Plenary Group approved the plan on June 5, 2002. The participants a the meeting who said they could "live with" this study plan were PCWA, El Dorado County, BLM, BOR, USFS, CSPA, SMUD, FOR, PG&E. None of the participants at the meeting said they could not "live with" this study plan.

2.4.11 Literature Cited

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

AQUATICS TWG NOTE:

1. *This study area will be revisited once SMUD and the USFS reach agreement regarding responsibility for and potential Project actions in "Defense and Threat" zones as defined in the Forest Service Plan Amendment EIS and Record of Decision*

PROJECT SOURCES OF SEDIMENT TECHNICAL REPORT

SUMMARY

This technical report provides the results of surveys for project sources of sediment on SMUD's Upper American River Project. Engineering staff from Devine Tarbell & Associates, Inc. along with SMUD staff (to locate roads to be surveyed) conducted the survey. The survey included driving or walking along all roads indicated to be surveyed on the master list and identifying erosion or sediment that had the potential to reach a watercourse. When potential problems were observed, a closer observation was conducted by walking the road area and taking photos to document the problem area.

The roads can be divided into several general categories that have similar characteristics. The first category is the main access roads to project features and campgrounds that have paved surfacing. These roads generally had a formal drainage system, implemented erosion control measures and little or no observed erosion and sediment transport. These roads are generally well maintained.

The largest group was probably the access roads to transmission line towers. These roads were generally surfaced with native materials and followed the natural grade with very little cut and fill. The grade of these roads was sometimes steep and often very narrow. The drainage features were normally water bars. Ruts were observed on several of these roads but the sediment most often did not leave the roadway and in the worst cases it migrated 15 to 20 feet from the road. With the small amount of usage these roads get each year, there is little maintenance done except for identified problems. These roads are typically high on the top of ridges and far from any stream or river. There is little chance of sediment from these roads reaching any project watercourses.

A third group of roads are those that provide access to project features but are surfaced with gravel or native material. These roads are typically constructed with cut and fill sections and have drainage features including side ditches, water bars and cross culverts. Some of these roads are located near watercourses and the have potential to transport sediment to the water. Most of these roads have a higher usage and appear to be maintained to provide access to the feature.

There were very few problem areas identified within any of the above road groups. Many of the problems that exist can generally be corrected with normal maintenance. However, there were some areas identified with potential problems. These problems are noted in the sections below:

- Road I6 - SF Silver Creek Gage Road. Off road jeep crossing of Silver Creek at Road Bend creating erosion into the creek.
- Road I8 – 11N52 - Ice House Dike Road to SF Silver Creek. New road to SF Silver Creek has created erosion and sediment movement towards Creek.
- Road I12A – Transmission Line Road to Towers 1459 through 1462. Trench backfill washed out and created sediment flow down the road towards a small ravine.
- Road J1 – Junction Dam Road. Water flowing across road has created a small ravine on low side and possible erosion into reservoir.
- Road C3 – Slab Creek Reservoir Road. Off road vehicles have created loose material near edge of reservoir with potential of erosion into reservoir.

In addition to the above problems, several areas were noted that need maintenance to prevent possible sediment from eroding into a watercourse.

- Road I9 – Jones Fork Powerhouse Road. Culvert inlet needs to be cleaned of sediment.
- Road J6 – Spoils area at Adit. Small drainage from adit needs to be re-graded to prevent erosion.
- Road J9 – Jaybird Gate House Road at Road J10 and J11. Culvert inlet is plugged with debris and needs to be cleaned.

- Road J10 – Jaybird Surge Shaft Road. Low point in road needs grading and possible down drain to direct water off roadway.
- Road W11 – Slab Creek Reservoir Boat Launch Road. Culvert inlet at the end of the road needs to be cleaned of debris.

1.0 INTRODUCTION

This technical report is one in a series of reports prepared by Devine Tarbell and Associates, Inc., for the Sacramento Municipal Utility District (SMUD) and Pacific Gas and Electric Company (jointly referred to as the Licensees) to support the relicensings of SMUD's Upper American River Project (UARP) and Pacific Gas and Electric Company's Chili Bar Project (jointly referred to as the Projects). The Licensees intend to append this technical report to their respective applications to the Federal Energy Regulatory Commission (FERC) for new licenses. The report addresses project sources of sediment and includes the following sections:

- **BACKGROUND** – Includes when the applicable study plan was 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; and the study area. In addition, requests by resource agencies for additions to and modifications of this technical report are described in this section.
- **METHODS** – A description of the methods used in the study.
- **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).

Also, this technical report does not include a discussion regarding shoreline sediment entering rivers and reservoirs. The Technical Report on Water Quality addresses turbidity; for more information on river and reservoir sediment see Technical Report on Channel Morphology.

2.0 BACKGROUND

2.1 Project Sources of Sediment Study Plan

The Aquatics Working Group (Aquatics TWG) developed the Sources of Sediment Study Plan, which was approved by the Aquatics TWG on January 25, 2002 and by the UARP Relicensing Plenary Group on February 28, 2002. On April 3, 2002 the Plenary Group directed the Aquatics TWG to include Chili Bar in the study plan. This was done and approved by the Aquatics TWG on April 25, 2002 and then by the Plenary Group on June 5, 2002. The study plan was designed to address, in part, the following issue questions developed by the Plenary Group:

Issue Question 5.	What effect do the Project features and operation have on fluvial geomorphology and stream habitat?
Issue Question 42.	How do Project-related features affect sediment budgets?

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

- Determine if UARP and/or Chili Bar project features contribute significant amounts of sediment to streams.
- If so, identify where and what measures are needed to reduce this sediment loading.

2.2 Agency Requested Information

There has been no additional agency-requested information received after the Study Plan was approved.

3.0 METHODS

The first step in performing this study was to develop a list of all the roads to be surveyed. A list was prepared by SMUD of all roads on the Eldorado National Forest that are used by SMUD vehicles during the normal course of Project operations. The list, and accompanying map, was prepared and presented to Rich Platt and other representatives of the U.S. Forest Service at a Land Use TWG meeting on August 1, 2003. Subsequent to consulting with the USFS on the roads list, SMUD prepared a modified version that contained a proposed set of roads that would be evaluated during the study. The list of roads to be included in the study was discussed with the Aquatic TWG on March 4, 2004, at which time SMUD received provisional approval to perform the study. The TWG-reviewed list of Project roads is shown in Tables 4.1-1 through 4.9-1 which include information on the level of effort to be applied to individual roads ranging from high effort (e.g., roads currently maintained by SMUD near stream courses) to no effort (e.g., roads little used by SMUD on private land, such as land owned by Sierra Pacific Industries, or SPI).

With this list of roads and the three Project maps showing road identifications and locations, a survey of the entire roads list was completed. In addition to the road survey, other project features including powerhouses, penstocks, surge chambers, adits and spoils piles were visited. The entire length of the road was observed for signs of erosion or sediment transport by a civil engineer with experience in road design. Results of the field investigations were documented by road name or number, and the project feature near the road was identified with the road.

A review of literature on sediment transport in the Sierra Nevada Mountains produced some work by graduate students from Colorado State University (Coe and MacDonald, 2003). They proposed a classification system, however their classification system would have categorized almost all of the roads surveyed as “Class 1”, which indicates no sign of gullying or sediment

transport. This report therefore did not use a classification system but described any erosion or sediment transport observed.

In addition, a review of the Forest Service web site produced the following information on road maintenance policy terms:

Appendix A: Forest Service Road Maintenance Policy Terms

Maintenance Level: Defines the level of service provided by, and maintenance required for, a specific road consistent with road management objectives and maintenance criteria.

Maintenance Level 1: Assigned to intermittent service roads during the time they are closed to vehicular traffic. The closure period must exceed one year. Basic custodial maintenance is performed to keep damage to adjacent resource to an acceptable level and to perpetuate the road to facilitate future management activities. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level. Appropriate traffic management strategies are "prohibit" and "eliminate". Roads receiving Level 1 maintenance may be of any type, class or construction standard, and may be managed at any other maintenance level during the time they are open for traffic. However, while being maintained at Level 1, they are closed to vehicular traffic, but may be open and suitable for non-motorized uses.

Maintenance Level 2: Assigned to roads open for use by high clearance vehicles. Passenger car traffic is not a consideration. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level. Appropriate traffic management strategies are either: 1) discourage or prohibit passenger cars, or 2) accept or discourage high clearance vehicles.

Maintenance Level 3: Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. Roads in this maintenance level are typically low speed, single lane with turnouts and spot surfacing. Some roads may be fully surfaced with either native or processed material. Appropriate traffic management strategies are either "encourage" or "accept". "Discourage" or "prohibit" strategies may be employed for certain classes of vehicles or users.

Maintenance Level 4: Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated. The most appropriate traffic management strategy is "encourage". However, the "prohibit" strategy may apply to specific classes of vehicles or users at certain times.

Maintenance Level 5: Assigned to roads that provide a high degree of user comfort and convenience. Normally, roads are double-lane, paved facilities. Some may be aggregate surfaced and dust abated. The appropriate traffic management strategy is "encourage".

Maintenance Level 5 Roads are generally classified as Forest Arterial Roads with over 100 average daily trips which would encompass the main UARP access roads. Maintenance Level 4 Roads are Forest Collector Roads with between 15 and 100 average daily trips and would typically be the campground roads and access to major project facilities. Most of the other roads to project features would fall in the Maintenance Level 3 roads category except for some of the transmission line roads which would be Maintenance Level 2 Roads.

4.0 RESULTS

The results are listed by UARP development name and road number in the order listed in Tables 4.1-1 through 4.9-1. A description of each road is provided in the following subsections. In many cases, roads evaluated during the study lead to or parallel the transmission lines. Segments of roads associated with different transmission lines are often identified below in relation to the number to the tower, described as “Tx”, where x is the tower number.

4.1 Loon Lake Development

- Road L1 – Loon Lake Dam Outlet Gage Road – Short road from the Ice House Road at Loon Lake Dam to gage. Moderate slope down from dam to outlet works and gage. Road is on rocky fill at dam and then on rocky natural material on grade. The fill is very rocky with little sign of erosion or erosion potential. There was lots of dispersed parking along road and at outlet works.
- Road L2 - Loon Lake Intake Road – Short paved road from Ice House Road to Loon Lake Intake. Road is on rock fill down to the reservoir elevation. Rocky material along road with little potential for erosion.
- Road L3 – Loon Lake PH Access Road – Short paved road from Ice House Road to powerhouse.
- Road L4 – Loon Lake Campground Road – A paved road from Ice House Road to the Loon Lake Campground. The paved road follows the natural terrain with minimum cut and fill. There are ditches on both sides with turnouts to drain runoff off the road. There was no sign of significant erosion along the road.
- Road L5 – Transmission Line road to T3-T13 – The road has several USFS road designations along its 2.5-mile length. The road begins at Ice House Road near Loon Lake as a gravel road to Tower T3 where the road surface changes to native material, mostly rocky. There are some cut and fill sections but the road is mostly on natural grade. Some erosion and ruts in steep sections but sediment is deposited close to road. Road surface from Tower T4 – T6 is rocky with little erosion and from T8 – T11 the surface is very rocky with some large boulders. Between Towers T11-T12 the road has low areas with standing water. The sediment from vehicles passing through the water appears to be contained in the road area.

- Road L6 – Transmission Line Road to T17 – T17 - This transmission line road is on natural grade with native material for surfacing. The road has some water bars in the steeper areas. There is some erosion in the steeper road sections but the sediment generally does not leave the road area. The road is high above the nearest watercourse. The road is rocky and overgrown with vegetation.
- Road L7 – Not surveyed
- Road L8 – Not surveyed
- Road L9 – Not surveyed
- Road L10 – Transmission Line Road to T24 – T34 – The road follows natural grade on moderate to steep grade under transmission lines. No drainage system exists along the road. The road has some steep areas on rocky material. Between Towers T31- T33 there were low wet areas. Sediment from wet areas appeared contained in transmission line right of way. The road is high above the nearest watercourse.
- Road L11 – Transmission Line Road to Towers 35 – 47 – Road begins at Ice House Road and has a surface of local materials. The grade is moderate to steep and has a few cut and fill sections but is mostly on natural grade. Some areas have side ditch for drainage. There are some ruts in the road from runoff but sediment appears contain in and near roadway. The road is high above the nearest watercourse.

Table 4.1-1. Project Sources of Sediment Study Road Survey Overview – Loon Lake Development

ID[1]	Road(s) Name	Destination	Start	End	Dist.	Surf.	Use[2]	Maint. Road[3]	Plow Snow	Level of Effort	Rationale
L1	Loon Lake Dam Outlet Gage Road	Loon Lake Dam Outlet Gage Station	Ice House Road	Gage Station	0.2	dirt	LV2	X		High	SMUD maintains road
L2	Loon Lake Intake Road	Loon Lake Intake	Ice House Road	Intake Housing	0.1	paved	LV2	X	X	High	SMUD maintains road
L3	Loon Lake PH Access Building Road	Loon Lake PH Access Building	Ice House Road	Access Building	0.1	paved	LV3, HV2	X	X	High	SMUD maintains road
L4	Loon Lake Campground Road	Loon Lake Campground	Ice House Road	Campgrnd	0.9	paved	LV2, DRF			Moderate	No hill slope features and no nearby river
L5	13N19(0.8) to 13N11(0.3) to 13N11C(1.4) ROW	T3 - T13	Ice House Road	Ice House Road	2.5	gravel/ dirt	LV4			High	Project Road with hill slope features and nearby streams
L6	ROW	T14 - T17	Ice House Road	T17	0.6	dirt	LV4			Moderate	No hill slope features and no nearby river
L7	No Name	T18 - T20	Wentworth Springs Rd.	T18	0.4	dirt	LV4			None	SMUD low level of use on SPI road
L8	No Name	T21	Ice House Road	T21	0.2	dirt	LV4			None	SMUD low level of use on SPI road
L9	13N57	T22 - T23	Ice House Road	T23	0.3	dirt	LV4			None	SMUD low level of use on SPI road
L10	Robbs Resort Rd(0.1) to ROW (1.5) to 13N21 (0.3)	T24 - T34	Ice House Road	T24	1.9	dirt	LV4			High	Hill slope features with nearby streams
L11	13N15 (0.3) to ROW (0.3) to ROW (0.4) to ROW (0.5) to 13N22 (0.3)	T35 - T47	Ice House Road	Ice House Road	1.8	dirt	LV4			Moderate	Hill slope features

[1] * next to Road ID indicates road is not shown on map

[2] **Light Vehicle Use**
LV1 - Heavy 100+ trips/year
LV2 - Medium 20-100 trips/year
LV3 - Light Vehicle 10-20 trips/year
LV4 - Periodic Vehicle 3-10 trips/year
LV5 - Infrequent Vehicle 1-2 trips/year
DRF - Developed Recreation Facility
URF - Undeveloped Recreation Facility

Heavy Vehicle Use
HV1 - Light Maintenance 1-10 times/year
HV2 - Operations 10-50 times/year
HV3 - Major Maintenance 1-2 times/10 years
Snow Plowing 10-20 times/year

[3] X - SMUD road maintenance
JX - Joint maintenance

4.2 Robbs Peak Development

- Road R1 – Gerle Creek Camp Ground Road – This is a paved road about 0.8 miles long beginning at Wentworth Springs Road. The road follows the natural grade with minimal cut and fill areas. There are culverts at low points in the road. There was no sign of erosion along the road.
- Road R2 – Angels Creek Picnic Area Road - This is a paved road with gravel shoulders about 0.6 miles long beginning at Wentworth Springs Road. The road follows the natural low to moderate grade with minimal cut and fill areas. There are ditches on the cut side with turnouts to drain water from the road. Negligible sign of erosion along the road.
- Road R3 – Gerle Creek Dam Road - This is a paved road about 0.8 miles long beginning at Wentworth Springs Road. The road has gravel shoulders and ditches with turnouts. There are cross culverts at drainages. There was no sign of erosion along the road.
- Road R4 – Gerle Creek Canal Road – This is a gravel road along the bank of the canal on a very flat grade. The road is on fill, with a very flat cross slope. There is no drainage along the road. There were negligible signs of erosion along the road.
- Road R5 – An access road from Road R6 to R4 about 0.5 miles long. The road surfacing is gravel and native materials. The road follows the natural terrain with minimum cut and fill. There are some side ditches and cross culverts at drainages. There were minimal signs of erosion along the road.
- Road R6 – Not surveyed.
- Road R7 – Robbs Reservoir Road – Short paved road from Ice House Road to Robbs Peak Forebay. This paved road is on a moderate slope with side ditch lined with rock. There was no sign of erosion along this road.
- Road R8 – Robbs Powerhouse Road – This 0.5-mile-long paved road begins at Ice House Road and goes to the powerhouse. The grade is moderate with cut and fill sections. There are side ditches with culverts or turnouts to remove the water from the roadway.
- Road R8A – SMUDEA Campground Road – This is a gravel-surfaced road from the Powerhouse Road to the SMUD Campground. The grade is flat to moderate on natural grade with minimum cut and fill sections. There are some side ditches to remove water from the roadway. Some minor road ruts but no sign of erosion outside the roadway.
- Road R9 – Robbs Surge Chamber Road – Very short road from Ice House Road to surge chamber with rocky surface of native material. The road was built as a cut section withrocky cut slopes visible. There were many rock falls in and along the road but no fine sediment. This road is high above any watercourse.
- Road R10 – Transmission Line Road to Tower T48 (12N22) - Road has gravel surfacing for first section of road and then natural materials. The grade is moderate to steep and road section is outsloped with water bars in steep areas. Road continues past Tower T48 for logging. Minimal sign of erosion and road is high above any watercourse.

- Road R11 – Transmission Line Road to Tower T49-T57 – The main access road begins at Ice House Road and has a surface transition from gravel to native materials. The road section is mostly outsloped with water bars in steeper areas and no side ditches. There are some sidehill cuts in steeper terrain but the road mostly follows natural terrain with small cuts and fills. Erosion is minimal and road is high above any watercourse.
- Road R11A – Access to Tower T 49 (13N31B) – A spur road from R11 to Tower T49. The road has native surfacing on a moderate to steep grade. The road has water bars and ditches off to the side to drain road runoff. There are some ruts in the road in the steep grades but minimum erosion outside the roadway.
- Road R11B - Access to Towers T52 – T50 – A spur road from Road R11 near Tower T52 to Tower T50. Very narrow road on the side of the hill in a cut section. Road is outsloped in very rocky material with little sign of erosion. Road is on slope high above any watercourse.
- Road R12 – Not surveyed.
- Road R13 – Transmission Line Road to Tower T59 –T61 – A 1.3-mile-long road with moderate to steep grade beginning and ending at Road U1. Narrow road on natural grade with minimum cut and fill. There are water bars in the steeper areas. Some erosion on road in wheel ruts on steep slopes. Sediment from ruts typically settles at water bars and does not go far from road.
- Road R14 – Transmission Line Road to Tower T62 & T63 – A short unpaved stub road beginning at Road U1 to access the towers. The road has native material for surfacing and is on a steep grade. There are water bars with turnouts to divert water off the roadway. There were deep ruts in the road with sediment settled out at low points or at water bars. The sediment has typically settled out within 20 feet of the road. There were no watercourses along the road or in the general area.
- Road R15 – Transmission Line Road to Towers T64-T70 – This 1.7 mile long access road begins and ends at Road U1. The road was constructed with moderate to steep slopes mostly on natural terrain. The road surface consists of native materials. There are water bars in the steeper areas. There were minimal ruts in the road with little sign of sediment outside the roadway.
- Road 15 Quarry – There was an old quarry near Tower T70. It appears the water is contained in the quarry with minimal runoff. There is a very small drainage area contributing water to the quarry.

Table 4.2-1. Project Sources of Sediment Study Road Survey Overview – Robbs Peak Development

ID[1]	Road(s) Name	Destination	Start	End	Dist.	Surf.	Use[2]	Maint. Road[3]	Plow Snow	Level of Effort	Rationale
R2	Angel Creek Picnic Area Road	Angel Creek Picnic Area	Wentworth Springs Rd.	Picnic Area	0.6	gravel	DRF			High	Hill slope features with nearby streams
R3	Gerle Creek Dam Road	Gerle Creek Dam	Wentworth Springs Rd.	Dam	0.6	paved	LV1	X	X	High	SMUD maintains road
R4	Gerle Canal Road	Gerle Creek Canal (in total)	Gerle Creek Dam	Robbs Reservoir	1.9	dirt	LV1	X	X	High	SMUD maintains road
R5	13N29	Gerle Creek Canal	13N28 (R6)	Gerle Creek Canal	0.5	dirt	LV2	X		High	SMUD maintains road
R6	13N28 to South Fork Campground Road	SF Rubicon Gage Station	Ice House Road	Gage Station	1.6	paved	LV2			None	SPI road with little SMUD use
R7	Robbs Reservoir Rd.	Robbs Reservoir & Robbs Met Station	Ice House Road	Met Station	0.1	paved	LV1	X	X	High	SMUD maintains road
R8	Robbs Powerhouse Road	Robbs Powerhouse	Ice House Road	Powerhouse	0.5	paved	LV1, HV2	X	X	High	SMUD maintains road
R9	Robbs Surge Shaft Road	Robbs Surge Shaft	Ice House Road	Surge Shaft	0.1	dirt	LV4	X		High	SMUD maintains road
R10	12N22(0.2) to 12N22F(0.1)	T48	Ice House Road	T48	0.3	gravel	LV4			Moderate	Hill slope features
R11	13N31 (2.0) to 13N31B (0.5) to 12N15Y (0.6) to ROW (1.1) to No Name Road (0.3) to No Name Road (2.0)	T49 - T57	Ice House Road	12N50 (Wolf Creek Road) (R12)	6.5	dirt	LV4			Moderate	Hill slope features, but much of road is SPI and other parts are FS Robbs Hut paved road
R12	12N50(1.3) to No Name(0.1)	T58	12N30 (U1)	T58	1.4	dirt	LV4			None	SPI road with little SMUD use
R13	12N30M	T59 - T61	12N30 (U1)	12N30	1.3	dirt	LV4			High	Hill slope features

Table 4.2-1. Project Sources of Sediment Study Road Survey Overview – Robbs Peak Development												
ID[1]	**Road(s) Name**	**Destination**	**Start**		**End**	**Dist.**	**Surf.**	**Use[2]**	**Maint. Road[3]**	**Plow Snow**	**Level of Effort**	**Rationale**
					(U1)							with nearby streams
R14	No Name	T62-T63	12N30 (U1)	T62	0.2	dirt		LV4			Moderate	Hill slope features, but no nearby streams
R15	ROW	T64 - T70	12N30 (U1)	12N30 (U1)	1.7	dirt		LV4			Moderate	Hill slope features, but no nearby streams

[1] * next to Road ID indicates road is not shown on map

[2] **Light Vehicle Use**
LV1 - Heavy 100+ trips/year
LV2 - Medium 20-100 trips/year
LV3 - Light Vehicle 10-20 trips/year
LV4 - Periodic Vehicle 3-10 trips/year
LV5 - Infrequent Vehicle 1-2 trips/year
DRF - Developed Recreation Facility
URF - Undeveloped Recreation Facility

Heavy Vehicle Use
HV1 - Light Maintenance 1-10 times/year
HV2 - Operations 10-50 times/year
HV3 - Major Maintenance 1-2 times/10 years
Snow Plowing 10-20 times/year

[3] X - SMUD road maintenance
JX - Joint maintenance

4.3 Union Valley Development

- Road U1 – 12N30 & 12N50 – This 5.3-mile-long road begins at Ice House Road and provides access to campgrounds on the north side of Union Valley Reservoir. The first section from Ice House Road to Yellow Jacket Campground Road is paved. The remainder of the road is native material with some gravel sections. The road has a moderate grade with cross culverts in low areas. Some of the gravel sections have water bars or more of a rolling bump to divert water from the roadway. There are some side ditches with turnouts. The road is high above the reservoir or other water features with negligible sign of erosion.
- Road U2 – Yellow Jacket Campground Road (12N33) – This is a paved road about 0.8-miles-long from Road U1 to Yellow Jacket Campground. The road grade is moderate to flat with side ditches, turnouts and cross culverts for drainage. The road is well maintained with no sign of erosion along the road.
- Road U3 – Wolf Creek Campground Road – A 0.8-mile-long paved road from Road U1 to Wolf Creek Campground. A moderate grade road with side ditches, turnouts and cross culverts. No sign of erosion along the road.
- Road U4 – Wench Creek Campground Road – A 0.7-mile-long paved road from Ice House Road to Wench Campground. The road has a relatively flat slope on natural grade with small cut slopes. There was no sign of erosion.
- Road U5 – West Point Campground Road – A short gravel road from Road U1 to the West Point Campground. The road has minimum cut or fill slopes and no drainage features. Water runs off road to adjoining areas. No sign of erosion along the road.
- Road U6 – Camino Cove Campground Road – This is a gravel road 0.3-miles-long that begins at Road U1 and ends at Camino Cove Campground. The road is on native material and grade with cut slopes less than five feet high. Cut slope appears stable with no sign of erosion. Water bars on road to divert water off roadway. No drainage features along the road.
- Road U7 – Peninsula Road – A paved road from Ice House Road to Sunset Campground. This road is on natural grade with flat to moderate grade and minimal cut slopes. Cut slopes are not high and laid back on a moderate slope. There are ditches on the high side with cross culverts to drain the road runoff. The road area has no sign of erosion.
- Road U8 – Jones Fork Campground Road – A paved road from Ice House Road to Jones Fork Campground. The road has a relatively flat slope on natural grade with small cut slopes. There was no sign of erosion.
- Road U9 – Big Hill Road – A paved road 2.5-miles-long from Ice House Road to the Big Hill Summit. A two-lane road except the upper section is on a moderate grade. The road starts on natural terrain with little cut or fill and then in the higher area there are moderate side slopes with cut and fill sections. There are side ditches with culverts to drain the

water under the road. The road is high above any watercourse with little potential for erosion.

- Road U10 – Peavine Ridge Road – This is a paved road high on the ridge that begins at Ice House Road and goes about 3.2 miles to Jaybird Springs Road. The road has a flat to moderate grade on native terrain with minimum cut or fill slopes. There are side ditches with turnouts and some cross culverts along the road. There were no signs of unstable slope, sloughing or erosion.
- Road U11 – Riverton Yard Road – A short 0.2-mile-long paved road beginning at Ice House Road and ending at the Riverton Yard. There was localized silt from the cut slope on the uphill side of the road. The silt did not appear to go more than 15-20 feet along the road. There was a culvert across from the yard that could be cleaned at the downstream end. This road is high above any watercourse with little chance of sediment transport.
- Road U12 – Not surveyed
- Road U13 – Bryant Springs Road – A paved road 5.7-miles-long beginning at Peavine Ridge Road and ending at Union Valley Dam. The first part of the road is high on the ridge area with no cut banks and has side ditches and turnouts. As the road proceeds down towards the dam, there are cut and fill sections with cross culverts in ravines. The road is well maintained with negligible signs of erosion.
- Road U13A – Intake Road – A paved road to the intake at Union Valley Dam. This short road was above the high water line of the reservoir and there was no sign of erosion.
- Road U14 – West Point Boat Ramp – Paved road 0.1-miles-long beginning at Road U1 and ending at the boat ramp. Road on natural terrain with minimal fill and no side slopes. Ditch along road could be cleaned to prevent sediment for moving towards the reservoir.
- Road U15 – Union Valley Powerhouse Road (12N30E) – A 0.8-mile-long road from Bryant Springs Road to the Union Valley Powerhouse. A paved road with wide shoulders and a drainage ditch on the side with turnouts or culverts under the roadway. The powerhouse area was rock excavation with little material to erode.
- Road U16 – Union Valley Switchyard Road – A paved road beginning at Bryant Springs Road and ending at the Union Valley Switchyard. Side ditches with turnouts and a drainage system around the switchyard. Top 15 to 20 feet of slope near substation have had some recent grading but no sign of recent erosion. Road and substation are high above dam and reservoir.
- Road U17 - Not surveyed

Table 4.3-1. Project Sources of Sediment Study Road Survey Overview – Union Valley Development

ID[1]	Road(s) Name	Destination	Start	End	Dist.	Surf.	Use[2]	Maint. Road[3]	Plow Snow	Level of Effort	Rationale
U1	12N30(3.2) 12N50(2.1) (Wolf Creek Road)	Union Valley Dam & T-Lines	Ice House Road	Dam	5.3	dirt/gravel	LV3			Moderate	Portions maintained by SPI and private parties
U2	Yellow Jacket Campground Road	Yellow Jacket Campground	12N50 (Wolf Creek Road) (U1)	Campgrnd	0.8	paved	DRF			Moderate	Moderate gradient without streams
U3	Wolf Creek Campground Road	Wolf Creek Campground	12N50 (Wolf Creek Road) (U1)	Campgrnd	0.8	paved	DRF			Moderate	Moderate gradient without streams
U4	Wench Creek Campground Road	Wench Creek Campground	Ice House Road	Campgrnd	0.7	paved	DRF			Moderate	Moderate gradient without streams
U5	West Point Campground Road	West Point Campground	12N30 (U1)	Campgrnd	0.1	dirt	DRF			Moderate	Moderate gradient without streams
U6	Camino Cove Campground Road	Camino Cove Campground	12N30 (U1)	Campgrnd	0.3	paved	DRF			Moderate	Moderate gradient without streams
U7	Peninsula Road	Sunset Campground	Ice House Road	Campgrnd	1.6	paved	DRF			Moderate	Moderate gradient without streams
U8	Jones Fork Campground Road	Jones Fork Campground	Ice House Road	Campgrnd	0.6	paved	DRF			Moderate	Moderate gradient without streams
U9	Big Hill Road	Big Hill Telecommunication and Met Station	Ice House Road	Big Hill Summit	2.5	paved	LV1	X	X	High	SMUD maintains road
U10	Peavine Ridge Road	Union Valley and Jaybird Facilities	Ice House Road	Jaybird Springs Road	3.2	paved	LV1,HV2	JX	X	High	SMUD maintains road
U11	Riverton Yard Road	Riverton Yard	Ice House Road	Riverton Yard	0.2	Paved	LV1, HV2	X	X	High	SMUD maintains road

Table 4.3-1. Project Sources of Sediment Study Road Survey Overview – Union Valley Development

ID[1]	Road(s) Name	Destination	Start	End	Dist.	Surf.	Use[2]	Maint. Road[3]	Plow Snow	Level of Effort	Rationale
U12	Round Tent Road	Telecommunication Repeater	Peavine Ridge Road	Repeater	6.1	paved gravel	LV5			None	
U13	Bryant Springs Road	Union Valley Dam	Peavine Ridge Road	Dam	5.7	paved	LV1,HV1	JX	X	High	SMUD maintains road
*U14	West Point Boat Ramp Road	West Point Boatramp	12N30 (U1)	Boat Launch	0.1	paved	LV4	JX	X	High	SMUD maintains road
U15	12N30E (Union Valley Powerhouse Road)	Union Valley Powerhouse	Bryant Springs Road	Powerhse	0.8	paved	LV1,HV1	X	X	High	SMUD maintains road
U16	Union Valley Switchyard Road	Union Valley Switchyard	Bryant Springs Road	Switchyard	0.6	paved	LV2,HV2	X	X	High	SMUD maintains road
U17	No Name	Telecommunication Repeater	Union Valley Dam	Repeater	4.1	dirt	LV5			None	SPI road with little SMUD use

[1] * next to Road ID indicates road is not shown on map

[2] **Light Vehicle Use**
LV1 - Heavy 100+ trips/year
LV2 - Medium 20-100 trips/year
LV3 - Light Vehicle 10-20 trips/year
LV4 - Periodic Vehicle 3-10 trips/year
LV5 - Infrequent Vehicle 1-2 trips/year
DRF - Developed Recreation Facility
URF - Undeveloped Recreation Facility

Heavy Vehicle Use
HV1 - Light Maintenance 1-10 times/year
HV2 - Operations 10-50 times/year
HV3 - Major Maintenance 1-2 times/10 years
Snow Plowing 10-20 times/year

[3] X - SMUD road maintenance
JX - Joint maintenance

4.4 Ice House Development

- Road I1 – Ice House Reservoir and Dam Road – This paved road on a moderate grade begins at Ice House Road and goes about 1.4 miles to Reservoir and Dam. The road is on natural terrain with minimal cut and fill. There are ditches on the uphill side with culverts under the road to drain water from the roadway. There are cross culverts at drainages. There was negligible erosion seen along the road.
- Road I2 – Jones Fork Gate House Road – The road is paved except the last section near the gatehouse. The road is outsloped with no drainage facilities except a cross culvert.
- Road I3 – Strawberry Point Campground Road – A short 0.1-mile-long paved road from Ice House – Wrights Lake Road to Strawberry Point Campground. No drainage system along the road and negliable sign of erosion.
- Road I4 - Northwind Campground Road – A short 0.1-mile-long paved road from Ice House – Wrights Lake Road to Northwind Campground. The road was built on the natural grade below a dike. There was negligible erosion seen.
- Road I5 – Ice House Dam and Facilities Access Road – The road begins at Ice House Road and goes to Ice House Dam, Gage and Outlet Facility. The road surface is gravel and native material on a cut and fill section. There are ditches and water bars for drainage control. There are some ruts and wet spots in the road. Minor erosion at water bars from last grading. Minimum erosion on the road and none noted outside the roadway section.
- Road I6 – SF Silver Creek Gage Road – This short 0.1-mile-long road begins at Road I5 and goes to the gage station next to Silver Creek. The road goes downhill on a moderate slope and makes a 90 degree turn near the creek before proceeding to the gage. At this turn there is a high potential for road sediment to go into the creek. There is a jeep (off road vehicle) creek crossing at the bend and indications are that the jeeps crossing the creek disturb the banks and move sediment into the creek.
- Road I7 – Ice House Dam Outlet Road – This road begins at Road I5 and goes down a moderate to steep grade to the base of the dam and outlet. The first section is on natural terrain and then is on the dam fill in the lower section. The road has a gravel surface with side ditches with turnouts. Minimal erosion along the road. The groin at base of the dam has an area with drainage from the road and hillside that may be leading to some minor erosion and sediment movement.
- Road I8 – 11N52 – Road begins at Ice House Dike Road and ends at SF Silver Creek – The first section to Strawberry Point Campground is paved and is transitioned to native material. There is a ditch on the uphill side with culverts to drain the water under the roadway. There are cross culverts at ravines. The road is on a relative flat grade above the reservoir elevation. Cut and fill sections with stable-appearing cut slopes that exhibit minimal signs of erosion. Some ruts and erosion in the road but mostly contained within the roadway. Potential erosion area near the end of the road at SF Silver where grading was done for access to the creek. Grading for the ramp to the creek contained fine

material with little provisions for drainage or sediment retaining structures. No erosion control apparent along the ramp.

- Road I9 – Jones Fork Powerhouse Road – A paved road from Ice House Road to the Jones Fork Powerhouse. The 0.6-mile-long road goes down a moderate grade to a paved area near the powerhouse. There is a ditch along the road for runoff. There was negligible erosion along the road and around the powerhouse. There is a culvert inlet in the parking area that needs cleaning before the winter rains to prevent sediment from going into the reservoir.
- Road I10 – Ice House Boat Launch and Jones Fork Intake Road – A paved road that follows the natural terrain that starts at Ice House Reservoir and Dam Road and ends at Ice House Intake. The paved road is on a moderate grade with minimal cut or fill. The large paved area above the boat ramp shows no sign of erosion around the perimeter.
- Road I11 – Ice House Dike Road – A paved road 1.6-miles-long that begins at Ice House Reservoir and Dam Road and ends at the dike. The road has ditches and culverts with some cut slopes that appear stable. Most of the road is high above any watercourse with little potential for sediment transport.
- Road I12 - Transmission Line Road Tower 1459 – 1430 - The survey began at Tower 1459 and continued to Jones Fork Powerhouse Road. The road is on moderate to steep grade following natural terrain with cut and fill sections in the steeper areas. The surfacing is of native material. There are water bars on the steeper grades. Some erosion is visible in the steeper areas but generally contained within 10 feet of the roadway. Most of the road is high above any watercourse. One major drainage crossing and no erosion seen in the vicinity of the crossing.
- Road I12A – Transmission Line Road to Towers 1456-1459 – This is a short stub road from I12 near Tower 1459 to Tower 1456. This road has a natural road surface on a moderate slope. There are no drainage features along this road. There was recent construction which appeared to place a buried conduit in the road. In the steep section of the road, the trench back fill had washed out leaving sediment in the lower road area. This area needs to be repaired and erosion control measures installed. GPS coordinates N 38 deg 50.933 min W 120 deg 25.119 min.
- Road I12B – Transmission Line Road to Towers 1459 – 1462 – Short road beginning near Tower 1459 and going to Tower 1462. The road has native material for surfacing and is built on the natural grade with minimum cut and fill. There are no drainage features along this road. The road runs under the transmission line with minor erosion visible.

Table 4.4-1. Project Sources of Sediment Study Road Survey Overview – Ice House

ID[1]	Road(s) Name	Destination	Start	End	Dist.	Surf.	Use[2]	Maint. Road[3]	Plow Snow	Level of Effort	Rationale
I2	Jones Fork Gate House Road	Jones Fork Gate House	Ice House Reservoir and Dam Road	Gate House	0.5	paved	LV2	X	X	High	SMUD maintains road
I3	Strawberry Point Campground Road	Strawberry Point Campground	Ice House - Wrights Lake Road	Campgrnd	0.1	paved	DRF			Moderate	Moderate gradient without streams
I4	Northwind Campground Road	Northwind Campground	Ice House - Wrights Lake Road	Campgrnd	0.1	paved	DRF			Moderate	Moderate gradient without streams
I5	Ice House Dam and Facilities Access Road	Ice House Dam, Gage, and Outlet Facilities	Ice House Road	Ice House Dam	0.8	dirt	LV2	X		High	SMUD maintains road
I6	SF Silver Creek Gage Road	SF Silver Creek Gage	Ice House Dam and Facilities Access Road (I5)	Gage Station	0.1	dirt	LV2	X		High	SMUD maintains road
I7	Ice House Dam Outlet Road	Ice House Dam Outlet	Ice House Dam and Facilities Access Road (I5)	Outlet Facilities	0.3	dirt	LV2	X		High	SMUD maintains road
I8	11N52	North Shore Ice House Reservoir	Ice House Dike Road	SF Silver Creek	1.6	dirt	URS	JX		Moderate	Moderate gradient without streams
I9	Jones Fork Powerhouse Road	Jones Fork Powerhouse	Ice House Road	Powerhse	0.6	paved	LV1	X	X	High	SMUD maintains road
I10	Ice House Boat Launch and Jones Fork Intake	Jones Fork Intake	Ice House Reservoir and Dam Road	Intake	0.3	paved	LV1		X	High	SMUD maintains road
I11	Ice House Dike Road	Ice House Dike	Ice House Reservoir and Dam Road (I1)	Dike	1.6	paved	LV2			Moderate	No hill slope features and no nearby river
I12	Jones Fork Transmission Line Road	Jones Fork Transmission Line (in total)	Jones Fork Powerhouse	Union Valley Switchyard	8.5	dirt	LV4			Moderate	Existing SPI/FS roads used with few streams

[1] * next to Road ID indicates road is not shown on map

[2] **Light Vehicle Use**
LV1 - Heavy 100+ trips/year
LV2 - Medium 20-100 trips/year
LV3 - Light Vehicle 10-20 trips/year
LV4 - Periodic Vehicle 3-10 trips/year
LV5 - Infrequent Vehicle 1-2 trips/year
DRF - Developed Recreation Facility
URF - Undeveloped Recreation Facility

Heavy Vehicle Use
HV1 - Light Maintenance 1-10 times/year
HV2 - Operations 10-50 times/year
HV3 - Major Maintenance 1-2 times/10 years
Snow Plowing 10-20 times/year

[3] X - SMUD road maintenance
JX - Joint maintenance

4.5 Jaybird Development

- Road J1 – Junction Dam Road – Steep graded gravel road from Bryant Springs Road to Junction Dam. The last few hundred feet of the road are paved. Most of the road cut section in very rocky material that looks stable. There are side ditches on the high side with culverts to drain the water under the roadway. Area near the beginning of the pavement has a small ravine on the low side of the road that appeared to be eroded due to water from the road (GPS N38 deg. 51.119 min. W 120 deg. 27.326 min.). This area needs maintenance on road and ditch to prevent water form causing erosion into the reservoir.
- Road J2 – Junction Reservoir Boat Launch Road – A steep gravel road from Bryant Springs Road down to Junction Reservoir Boat Launch. The road is outsloped and has no drainage ditches. Although there did not appear to be any erosion along the road, the boat launch area is native soil with the potential for erosion into the reservoir.
- Road J3 – Not surveyed.
- Road J4 – Not surveyed.
- Road J5 – Jaybird Springs Road – A main access road that is paved and built on natural grade with minimum cut and fill. There are drainage ditches on both sides of the road with culverts or turnouts to drain water from the roadway. There were culverts at low points in the road. The road is high on the ridge with little change of erosion getting to a watercourse. There was no significant erosion seen along the road.
- Road J5 Spoils Area – A spoils pile along Road J5. The spoils pile is in a large flat area high on the ridge with little potential for erosion into a watercourse.
- Road J5/J8 Spoils Area – The spoils area drains to a small ravine. The slope does not appear to slough or show signs of erosion. The slope of the spoils area is mostly rock.
- Road J6 – Adit Road (11N71) – The road begins at Jaybird Springs Road (J5) and goes about 1.3 miles to a Jaybird tunnel adit and spoils area. The road has a surface of native material with some gravel. The road is insloped with an inside ditch and some culverts. Some sections of the ditch have been filled in from cut bank slough and needs maintenance. Some drainage is needed around adit to prevent erosion. Spoils pile looks stable but goes to the edge of Silver Creek. Drainage is diverted to a drainage system to prevent it from going over the slope. Erosion problems can be corrected at adit with normal maintenance.
- Road J7 – Transmission Line Road to Towers T90-T97 – A 1.3-mile-long road with surfacing of native materials. The road has a flat to moderate grade with some water bars in the road. There were some ruts in the road but minimal signs of erosion off the road.
- Road J8 – Jaybird Canyon Road – A paved road about three miles long, beginning where the transmission line crosses the road and going to the Jaybird powerhouse. The road is steep with switchback curves mostly in a rock-cut section. There was a ditch on the uphill side of the road with culverts and some down-drains to remove the water from the

roadway. Some of the ditches on steeper grades were lined with rock. There were cross culverts at ravines. There were some rock falls from cut slopes but no sign of slide areas. Negligible signs of erosion along the road.

- Road J9 – Jaybird Gate House Road – A 0.5-mile-long road surfaced with native materials and some gravel that starts at Jaybird Canyon Road and goes to the tunnel gate house. Moderate grade with a mostly cut section with stable slopes. There is a ditch on the uphill side and culverts at the ravines. The culvert at the road intersection with J10 & J11 has an inlet that is plugged with sediment and needs maintenance. There were negligible signs of erosion along the road.
- Road J10 – Jaybird Surge Shaft Road – A short 0.2-mile-long road from Jaybird Gate House Road (J10) to the Surge Shaft. The road has native material for surfacing and has a slight up-grade to the Surge Shaft. There was some erosion across the road (no more than 4-inches deep at the edge) and it was contained within 10 feet of the lower road. This is a low point in the road and could use maintenance and possibly a down-drain.
- Road J11 – Transmission Line Road to Tower T99 – Surfaced with native materials, this road begins at Jaybird Gate House Road (J9) and ends at Tower T99. The road is on a moderate grade and out-sloped with water bars along the main road. The road section near tower pad did not appear to be maintained recently but probably is not used often. There was no sign of significant erosion along the road.
- Road J12 – Transmission Line Road to Towers T100–T103 - A road with surface of native materials beginning at Jaybird Gate House Road (J9) and ending at Tower T103. The grade is moderate to steep with water bars spaced every 200-300 feet for drainage. The road is in a cut section with slopes that appear stable. The road had no ruts or signs of erosion along the road. There was lots of vegetation growing along the road.

Table 4.5-1. Project Sources of Sediment Study Road Survey Overview – Jaybird Development

ID[1]	Road(s) Name	Destination	Start	End	Dist.	Surf.	Use[2]	Maint. Road[3]	Plow Snow	Level of Effort	Rationale
J2	Junction Reservoir Boat Launch Road	Junction Boat Launch	Junction Dam Road	Boat Launch	0.3	dirt	LV5 URS	X		High	SMUD maintains road
J3	12N37 (0.5) to ROW (0.9)	T74 - T80	Junction Dam Road	Bryant Springs Road	1.4	dirt	LV4			None	SPI road with little SMUD use
J4	No Name (2.7) to 11N71A (0.2)	T81 - T89	12N37	T80	2.9	dirt	LV4			None	SPI road with little SMUD use
J5	Jaybird Springs Road	T-Line Crossover	Peavine Ridge Road	T-Line Crossover	4.6	paved	LV1, HV2	JX	X	High	SMUD maintains road
J6	11N71	Jaybird Adit	Jaybird Springs Road	Adit	1.3	dirt	LV3, HV3	X		High	SMUD maintains road
J7	ROW	T90 - T97	Jaybird Springs Road	Jaybird Springs Road	1.3	dirt	LV4			Moderate	No hill slope features and no nearby river
J8	Jaybird Canyon Road	Jaybird Powerhouse	T-Line Crossover	Powerhouse	3.1	paved	LV1, HV2	X	X	High	SMUD maintains road
J9	Jaybird Gate House Road	Jaybird Gate House	Jaybird Canyon Road (J8)	Gate House	0.5	dirt	LV2	X	X	High	SMUD maintains road
*J10	Jaybird Surge Shaft Road	Jaybird Surge Shaft	Jaybird Gate House Road (J9)	Surge Shaft	0.2	dirt	LV4	X		High	SMUD maintains road
J11	No Name	T99	Jaybird Gate House Road (J9)	T99	0.2	dirt	LV4			High	Strong hill slope features
J12	No Name	T100 - T103	Jaybird Gate House Road (J9)	T103	0.4	dirt	LV4			High	Strong hill slope features

[1] * next to Road ID indicates road is not shown on map

[2] **Light Vehicle Use**
LV1 - Heavy 100+ trips/year
LV2 - Medium 20-100 trips/year
LV3 - Light Vehicle 10-20 trips/year
LV4 - Periodic Vehicle 3-10 trips/year
LV5 - Infrequent Vehicle 1-2 trips/year
DRF - Developed Recreation Facility
URF - Undeveloped Recreation Facility

Heavy Vehicle Use
HV1 - Light Maintenance 1-10 times/year
HV2 - Operations 10-50 times/year
HV3 - Major Maintenance 1-2 times/10 years
Snow Plowing 10-20 times/year

[3] X - SMUD road maintenance
JX - Joint maintenance

4.6 Camino Development

- Road C1 – Camino Dam Road – Road from Jaybird Canyon Road (J8) to Camino Dam that has a surface of native material with some gravel. Flat grade along the reservoir with steep rock slope on uphill side. Ditch on the uphill side of road with some culverts. Road has a small area at low point with some erosion but it is contained near the road. No other sign of significant erosion along the road.
- Road C2 – Camino Powerhouse Road – Paved road about 4.6 miles from Forebay Road down to the Camino Powerhouse near SFAR. Drainage along inside (cut side) with inlets and culverts to drain water under roadway. A curb on outside part of the road to prevent water from going over the slope. No sign of significant erosion along the road. Most of the road is high above the watercourse.
- Road C2 Camino Powerhouse Area – The area around the powerhouse was being regraded and the slope behind the powerhouse stabilized with rock anchors and gunite. That part of the area had been repaved and the area graded to drain to drainage outlets.
- Road C3 – Slab Creek Reservoir Road – A road with flat to moderate grade from Brush Creek Reservoir Road to the upper end of Slab Creek Reservoir. Road surface of native materials with spurs leading to parking along river and to dispersed camping areas. Road and access goes to the river's edge and has potential for erosion into the river and then the reservoir. Appears to be a great deal of off-road vehicle use in this area that has created some loose material which could erode to the river in a rain storm.
- Road C4 – Brush Creek Reservoir Road – A paved road 4.2-miles-long from Camino Powerhouse Road (C2) to Brush Creek Reservoir. The road has a moderate grade with sidehill cut and fill sections in the canyon. The road has a good drainage system with ditches and culverts. No sign of significant erosion along the road.
- Road C4A – Boat Ramp to Brush Creek. The road begins at Brush Creek Reservoir Road (C4) and goes into the reservoir. A very short road on moderate grade down to the reservoir. The road is a cut section with native material surfacing and some gravel. There was one drainage culvert along the road. Negligible sign of erosion along the boat ramp.
- Road C5- Camino Surge Shaft Road – A short road with moderate grade from Brush Creek Reservoir Road up to the surge tank. A gravel road with no drainage system. Negligible sign of erosion along road and at surge shaft.
- Road C6 – Camino Penstock Road – The road begins at Brush Creek Reservoir Road (C4) and goes to the Camino penstock and Valve House. A 0.4-mile-long road with a gravel surface and no drainage system. Road to penstock on steep grade. Negligible sign of erosion along the road.
- Road C7 – Camino Adit Road – Road begins at Brush Creek Reservoir Road and ends at the tunnel adit and spoils pile. The surface is of native material, grade is flat to moderate and the section is in-sloped with inside ditch and culverts to drain water under road. The

road follows the contours on the side of a very steep slope. The road is mostly rock excavation with little fill. Very rocky surface with few fines and minimal erosion.

- Road C7 Spoils Area – The spoils area is at the end on Road C7 below the tunnel adit. The spoils pile appears to begin near Silver Creek below and the rock slope continues up to near the road. The water in the upper area is contained and diverted.
- Road C8 – Poho Ridge Road (12N34) – Road begins at Brush Creek Reservoir Road and ends at Road C9. A 5.3-mile-long major logging access road with flat to moderate grade and gravel surfacing. Mostly out-sloped cross section, some areas with ditches or berms on the low side with turnouts to remove water from the roadway. Cross culverts at ravines. The road is high above any stream or river. Lots of logging activity along the road with local soil disturbances.
- Road C9 – Sugar Pine Road (12N54) – Logging road used for access to transmission line spur roads. Road is mostly a cut section on natural slope with berm on the low side of the road and turnouts for drainage. Some cross culverts at low points. Minimum erosion in road and high above any stream or river.
- Road C10 – Transmission Line Road to Tower T112-T116 (12N23Y) – Road begins at the end of Road C9 and has a surface of native materials. The road is on grade with minimal cut and fill. Most of the road length has an out-sloped cross section. Ditch or berm on the low side of the road with turnouts to drain the water from the roadway. Some short spur roads to individual towers. Only minimal erosion which is contained on the road. Road is high above any watercourse.
- Road C11 – Transmission Line Road to Tower T117 (12N54D) – A short 0.3-mile-long road with surface of native materials. Moderate to steep grade with out-sloped section. Last 1000 feet very steep up to tower. Berms on low side of road with turnouts to drain water from roadway. Negligible signs of erosion.
- Road C12 – Transmission Line Road to Tower T118 - A short 0.2-mile-long road with surface of native materials. Moderate to steep grade with out-sloped section. New water bars along road appear part of recent logging. No sign of significant erosion along the road.
- Road C13 – Transmission Line Road to Tower T119 - A short 0.2-mile-long road with surface of native materials. The steep section has water bars. Some minor erosion at water bar on the tower pad but sediment is contained within 10 feet of road. Fine erodable material on tower pad and road near tower. Road is high above any watercourse.
- Road C14 – Transmission Line Road to Towers T124-T127 (11N20Y) – A 1.8 mile long road beginning and ending at Poho Ridge Road (C8). The road surface is of native material built on the natural grade. Some cross culverts at ravines. Frequent water bars on steeper slopes. Some erosion and ruts in the road but the sediment appears to be contained on or near the road.

- Road C14A – Transmission Line Road to Tower T130 – A short road on natural grade from Brush Creek Reservoir Road (C4) to Tower 130. Road has native material for surfacing and no sign of significant erosion along the 0.1-mile-long road.
- Road C15 – Transmission Line Road to Tower T132 – A road with native material for surfacing from Brush Creek Reservoir Road (C4) to Tower 132. The road is a side-hill cut section on a steep grade down to the tower. There were signs of old erosion along the road but it did not leave the roadway. The road is high above any watercourse with little chance for sediment transport.

Table 4.6-1. Project Sources of Sediment Study Road Survey Overview – Camino Development

ID[1]	Road(s) Name	Destination	Start	End	Dist.	Surf.	Use[2]	Maint. Road[3]	Plow Snow	Level of Effort	Rationale
C2	Camino Powerhouse Road	Camino Powerhouse	Forebay Road	Powerhse	4.6	paved	LV1, HV2	X		High	SMUD maintains road
C3	No Name	End of Slab Reservoir	Camino Powerhouse Road (C2)	Reservoir	0.3	dirt	URS, LV5			High	Proximity to stream
C4	Brush Creek Reservoir Road	Brush Creek Reservoir	Camino Powerhouse Road (C2)	Reservoir	4.2	paved	LV1, HV2	X	X	High	SMUD maintains road
*C5	Camino Surge Shaft Road	Camino Surge Shaft	Brush Creek Reservoir Road (C4)	Surge Shaft	0.1	dirt	LV4	X		High	SMUD maintains road
C6	Camino Penstock Road	Camino Penstock	Brush Creek Reservoir Road (C4)	Penstock	0.4	dirt	LV2	X		High	SMUD maintains road
C7	Camino Adit Road	Camino Adit	Brush Creek Reservoir Road (C4)	Adit	3.6	dirt	LV3, HV1	X		High	SMUD maintains road
C8	12N34 (Poho Ridge Road) to Camp 7 Road	Jaybird-Camino Transmission Line	Brush Creek Reservoir Road (C4)	12N54 (Sugar Pine Road) (C9)	5.3	dirt	LV4			Moderate	No hill slope features and few nearby streams
C9	12N54 (Sugar Pine Road)	Jaybird-Camino Transmission Line	12N34 (Poho Ridge) (C8)	No Name	1.3	dirt	LV4			Moderate	No hill slope features and few nearby streams
C10	No Name	T112 - T116	12N54 (Sugar Pine Road) (C9)	T112	1.3	dirt	LV4			Moderate	No hill slope features and few nearby streams
C11	No Name	T117	12N54 (Sugar Pine Road) (C9)	T117	0.3	dirt	LV4			Moderate	No hill slope features and few nearby streams
C12	No Name	T118	12N54 (Sugar	T118	0.2	dirt	LV4			Moderate	No hill slope

Table 4.6-1. Project Sources of Sediment Study Road Survey Overview – Camino Development

ID[1]	Road(s) Name	Destination	Start	End	Dist.	Surf.	Use[2]	Maint. Road[3]	Plow Snow	Level of Effort	Rationale
			Pine Road) (C9)								features and few nearby streams
C13	12N34K	T119	12N34(Poho Ridge) (C8)	T119	0.2	dirt	LV4			Moderate	No hill slope features and few nearby streams
C14	11N20Y	T124 - T127	12N34 (Poho Ridge) (C8)	12N34 (C8)	1.8	dirt	LV4			Moderate	No hill slope features and few nearby streams
C15	No Name	T132	Brush Creek Reservoir Road (C4)	T132	0.4	dirt	LV4			Moderate	No hill slope features and few nearby streams

[1] * next to Road ID indicates road is not shown on map

[2] **Light Vehicle Use**
LV1 - Heavy 100+ trips/year
LV2 - Medium 20-100 trips/year
LV3 - Light Vehicle 10-20 trips/year
LV4 - Periodic Vehicle 3-10 trips/year
LV5 - Infrequent Vehicle 1-2 trips/year
DRF - Developed Recreation Facility
URF - Undeveloped Recreation Facility

Heavy Vehicle Use
HV1 - Light Maintenance 1-10 times/year
HV2 - Operations 10-50 times/year
HV3 - Major Maintenance 1-2 times/10 years
Snow Plowing 10-20 times/year

[3] X - SMUD road maintenance
JX - Joint maintenance

4.7 White Rock Development

- Road W1 – Not surveyed
- Road W2 – Transmission Line Road to Tower T134/606 – A 0.3-mile-long road with a surface of native material beginning at Akin Powerhouse Road (12N34H) (W1). The road follows the natural grade with minimal cut and fill. There was a water bar for drainage. There was one low spot and some ruts in the road but the sediment appears contained within a few feet of the road. The tower pad had no significant erosion and vegetation and grass growing at the edge of the pad.
- Road W3 – Transmission Line Road to Tower T137/609 (12N34J) – This road begins at Camino Powerhouse Road (C2) and follows a small ridge to the tower pad. The road has native material for surfacing and is built on grade. There were some ruts in the road 2-3 inches deep but minimal sign of erosion off the road. There was minor erosion on the side of the tower pad but the sediment was contained within about 10 feet of the pad. The road and tower pad are high on the ridge with little chance of sediment reaching a watercourse.
- Road W4 – Transmission Line Road to Tower T138/610 - This road begins at Camino Powerhouse Road (C2) and follows a small ridge to the tower pad. The road has native material for surfacing and is built on grade. There were some ruts in the road 2-3 inches deep but no sign of significant sediment off the road. The tower pad had some minor erosion but it was contained within about 20 feet of the tower pad. The road and tower pad are high on the ridge with little chance of sediment reaching a watercourse.
- Road W5 – Transmission Line Road to Towers T139/611 & T140/612 - This road begins at Camino Powerhouse Road (C2) and follows the natural terrain to the tower pads. There were some ruts in the road but no sign of significant sediment off the roadway.
- Road W6 – Transmission Line Road to Tower T141/613 - This road begins at Cable Road and follows a small ridge to the tower pad. The road has native material for surfacing and is built on grade. There were ruts in the road and no sign of sediment of the road except at the low point near the tower pad. The water runs off the road and has formed a small ditch where the sediment goes about 20 feet from the road. The road and tower pad are high on the ridge with little chance of sediment reaching a watercourse.
- Road W7 – Transmission Line Road to Towers T143/615-T145/617 - This road begins at Cable Road and follows the natural terrain about 0.8 miles to the last tower pad. There were some ruts in the steeper road section but no sign of significant sediment off the roadway. The first section of the road is access to a private residence and has a gravel surface.
- Road W8 - Transmission Line Road to Towers T168/640-T171/643 - This road begins at Mosquito Road and follows the natural terrain in the transmission line right-of-way about 0.8 miles to the last tower pad. No drainage facilities in roadway. Local erosion in road but not much erosion outside the road section. No watercourse along or near the road.

- Road W9 – White Rock Surge Tank Road – This road begins at Highland Drive and goes to the White Rock Surge Tank. The road grade is moderate to steep and has a surface of natural material. The road follows the natural grade with some small cut and fill sections in the steeper areas. There are some ditches on the inside of the road. A few road areas with ruts in the steep road sections but little sign of erosion outside the road section. The road is high above any watercourse with little chance of sediment transport. There was lots of vegetation along the road.
- Road W10 – Slab Creek Reservoir Dam Road – The road begins at Chute Camp Road at Iowa Canyon Creek and proceeds to Slab Creek Dam and powerhouse. This is a paved or hard packed rocky road about 0.3-miles-long to the powerhouse. There was minimal sign of any ruts or other erosion along the road.
- Road W11 – Slab Creek Reservoir Boat Launch Road – The road begins at Slab Creek Dam and ends about 0.9 miles at the Boat Launch. Relatively flat grade above the reservoir level. Most of the road is a cut section and the road surface is native rocky material. Few road ruts and little sign of erosion along the road. The culvert at the end of the road near the boat launch needs cleaning to prevent silt from entering the reservoir.
- Road W12 – White Rock Tunnel Adit No. 1 Road – This road has a concrete surface and begins at Slab Creek Dam and ends at Adit No. 1. The road surface is old concrete from the construction and there is no sign of erosion or much potential for erosion along the road.
- Road W13 – White Rock Tunnel Adit No. 2 Road – This road begins at Kona Lane and goes about 1 mile to Adit No. 2. The road surface is of native material which is very rocky and may be tunnel spoil. The road is mostly in-sloped. There is one switch back area near the bottom at the adit where there was a small surface slide between the roads. The sediment from the slide was contained on the lower road section. The spoils pile at the adit is sloped to one outlet which has large rock and little chance for any erosion of fine materials.
- Road W14 – Not surveyed.
- Road W15 – White Rock Powerhouse Road – A 1-mile-long paved road from Meadow Lane to the White Rock Powerhouse. The grade was moderate to steep with cut and fill sections. The road was mostly cut sections with rocky slopes. There was an inside ditch with culverts to drain the ditch under the road. Negligible sign of erosion or sediment.
- Road W16 – White Rock Penstock Road – A 1-mile-long road with moderate grade and some cut and fill sections. The road surface was native materials with some gravel sections. There were side ditches with culverts to drain the water under the road. There are some fill sections in the ravines with cross culverts. The road was well maintained with little sign of ruts in road or erosion along the road.
- Road W16A – Spur road to lower penstock area – This is a steep, gravel road down to a lower penstock point. The road appeared to be partly on fill from tunnel tailings. The road surface was rocky. The drainage included side ditches and water bars. There was

minor erosion along the road which stayed within the roadway. This road was high above any watercourse with little chance for sediment transport.

- Road W17 – Not surveyed.
- Road W18 – (not on original list) Spur road from Rock Creek Road to Tower 175 - The road is on the opposite bank from White Rock Powerhouse. The road is very steep on natural grade with cut slopes and sharp switchbacks. There were some signs of ruts in the road and erosion at the switchbacks. The road appeared to have been grade this year as routing maintenance. There was heavy vegetation on the steep slopes on each side of the road. There were no water bars or other drainage facilities along the road. The road was a combination of in-slope sections and out-slope sections. There were signs of erosion along the road but little evidence of sediment in the brush or the lower sections of the road at switchbacks. The road is high above the river and it appeared any erosion or sediment is contained near the roadway.

Table 4.7-1. Project Sources of Sediment Study Road Survey Overview – White Rock Development

ID[1]	Road(s) Name	Destination	Start	End	Dist.	Surf.	Use[2]	Maint. Road[3]	Plow Snow	Level of Effort	Rationale
W2	No Name	T134/606	12N34H (W1)	T134/606	0.3	dirt	LV4			High	Hill slope road nearby to streams
W3	12N34J	T137/609	Camino Powerhse Road (C2)	T137/609	0.3	dirt	LV4			Moderate	Ridge roads with no nearby streams
W4	No Name	T138/610	Camino Powerhse Road (C2)	T138/610	0.2	dirt	LV4			Moderate	Ridge roads with no nearby streams
W5	No Name	T139/611 - T140/612	Camino Powerhse Road (C2)	T140/612	0.2	dirt	LV4			Moderate	Ridge roads with no nearby streams
W6	11N82	T141/613	Cable Road	T141/613	0.2	dirt	LV4			Moderate	Ridge roads with no nearby streams
W7	No Name	T143/615 - T145/617	Cable Road	T145/617	0.8	dirt	LV4			Moderate	Ridge roads with no nearby streams
W8	ROW	T168/640 - T171/643	Mosquito Road	T171/643	0.3	dirt	LV4			Moderate	Ridge roads with no nearby streams
W9	White Rock Surge Shaft Road	White Rock Surge Shaft	Highland Drive	Surge Shaft	0.4	dirt	LV4	X		High	SMUD maintains road
W10	Slab Creek Reservoir Dam Road	Slab Creek Dam	Chute Camp Road at Iowa Canyon Creek	Dam	0.3	paved	LV1, HV1	X		High	SMUD maintains road

Table 4.7-1. Project Sources of Sediment Study Road Survey Overview – White Rock Development

ID[1]	Road(s) Name	Destination	Start	End	Dist.	Surf.	Use[2]	Maint. Road[3]	Plow Snow	Level of Effort	Rationale
W11	Slab Creek Reservoir Boat Launch Road	Slab Boat Launch	Slab Creek Dam	Boat Launch	0.9	dirt	URS, LV3	X		High	SMUD maintains road
W12	White Rock Tunnel Adit No. 1 Road	White Rock Tunnel Adit No. 1	Slab Creek Dam	Tunnel Adit	0.2	paved	LV2	X		High	SMUD maintains road
W13	White Rock Tunnel Adit No. 2 Road	White Rock Tunnel Adit No. 2	Kona Lane	Tunnel Adit	1	dirt	LV4, HV1	X		High	SMUD maintains road
W14	White Rock Tunnel Adit No. 3 Road	White Rock Tunnel Adit No. 3	Mosquito Road	Tunnel Adit	0.4	dirt	LV4			None	Private road, little used by SMUD
W15	White Rock Powerhouse Road	White Rock Powerhouse	Meadow Lane at SMUD Gate	Powerhse	1	paved	LV1, HV2	X		High	SMUD maintains road
W16	White Rock Penstock Road	White Rock Penstock	Meadow Lane	Penstock	1	dirt	LV1, HV1	X		High	SMUD maintains road
W17	No Name	Communications Repeater	Cable Road	Communications Repeater	0.6	dirt	LV5			None	FS road little used by SMUD

[1] * next to Road ID indicates road is not shown on map

[2] **Light Vehicle Use**
LV1 - Heavy 100+ trips/year
LV2 - Medium 20-100 trips/year
LV3 - Light Vehicle 10-20 trips/year
LV4 - Periodic Vehicle 3-10 trips/year
LV5 - Infrequent Vehicle 1-2 trips/year
DRF - Developed Recreation Facility
URF - Undeveloped Recreation Facility

Heavy Vehicle Use
HV1 - Light Maintenance 1-10 times/year
HV2 - Operations 10-50 times/year
HV3 - Major Maintenance 1-2 times/10 years
Snow Plowing 10-20 times/year

[3] X - SMUD road maintenance
JX - Joint maintenance

4.8 Chili Bar Development

- Road CB1 – Chili Bar Road – Access road from Highway 193 to Chili Bar Dam. The first 200 feet is paved and the remainder has a gravel surface. The road splits near the dam with one road going to the top of the dam and the other to the powerhouse near the bottom of the dam. The road has a moderate grade and is out-sloped with no road drainage. There is a cross culvert in a local drainage feature. The cut slopes are very rocky and almost vertical in some areas. There was little sign of rock sloughing. There were negligible signs of erosion along the road.

4.9 Hydro Meteorological Stations

- Road M1 – Not surveyed.
- Road M2 – Not surveyed.
- Road M3 – Not surveyed.
- Road M4 – Not surveyed.
- Road M5 – Not surveyed.
- Road M6 – Not surveyed.
- Road M6 – Not surveyed.
- Road M8 – Not surveyed.
- Road M9 – Not surveyed.
- Road M10 – Not surveyed.
- Road M11 – Access road about 0.5-miles-long that begins at Mosquito Road and ends at the Hydro Met Station. This is a road with a surface of native material on a relatively flat grade that ends near a mountain peak. This road is high above any watercourse with little chance of any sediment transport.

Table 4.8-1. Project Sources of Sediment Study Road Survey Overview – Chili Bar Development

ID[1]	Road(s) Name	Destination	Start	End	Dist.	Surf.	Use[2]	Maint. Road[3]	Plow Snow	Level of Effort	Rationale
CB1*	Chili Bar Road	Chili Bar Dam	Hwy. 193	Chili Bar Dam	0.5	dirt/gravel	LV2	_	_	Moderate	Access road is adjacent to river

[1] * next to Road ID indicates road is not shown on map

[2] **Light Vehicle Use**
LV1 - Heavy 100+ trips/year
LV2 - Medium 20-100 trips/year
LV3 - Light Vehicle 10-20 trips/year
LV4 - Periodic Vehicle 3-10 trips/year
LV5 - Infrequent Vehicle 1-2 trips/year
DRF - Developed Recreation Facility
URF - Undeveloped Recreation Facility

Heavy Vehicle Use
HV1 - Light Maintenance 1-10 times/year
HV2 - Operations 10-50 times/year
HV3 - Major Maintenance 1-2 times/10 years
Snow Plowing 10-20 times/year

[3] X - SMUD road maintenance
JX - Joint maintenance

Table 4.9-1 Project Sources of Sediment Study Road Survey Overview – Hydrometrolocial Stations

ID[1]	Road(s) Name	Destination	Start	End	Dist.	Surf.	Use[2]	Maint. Road[3]	Plow Snow	Level of Effort	Rationale
M2	13N15	Robbs Saddle Met Station	Ice House Road	Hydro Met Station	0.4	dirt	LV4			None	Existing SPI/FS road little used by SMUD
M3	Picket Pen Road to12N86 to 12N17	Morattini Met Station	Ice House Road	Hydro Met Station	8	dirt	LV4			None	Existing SPI/FS road little used by SMUD
M4	Ice House - Wright's Lake Road	Wright's Lake Met Station	Ice House Dike Road (I11)	Hydro Met Station	8	paved	LV5			None	Existing SPI/FS road little used by SMUD
M5*	Forni Road (11N284)	Alpha Met Station	Highway 50 - Wrights Lake Road	Hydro Met Station	1	dirt	LV5			None	Existing SPI/FS road little used by SMUD
M6*	17E24	Mud Lake Met Station	Highway 88	Hydro Met Station	2.2	dirt	LV5			None	Existing SPI/FS road little used by SMUD
M7*	14N34	Lost Corner Met Station	Highway 89	Hydro Met Station	6.6	dirt	LV5			None	Existing SPI/FS road little used by SMUD

Table 4.9-1 Project Sources of Sediment Study Road Survey Overview – Hydrometrolocial Stations

ID[1]	Road(s) Name	Destination	Start	End	Dist.	Surf.	Use[2]	Maint. Road[3]	Plow Snow	Level of Effort	Rationale
M8*	10N97	Iron Mountain Met Station	Mormon Emigrant Trail	Hydro Met Station	0.5	dirt	LV4			None	Existing SPI/FS road little used by SMUD
M10*	Bonetti Road (3.0) 10N64	Baltic Mountain Met Station	Mormon Emigrant Trail	Hydro Met Station	4.5	paved/dirt	LV4			None	Existing SPI/FS road little used by SMUD
M11	Slate Mountain Road	Slate Met Station and Telecommunications	Mosquito Road	Hydro Met Station	0.5	dirt	LV2	X		High	SMUD maintains road

[1] * next to Road ID indicates road is not shown on map

[2] **Light Vehicle Use**
LV1 - Heavy 100+ trips/year
LV2 - Medium 20-100 trips/year
LV3 - Light Vehicle 10-20 trips/year
LV4 - Periodic Vehicle 3-10 trips/year
LV5 - Infrequent Vehicle 1-2 trips/year
DRF - Developed Recreation Facility
URF - Undeveloped Recreation Facility

Heavy Vehicle Use
HV1 - Light Maintenance 1-10 times/year
HV2 - Operations 10-50 times/year
HV3 - Major Maintenance 1-2 times/10 years
Snow Plowing 10-20 times/year

[3] X - SMUD road maintenance
JX - Joint maintenance

5.0 LITERATURE CITED

Coe, Drew, and MacDonald and Lee, Colorado State University–Department of Earth Sciences, 2003. "Sediment Production and Delivery from Forest Roads in the Central Sierra Nevada, California."

APPENDIX A

PHOTOGRAPHS OF ROAD FEATURES

(Provided on CD)

Appendix A
Photographs of Road Features Index