Transportation and Trails System Management Plan

Sacramento Municipal Utility District

Hydro License Implementation • November 2015

Upper American River Project

FERC Project No. 2101

Powering forward. Together.

SMUD®

This page intentionally left blank.

Table of Contents

1.0 INTRODUCTION 1
1.1 Scope and Content of the Transportation System Management Plan 1
1.1.1 UARP License Conditions 1
1.1.2 Facilities Addressed by the Transportation System Management Plan 2
1.2 Relationship to Other Project License Conditions 2
1.2.1 Facility Management Plan 3
1.2.2 Vegetation and Invasive Weed Management Plan 3
1.2.3 Recreation Measures 3
1.2.4 Forest Service Standard 4(e) Conditions related to Transportation 4
1.3 Agency Consultation 5
1.4 Plan Updates 6
2.0 TRANSPORTATION SYSTEM MANAGEMENT PLAN DEVELOPMENT 7
2.1 Forest Service Coordination and Sources of Data 7
2.2 Road and Trail Condition Inventory 9
2.3 Hydrology Assessment—Culvert Sizing Analysis 10
2.4 Transportation System Maps 10
3.0 PROJECT-RELATED ROADS, TRAILS AND HELISPOTS 11
3.1 Forest Service System Roads 11
3.1.1 Maintenance Level 1 and 2 Roads 11
3.1.2 Maintenance Level 3, 4, and 5 Roads 21
3.1.3 Road Maintenance Activities 28
3.2 Access Roads Connecting to Recreation Facilities 30
3.3 Road Easements 32
3.4 Project-Related Administrative Trails 32
3.4.1 Trail Maintenance 32
3.4.2 SMUD Administrative-use Trails 33

3.5 Helispots 34
3.5.1 Loon Lake Helispot 34
3.5.2 Buck Island Lake, Desolation Boundary and Rubicon Reservoir Helispots 36
3.5.3 Helicopter Flight Notification 36
3.6 Gates 36
3.6.1 Existing Gates 36
3.6.2 New Gates 41
3.7 Erosion Control and Sediment Management 42
4.0 TRAFFIC SAFETY AND SIGNAGE PLAN 49
4.1 Sign Design and Placement 49
4.1.1 Manual of Uniform Traffic Control Devices 49
4.1.2 Sign and Poster Guidelines for the Forest Service 49
4.2 Sign Maintenance 50
4.3 Sign Inventory 50
5.0 CULVERT REPLACEMENT PLAN 63
6.0 REFERENCES 67

Tables

Table 2.1-1. Forest Service Road Maintenance Level definitions. 8

Table 3.1-1. Maintenance level 2 Project-related roads. 13

Table 3.1-2. Road maintenance prescription guidelines for Maintenance Level 2 roads. 21

Table 3.1-3. Maintenance Level 3, 4, and 5 Project-related roads. 23

Table 3.1-4. Road maintenance prescription guidelines for Maintenance Level 3, 4, and 5 roads. 27

Table 3.2-1. Roads providing access to Project recreation facilities. 30

Table 3.4-1. Project administrative trails. 33

Table 3.6-1. Existing gate locations and condition information for Project-related roads. 37

Table 3.6-2. Locations for proposed gates. 41

Table 3.7-1. Forest Service (Pacific Southwest Region) Best Management Practices applicable to Project-related road and trail maintenance 44

Table 4.3-1. Sign condition inventory for Project-related roads and other roads intersecting Project-related roads. 51

Table 5.0-1. Attributes of culverts scheduled for replacement (those that convey a perennial or intermittent stream). 64

Figures

Figure 3.5-1. Locations of Project-related helispots. 35

Appendices

Appendix A – License Conditions Related to the TSMP

Appendix B – Consultation Record

Appendix C – Data Dictionary

Appendix D – Hydrology Assessment – Culvert Analysis

Appendix E – Transportation System Maps

Appendix F – Culvert Analysis Maps

Appendix G – Eldorado National Forest Standard Road Maintenance Specifications

Appendix H – 5-year Road and Trail Maintenance Plan

Appendix I – Hydro Safety Procedure: Helicopter Flight Communications

Appendix J – Maintenance Level 1 Roads to Change in Forest Service Database

Appendix K – Additional Applicable Best Management Practices from Region 5 Forest Service Handbook 2509.22, Chapter 10, Water Quality Management Handbook

Acronyms and Abbreviations

ACOE	U.S. Army Corps of Engineers
Agreement	Cooperative Road Maintenance Agreement Between the Forest Service and SMUD
BMP	Best Management Practice
ENF	Eldorado National Forest
FERC	Federal Energy Regulatory Commission
Forest Service	U.S. Forest Service or USFS
GIS	Geographic Information System
ML	Maintenance Level
MUTCD	Manual on Uniform Traffic Control Devices
NFS	National Forest System
O&M	Operation and Maintenance
Project	Upper American River Project (FERC Project No. 2101) or UARP
Project boundary	UARP FERC Project Boundary
SMUD	Sacramento Municipal Utility District or Licensee
SWRCB	State Water Resources Control Board
TSMP	Transportation System Management Plan
UARP	Upper American River Project (FERC Project No. 2101) or Project
WQC	SWRCB Section 401 Water Quality Certification

This page intentionally left blank.

1.0 INTRODUCTION

1.1 Scope and Content of the Transportation System Management Plan

By order dated July 23, 2014, the Federal Energy Regulatory Commission issued a new License to the Sacramento Municipal Utility District (SMUD) for operating the Upper American River Project (UARP). The new License incorporates Conditions that are consistent with a Settlement Agreement between SMUD and stakeholders that resolved resource issues related to SMUD's Application for a New License to Operate and Maintain the UARP (SMUD 2007). Specifically, the purpose of this Transportation and Trails System Management Plan (TSMP) is to address the effects of the UARP that are associated with use of National Forest System (NFS) land and roads over the term of the License. The objectives of this plan relative to UARP-related roads, trails and helispots include:

- Identifying and mapping locations of specific roads, trails and helispots;
- Defining road maintenance levels and SMUD's maintenance responsibility;
- Identifying roads and trails requiring a special use authorization for Project operation and maintenance;
- Reporting condition and needs for construction, reconstruction and maintenance (including traffic signage);
- Analyzing road and stream interfaces and providing hydraulic calculations for culverts;
- Addressing erosion control on Project-related roads; and
- Providing a 5-year maintenance and reconstruction plan for roads and trails.

SMUD prepared this TSMP to comply with the U.S. Forest Service (Forest Service) 4(e) Conditions (Conditions) contained in the UARP License (Appendix B of License) and the State Water Resources Control Board's (SWRCB) Clean Water Act, Section 401 Water Quality Certification (WQC) Condition (Appendix A of License) described below.

1.1.1 UARP License Conditions

Two Forest Service 4(e) Conditions contain specific elements to be addressed in the TSMP. These 4(e) Conditions call for separate plans to be developed for both transportation (other than trails) and trails. In consultation with the approving agencies, SMUD has combined the two plans into this one TSMP which addresses roads, trails and helispots. The two primary 4(e) Conditions, which define the scope of this TSMP are:

- Condition No. 56, Transportation System Management
- Condition No. 57, Trails System Management Plan

The opening paragraph of Condition 56 succinctly summarizes the purpose of the TSMP:

> *Within 1 year of License issuance, the Licensee shall file with FERC a Transportation System Management Plan that is approved by FS for roads on or affecting National Forest System lands. The plan shall establish the level of Licensee responsibility for Project-related roads. The Licensee shall have primary responsibility for non-system roads and for maintenance level 1 and 2 roads. There shall be shared levels of responsibility for maintenance level 3, 4, and 5 roads. FS shall make available to the Licensee all information it has about these roads. The Licensee shall implement the plan upon approval.*

The Trails System Management Plan, 4(e) Condition 57, contains very similar language and requirements for trails that SMUD uses to maintain and operate the Project on or affecting NFS lands. These Conditions are incorporated by reference into this TSMP and are provided in Appendix A of this TSMP.

Condition 15 from the SWRCB's 401 WQC mirrors the 4(e) Condition but emphasizes the need for SMUD to protect waters of the state and consult with the SWRCB prior to initiating any road construction activities. All road and trail maintenance and reconstruction will be accomplished in a manner that protects water quality and beneficial uses of waters in watersheds associated with the UARP, consistent with the Water Quality Control Plan for the Sacramento and San Joaquin River Basins (Basin Plan). The complete text of the 401 Condition No. 15 is also provided in Appendix A of this TSMP.

1.1.2 Facilities Addressed by the Transportation System Management Plan

Consistent with the License Conditions, this TSMP identifies all roads, trails, and helispots located on NFS land necessary to operate and maintain the UARP. Roads, trails and helispots that are outside the Project boundary are identified in the TSMP and SMUD will apply for the appropriate Special Use Permit from the Forest Service to operate and maintain these roads, helispots and trails.

1.2 Relationship to Other Project License Conditions

Several other UARP License Conditions also affect operation and maintenance of UARP-related roads and trails, and in relevant part are summarized in this section. Together with this TSMP, these plans provide a comprehensive approach to managing the transportation system.

1.2.1 Facility Management Plan

The Facilities Management Plan (Condition No. 58) contains information about UARP facilities located on National Forest System (NFS) lands. This TSMP identifies roads and trails necessary for facility access and considers existing access that may no longer be necessary for facilities proposed for removal. The Facility Management Plan also contains maps and photos of SMUD's UARP facilities, which may be useful to help understand the relationship between access roads and facilities. SMUD will cross-reference this plan when implementing the TSMP to ensure necessary roads and trails on NFS land are identified, properly authorized (e.g., Special Use Permit for certain roads), operated, and maintained.

1.2.2 Vegetation and Invasive Weed Management Plan

The Vegetation Management Plan (Condition No. 59) identifies and prioritizes areas to be revegetated or rehabilitated and provides details about plant species, methods and densities. Because operation and maintenance activities associated with the roads, trails, and helispots identified in this plan may require revegetation or take place in the vicinity of treatment areas, the TSMP will reference the Vegetation Management Plan to ensure protection for revegetated areas and achieve consistent vegetation management practices for the UARP.

Condition 39, the Vegetation and Invasive Weed Management Plan, requires SMUD to prepare a plan that addresses the treatment/management of invasive weeds and other vegetation within the Project boundary. The plan includes details on monitoring and treating vegetation around all of SMUD's facilities in the UARP, including roads and trails. When treating vegetation along roads and trails that are within the Project boundary, SMUD will follow the approved prescriptions in this Vegetation and Invasive Weed Management Plan. Herbicide use to control vegetation on roads in the Project boundary will be described in the Vegetation and Invasive Weed Management Plan. For roads outside of the Project boundary SMUD will follow vegetation management guidelines provided by the Forest Service.

SMUD plans to combine the requirements of Conditions 39 and 59 into one comprehensive Vegetation Management Plan. Any further reference to the Vegetation Management Plan in this TSMP is meant to reference the Plan which includes both of these Conditions.

1.2.3 Recreation Measures

Specific Recreation Measures (Condition No. 45) identifies recreation developments and measures that SMUD is responsible for implementing. The facilities and modifications required by the Condition cover a broad spectrum of actions such as

constructing and improving trails, installing and replacing infrastructure (e.g., restrooms, wildlife resistant food storage lockers), constructing and reconstructing new/existing campgrounds and day use areas, and installing potable water systems. Because road and trail access will be needed to implement these measures, the scope of and schedule for these developments will be referenced to avoid conflicts with maintenance activities. Further, cost efficiencies (e.g., equipment cost) would be likely if road and trail maintenance activities are coordinated with the adjacent planned recreation development activities.

In addition, Conditions 44 and 46 describe SMUD's obligation to comprehensively review the condition of all developed recreation facilities with the Forest Service and SMUD's requirement to fund heavy maintenance. SMUD and the Forest Service will meet regularly to discuss heavy maintenance priorities based on the 6-year review cycle required in Condition 46. Heavy maintenance includes repairs to roads leading into campgrounds and other recreation facilities. SMUD has prepared a Recreation Implementation Plan which discusses the implementation of the various recreation measures of the License in more detail.

1.2.4 Forest Service Standard 4(e) Conditions related to Transportation

There are several standard Forest Service 4(e) Conditions that describe the Licensee's responsibility as it relates to the use of roads on NFS lands. These include:

- Condition No. 15 – Project Access Roads – requires Licensee to rehabilitate non-public roads damaged by erosion and install gates or other measures to protect resources.
- Condition No. 16 – Traffic Safety – requires Licensee to provide traffic controls and other measures to provide the public with adequate warning and protection during construction or other Project operations.
- Condition No. 17 – Access and Road Use by Licensee – requires Licensee to confine vehicle use for Project purposes to roads identified in this TSMP. The National Forest reserves the right to close any road or require the Licensee to reconstruct roads where damage to resources is occurring.
- Condition No. 18 – Crossings – requires Licensee to maintain all crossings where roads or trails interest the Licensee's linear facilities.
- Condition No. 19 – Access and Road Use by Government – The United States shall have access to any roads controlled by the Licensee.
- Condition No. 20 – Signs – requires the Licensee to consult with Forest Service before placing any signs and meet at least annually to participate in a sign survey and discuss issues related to signs. SMUD and the Forest Service will meet annually in September to perform surveys required by this condition.

For reference purposes only, the complete text of these Conditions is contained in Appendix A of this TSMP.

1.3 Agency Consultation

Condition 15 from the SWRCB 401 WQC for the UARP requires SMUD to consult with the SWRCB to develop this TSMP and Conditions 56 and 57 require consultation with the Forest Service. SMUD initiated consultation with the Forest Service in December of 2013, prior to issuance of the License, due to the complexity of the plan and the requirement to file the Plan with FERC in 1 year of License issuance. The purpose of this consultation was to determine the scope of the roads and trails that need to be covered by this TSMP. Feedback was received and used to continue developing the approach to completing the TSMP. Consultation continued through 2015 to refine the list of roads and trails for completing an inventory, obtain resource information (e.g., Geographic Information System [GIS] files), and provide clarification about conditions encountered during the inventory.

A summary of additional consultation follows:

- February 2014 - Meeting with the Eldorado National Forest (ENF) Transportation Coordinator to discuss each Project-related road and to determine which roads SMUD would complete field assessments on (these are the roads for which SMUD will have primary maintenance responsibility).
- May 2014 – Meeting with the ENF and SMUD's contractor to go over planned field assessments and methodology.
- August 2014 – SMUD presented approach and provided an update to the entire Consultation Group, including the SWRCB, to seek Consultation Group feedback.
- December 2014 – Additional email exchanges with the ENF to gather feedback on field work.
- January 2015 – Meeting with ENF to discuss outstanding issues related to the field assessment.
- March to September 2015 – Multiple meetings between SMUD and Forest Service to discuss a variety of issues related to the draft TSMP.

At the August 2014 meeting the SWRCB requested that the TSMP discuss SMUD's approach to erosion control and the need to get appropriate permits before doing work that would affect state and federal waters. Specific details of the consultations have been captured in meeting notes and letters, which are contained in Appendix B.

1.4 Plan Revisions and Updates

If SMUD, Forest Service and SWRCB collaboratively determine that revisions should be made to the TSMP, SMUD will make any revisions to the TSMP in coordination and consultation with the listed resource agencies. Any revisions to the plan must be approved by Forest Service and SWRCB. Any revisions shall be filed with FERC for approval prior to implementing.

Every 5 years SMUD will update the 5-year Road and Trail Maintenance Plan. SMUD will provide the 5-year plans to the SWRCB and the RWQCB for review.

2.0 TRANSPORTATION SYSTEM MANAGEMENT PLAN DEVELOPMENT

The primary elements associated with TSMP development included consulting with the Forest Service and Consultation Group, assembling a detailed road and condition inventory database and conducting a hydrological assessment of culverts.

2.1 Forest Service Coordination and Sources of Data

SMUD identified all roads and trails necessary for Project operation and maintenance, including access for Project recreation, without regard to which entity undertook historical operation and maintenance responsibility. However, this TSMP excludes roads and trails that do not serve a project purpose. Additionally, roads and trails that are within the boundary of developed recreation sites and within the Project boundary but also serve a Project Operation and Maintenance (O&M) purpose (e.g., boat launch) are also not included in the TSMP because maintaining these will be addressed during the implementation of Forest Service 4(e) Conditions 44, 45 and 46. For each road and trail on the resulting list, SMUD and the Forest Service identified whether the maintenance would be (1) primarily SMUD's responsibility; (2) a shared responsibility; or (3) if additional information or more discussion (i.e., information from the inventory) would be needed to determine appropriate responsibility. SMUD's field inventory effort was based on these discussions between SMUD and the Forest Service and limited to the roads for which SMUD would have primary maintenance responsibility.

The Forest Service provided existing information about the roads and trails to use for TSMP development. In addition, the Forest Service provided Road Maintenance Objectives as reported in its GIS database that reflect the desired maintenance levels for the roads. It should be noted that an *operational* maintenance level refers to the level to which the road is currently being maintained and the *objective* maintenance level is the desired level assigned at a future time that considers future Road Maintenance Objectives, traffic needs, budget constraints, and environmental concerns. In the context of this plan, maintenance levels refer to the *operational* maintenance levels of the roads. Table 2.1-1 lists the five definitions of Maintenance Levels (ML) the Forest Service uses to define the level of service provided by, and maintenance required for, a specific road (Forest Service 2009).

Condition 56 states that SMUD shall have primary maintenance responsibility for all Project-related ML 1 and 2 roads while there would be shared responsibility for all Project-related, ML 3-5 roads; However, it was mutually agreed to by SMUD and the Forest Service during consultations that SMUD would have primary responsibility for some ML 3-5 roads and would not have primary responsibility for some ML 2 roads that have low Project-related use.

Table 2.1-1. Forest Service Road Maintenance Level definitions.[1]

Level 1	These are roads that have been placed in storage between intermittent uses. The period of storage must exceed 1 year. Basic custodial maintenance is performed to prevent damage to adjacent resources and to perpetuate the road for future resource management needs. 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" all traffic. These roads are not shown on motor vehicle use maps. 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 available and suitable for non-motorized uses.
Level 2	Assigned to roads open for use by high clearance vehicles. Passenger car traffic, user comfort, and user convenience are not considerations. Warning signs and traffic control devices are not provided with the exception that some signing, such as W-18-1 “No Traffic Signs,” may be posted at intersections. Motorists should have no expectations of being alerted to potential hazards while driving these roads. 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 to discourage or prohibit passenger cars, or accept or discourage high clearance vehicles.
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. The Manual on Uniform Traffic Control Devices is applicable. Warning signs and traffic control devices are provided to alert motorists of situations that may violate expectations. Roads in this maintenance level are typically low speed with single lanes and turnouts. Appropriate traffic management strategies are either "encourage" or "accept." "Discourage" or "prohibit" strategies may be employed for certain classes of vehicles or users.
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. Manual on Uniform Traffic Control Devices is applicable. The most appropriate traffic management strategy is "encourage." However, the "prohibit" strategy may apply to specific classes of vehicles or users at certain times.
Level 5	Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double lane, paved facilities. Some may be aggregate surfaced and dust abated. Manual on Uniform Traffic Control Devices is applicable. The appropriate traffic management strategy is "encourage."

Source: Table 2.1-1 is from the Forest Service Handbook 7709.59, Road System Operations and Maintenance Handbook. Forest Service (2009)

[1] These definitions are derived from the Forest Service’s operational maintenance level, which refers to the level to which the road is currently being maintained. This TSMP does not use the objective maintenance level.

The ML assigned to a road reflects different parameters such as service life, type, and volume of intended traffic (Forest Service 2009). ML 1, the lowest ML, applies to roads that are closed to public use and maintained to provide basic custodial care. Roads assigned ML 2 roads are open to public use and maintained to allow high clearance vehicle use. Roads assigned ML 3 to ML 5 are open to the public, maintained for all types of vehicle use, and provide for increasing degrees of comfort and travel speeds over the range of MLs (3-5). Other information provided by the Forest Service included GIS layers, road maintenance objectives and standards, and culvert size requirements.

2.2 Road and Trail Condition Inventory

After identifying the roads and trails to include in the TSMP, SMUD conducted a detailed inventory of these routes in the summer of 2014. SMUD developed a data dictionary of parameters for collecting field information based on Condition No. 56; the Forest Service reviewed and approved the data dictionary. The data dictionary for the field assessment is provided in Appendix C. In addition to recording physical attributes, data collection included taking photographs of roads, trails, intersections, culverts, signs, and other transportation system-related features, and evaluating potential gate locations. Field data were collected using a Trimble GeoExplorer® 6000 GPS unit and Pathfinder® software. SMUD inventoried 64 miles of roads, 4 miles of trails, and conditions at 4 helispots. All of the information collected during the field assessment, including photos, is contained in a geodatabase that SMUD will update as work is performed.

SMUD analyzed the inventory data to report road and trail condition and to correct existing road and trail parameters, such as maintenance levels, locations and lengths. Additionally, the inventory data provided information to consider relative to assessing maintenance responsibility and allowed SMUD to refine the set of roads and trails needed to operate and maintain the Project. This included both additions and deletions of some roads or road segments. The inventory provided GIS data which SMUD used to assess the adequacy of culverts, to determine maintenance needs, and to create comprehensive GIS maps of the roads and trail system showing locations of routes, signs, and culverts.

During the inventory, SMUD identified a number of road segments that did not have NFS road system numbers. At the request of the Forest Service, SMUD assigned numbers to these non-system roads that the Forest Service could use to add these roads to its system. If non-system routes or motorized trails are added in future updates to the TSMP, additional Best Management Practices (BMPs), specific to these roads and trails will be required.

2.3 Hydrology Assessment—Culvert Sizing Analysis

SMUD used the condition inventory data, GIS data (to calculate drainage areas), and meteorological information to conduct hydrologic and hydraulic analyses of 91 culverts to determine if they were sufficiently sized to convey 100-year storm flows. These analyses were conducted for culverts located on perennial and intermittent drainages as well as additional ditch relief culverts adjacent to intermittent drainages. Based on the analysis (Appendix D) 57 culverts, mostly ditch relief culverts, are undersized and would not provide 100-year flow conveyance. Those culverts that are on perennial and intermittent streams are a priority for replacement (as required under Condition 56 of the License) as described in the Culvert Replacement Plan (see Section 5.0).

2.4 Transportation System Maps

SMUD developed a comprehensive set of maps with base-layer information showing roads (Project-related and NFS system), streams, reservoirs, transmission lines, FERC Project boundaries, recreation developments, place names, and landmarks. The maps fulfill requirements in Condition 56. Sections 1(a), (d), (e), (g), and (h) and depict the following information required by the TSMP:

- Road maintenance levels, ownership and responsibility (primary or shared)
- Culvert locations
- Sign and missing sign locations (safety and directional)
- Gate locations (existing and proposed)
- Helispot locations
- Trail locations

Because of the large amount of information described above, SMUD prepared two sets of maps to clearly display all of the necessary data. Maps are provided in Appendices E (Transportation System Maps) and F (Culvert Analysis Maps).

3.0 PROJECT-RELATED ROADS, TRAILS AND HELISPOTS

This section discusses maintenance of Project-related roads, including existing and proposed gates, trails, and helispots.

3.1 Forest Service System Roads

The details of road maintenance responsibility will be contained in the *Cooperative Road Maintenance Agreement Between the Forest Service and SMUD (*Agreement*)*. This Agreement between the Forest Service and SMUD will outline each party's responsibilities relating to maintenance of all Project-related roads. Included will be a comprehensive list of roads; categories of maintenance work; description of how maintenance costs will be shared; and how payment will be made. The Agreement will be developed following approval of this TSMP. SMUD anticipates working with the Forest Service to obtain any Special Use Authorization required by law for the use and maintenance of roads, trails and helispots on NFS lands.

3.1.1 Maintenance Level 1 and 2 Roads

Condition No. 56 states SMUD will have primary responsibility for maintaining all ML 1 and ML 2 Project-related roads. By definition, ML 1 roads are "placed in storage with all vehicular traffic eliminated" for a period exceeding 1 year (Forest Service 2009). Because SMUD uses all of the Project-related roads at least once a year, none of the Project-related roads technically qualify as ML 1 roads; however, some of the roads SMUD uses are classified as ML 1 in the Forest Service database. Appendix J provides a table showing the maintenance level 1 roads that should be changed to maintenance level 2 in the Forest Service database.

Maintenance level 2 Project-related roads are listed in Table 3.1-1, which reports several road attributes including road condition. Although some ML 2 roads are open for public vehicular use, others are gated and closed to public use. SMUD proposes to install gates on additional roads (e.g., those used for transmission line maintenance) to prohibit public vehicular access in order to protect Project infrastructure from vandalism and to prevent resource damage, such as erosion, associated with unauthorized vehicle use. Any ML 2 roads used by SMUD to access Project infrastructure that are closed to public use will be gated by SMUD. The gates will be installed and maintained to Forest Service standards. Gate locations, both existing and proposed, are shown on the maps in Appendix E.

This page intentionally left blank.

Table 3.1-1. Maintenance level 2 Project-related roads.

FS Road Number & *Map Book Page*	Road Name (where applicable)	Destination	Start	End	Distance (miles)	Width (ft)	Grade (%)	Slope Position	Surface	Use[1]	Purpose[2]	Primary Maintenance	General Road Condition[3]	In Project Boundary (Y/N)	Open to Public (Y/N)	Plow Snow (Y/N)	Road Crosses Private Land (Y[Landowner]/N)
LOON LAKE DEVELOPMENT																	
13N11 *21*	Loon Powerline	T3 - T13	Ice House Road	13N19A	2.3	10-12	6	Top and middle of ridge	aggregate /native	LV4	7	SMUD	Poor	Yes	Yes	No	Yes (SPI)
13N11C *21*	Under Powerline	T14 - T17	Ice House Road	T17	0.7	12	4	Top of ridge	native	LV4	7	SMUD	Fair	Yes	No	No	Yes (SPI)
13N11F *21*		T4	13N11	T4	0.1	12	8	Top of ridge	native	LV4	7	SMUD	Poor	Yes	No	No	No
13N11G *21*		T5	13N11	T5	0.1	8	7	Top of ridge	native	LV4	7	SMUD	Fair	Yes	No	No	No
13N11GA *21*		T6	13N11G	T6	0.1	8	10	Top of ridge	native	LV4	7	SMUD	Fair	Yes	No	No	No
13N11H *21*		T7	13N11	T7	0.1	8	4	Top of ridge	native	LV4	7	SMUD	Fair	Yes	No	No	No
13N11HA *21*		T8	13N11H	T8	0.1	8	7	Top of ridge	native	LV4	7	SMUD	Fair	Yes	No	No	No
13N15 *18*	Swift Access	T46 - T47, T40 - T23; Robbs Saddle Met	Ice House Road	T43	1.55	10-12	4	Top and middle of ridge	native	LV4	7, 10	SMUD	Fair	Yes	Yes	No	No
13N15B *18*	Powerline North	T36 - T40	Cheese Camp Road	Ice House Road	0.82	12	6	Top of ridge	native	LV4	7	SMUD	Poor	Yes	Yes	No	Yes (SPI)
13N15D *18*		T39 and T46	13N15	13N15B	0.33	10	6	Top of ridge	native	LV4	7	SMUD	Poor	Yes	No	No	No
13N19A *21*	Chipmunk Spur	T3 - T13	13N19	13N11	0.8	18	6	Top of ridge	aggregate /native	LV4	7	SMUD	Fair	Yes	Yes	No	No
13N19AE *21*		T3	13N19A	T3	0.1	10	12	Top of ridge	native	LV4	7	SMUD	Fair	Yes	No	No	No
13N21 *19*	Powerline	T24 - T26	Ice House Road	T24	0.4	10-14	<1	Middle of ridge	native	LV4	7	SMUD	Fair	Yes	No	No	Yes (SPI)
13N21A *19*		T25	13N21	T25	0.06	12	6	Top of ridge	native	LV4	7	SMUD	Fair	Yes	No	No	No
13N21B *19*		T24	13N21	T24	0.04	12	10	Middle of ridge	native	LV4	7	SMUD	Fair	Yes	No	No	No
13N57 *19*	South Power Access	T22 - T23	Ice House Road	T23	0.43	12	2	Top of ridge	native	LV4	7	SMUD	Fair	Yes	Yes	No	Yes (SPI)
13N70 --	Robbs Barn	T-line	Ice House Road	end of NFS land	0.4	--	--	--	asphalt	LV4	7	FS	--	No	Yes	No	Yes (Other)

FS Road Number & *Map Book Page*	Road Name (where applicable)	Destination	Start	End	Distance (miles)	Width (ft)	Grade (%)	Slope Position	Surface	Use[1]	Purpose[2]	Primary Maintenance	General Road Condition[3]	In Project Boundary (Y/N)	Open to Public (Y/N)	Plow Snow (Y/N)	Road Crosses Private Land (Y[Landowner]/N)
ROBBS PEAK DEVELOPMENT																	
12NY15 *18*	West Robbs Peak	T49 - T57	13N31 Robbs Peak	T-Line	0.63	14	2	Top of ridge	native	LV4	7	SMUD	Fair	No	Yes	No	No
12NY15E *18*		T52 - T57	12NY15 West Robbs Peak	USFS Boundary	0.41	12	7	Middle of ridge	native	LV4	7	SMUD	Fair	Yes	No	No	No
12NY15EA *18*		T50 - T51	12NY15E	T-50	0.25	12	14	Middle of ridge	native	LV4	7	SMUD	Poor	Yes	No	No	No
12N22 *18*	Headache	T48	Ice House Road	12N22F	0.27	14	3	Middle of ridge	aggregate	LV4	7	SMUD	Fair	No	Yes	No	No
12N22F *18*	Spring Spur	T48	12N22	T48	0.21	12	9	Middle of ridge	native	LV4	7	SMUD	Fair	Yes	Yes	No	No
12N30G *10, 17*		T64 - T70	12N30	T62	1.87	12-16	<1	Middle of ridge	native	LV4	7	SMUD	Poor	Yes	No	No	No
12N30M *10*	Miwok Spur	T59 - 60	12N30	T-line	0.40	12	3	Middle of ridge	native	LV4	7	SMUD	Fair	No	Yes	No	No
12N30M *10*	Miwok Spur	T62-T63	T-line	12N30	1.83	12	10	Middle of ridge	native	LV4	7	SMUD	Poor	Partially	No	No	No
12N30MA *10*		T61	12N30M	T61	0.05	12-14	33	Middle of ridge	native	LV4	7	SMUD	Poor	Yes	No	No	No
12N52 *10*		T58	12N30	Spur to T58/ T-line	1.10	--	--	--	native	LV4	7	FS	--	No	Yes	No	No
13N31 *18*	Robbs Peak	T49 - T57	Ice House Road	12NY15 West Robbs Peak	2	--	--	--	native	LV4	7	FS	--	No	Yes	No	Yes (SPI)
13N31B *18*	South Robbs Peak	T49	13N31 Robbs Peak	T49	0.55	10	10	Top of ridge	native	LV4	7	SMUD	Fair	Yes	Yes	No	No
17N12B2 *18*	Robbs Surge Shaft Road	Robbs Surge Shaft	Ice House Road	Surge Shaft	0.16	12	4	Middle of ridge	native	LV4	4	SMUD	Fair	Yes	No	No	Yes (SPI)
UNION VALLEY DEVELOPMENT																	
11N55 *9*	Peavine Ridge Road	Union Valley and Jaybird Facilities	Ice House Road	Jaybird Springs Road	3.5	--	--	--	asphalt	LV1,HV2	1,2,3,4,7,8, 9	FS	--	No	Yes	Yes	Yes (SPI)
12N30 *10*	Bryant Springs Road	Robbs-Union Valley T-Line Roads	North end of Union Valley Dam	12N52	3.23	--	--	--	--	LV4	7	SMUD	--	Partially	Yes	No	No
12N30L *7*		T73	12N30	T73	0.09	10	3	Middle of ridge	native	LV4	7	SMUD	Fair	Partially	No	No	No
12N42	Little Silver Creek	Telecommunic-	Union Valley	end of	1.8	--	--	--	native	LV5	10	FS	--	No	Yes	No	No

FS Road Number & *Map Book Page*	Road Name (where applicable)	Destination	Start	End	Distance (miles)	Width (ft)	Grade (%)	Slope Position	Surface	Use[1]	Purpose[2]	Primary Maintenance	General Road Condition[3]	In Project Boundary (Y/N)	Open to Public (Y/N)	Plow Snow (Y/N)	Road Crosses Private Land (Y[Landowner]/N)
7		ation Repeater	Dam	Federal land													
12N52 *10*	Wolf Creek	T-Line Roads	12N78	T-Line Roads	1.50	--	--	--	aggregate	LV3	7,3,8	FS	--	No	Yes	No	Yes (SPI)
ICE HOUSE DEVELOPMENT																	
11N98B *12*		Forest Service Bdy	11N98	Forest Service Bdy	0.35	20	8	Middle of ridge	native/ asphalt	LV2	3,6,11	SMUD	Fair	Partially	Yes	Yes	No
17N12C1 *12*		Ice House Dam, Outlet Facilities, and Gage	Ice House Road	Forest Service Bdy	0.1	16	24	Bottom of ridge	native	LV2	3,6,11	USFS	Fair	No	Yes	No	Yes (SPI)
12NY04 *11*		12N21B	12NY04D	12N21B	0.57	12	10	Middle of ridge	native	LV4	7	SMUD	Poor	Yes	Yes	No	No
12NY04A *11*		T1454	12NY04	T1454	0.04	12	18	Top of ridge	native	LV4	7	SMUD	Poor	Yes	No	No	No
12NY04D *11*		T1452	12NY04	12N21B	0.31	12	9	Top of ridge	native	LV4	7	SMUD	Poor	Yes	No	No	No
12NY05 *11*	Big Hill Crystal	Jones Fork Transmission Line (T1434 to T1464)	12N21	Jones Fork Powerhouse Rd.	0.82	12	7	Middle of ridge	native	LV4	7	SMUD	Fair	Partially	Yes	No	Yes (SPI)
12NY05C *11*		T1441	12NY05	T1441	0.05	10	6	Top of ridge	native	LV4	7	SMUD	Poor	Yes	No	No	Yes (SPI)
12NY05D *11*		T1434	12NY05	T1434	0.09	10	7	Middle of ridge	native	LV4	7	SMUD	Fair	Yes	No	No	No
12N21 *11*	Kern Cabin	Jones Fork Transmission Line	12N21B	12NY05	1.32	12	6	Top and middle of ridge	native	LV4	7	SMUD	Fair	Yes	Yes	No	No
12N21B *11*	North Big Hill	T1462	12N21	T1462	2.04	12	2	Top and middle of ridge	native	LV4	7	SMUD	Fair	Yes	Yes	No	Yes (SPI)
12N21D *11*		T1446-1444	12N21	T1444	0.22	10	14	Top of ridge	native	LV4	7	SMUD	Poor	Partially	No	No	No
12N21E *11*		T1442-1443	12N21	T1443	0.09	10	24	Top of ridge	native	LV4	7	SMUD	Poor	Yes	No	No	No
JAYBIRD DEVELOPMENT																	
11N60 *5, 6, 8*	Jaybird Canyon Road	Jaybird Powerhouse and Camino Dam	T-Line Crossover	Camino Dam	4.8	16	4	Top and middle of ridge	asphalt/ aggregate	LV1, HV2	1,2,3,4,6,8	SMUD	Fair	Yes	Partially	Yes	No
11N60A *5*		T91 - T98	11N60 Jaybird Spring	Jaybird Springs Road	1.41	12	2	Top of ridge	native	LV4	7	SMUD	Poor	Yes	No	No	No

FS Road Number & *Map Book Page*	Road Name (where applicable)	Destination	Start	End	Distance (miles)	Width (ft)	Grade (%)	Slope Position	Surface	Use[1]	Purpose[2]	Primary Maintenance	General Road Condition[3]	In Project Boundary (Y/N)	Open to Public (Y/N)	Plow Snow (Y/N)	Road Crosses Private Land (Y[Landowner]/N)
11N60B *5, 8*	Jaybird North	T-line	11N60	T-line	1.47	12	2	Top of ridge	native	LV4	7	SMUD	Fair	Yes	Yes	No	No
11N60BD *5*		T89	12N60B	T89	0.13	10	8	Top of ridge	native	LV4	7	SMUD	Poor	Yes	No	No	No
11N60BE *5*		T87	12N60B	T87	0.41	12	5	Top of ridge	native	LV4	7	SMUD	Poor	Yes	No	No	No
11N60D *5*		Jaybird Valve House	11N60	Gate House	0.64	16	6	Middle of ridge	native	LV2	6	SMUD	Fair	Yes	No	Yes	No
11N60DA *5*		Jaybird Surge Shaft	11N60D	Surge Shaft	0.23	16	2	Middle of ridge	native	LV4	4	SMUD	Fair	Yes	No	No	No
11N60DB *5*		T99	11N60D	T99	0.22	12	11	Bottom of ridge	native	LV4	7	SMUD	Poor	Yes	No	No	No
11N60DC *5*		T100 - T103	11N60D	Penstock	0.6	12	14	Middle of ridge	native	LV4	4,7	SMUD	Fair	Yes	No	No	No
11N60DCA *5*		T100	11N60DC	T100	0.23	12	3	Middle of ridge	native	LV4	7	SMUD	Poor	Yes	No	No	No
11N60DCB *5*		Penstock	11N60DC	Penstock	0.02	12	38	Middle of ridge	native	LV4	4	SMUD	Fair	Yes	No	No	No
11N60Z *5*		11N60	11N60	11N60	0.79	20	7	Middle and top of ridge	asphalt	HV2	1,2,3,4,6,8	SMUD	Fair	Yes	No	No	No
11N69 *5*	Powerline Rim	T94	11N60	T94	0.2	12	4	Top of ridge	native	LV4	7	SMUD	Fair	No	Yes	No	No
11N69 *5*	Powerline Rim	T90	11N71 Jaybird Canyon Springs	T-line	0.11	12	4	Middle of ridge	native	LV4	7	SMUD	Fair	No	Yes	No	No
11N71 *5*	Jaybird Canyon Springs	Jaybird Adit	11N60 Jaybird Spring	Adit	1.19	16	10	Middle of ridge	native	LV3, HV3	9	SMUD	Fair	Yes	Yes	No	No
12N30D *7*	Dam Spur	Junction Dam	12N30	Junction Dam	1.53	12-20	<1	Middle of ridge	aggregate/ native	LV4, HV1	3,6	SMUD	Fair	Yes	Partially	Yes	No
12N30DB *7*		T75 - T80	12N30D	USFS Boundary	0.44	12	12	Middle of ridge	native	LV4	7	SMUD	Fair	Partially	No	No	No
12N30DBA *7*		T75	12N30DB	T75	0.2	10	13	Top of ridge	native	LV4	7	SMUD	Poor	Yes	No	No	No
12N30DBB *7*		T-line R/W	12N30DB	12N30DBA	0.09	12	9	Middle of ridge	native	LV4	7	SMUD	Fair	Yes	No	No	No
12N37 *7*	Gravel Pit	T-line	12N30	USFS Boundary	0.23	12	2	Top of ridge	native	LV4	7	SMUD	Fair	Yes	No	No	No

FS Road Number & *Map Book Page*	Road Name (where applicable)	Destination	Start	End	Distance (miles)	Width (ft)	Grade (%)	Slope Position	Surface	Use[1]	Purpose[2]	Primary Maintenance	General Road Condition[3]	In Project Boundary (Y/N)	Open to Public (Y/N)	Plow Snow (Y/N)	Road Crosses Private Land (Y[Landowner]/N)
CAMINO DEVELOPMENT																	
11NY05 *3*	Crooked Silver	Camino Adit	12N34	Adit	3.5	16	<1	Middle of ridge	native	LV3, HV1	9	SMUD	Poor	Yes	No	No	No
11NY05A *3, 4*		Tunnel Muck Pit	11NY05	Pit	0.18	12	10	Middle of ridge	aggregate	LV4	11	SMUD	Fair	No	No	No	No
11N12 *3*	Poho Ridge Road	Brush Creek Reservoir	12N34	Brush Creek Reservoir	1.64	14	6	Top of ridge	asphalt/ aggregate	LV1, HV2	3,8,11	SMUD	Fair	No	Yes	Yes	No
11N12A *3*		T14502	11N12	T14502	0.23	12	4	Top of ridge	native	LV4	7	SMUD	Fair	No	Yes	No	No
11N12C *3*		T130	11N12	T130	0.13	12	10	Top of ridge	native	LV4	7	SMUD	Poor	Yes	No	No	No
11N12D *3*		Brush Creek Dam	11N12	Brush Creek Dam	0.1	14	8	Bottom of ridge	asphalt/ native	LV1, HV2	3,6	SMUD	Good	Yes	No	No	No
11N12E *3*		Power Pole	11N12	Pole	0.03	12	30	Bottom of ridge	native	LV4	11	SMUD	Fair	Yes	No	No	No
11NY20 *3*		11NY20A	12N34	11NY20A	0.46	12	5	Top of ridge	native	LV4	7	SMUD	Fair	No	Yes	No	No
11NY20A *3, 4*		T125 - T127	11NY20	12N34	1.68	14	2	Top of ridge	native	LV4	7	SMUD	Fair	Partially	No	No	No
11NY20AA *3*		T126	11NY20A	T126	0.02	12	2	Middle of ridge	native	LV4	7	SMUD	Poor	Yes	No	No	No
12NY23 *4*	High Tension Spur	T112 - T116	12N54	T112	1.92	10-16	1	Top of ridge	native	LV4	7	SMUD	Fair	No	No	No	No
12NY23A *4*		T116	12NY23	T116	0.1	12	17	Top of ridge	native	LV4	7	SMUD	Poor	Yes	No	No	No
12NY23B *4*		T115	12NY23	T115	0.15	12	17	Middle of ridge	native	LV4	7	SMUD	Fair	Yes	No	No	No
12NY23C *4*		T114	12NY23	T114	0.09	12	26	Top of ridge	native	LV4	7	SMUD	Poor	Yes	No	No	No
12N34 *4*	Forebay Road	Jaybird-Camino Transmission Line	Brush Creek Reservoir Road	12N54 (Sugar Pine Road)	5.6	--	--	--	native	LV4	7	FS	--	No	Yes	No	No
12N34 *3*	Forebay Road	Brush Creek Reservoir / T-line	SFAR bridge	11N12	3.69	12-18	9	Top, middle and bottom of ridge	asphalt	LV1, HV2	1,2,3,4,7,8, 9,	SMUD	Fair	No	Yes	Yes	No
12N34P *3*		Camino Penstock	12N34	Penstock	0.46	12-14	14	Middle of ridge	aggregate	LV2	4	SMUD	Fair	Yes	No	No	No
12N34PA *3*		Camino Penstock Valvehouse	12N34P	Penstock valvehouse	0.12	16	9	Middle of ridge	native	LV2	4	SMUD	Fair	Yes	No	No	No

FS Road Number & *Map Book Page*	Road Name (where applicable)	Destination	Start	End	Distance (miles)	Width (ft)	Grade (%)	Slope Position	Surface	Use[1]	Purpose[2]	Primary Maintenance	General Road Condition[3]	In Project Boundary (Y/N)	Open to Public (Y/N)	Plow Snow (Y/N)	Road Crosses Private Land (Y[Landowner]/N)
12N34R *4*		T122	12N34	T122	0.07	12	<1	Top of ridge	native	LV4	7	SMUD	Fair	Yes	No	No	No
12N34S *3*		T128	12N34	T128	0.07	12	3	Top of ridge	native	LV4	7	SMUD	Fair	Yes	No	No	No
12N34U *4*		T120	12N34	T120	0.17	12	10	Top of ridge	native	LV4	7	SMUD	Fair	Yes	No	No	No
12N34V *4*		T119	12N34	T119	0.17	12	1	Top of ridge	native	LV4	7	SMUD	Fair	Yes	No	No	No
12N34W *3*		T132	12N34	T132	0.41	12	10	Top of ridge	native	LV4	7	SMUD	Poor	Yes	No	No	No
12N34ZZ *3*		Surge Chamber	12N34	Surge Chamber	0.02	16	17	Middle of ridge	native	LV4	11	SMUD	Good	Yes	No	No	No
12N54 *4*	Sugar Pine Road	Jaybird-Camino Transmission Line	12N34	12NY23	1.4	14	--	--	native	LV4	7	FS	--	No	Yes	No	No
12N54D *4*		12N54DA	12N54	12N54DA	0.14	14	10	Middle of ridge	native	LV4	7	SMUD	Fair	Yes	No	No	No
12N54DA *4*		T117	12N54D	T117	0.17	12	8	Middle of ridge	native	LV4	7	SMUD	Fair	Yes	No	No	No
12N54E *4*		T118	12N54	T118	0.04	12	11	Top of ridge	native	LV4	7	SMUD	Fair	Yes	No	No	No
WHITE ROCK DEVELOPMENT																	
11N08A *2*		T143/615 - T145/617	11N08	T145/617	1.05	12	2	Middle of ridge	native	LV4	7	SMUD	Poor	Yes	No	No	No
11N08C *2*		Communication Repeater	11N08	Communication Repeater	0.35	12	12	Top of ridge	native	LV5	10	SMUD	Poor	No	No	No	Yes (SMUD)
11N82 *2*	Cable North	T141/613	11N08	T141/613	0.28	12	2	Middle of ridge	native	LV4	7	SMUD	Good	Yes	Yes	No	No
11N96B *2*		White Rock Tunnel Adit No. 3	11N96	Tunnel Adit	0.24	14	21	Bottom of ridge	concrete	LV2	9	SMUD	Fair	Yes	No	No	No
12N34A1 *2, 3*		T139/611 - T140/612	12N34	T140/612	0.35	12	6	Top of ridge	native	LV4	7	SMUD	Fair	Yes	No	No	No
12N34B *3*	Independence Flat	T136/608	12N34H	T136/608	0.4	12	5	Top of ridge	native	LV4	7	SMUD	Good	Partially	No	No	No
12N34H *3*	Powerhouse El Dorado	Camino - White Rock Transmission Line	Forebay Road	12N34HA	1.6	--	--	--	native/ aggregate	LV3	7	FS/EID	--	No	No	No	No
12N34HA *3*		T134/606	12N34H	T134/605	0.48	12	13	Middle of ridge	native	LV4	7	SMUD	Poor	Yes	No	No	No

FS Road Number & *Map Book Page*	Road Name (where applicable)	Destination	Start	End	Distance (miles)	Width (ft)	Grade (%)	Slope Position	Surface	Use[1]	Purpose[2]	Primary Maintenance	General Road Condition[3]	In Project Boundary (Y/N)	Open to Public (Y/N)	Plow Snow (Y/N)	Road Crosses Private Land (Y[Landowner]/N)
12N34J *3*	Powerful Independence	T137/609	12N34	T137/609	0.32	12	7	Top of ridge	native	LV4	7	SMUD	Fair	Yes	No	No	No
12N34Z *3*		T138/610	12N34	T138/610	0.3	12	10	Top of ridge	native	LV4	7	SMUD	Fair	Yes	No	No	No
HYDRO METEOROLOGICAL STATIONS																	
10N13 *23, 24*	Sneider Camp 4WD	Schneider's Met Station	ALP-164	10N13C	3.9	12	3	--	native	LV5	10	FS	--	No	Yes	No	No
10N13C *23*	Shortcake Spur	Schneider's Met Station	10N13	Hydro Met Station	1.3	12	8	Top of ridge	native	LV5	10	SMUD	Poor	No	No	No	No
12N76 *1*	Slate Mountain Road	Slate Met Station and Telecommunications	ELD-60 Mosquito Road	Hydro Met Station	0.7	--	--	--	native	LV2	10	FS	--	No	Yes	No	No
12N76A *1*	Slate Mountain Road A Spur	Slate Met Station and Telecommunications	12N76 Slate Mountain Road	Hydro Met Station	0.11	12	14	Top of ridge	native	LV2	10	SMUD	Fair	No	No	No	No
12N77A *17*		Morattini Met Station	12N77	Hydro Met Station	0.05	10	6	Middle of ridge	native	LV4	10	SMUD	Poor	No	No	No	No
12N68 *16*	Picket Pen Road	Morattini Met Station	Ice House Road	12N77	--	--	--	--	native	LV4	10	FS	--	No	Partially	No	Yes (SPI)
12N77 *17*	Pearl Lake 4WD	Morattini Met Station	12N77	Morattini Met Station	--	--	--	--	native	LV4	10	FS	--	No	Partially	No	Yes (Other)
13N22 *18*		Van Vleck Met Station	Tells Creek Gate	Hydro Met Station	1.1	--	--	--	native	LV4	10	SMUD	--	No	No	No	No
14N39 *22*	Richardson Lake 4WD	Lost Corner Met Station and Sourdough Hill Com Station	ELD-63	Sourdough Hill Com Station	2.7	--	--	--	native	LV5	10	FS	--	No	Yes	No	No
14N39B *22*		Lost Corner Met Station	14N39	Hydro Met Station	0.14	10	6	Top of ridge	native	LV5	10	SMUD	Poor	No	No	No	No
11NY28 *15*		Alpha Met Station	11N26	11NY28B	--	--	--	--	native	LV5	10	SMUD	--	No	Partially	No	--
11NY28B *15*		Alpha Met Station	11NY28	Alpha Met Station	--	--	--	--	native	LV5	10	SMUD	--	No	Partially	No	--

Notes:

-- Used where attributes of roads are not known because they were not assessed in the 2014 inventory.

[1] 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

[1] 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

[2]Purpose

1 = Powerhouse
2 = Substation
3= Dam
4= Penstock
5= Canal
6= Gatehouse
7 = T-line
8 = Reservoir
9 = Tunnel
10 = Telecom/met
11 = Other

[3] General Road Condition

Good - Meets current road maintenance standards. Supports anticipated use.
Fair - Requires annual routine road maintenance activities to meet maintenance standards.
Poor - Requires road maintenance activities or repair to support Project use and /or protect resources.

SMUD will maintain all ML 2 roads, for which it has primary maintenance responsibility, consistent with the road maintenance prescriptions guidelines applicable to ML 2 roads as shown in Table 3.1-2 (Forest Service 2005).

Table 3.1-2. Road maintenance prescription guidelines for Maintenance Level 2 roads.

Road Attribute	Maintenance Level 2 Road Maintenance Prescription Guidelines
Traveled way	Log out and brush as necessary to provide passage for planned traffic. Maintain road prism to provide for passage of high-clearance vehicles.
Shoulder	Maintain only as necessary for planned traffic.
Drainage	As necessary to keep drainage facilities functional and prevent unacceptable environmental damage.
Roadway	Manage vegetative cover as needed for planned traffic. Remove and/or repair slides and/or slumps as needed for access with high clearance vehicles to control resource damage.
Roadside	Manage vegetative cover as needed for planned traffic. Remove and/or repair slides and/or slumps as needed for access with high clearance vehicles to control resource damage.
Structures	Maintain all structures to provide for the passage of planned traffic.
Traffic Service	Install and maintain route markers; warning, regulatory, and guide signs; and other traffic control devices to provide for planned traffic and an appropriate traffic management strategy.

Source: Table 3.1-2 is from the Forest Service Handbook 7709.59, Road System Operations and Maintenance Handbook. Forest Service (2009)

3.1.2 Maintenance Level 3, 4, and 5 Roads

Consistent with Condition No. 56, SMUD will have shared maintenance responsibility for ML 3, ML 4, and ML 5 roads as identified in Table 3.1-3, which identifies several road attributes including road condition, and are shown on the maps in Appendix E. SMUD's level of responsibility will be proportionate to its use of a road or road segment compared with overall use of the road or road segment by all persons, including but not limited to Forest Service, timber companies, recreation companies and the general public. This will be described in detail in the cooperative maintenance agreement between SMUD and the Forest Service.

This page intentionally left blank.

Table 3.1-3. Maintenance Level 3, 4, and 5 Project-related roads.

FS Road Number	Road Name	Destination	Start	End	Distance (miles)	Width (ft)	Grade	Slope Position	Surface	Use[1]	Purpose[2]	Primary Maintenance	General Road Condition[3]	In Project Boundary (Y/N)	Open to Public (Y/N)	Plow Snow (Y/N)	Maintenance Level[4]	Road Crosses Private Land (Y[Landowner]/N)
LOON LAKE DEVELOPMENT																		
13N18A *21*		Loon Lake Intake	Ice House Road	Intake Housing	0.2	16	8	Top of ridge	asphalt	LV2	6	SMUD	Good	Yes	No	No	ML4	No
13N19 *21*	Chipmunk Bluff	T3 - T13	Ice House Road	13N19A	0.2	10-16	7	Top of ridge	asphalt	LV4	7	SMUD	Fair	Yes	Yes	No	ML3	No
13N19C *21*		Loon Lake PH Access Building	Ice House Road	Access Building	0.2	12-65	4	Middle of ridge	asphalt	LV3,HV2	1,2	SMUD	Good	Yes	No	No	ML3	No
13N19D *21*		Heliport	13N19	heliport	0.1	14-16	3	Top of ridge	aggregate/ native	LV4	11	SMUD	Good	Yes	Yes	No	ML3	No
ROBBS PEAK DEVELOPMENT																		
12N44 *18*	Robbs Powerhouse Road	Robbs Powerhouse	Ice House Road	Powerhouse	1.1	20	8	Middle of ridge	asphalt	LV1,HV2	1,2,4,7,8, 10	SMUD	Good	Yes	No	Yes	ML3	Yes (SPI)
13N23 *21*		Spoils area	Wentworth Springs Rd.	Spoils area	1.09	14-16	5	Middle of ridge	asphalt/ aggregate	LV1	11,3,5,6,8	SMUD	Fair	Yes	No	Yes	ML3	No
13N23B *21*		Gerle Creek Dam	13N23	Dam	0.1	16	10	Middle of ridge	asphalt	LV1	3	SMUD	Fair	Yes	No	Yes	ML3	No
13N23C *21*		Gerle Creek Canal (in total)	13N23	Dam	0.21	14	1	Middle of ridge	aggregate	LV1	5	SMUD	Fair	Yes	No	Yes	ML3	No
13N23D *19, 21*		Gerle Creek Canal (in total)	13N23	Robbs Reservoir	1.59	16	1	Middle of ridge	aggregate	LV1	5	SMUD	Fair	Yes	No	Yes	ML3	Yes (SPI)
13N28 *19*	South Creek	SF Rubicon Gage Station DS of confluence with Gerle Creek	County Road ELD-147F	Gage Station	0.9	--	--	--	asphalt	LV2	11	FS	--	No	Yes	No	--	No
17N12A2 *19*	Robbs Forebay Road	Robbs Forebay & Robbs Met Station	Ice House Road	Met Station	0.2	20	4	Bottom of ridge	asphalt	LV1	3,6,8,10	SMUD	Fair	Yes	No	Yes	ML3	Yes (SPI)
UNION VALLEY DEVELOPMENT																		
11N58 *11*	Big Hill Lookout	Big Hill Telecommuni-cation and Met Station	Ice House Road	Big Hill Summit	2.6	--	--	--	asphalt	LV1	10,7	FS	--	No	Yes	Yes	--	No
12N30 *7, 8, 9*	Bryant Springs Road	Union Valley Dam	Peavine Ridge Road	Union Valley Dam near Valve House	5.7	--	--	--	asphalt	LV1,HV1	1,2,3,7,8,	SMUD	--	Partially	Yes	Yes	Yes (SPI)	

FS Road Number	Road Name	Destination	Start	End	Distance (miles)	Width (ft)	Grade	Slope Position	Surface	Use[1]	Purpose[2]	Primary Maintenance	General Road Condition[3]	In Project Boundary (Y/N)	Open to Public (Y/N)	Plow Snow (Y/N)	Maintenance Level[4]	Road Crosses Private Land (Y[Landowner]/N)
12N30 *7*	Bryant Springs Road (over Union Valley Dam and Spillway Gates	Union Valley Dam and Spillway	SE end of dam	NW end of dam/ spillway	0.39	20	--	--	asphalt	LV4	3,7	SMUD	Fair	Yes	Yes	Yes	ML3	No
12N30E *7*	Powerhouse Spur	Union Valley Powerhouse & T74	Bryant Springs Road	Powerhouse	1.02	16-24	<1	Middle of ridge	asphalt	LV1,HV1	1	SMUD	Fair	Yes	Partially	Yes	ML4	No
12N30H *7*		Union Valley Switchyard	Bryant Springs Road	Switchyard	0.77	16	11	Middle of ridge	asphalt	LV2,HV2	2	SMUD	Fair	Yes	No	Yes	ML3	No
12N30Z *7*		Gatehouse	12N30	Gatehouse	0.04	18	7	Bottom of ridge	asphalt	LV1	6	SMUD	Good	Yes	No	No	ML3	No
12N78 (Mi.0-1.25) *10*	Union Valley	T-Line Roads	Ice House Road	12N52	0.75	--	--	--	asphalt	LV3	7,3,8	FS	--	No	Yes	No	--	Yes (SPI)
ICE HOUSE DEVELOPMENT																		
11N37 *12*	Ice House Wrights Lake	Ice House Dam	Ice House Road	11N98	--	--	--	--	asphalt	LV1	3,6,8	FS	--	Partially	Yes	Yes	--	--
11N98 *12*	Gobbi	Ice House Dam	11N37	Ice House Dam	--	--	--	--	asphalt	LV1	3,6,8	FS	--	Partially	Yes	Yes	--	--
11N37 and 11N37K *12*		Ice House Dike 1	Intersection of 11N98	Dike 1	1.3	--	--	--	asphalt	LV4	3	FS	--	Partially	Yes	No	--	Yes (SPI)
11N37E *12*		Jones Fork Valvehouse	11N37	Valvehouse	0.58	12-18	7	Middle of ridge	aggregate/ asphalt	LV2	6	SMUD	Poor	Yes	No	Yes	ML3	No
11N98 *12*		Ice House Dam and Spillway Gates	11N98	East end of dam/spillway	0.38	16	1	Top of ridge	aggregate/ asphalt	LV2	3	SMUD	Fair	Yes	No	No	ML3	No
11N98C *12*		Ice House Dam Outlet	11N98	Outlet Facilities	0.44	16	7	Middle of ridge	asphalt	LV2	3,11	SMUD	Fair	Yes	No	Yes	ML3	No
12NY05X *11*		Jones Fork Powerhouse	USFS Property	Powerhouse	0.08	30	4	Middle of ridge	asphalt	LV1	1,2	SMUD	Fair	Yes	No	Yes	ML3	Yes (SMUD)
JAYBIRD DEVELOPMENT																		
11N57 and 11N64 *6*	Round Tent Canyon Road and Spring Valley Road	Telecommuni-cation Repeater	Jaybird Springs Road	Repeater	6.3	--	--	--	asphalt/ aggregate	LV5	10	FS	--	No	Yes	No	--	Yes (SPI)

FS Road Number	Road Name	Destination	Start	End	Distance (miles)	Width (ft)	Grade	Slope Position	Surface	Use[1]	Purpose[2]	Primary Maintenance	General Road Condition[3]	In Project Boundary (Y/N)	Open to Public (Y/N)	Plow Snow (Y/N)	Maintenance Level[4]	Road Crosses Private Land (Y[Landowner]/N)
11N60 *5*	Jaybird Spring Road	T-Line Crossover	Peavine Ridge Road	T-Line Crossover	4.5	--	4	Top of ridge	asphalt	LV1, HV2	1,2,3,4,7,8,9	SMUD	--	No	Yes	Yes	--	Yes (SPI)
12N34 *3*	Forebay Road	Camino Powerhouse	End of county-maintained road	Just south of SFAR bridge	4.2	--	8	--	asphalt	LV1, HV2	1,2,3,4,7,8,9,	FS	--	No	Yes	No	--	No
CAMINO DEVELOPMENT																		
12N34N *3*		Camino Powerhouse	12N34	Powerhouse	0.42	14	4	Bottom of ridge	asphalt	LV1, HV2	1,2,4	SMUD	Good	Yes	Partially	No	ML3	No
WHITE ROCK DEVELOPMENT																		
ELD County-8014 *2*	Slab Creek Road	Slab Creek Dam/Reservoir	USFS Property	11N96A/ 11N96B	0.52	18	4	Middle of ridge	aggregate	LV1, HV1	1,3,6,8,9, 11	SMUD	Good	Yes	Yes	No	ML3	No
11N96A *2*		Slab Creek Dam/Gatehouse	11N96	Slab Creek Dam	0.21	14	6	Bottom of ridge	aggregate	LV1, HV1	1,3,6	SMUD	Good	Yes	No	No	ML3	No
HYDRO METEOROLOGICAL STATIONS																		
11N26 *15*	Wrights Lake	Alpha Met Station	Highway 50 - Wrights Lake Road	11NY28	--	--	--	--	asphalt/ native	LV5	10	FS	--	No	Partially	No	--	No
11N37 *12, 13, 14*	Ice House - Wright's Lake Road	Wright's Lake Met Station	Ice House Dike Road	Hydro Met Station	8.5	--	--	--	asphalt	LV5	10	FS	--	No	Yes	No	--	Yes (SPI)
13N22 *18, 20*		Van Vleck Met Station	Ice House Road	Tells Creek Gate	5.4	--	--	--	asphalt	LV4	10	FS	--	No	Yes	No	--	No

Notes:

-- Used where attributes of roads are not known because they were not assessed in the 2014 inventory

SPI—Sierra Pacific Industries

[1] 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

[1] 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

[2]Purpose

1 = Powerhouse
2 = Substation
3= Dam
4= Penstock
5= Canal
6= Gatehouse
7 = T-line
8 = Reservoir
9 = Tunnel
10 = Telecom/met
11 = Other

[3] General Road Condition

Good - Meets current road maintenance standards. Supports anticipated use.
Fair - Requires annual routine road maintenance activities to meet maintenance standards.
Poor - Requires road maintenance activities or repair to support Project use and /or protect resources.
Roads without road condition information were not assessed in the 2014 inventory.

[4] FS Maintenance Levels (from FS roads database)

1 - Basic Custodial Care (closed)
2 - High Clearance Vehicles
3 - Suitable for Passenger Cars
4 - Moderate degree of User Comfort

SMUD will share in the responsibility to maintain these roads consistent with the applicable road maintenance prescriptions guidelines as shown in Table 3.1-4 (Forest Service 2005). SMUD may perform work, hire a contractor to perform work or deposit funds with the Forest Service to complete its commensurate share of road maintenance responsibility consistent with Forest Service directives (Forest Service 2009). As described above in Section 3.1, a cooperative agreement will be developed after TSMP approval.

Table 3.1-4. Road maintenance prescription guidelines for Maintenance Level 3, 4, and 5 roads.

Road Attribute	Maintenance Level 3 Road Maintenance Prescription Guidelines
Traveled way	Maintain surface to provide travel by prudent drivers in standard passenger cars. Some surface roughness is tolerated. User comfort and convenience is a low priority. Maintain a traveled way crown or cross slope to provide adequate drainage. Replace the base course and surfacing as needed.
Shoulder	Maintain existing shoulders commensurate with the traveled way.
Drainage	As necessary to keep drainage facilities functional and prevent unacceptable environmental damage.
Roadway	Maintain existing vegetative cover. Control the vegetation to provide sight distance. Repair and/or remove slides and slumps to provide passage by prudent drivers in standard passenger cars.
Roadside	Remove hazard trees and clean up litter.
Structures	Maintain all structures to provide for passage of planned traffic and to preserve structures for future use. Defer noncritical items and combine to provide for more economical project. For example, defective bridge rails, running planks, and bridge guideposts on a current basis. Defer the painting of bridge rails to a logical project cycle.
Traffic Service	Install and maintain route markers; warning, regulatory, and guide signs; and other traffic devices to provide for planned traffic.
	Maintenance Level 4 Road Maintenance Prescription Guidelines
Traveled way	Maintain traveled way to provide for moderate degree of user comfort and convenience and for protection of investment and resource values. Replace surfacing to the depth required for blade maintenance and to prevent wear of the base course. Abate dust when needed.
Shoulder	Maintain existing shoulders commensurate with the traveled way.
Drainage	As necessary to keep drainage facilities functional and prevent unacceptable environmental damage.
Roadway	Maintain existing vegetative cover. Control vegetation to provide sight distance. Repair and/or remove slides and slumps to provide passage by prudent drivers in standard passenger cars.
Roadside	Clean up litter in accordance with road management objectives. Remove hazard trees and perform landscape treatments as required.

Structures	Maintain all structure to provide for passage of planned traffic and to preserve structures for future use. Defer noncritical items and combine to provide for a more economical project. For example, defective bridge rails, running planks, and bridge guideposts on a current basis. Defer the painting of bridge rails to a logical project cycle.
Traffic Service	Install and maintain route markers; warning, regulatory, and guide signs; and other traffic devices to provide for planned traffic.
	Maintenance Level 5 Road Maintenance Prescription Guidelines
Traveled way	Maintain surface to provide for the protection of investment and resource values, and for a high degree of user comfort and convenience.
Shoulder	Maintain to the same standard as the traveled way.
Drainage	As necessary to keep drainage facilities functional and prevent unacceptable environmental damage.
Roadway	Maintain existing vegetative cover. Control vegetation to provide sight distance. Repair and/or remove slides and slumps to provide passage by prudent drivers in standard passenger cars.
Roadside	Clean up litter in accordance with road management objectives. Remove hazard trees and perform landscape treatments as required.
Structures	Maintain all structures to provide for the passage of planned traffic and to preserve structures for future use. Defer noncritical items and combine to provide for a more economical project. For example, defective bridge rails, running planks, and bridge guideposts on a current basis. Defer painting of bridge rails to a logical project cycle.
Traffic Service	Install and maintain route markers; warning, regulatory, and guide signs; and other traffic devices to provide for planned traffic. Renew centerlines, edge stripes, and other pavement and curb markings as needed to provide for planned traffic.

Source: Table 3.1-4 is from the Forest Service Handbook 7709.59, Road System Operations and Maintenance Handbook. Forest Service (2009)

3.1.3 Road Maintenance Activities

Maintenance of roads falls into several categories: Recurrent Maintenance, Deferred Maintenance, Extraordinary Repairs and Capital Improvements. These terms are defined below.

- **Recurrent Maintenance** is work that typically must be performed on roads almost every year and is jointly determined and mutually agreed upon in the TSMP and 5-year maintenance plan. Recurrent Maintenance items include but are not limited to clearing timber from roads and ditches; blading and shaping of road surface and shoulders; cleaning ditches and culverts; road surface repair; maintenance of running surfaces on bridges; removal or repair of minor slides or washouts; upkeep of signs and bridges; dust abatement when necessary (i.e., to provide for public safety when dust limits visibility such that tail lights and turn

signals are obscured) ; brush control; and hazard tree removal. For roads that SMUD has primary responsibility, these activities would be completed as needed using approved Forest Service methods, including use of appropriate BMPs and erosion control measures.

- **Deferred Maintenance** is work that must be performed periodically to keep the road and related structures in good repair and is jointly determined and mutually agreed upon in the TSMP and 5-year maintenance plan. Deferred Maintenance items include, but are not limited to, resurfacing of the road, culvert replacement, and bridge painting, redecking, and replacement. These items would be discussed with the Forest Service at O&M meetings and/or other meetings to discuss transportation issues. These are the types of maintenance activities identified in the 5-year maintenance plan in Appendix H.
- **Extraordinary Repairs** include such things as major blow downs, slides, slips and washouts of the road or failure of road structures.
- **Capital Improvements** include major reconstruction of roads and bridges. These items would be discussed with the Forest Service at O&M meetings and/or other meetings to discuss transportation issues. These types of improvements would be identified in the 5-year maintenance plan in Appendix H. Several Capital Improvement Projects have been identified in Condition No. 56 Section 2(a-e) of the 4(e) Conditions.

For the purpose of this plan, primary maintenance activities include activities described above as Recurrent Maintenance. Heavy maintenance activities described above as Deferred Maintenance, Extraordinary Repairs and Capital Improvements are considered maintenance responsibilities that are shared with the Forest Service. Because SMUD shares maintenance responsibility for some of the Project-related roads, maintenance activities on a specific road may be performed by SMUD or another party. Annual maintenance will be performed to keep roads clear and functional and avoid more extensive maintenance activities. These activities will be limited to the road surface and the area within 10 feet of the edge of the road surface. Details of vegetation management, including herbicide use, along roads and trails will be discussed further in SMUD's Vegetation Management Plan.

All road maintenance activities performed by SMUD will follow guidance in the Eldorado National Forest Standard Road Maintenance Specifications for Roads (Eldorado National Forest 2014) (ENF Maintenance Manual), and any subsequent revisions, which is included in Appendix G. Additionally, any work performed under this TSMP will follow the guidelines contained in the Sierra Nevada Forest Plan Amendment (Forest Service 2004). Forest Service 4(e) Condition 56 requires SMUD to develop a plan every 5 years that identifies the maintenance and reconstruction needs for Project-related roads. Based on the field assessment of road conditions, SMUD has prepared a plan for

the first 5 years, beginning after this TSMP has been approved and filed with FERC. The first 5-year maintenance plan is provided in Appendix H.

3.2 Access Roads Connecting to Recreation Facilities

Roads related to the Project also include those that access Project recreation facilities. These roads present a variety of conditions in terms of supporting other non-Project use, inclusion in the Project recreation facility maintenance program and location relative to the Project boundary. Table 3.2-1 lists the access roads for Project-related recreation and identifies whether the maintenance for each road is provided for in the annual recreation facility maintenance funding provided by SMUD. Additionally, the table indicates whether the road is used exclusively for access to the Project-related recreation facility and the road location with regard to the Project boundary.

Recurrent maintenance of these roads, as defined above in Section 3.1.3, would be accomplished by the Forest Service or its concessionaire using funds provided by SMUD as specified in Condition 47. SMUD will either perform deferred maintenance, extraordinary repairs and capital improvements for roads (i.e., Heavy Maintenance) or provide funding to the Forest Service to perform heavy maintenance, as specified in Condition 46.

Table 3.2-1. Roads providing access to Project recreation facilities.

Road No.	Recreation Facility Name	Only Accesses Project Recreation Facility (Yes or No)	Within Project Boundary (Yes or No)	Maintained Through Annual Project Recreation Facility Maintenance Funding*	Comments
12N35	Sunset/ Fashoda Campground	Yes	Partial/USFS	Partial	Segment on NFS is within Project; Intersection at Ice House Road is owned by SPI.
17N12Q	Jones Fork Campground	Yes	Partial/USFS	Partial	Segment on NFS is within Project; Intersection at Ice House Road is owned by SPI.
17N12N	Wench Creek Campground	Yes	Yes	Yes	
12N33	Yellowjacket Campground	No	Partial/USFS	Partial	Crosses SPI-owned land.
12N52C	Wolf Creek Campground	No	Partial/USFS	Partial	Crosses SPI-owned land.

Road No.	Recreation Facility Name	Only Accesses Project Recreation Facility (Yes or No)	Within Project Boundary (Yes or No)	Maintained Through Annual Project Recreation Facility Maintenance Funding*	Comments
12N30J	Camino Cove Campground	No	Partial	Partial	
12N30R	West Point Campground	Yes	Yes	Yes	
12N30S	West Point Campground	Yes	Yes	Yes	
11N98A	Ice House Day Use Area	Yes	Yes	Yes	
11N37H	Ice House Campground	Yes	Yes	Yes	
11N37HB	Ice House Campground	Yes	Yes	Yes	
11N37K	Northwind Campground	Yes	Yes	Yes	
11N52	Ice House Lake Shore	Yes	Yes	Yes	
11N52B	Strawberry Pt. Campground	Yes	Yes	Yes	
13N26	Gerle Campground	Yes	Yes	Yes	
13N26B	Gerle Campground	Yes	Yes	Yes	
17N12K	Angel Creek Day Use Area	Yes	Yes	Yes	
13N14	Airport Flat Campground	No	Yes	Yes	
13N17	Loon Lake Campground/ Boat Ramp	Yes	Yes	Yes	
13N18C	Northshore Campground	Yes	Yes	Yes	
13N18B	Red Fir Campground	Yes	Yes	Yes	

***** Routine maintenance of roads used exclusively to access UARP-related recreation facilities is the responsibility of SMUD and will be implemented according to Condition 47 of the Project license. Heavy maintenance needs for these roads will be evaluated every 6 years by SMUD and the Forest Service and SMUD will be responsible for heavy maintenance according to Condition 46 of the Project license.

3.3 Road Easements

Several roads or road segments addressed in this plan cross private land and connect with NFS roads. The last columns in Tables 3.1-1 and 3.1-3 indicate which roads cross private land. SMUD is investigating which of these roads have easements and which will require easements to be obtained. SMUD will provide a map and list of roads for which it has easements or other right-of-way agreements within 2 years of approval of the TSMP. SMUD will acquire any needed easements.

3.4 Project-Related Administrative Trails

3.4.1 Trail Maintenance

According to Forest Service 4(e) Condition 57, SMUD is responsible for maintaining trails that are needed for Project operations on or affecting National Forest System Lands. SMUD will inspect all Project-related trails annually to identify routine maintenance needs and will be solely responsible for maintaining each of these trails. Trails will be maintained to protect environmental resources and provide safe access to operate and maintain the Project. Routine maintenance activities will include trimming vegetation and targeted herbicide applications (as described in the UARP Vegetation Management Plan) to maintain the trail corridor; repairing trail surface; installing or repairing rolling dips or other water diversion structures; repairing stairs and steps; and grubbing vegetative growth encroaching in the trail tread. If emergency repairs are needed, SMUD will repair trails as soon as field conditions allow. SMUD did not identify any maintenance needs for the administrative trails in its 2014 road and trail condition inventory; however, the King Fire, which occurred in September-October of 2014 after the assessments were complete, damaged several trails that will need to be repaired. These are identified in Table 3.4-1 and in the 5-year Road and Trail Maintenance Plan in Appendix H. Some trails were repaired immediately following the fire.

SMUD reviewed Forest Service documents for BMPs (USDA 2012, 2011) to determine guidance applicable to trail maintenance. Relevant BMPs pertain to erosion control, slope stabilization, surface and subsurface drainage, and debris disposal. SMUD incorporates these BMPs by this reference (Table 3.7-1) and any future revisions in this plan and will employ these practices to accomplish trail maintenance.

3.4.2 SMUD Administrative-use Trails

The Project includes 11 administrative-use trails listed in Table 3.4-1, which reports several trail attributes, including trail condition. These trails are all located on NFS lands and are intended for use by SMUD staff to access Project infrastructure and monitoring equipment such as gages and weirs. SMUD reviewed the Forest Service Handbook, which describes five trail classes of trail development, ranging from the least developed, Trail Class 1, to the most developed, Trail Class 5. Because these trails are not public recreational trails and the Forest Service has not established Trail Management Objectives for these trails, these trails will be managed to facilitate Project operation and maintenance while protecting resources, rather than to achieve a prescribed scale of development for public use, which would be represented by a Trail Class designation.

Table 3.4-1. Project administrative trails.

Trail Name	Trail Location	Length	Purpose or Facility Accessed	Condition
Silver Creek Confluence	Forest Service Road 11NY05 to confluence of Silver Creek and SFAR	1.46 mi	Solar panel	Fire Damage
Slab Creek Dam North	11N96B across to north side of river and proceeding east past Slab Creek Dam	0.30 mi	Segment 1—Dam	Good
		0.45 mi	Segment 2—Boom	Good
Brush Creek Stream Gage	South end of Brush Creek Dam to Brush Creek gage	0.16 mi	Gaging station and dam outlet	Fair
Junction Stream Gage	12N30D downstream of Junction Dam to Silver Creek	0.09 mi	Gaging station and dam outlet	Good
SFAR, Camino Powerhouse	Camino Powerhouse upstream to SFAR	0.40 mi	Resource monitoring	Fire Damage
Camino Reservoir Temperature Sensor	11N60 near Jaybird Powerhouse to Silver Creek	0.10 mi	Temperature sensor	Good
Camino Stream Gage	Northwest side of Camino Dam downstream to confluence of Silver Creek and Round Tent Canyon	0.47 mi	Gaging station	Fire Damage
Rubicon Gerle Gage (North)	Forest Service Road 13N28 to SF Rubicon River downstream of confluence with Gerle Creek (north side of creek)	0.07 mi	Tramway	Fair

Trail Name	Trail Location	Length	Purpose or Facility Accessed	Condition
Rubicon Gerle Gage (South)	Forest Service Road 13N28 to SF Rubicon River downstream of confluence with Gerle Creek (south side of creek)	0.07 mi	Gaging station	Good
Loon Lake Aux. Dam Stream Gage	South end of Loon Lake Auxiliary Dam downstream to dam failure gage	0.10 mi	Gaging station	Fair
Camino Adit	Forest Service Road 11NY05A near Camino Adit to Silver Creek	0.30 mi	Resource monitoring	Fire Damage

3.5 Helispots

SMUD uses five helispots to provide access for operating and maintaining Project infrastructure. The helipad at the Pacific District Ranger Station is used by SMUD but that site is managed by the Forest Service; therefore, it is not included in this TSMP. SMUD has worked cooperatively with the Forest Service to improve that facility. Of the four helispots addressed in this TSMP, three are located within the Project boundary and one is outside of the Project boundary. The helispot outside of the Project boundary is at the Desolation Wilderness boundary and is occasionally used to transport staff and equipment up to, but not crossing, the Wilderness boundary. Figure 3.5-1 shows the helispot locations at Loon Lake, Buck Island, and Rubicon reservoirs (Figure 3.5-1).

3.5.1 Loon Lake Helispot

This helispot is located near Loon Lake Auxiliary Dam with vehicular access via Ice House Road and roads 13N19 and 13N19D. The site, which includes a staging area, is near Loon Lake Chalet and the area adjacent to the heliport receives heavy recreation use. SMUD will post temporary barriers and warning signs in advance of helicopter operations at the site.

SMUD will use ground-based staff to ensure the helispot is clear of all persons and vehicles prior to landing helicopters and while the helispot is in use.

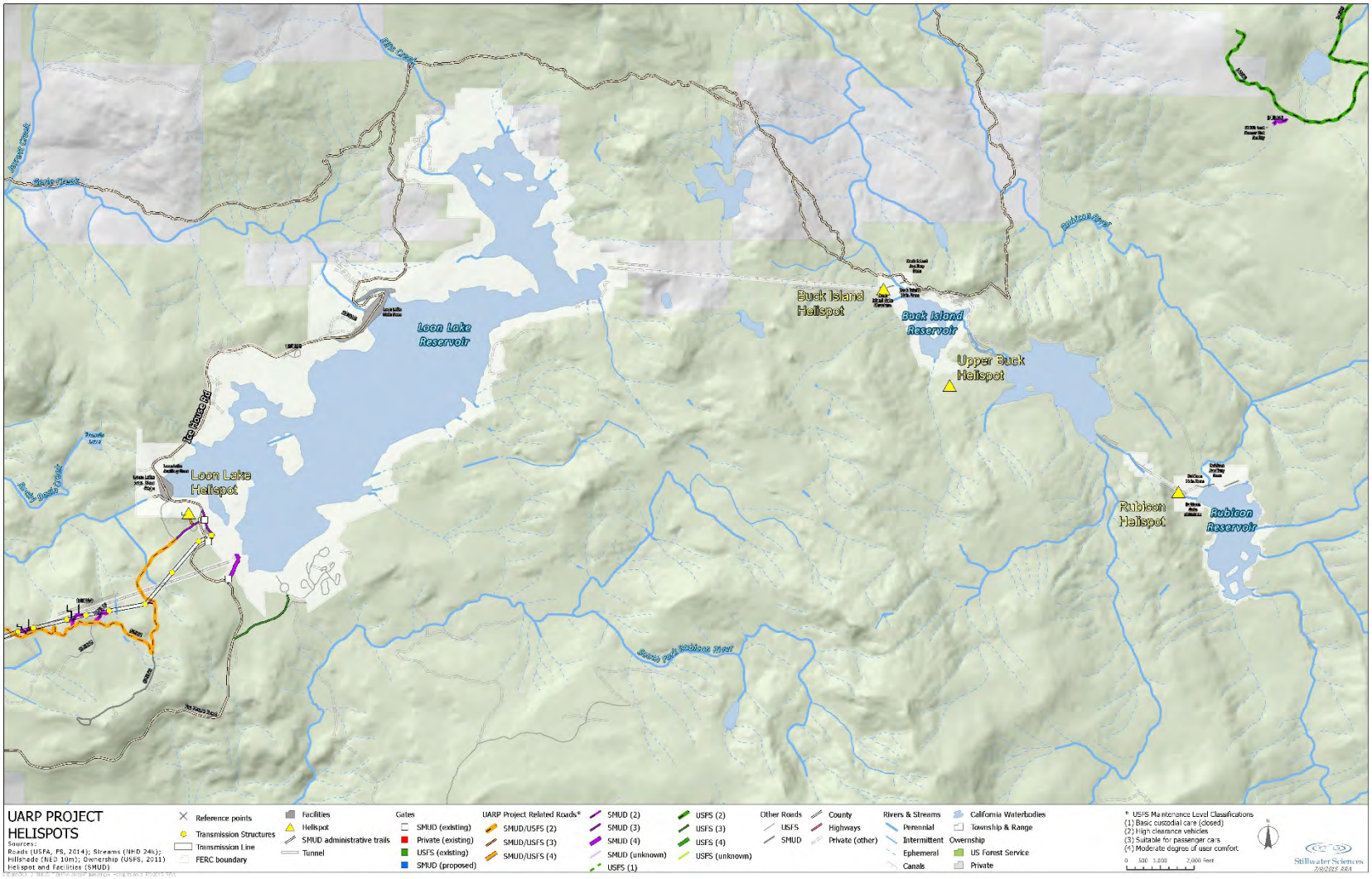


Figure 3.5-1. Locations of Project-related helispots.

3.5.2 Buck Island Lake, Desolation Boundary and Rubicon Reservoir Helispots

All of these helispots are in the backcountry; two are located near the dams of each reservoir, while the third is at the Wilderness boundary. Buck Island Lake is outside of the Desolation Wilderness and Rubicon Reservoir is within the Wilderness. The helispot at Buck Island Lake has been improved by SMUD; the other helispots are just open areas on bedrock. The helispot at the Wilderness boundary is used to ferry staff and supplies closer to Rubicon Reservoir without crossing the boundary, due to Wilderness restrictions on air traffic. SMUD will work with the Forest Service to obtain any required Special Use Authorizations for helispots located outside of the Project boundary.

3.5.3 Helicopter Flight Notification

SMUD follows established procedures in its Hydro Safety Procedure Manual (Appendix I) that define proper communications and responsibilities for setting up and communicating during flights over the Project. Procedures include preparing and filing a flight plan with Fresh Pond Administrative staff. SMUD will include the Forest Service dispatcher in Camino when making helicopter-use email notifications. When using the helispots at Buck Island Lake and Rubicon Reservoir, SMUD also requires staff to file a UARP Flight and Back Country Plan (attachment 4.2 of the Hydro Safety Procedure Manual) at least three days before the trip begins.

3.6 Gates

3.6.1 Existing Gates

Locations of existing gates and condition information is provided in Table 3.6-1; existing gate locations are also shown on maps provided in Appendix E. For gates on ML 2 roads for which SMUD has primary maintenance responsibility SMUD will perform necessary maintenance, replace or provide additional gate signage, as necessary, to comply with Forest Service standards. Signage on the gates on these roads that do not meet Forest Service standards and all other gate maintenance or replacement will be brought into compliance over the next 5 years, prior to developing the next 5-year maintenance plan.

SMUD will share with Forest Service the responsibility for sign installation, repair or replacement of gates on Project-related, ML 3, 4 and 5 roads. The maintenance and replacement schedule for gates on these roads will be developed as part of the cooperative agreement.

Table 3.6-1. Existing gate locations and condition information for Project-related roads.

Road Number	Latitude/ Longitude	Primary Road Maintenance Responsibility	Road Maintenance Level	Gate Condition	Single or Double Lane	Width (feet)	Complies with Signage Standards	Replace Gate?	Comments
11N08C	38.77887678/ 120.68151942	SMUD	2	Poor, not functional	Single Lane	12	No	Yes	Private cable gate
11N12D	38.81115842/ 120.62024469	SMUD	2	Not recorded	Single Lane	12	No	No	Missing all signs front and back
11N37E	38.83153621/ 120.36738876	SMUD	3	Good, fully functional	Single Lane	Other	No	No	20' wide, needs all signs front and back
11N60	38.84150885/ 120.53258004	SMUD	2	Good, fully functional	Not recorded	Other	No	No	20' wide, needs all signs front and back
11N60	38.84053173/ 120.53378544	SMUD	2	Not recorded	Single Lane	16	No	Yes	Chain gate, not legal
11N60	38.83484717/ 120.53176514	SMUD	2	Good, fully functional	Single Lane	Other	No	No	20' wide, needs all signs front and back
11N60B	38.82210225/ 120.47315401	SMUD	2	Poor, not functional	Single Lane	16	No	Yes	Rusted open, cannot close, needs all signs front and back
11N60D	38.83627675/ 120.52190393	SMUD	2	Good, fully functional	Single Lane	16	No	No	Needs all signs front and back
11N60Z	38.84168844/ 120.53304116	SMUD	2	Good, fully functional	Single Lane	Other	No	No	25' wide needs all signs front and back
11N69	38.83403006/ 120.49155787	SMUD	2	Good, fully function	Single Lane	16	No	No	Needs all signs front and back
11N69	38.83293590/ 120.50585112	SMUD	2	Poor, not functional	Single Lane	16	No	Yes	
11N96A	38.77149092/ 120.70101608	SMUD	3	Good, fully functional	Double Lane	Other	No	No	Two gates, 32' total length, needs all signs front and back
11N96A	38.77149092/	SMUD	3	Good, fully	Single Lane	16	No	No	Security gate

Road Number	Latitude/ Longitude	Primary Road Maintenance Responsibility	Road Maintenance Level	Gate Condition	Single or Double Lane	Width (feet)	Complies with Signage Standards	Replace Gate?	Comments
	120.70101608			functional					
11N96B	38.77120390/ 120.70117997	SMUD	2	Good, fully functional	Single Lane	Other	No	No	20' wide, needs all signs front and back
11N98	38.82373169/ 120.36411884	SMUD	3	Good, fully functional	Single Lane	Other	No	No	20' wide, needs all signs, front and back
11N98C	38.82357105/ 120.36427583	SMUD	3	Good, fully functional	Single Lane	Other	No	No	18' wide, needs all signs front & back
11NY05	38.79966159/ 120.61550860	SMUD	2	Good, fully functional	Single Lane	16	No	No	Needs all signs front and back
11NY20A	38.80654685/ 120.60766909	SMUD	2	Good, fully functional	Single Lane	16	No	No	Needs all signs front and back, unknown ownership, east end of road open
12N30D	38.85243476/ 120.45081601	SMUD	2	Good, fully functional	Single Lane	Other	No	No	18' wide, needs all signs front and back
12N30E	38.85898474/ 120.45037062	SMUD	4	Good, fully functional	Single Lane	Other	Yes	No	22' wide, needs signs front and back
12N30G	38.87104945/ 120.44238040	SMUD	2	Fair, functional	Single Lane	Other	No	No	20' wide, needs all signs front and back
12N30H	38.86400606/ 120.43957135	SMUD	3	Good, fully functional	Single Lane	Other	No	No	20' wide, needs all signs on both sides
12N30M	38.88906844/ 120.42556509	SMUD	2	Not recorded	Single Lane	16	No	No	Needs all signs front and back
12N30Z	38.86439841/ 120.43884516	SMUD	3	Good, fully functional	Single Lane	Other	No	No	24' wide, needs all signs, front and back
12N34A1	38.78177515/ 120.63700086	SMUD	2	Good, fully functional	Single Lane	Other	No	No	Needs all signs on back and object marker on tie back post

Road Number	Latitude/ Longitude	Primary Road Maintenance Responsibility	Road Maintenance Level	Gate Condition	Single or Double Lane	Width (feet)	Complies with Signage Standards	Replace Gate?	Comments
12N34J	38.78283389 120.62891245	SMUD	2	Good, fully functional	Single Lane	16	No	No	Needs signs on back side
12N34N	38.79466437 120.62402773	SMUD	3	Good, fully functional	Single Lane		No	No	Needs all signs front and back
12N34P	38.79936145 120.62059276	SMUD	2	Good, fully functional	Single Lane	16	No	No	Needs all signs front and back
12N34Z	38.78208419 120.63157448	SMUD	2	Fair, functional	Single Lane	16	No	No	Needs signs on back
12N37	38.83920811 120.45382723	SMUD	2	Fair, functional	Single Lane	16	No	No	Replace signs, needs signs on back side
12N44	38.90274284 120.37657355	SMUD	3	Good, fully function	Single Lane	Other	No	No	20' wide, needs proper object markers, missing signs on back
12N44	38.89730042 120.37923373	SMUD	3	Fair, functional	Single Lane	Other	No	No	20' wide, needs all signs for front and back; minor damage to post and left gate.
12N76A	38.82396125 120.68459432	SMUD	2	Good, fully functional	Single Lane	12	No	No	Needs all signs front and back
12NY05X	38.84986540 120.38243038	SMUD	3	Good, fully functional	Double Lane	Other	No	No	20' wide, needs all signs front and back
13N18A	38.98090134 120.32561454	SMUD	4	Good, fully functional	Single Lane	16	No	No	Right object marker is wrong, needs gate closed sign, object reflectors, sign back of gate
13N19C	38.98393332 120.32775695	SMUD	3	Good, fully functional	Double Lane	Other	No	No	20' wide, missing object markers, road closed sign, not signed on back

Road Number	Latitude/ Longitude	Primary Road Maintenance Responsibility	Road Maintenance Level	Gate Condition	Single or Double Lane	Width (feet)	Complies with Signage Standards	Replace Gate?	Comments
13N19C	38.98570870 120.32815447	SMUD	3	Good, fully functional	Double Lane	Other	No	No	20' wide, missing object markers, road closed sign, not signed on back
13N23	38.96633911 120.38369069	SMUD	3	Good, fully functional	Single Lane	Other	No	No	20' wide, needs all signs, object markers front and back
13N23D	38.95160993 120.39476378	SMUD	3	Fair, functional	Single Lane	Other	No	No	Missing all signs front and back, double gate
13N23D	38.95153727 120.39456230	SMUD	3	Poor, not functional	Single Lane	Other	No	Yes	18' double gate, needs all signs on both sides
13N23D	38.95065035 120.39153065	SMUD	3	Poor, not functional	Single Lane	16	No	Yes	Double gate, needs all signs on both sides
13N23D	38.95062107 120.39142946	SMUD	3	Fair, functional	Single Lane	16	No	No	Double gate, needs all signs on both sides
17N12A2	38.94601782 120.3880271	SMUD	3	Good, fully functional	Single Lane	Other	No	No	Missing signs and object marker markers on both sides
11NY28	Unknown	SMUD	2	Damaged	Single Lane	Other	No	Yes	Gate damaged; not assessed by SMUD
ELD County-8014	38.77105532 120.70108274	SMUD	0	Good, fully functional	Single Lane	Other	No	No	18' wide, needs all signs front and back

3.6.2 New Gates

Table 3.6-2 lists proposed locations for new gates or barrier rock placement which are necessary to restrict access to Project infrastructure and protect natural resources. The locations for proposed gates and rock placement are shown on the maps contained in Appendix E. Installing gates on roads that are currently open for public use will require public scoping, NEPA analysis, and Forest Service approval before installing any proposed gates. Installing gates on roads that are currently closed to public use will only require Forest Service approval. Any NFS road SMUD uses to access Project-related facilities that is closed to public use will be gated. SMUD will be responsible for maintaining any new gates that are installed.

Table 3.6-2. Locations for proposed gates.

Road Number	Latitude (North coordinates)	Longitude (West coordinates)	Road Name/Vicinity	Comments
11N60	38.83148611111	120.516275	Jaybird Springs Road	
11N60A	38.83363780560	120.51826028800	Powerline access road connecting to Jaybird Springs Road	
11N60A	38.83361944444	120.51835	Jaybird Springs Road	Install boulders to block access to powerline right-of-way
11N60A	38.83351944445	120.49466388889	Jaybird Springs Road	
11N60B	38.82199166667	120.47326111111	Jaybird Springs Road	Lock existing FS gate.
11N69	38.83389934430	120.49128368400	Powerline access road connecting to Jaybird Springs Road	Replace broken FS gate.
12N21	38.85001666667	120.40031111112	T1446 south of Union Valley Reservoir	
12N30D	38.85211161480	120.45089419800	Junction Dam access road	
12N30E	38.85936388889	120.44766666668	Union Valley Powerhouse	
12N30G	38.88321388889	120.43880277778	T64 north of Union Valley Reservoir	
12N30H	38.86430541410	120.43980845000	Access road to Union Valley Switchyard	
12N30M	38.89310555556	120.42752222222	T59 north of Union Valley Reservoir	
12NY15EA	38.90902222222	120.40727777778	T51 north of Union Valley Reservoir	
13N11	38.97498055554	120.33378333333	T3-8 near Loon Lake	
13N11	38.96838055555	120.36370277777	T13 near Ice House Road	
13N15	38.91608333333	120.38643333334	T47 near Ice House Road	

Road Number	Latitude (North coordinates)	Longitude (West coordinates)	Road Name/Vicinity	Comments
13N15B	38.91871388889	120.38121944444	T36 near Ice House Road	
13N11C	38.96694444444	120.36430277776	T14 near Ice House Road	
13N21	38.94170833333	120.38877500001	T25-26 near Ice House Road	
13N57	38.95315772010	120.38130873600	South Power access road (T22-23) near Ice House Road	

3.7 Erosion Control and Sediment Management

As required by Condition 56, SMUD will construct, operate and maintain Project facilities, including roads, parking and storage lots, reservoir shorelines, bridges and culverts to maintain natural fluvial and colluvial sediment transport to the Project reaches, to the degree possible. To accomplish this, SMUD will use BMPs described in the National Core BMP Technical Guide (USDA 2012) and Forest Service Handbook 2509.22, Water Quality Management Handbook (Forest Service 2011). SMUD will also follow standards and guidelines contained in the Eldorado National Forest Land and Resource Management Plan (ENF 1989).

Condition 56(g) requires SMUD to address measures to control erosion at roads, trails and Project facilities. SMUD will use appropriate BMPs from the sources listed above to manage erosion associated with Project facilities and roads. Additional details regarding erosion management associated with Project-related roads and trails are discussed below. Specific details related to management of erosion at Project facilities will be addressed in the 5-year maintenance plans prepared according to SMUD's UARP Facility Management Plan. All significant maintenance actions performed by SMUD will be discussed with the Forest Service at regularly scheduled O&M meetings.

3.7.1 Erosion Control on Project-related Roads and Trails

To determine BMP guidance applicable to road and trail maintenance, SMUD reviewed two Forest Service documents : (1) National Core BMP Technical Guide (USDA 2012) and (2) Forest Service Handbook 2509.22, Water Quality Management Handbook (Forest Service 2011). SMUD incorporates the BMPs and any future revisions, in the TSMP and will employ these practices to accomplish all road and trail maintenance (discussed in Section 3.2.1). The guidance contained in the two documents is duplicative, in some cases, but also contain minor differences. Because Forest Service direction is to use the BMPs in both documents, SMUD considers the BMPs in both documents as applicable to maintaining Project roads and trails (Table 3.7-1). Forest

Service direction includes developing site specific prescriptions based on the 5-year plan and annual program of work. SMUD will develop and submit to the Forest Service for review and approval, site-specific design criteria as appropriate for significant maintenance items (i.e., actions other than recurrent maintenance as defined above), before performing the work. For significant maintenance items, SMUD will develop an Erosion Control Plan in consultation with the SWRCB describing mitigation measures to minimize erosion and sedimentation. SMUD will submit the Erosion Control Plan to the Deputy Director for review and approval. Additionally, SMUD will develop an annual Erosion Control Plan, which will identify specific BMPs to implement when accomplishing regular road and trail maintenance.

The Forest Service requested including several other BMPs in the TSMP. These include:

- Off-road vehicles and equipment must be free of invasive plant material before moving into the Project area. Equipment will be considered clean when visual inspection does not reveal soil, seeds, plant material or other such debris.
- All gravel, fill, or other materials used for road construction or maintenance are required to be from sources certified to be weed free or approved by the Forest Service botanist.
- All erosion control material are required to be certified as weed-free or approved by the Forest Service botanist.
- To the extent possible and where warranted, SMUD will patrol Project-related roads before and after major storms to prevent and repair damage on roads that may adversely affect water quality.

Table 3.7-1 lists and describes several Forest Service BMPs that address erosion prevention and remediation. The road and trail condition and hydrology assessments, performed to prepare the TSMP, identified roads and trails with excessive erosion, undersized culverts, and areas where rolling dips or other types of erosion control or prevention measures may be appropriate. The 5-year maintenance plan identifies roads with significant erosion problems and roads which have a high potential to cause erosion related resource damage. These roads will be repaired according to the ENF road maintenance standards (ENF 2014) using the appropriate BMPs listed in Table 3.7-1 and Appendix K, as appropriate.

In addition, SMUD will obtain all necessary permits and authorizations from the Army Corps of Engineers, Regional Water Quality Control Board and California Department of Fish and Wildlife before performing road or trail upgrades or maintenance that could potentially impact surface waters. Any additional BMPs or other measures to protect water quality, contained in these permits will be implemented by SMUD. During and

after road construction SMUD will also use appropriate BMPs found in the California Department of Transportation Construction Site BMP Manual (CalTrans 2003).

Table 3.7-1. Forest Service (Pacific Southwest Region) best management practices applicable to Project-related road and trail maintenance.

Note: Similar BMPs are presented in the same row of the table.[1]

Forest Service Handbook 2509.22, Water Quality Management Handbook, BMP 2.4, Road Maintenance and Operations	National Core BMP Technical Guide (USDA 2012)
Road Maintenance	
Develop and implement an erosion control plan commensurate with the complexity and scale, and duration of the activity. See BMP 2.13 (Excerpt below). Ground-disturbing activities will be exempt from the requirement to prepare an erosion control plan under any of the four exemption categories below: 1. Area-based - less than 50 square feet in riparian area; less than 10,000 square feet in a non-riparian area; 2. Activity-based - activities conducted under a categorical exclusion with no wheeled or tracked equipment, or included under North Coast Regional or State waiver Category A; 3. Site-condition criteria - project locations that are: outside of riparian areas and on soils with high infiltration rates (more than 2 inches per hour) and on slopes less than 15 percent. 4. Flexibility criteria - any activity approved by the forest hydrologist with documentation explaining the rationale for the exemption. BMP checklists will be prepared for all projects even if an erosion control plan is not necessary. Erosion control plans for any ground-disturbing activity not meeting the exemption categories above will be reviewed and recommended by the forest hydrologist, and approved and signed by the District Ranger. The hydrologist's recommendation and signature indicates that all mitigation measures prescribed in environmental documents and project plans, or resource specialist's recommendations are included on the environmental control plan. The Forest Supervisor will approve and sign the environmental control plan for forest wide ground-disturbing activities, such as annual road maintenance	

Forest Service Handbook 2509.22, Water Quality Management Handbook, BMP 2.4, Road Maintenance and Operations	**National Core BMP Technical Guide (USDA 2012)**
Maintain road surfaces to dissipate intercepted water in a uniform manner along the road by outsloping with rolling dips, insloping with drains, or crowning with drains. Where feasible and consistent with protecting public safety, utilize outsloping and rolling the grade (rolling dips) as the primary drainage technique.	Maintain the road surface drainage system to intercept, collect, and remove water from the road surface and surrounding slopes in a manner that reduces concentrated flow in ditches, culverts, and over fill slopes and road surfaces. *Clean ditches and catch basins only as needed to keep them functioning. *Do not undercut the toe of the cut slope when cleaning ditches or catch basins. *Use suitable measures to avoid, to the extent practicable, or minimize direct discharges from road drainage structures to nearby waterbodies.
Adjust surface drainage structures to minimize hydrologic connectivity by: a. Discharging road runoff to areas of high infiltration and high surface roughness. b. Armoring drainage facility outlet as energy dissipater and to prevent gully initiation. c. Increasing the number drainage facilities with stream management zones.	
Clean ditches and drainage structure inlets only as often as needed to keep them functioning. Prevent unnecessary or excessive vegetation disturbance and removal on features such as swales, ditches, shoulders, and cut and fill slopes.	Remove vegetation from swales, ditches, and shoulders, and cut and fill slopes only when it impedes adequate drainage, vehicle passage, or obstructs necessary sight distance to avoid or minimize unnecessary or excessive vegetation disturbance.
Minimize diversion potential by installing diversion prevention dips that can accommodate overtopping runoff. a. Place diversion prevention dips downslope of crossing, rather than directly over the crossing fill, and in a location that minimizes fill loss in the event of overtopping. b. Armor diversion prevention dips when the expected volume of fill loss is significant.	Identify diversion potential on roads and prioritize for treatment. Minimize diversion potential through installation and maintenance of dips, drains, or other suitable measures.
Address risk and consequence of future failure at the site when repairing road failures. Use vegetation, rock, and other native materials to help stabilize failure zones.	Maintain permanent stream crossings and associated fills and approaches to reduce the likelihood that water would be diverted onto the road or erode the fill if the structure becomes obstructed.
Maintain road surface drainage by removing berms, unless specifically designated otherwise.	
Install and preserve markers to identify and protect drainage structures that can be damaged	

Forest Service Handbook 2509.22, Water Quality Management Handbook, BMP 2.4, Road Maintenance and Operations	**National Core BMP Technical Guide (USDA 2012)**
during maintenance activities (that is, culverts, subdrains, and so forth)	
When grading roads or cleaning drainage structure inlets and ditches, avoid undercutting the toe of the cut slope.	Do not undercut the toe of the cut slope when grading roads.
Grade road surfaces in accordance with road management objectives and assigned maintenance level. Grade only as needed to maintain a stable running surface and adequate surface drainage.	Grade road surfaces only as necessary to meet the smoothness requirements of the assigned operational maintenance level and to provide adequate surface drainage.
Accompany grading of hydrologically connected road surfaces and inside ditches with erosion and sediment control installation	
Identify additional road maintenance measures to protect and maintain water; aquatic, and riparian resources including: surfacing and resurfacing, outsloping, dips and cross drains, armoring of ditches, spot rocking, replacing culverts, and installing new drainage features.	Identify waterbody-crossing structures that lack sufficient capacity to pass expected flows, bedload, or debris, or that do not allow for desired aquatic organism passage, and prioritize for treatment. Use applicable practices of BMP Road-7 (Stream Crossings) to improve crossings.
Effectively maintain roads in storage to eliminate all motorized vehicle use. Maintain physical closure devices, if present, to be safe and effective. For roads where physical closure methods are not feasible, install signing to inform of road closure.	
Enforce pre-haul maintenance, maintenance during haul, and post haul maintenance (putting the road back in storage) specifications when maintenance level 1 roads are opened for use on commercial resource management projects. Require the commercial operator to leave roads in a satisfactory condition when project is completed.	Ensure the necessary specifications concerning prehaul maintenance, maintenance during haul, and posthaul maintenance (putting the road back in storage) are in place when maintenance level 1 roads are opened for use on commercial resource management projects or other permitted activities. Use applicable practices of BMP Road-6 (Road Storage and Decommissioning) for maintenance and management of Maintenance Level 1 roads.
Opened for use on commercial resource management projects. Require the commercial operator to leave roads in a satisfactory condition when project is completed.	Require the commercial operator or responsible party to leave roads in a satisfactory condition when project is completed.
	Maintain road surface treatments to stabilize the roadbed, reduce dust, and control erosion consistent with anticipated traffic and use.
	Do not permit sidecasting of maintenance-generated debris within the AMZ to avoid or

Forest Service Handbook 2509.22, Water Quality Management Handbook, BMP 2.4, Road Maintenance and Operations	National Core BMP Technical Guide (USDA 2012)
	minimize excavated materials entering waterbodies or riparian areas.
	Avoid overwidening of roads due to repeated grading over time, especially where sidecast material would encroach on waterbodies.
	Use potential sidecast or other waste materials on the road surface where practicable.
	Dispose of unusable waste materials in designated disposal sites.
Non-motorized Trail Maintenance	
[FSH 2509.22 only contains BMP guidance for motorized trails.]	Use applicable Road Management Activities BMPs for construction, operation, and maintenance of motorized trails.
	Locate or relocate trails to conform to the terrain, provide suitable drainage, provide adequate pollutant filtering between the trail and nearby waterbodies, and reduce potential adverse effects to soil, water quality, or riparian resources. *Avoid sensitive areas, such as riparian areas, wetlands, stream crossings, inner gorges, and unstable areas to the extent practicable. *Use suitable measures to mitigate trail impacts to the extent practicable where sensitive areas are unavoidable. *Use suitable measures to hydrologically disconnect trails from waterbodies to the extent practicable.
	Design, construct, and maintain trail width, grades, curves, and switchbacks suitable to the terrain and designated use.
	Use applicable practices of BMP Fac-2 (Facility Construction and Stormwater Control) for control of erosion and stormwater when constructing trails.
	Install and maintain suitable drainage measures to collect and disperse runoff and avoid or minimize erosion of trail surface and adjacent areas.
	Use and maintain surfacing materials suitable to the trail site and use to withstand traffic and minimize runoff and erosion.

Forest Service Handbook 2509.22, Water Quality Management Handbook, BMP 2.4, Road Maintenance and Operations	National Core BMP Technical Guide (USDA 2012)
	Design stream crossings to use the most cost-efficient structure consistent with resource protection, facility needs, and types of use and safety obligations (see BMP Road-2 [Road Location and Design] and BMP Road-7 [Stream Crossings]).
	Designate season of use to avoid periods when trail surfaces are particularly prone to unacceptable erosion, rutting, or compaction.
	Designate class of vehicle and type of nonmotorized uses (e.g., hiking, bicycling, and equestrian uses) suitable for the trail width, location, waterbody crossings, and trail surfaces to avoid or minimize adverse effects to soil, water quality, or riparian resources.
	Monitor trail condition at regular intervals to identify drainage and trail surface maintenance needs to avoid, minimize, or mitigate adverse effects to soil, water quality, and riparian resources.

[1] This list is not intended to be inclusive of all potential BMPs SMUD may employ to maintain Project infrastructure, including roads. Appendix K contains a list of other potentially applicable BMPs from Forest Service Handbook 2509.22.

4.0 TRAFFIC SAFETY AND SIGNAGE PLAN

SMUD will work in collaboration with the Forest Service to install and maintain safety and directional signs for the Project-related roads for which it is has primary maintenance responsibility. Considering the volume of deficient signage identified in the roads assessment, SMUD will work with the Forest Service to develop a priority list of signs to be added, replaced and/or maintained. Following development of this priority list, SMUD and the Forest Service will meet to determine an approach to completing the necessary work.

4.1 Sign Design and Placement

Applicable references for sign design and placement include the MUTCD (Federal Highway Administration 2012) and Sign and Poster Guidelines for the Forest Service (Forest Service 2013). These sources, and any revisions, are incorporated by reference into the TSMP and all sign design, placement, and maintenance will conform to these guidelines, as applicable.

4.1.1 Manual of Uniform Traffic Control Devices

The MUTCD establishes national standards for signs and other devices used to control traffic on public highways and roads. As described in the MUTCD, while the MUTCD provides standards, guidance, and options for design and application of traffic control devices, the installation of these traffic control devices is not a legal requirement and the decision to use a particular device at a particular location will be made on the basis of engineering judgment or an engineering study in consultation with the Forest Service.

4.1.2 Sign and Poster Guidelines for the Forest Service

The Sign and Poster Guidelines for the Forest Service provide recommendations for Forest Service signs located on NFS lands (Forest Service 2013). These guidelines identify the basic signing principles for planning, designing, procuring, installing, and maintaining signs and posters on NFS lands and are intended to be specific to the Forest Service signage responsibilities. For public roads, these guidelines adopt and build upon the MUTCD guidelines.

4.2 Sign Maintenance

Proper sign inspection and maintenance helps ensure that signs remain functional, clean, legible, and properly positioned for visitor use and safety. Existing and newly installed signs will be annually inspected to identify routine maintenance needs and identify missing signage. Maintenance standards for Project signs and their structures include:

- Damaged signs and sign structures will be repaired or replaced in a timely manner.
- Grass, brush, and other vegetation that may obscure a sign will be routinely removed to restore the full visibility of the sign.
- Faded or illegible signs will be repaired, restored or replaced.
- Signs that do not meet MUTCD or Sign and Poster Guide standards, as applicable, (e.g., reflectivity) will be restored or replaced.

4.3 Sign Inventory

SMUD inventoried signs as part of the Project-related road and trail condition inventory (Section 2.2). As part of this inventory, the signs on Project-related roads and on other roads that intersect Project-related roads were photographed, mapped, and their characteristics and condition were recorded in the GIS database prepared by SMUD as part of the road condition assessment. Inventoried characteristics included sign types, messages, font size, and condition of signs and sign posts. SMUD also recorded GIS locations where safety or directional signage is needed to comply with applicable guidelines. Table 4.3-1 lists the Project-related roads and other roads that intersect Project-related roads with identified maintenance and additional signage needs. Signs and missing sign locations are shown on the maps in Appendix E.

SMUD will replace all missing signs and repair all signs and sign posts reported as in “poor” condition on Project-related roads and on other roads intersecting these roads for which SMUD has primary maintenance responsibility according to Table 4.3-1. Missing signs or signs in poor condition which are revealed by future annual inspection findings on these roads will be replaced or repaired, as appropriate, within 1 year of inspection.

Table 4.3-1. Sign condition inventory for Project-related roads and other roads intersecting Project-related roads.

FS Road Number	Latitude (North coordinates)	Longitude (West coordinates)	Missing (M) or Existing (E)	Type[a]	Meets FS Sign Standards (Y/N)	Condition/ Structural Lifespan[b]	Size- width x length (inches)	Comments
10N13C	38.74657114	120.08216117	E	D/D	No	P/P	4x36	Needs to be replaced
11N08A	38.77209195	120.65225827	M					Missing road number sign
11N60A	38.83362653	120.51831516	M					Missing road number sign
11N60A	38.83310144	120.50594154	M					Missing road number sign
11N60A	38.83304715	120.50575367	M					Missing road number sign
11N60A	38.83344110	120.49451453	M					Missing road number sign
13N19A	38.98416870	120.33111599	M					Missing road number sign
13N19A	38.97465752	120.33355507	M					Missing road number sign
13N19AE	38.97889936	120.33347109	M					Missing road number sign
13N19C	38.98384515	120.32783068	M					Missing road number sign
13N19D	38.98534609	120.32922941	M					Missing road number sign
13N21	38.94160560	120.38915084	E	D/D	Yes	G/G		
13N21	38.94163123	120.38907849	E	R	Yes	G/G	4x36	
13N21A	38.94212583	120.38308445	M					Missing road number sign
13N21B	38.94501854	120.38304254	M					Missing road number sign
13N23	38.96625695	120.38339919	M					Missing stop sign
13N23	38.96638865	120.38362118	M					Missing road number sign
13N23	38.96436552	120.39092550	M	S	No			Missing object markers on bridge approaches
13N23B	38.96504524	120.39149525	M					Missing road number sign

FS Road Number	Latitude (North coordinates)	Longitude (West coordinates)	Missing (M) or Existing (E)	Type[a]	Meets FS Sign Standards (Y/N)	Condition/ Structural Lifespan[b]	Size- width x length (inches)	Comments
13N23C	38.96416509	120.39114869	M					Missing road number sign
13N23C	38.96564005	120.39341959	M	S	No			Missing object marker markers on both ends of bridge
11N60A	38.83142638	120.51623292	M					Missing road number sign
13N23D	38.96278400	120.38997813	M					Missing road number sign
13N23D	38.95153447	120.39461425	M					Missing road number sign
13N23D	38.95160659	120.39470424	M					Missing road number sign
13N23D	38.95067335	120.39152721	M					Missing road number sign
13N23D	38.95058419	120.39138784	M					Missing road number sign
13N31B	38.91628558	120.40118366	E	D/D	Yes	F/G	4x36	Reset post
13N57	38.95313295	120.38130244	E	D/D	Yes	G/G		Missing road number sign
14N39B	39.01858573	120.21513990	M					Missing road number sign
17N12A2	38.94577141	120.38759004	M		No			Missing stop sign; road striping bar needs repainted
17N12A2	38.94578593	120.38760331	M					Missing road number sign
17N12B2	38.90348154	120.37812529	M					Missing road number sign
17N12B2	38.90343770	120.37801056	M					Missing stop sign
13N19D	38.98627755	120.32983724	M					Missing road number sign
TRAIL_1	38.79527734	120.59243224	E	Other	Yes	G/G	8x8	
TRAIL_1	38.79433824	120.59249073	E	Other	Yes	G/G	8x8	
TRAIL_1	38.79666902	120.59251886	E	S	Yes	G/G	8x8	

FS Road Number	Latitude (North coordinates)	Longitude (West coordinates)	Missing (M) or Existing (E)	Type[a]	Meets FS Sign Standards (Y/N)	Condition/ Structural Lifespan[b]	Size- width x length (inches)	Comments
TRAIL_6	38.83561981	120.53220169	M		No			Missing object markers for road edge
TRAIL_8	38.95480638	120.39949760	E	R	Yes	G/G	4x4	
TRAIL_8	38.95472896	120.39927891	E	D/D	Yes	G/G	4x36	Missing road number sign
11N60B	38.82186992	120.47324574	E	D/D	Yes	P/F	4x36	Missing road number sign
11N60BD	38.83638926	120.48575095	M					Missing road number sign
11N60BE	38.83643162	120.48565295	M					Missing road number sign
11N60D	38.83662167	120.52289012	M					Missing road number sign
11N60D	38.83664743	120.52276604	M					Missing stop sign
11N60DA	38.83507109	120.52022886	M					Missing road number sign
11N60DB	38.83510213	120.52003579	M					Missing road number sign
11N60DC	38.83553874	120.52493115	M					Missing road number sign
11N60DCA	38.83513206	120.52583750	M					Missing road number sign
11N08C	38.77911131	120.68096961	M					Missing road number sign
11N60DCB	38.83540586	120.52652404	M					Missing road number sign
11N60Z	38.84161966	120.53278803	M					Missing road number sign
11N69	38.83400597	120.49146460	E	D/D	Yes	G/G	4x36	Missing road number sign
11N69	38.83145693	120.50487147	E	D/D	Yes	G/G	4x36	Missing road number sign
11N69	38.83136887	120.50485490	M					Missing stop sign
11N71	38.83295374	120.49461434	E	D/D	Yes	F/G	4x36	Missing road number sign
11N71	38.83290982	120.49474516	M					Missing stop sign

FS Road Number	Latitude (North coordinates)	Longitude (West coordinates)	Missing (M) or Existing (E)	Type[a]	Meets FS Sign Standards (Y/N)	Condition/ Structural Lifespan[b]	Size- width x length (inches)	Comments
11N71	38.83385451	120.49105582	E	D/D	Yes	F/F	4x36	Missing road number sign
11N82	38.77454359	120.64570864	E	D/D	Yes	P/P	4x36	Replace sign
11N96A	38.77131772	120.70105790	M					Missing road number sign
11N96B	38.77122509	120.70107337	M					Missing road number sign
11N98	38.82408481	120.36469691	M					Missing stop sign
11N98	38.82393337	120.36470822	M					Missing road number sign
11N98	38.82369909	120.36414053	M					Missing object marker at end of guardrail
17N12C1	38.82385420	120.36469635	M					Missing stop sign
17N12C1	38.82385794	120.36493096	E	D/D	Yes		4x36	Missing road number sign
11N12	38.80406362	120.61737050	M					Missing road number sign
11N12	38.80285741	120.62115550	E	D/D	Yes	P/P	4x36	Replace and relocate to correct intersection
11N12	38.81044198	120.62232723	M					Missing object marker at fence
11N12	38.81093386	120.62124053	M					Missing object marker at end of guardrail
11N12	38.81100852	120.62027692	M	Safety				Missing object marker at guardrail
17N12C1	38.81728578	120.37303417	E	D/D	Yes	P/F	4x36	Replace sign
17N12C1	38.81735582	120.37314558	M					Missing stop sign
17N12C1	38.81736256	120.37286744	E	Other	Yes	P/F	16x25	Replace backing board
11N98C	38.82374345	120.36430578	M					Missing road number sign

FS Road Number	Latitude (North coordinates)	Longitude (West coordinates)	Missing (M) or Existing (E)	Type[a]	Meets FS Sign Standards (Y/N)	Condition/ Structural Lifespan[b]	Size- width x length (inches)	Comments
11NY05	38.79940973	120.61587671	M					Missing road number sign
11NY05A	38.81279206	120.58013384	M					Missing road number sign
11NY20	38.81319851	120.59301399	E	D/D	Yes	G/G	4x36	Missing road number sign
11NY20A	38.81514328	120.59916565	E	D/D	Yes	G/G	4x36	
11NY20A	38.80622653	120.60803107	M					Missing road number sign
11NY20AA	38.80947346	120.60254692	M					Missing road number sign
12NY05	38.85207238	120.39353342	E	D/D	Yes	G/G	4x36	
12NY05	38.84955264	120.38294889	M		No			Missing object markers at both ends
12NY05C	38.85048780	120.39263977	M					Missing road number sign
11N12A	38.80274401	120.62128902	M					Missing road number sign
12N21	38.85206888	120.39371050	E	D/D	Yes	G/F	4x36	Clear vegetation
12N21B	38.85026981	120.40066708	E	D/D	Yes	G/G	4x36	
12N21D	38.85019973	120.40023121	M					Missing road number sign
12N21D	38.85036625	120.40011195	E	R	Yes	F/G	4x36	
12N21E	38.85080107	120.39481737	M					Missing road number sign
12N22F	38.91253932	120.39078054	E	D/D	Yes	P/F	4x36	Reinstall sign
12NY23	38.83255619	120.56191713	E	D/D	Yes	G/F	4x36	Needs sticker
12NY23A	38.83306386	120.55739095	M					Missing road number sign
12NY23B	38.83348961	120.55106879	M					Missing road number sign
12NY23C	38.83462579	120.54819372	M					Missing road number sign

FS Road Number	Latitude (North coordinates)	Longitude (West coordinates)	Missing (M) or Existing (E)	Type[a]	Meets FS Sign Standards (Y/N)	Condition/ Structural Lifespan[b]	Size- width x length (inches)	Comments
11N12C	38.80377344	120.61728691	M					Missing road number sign
12N30	38.86431456	120.43911530	E	R	No	G/G	18x24	Reset sign
12N30	38.86413816	120.43915272	M					Missing object marker at end of guardrail
12N30	38.86447204	120.43919882	E	S	Yes	G/G	22x14	
12N30	38.86584275	120.44032048	E	S	Yes	G/G	22x14	
12N30	38.86753847	120.44299091	M					Missing object marker at end guardrail
12N30	38.86749413	120.44303683	M					Missing object marker at end of guardrail
12N30	38.86790250	120.44344158	M					Missing object marker at end of guardrail
12N30D	38.84892889	120.44936527	M					Missing stop sign
12N30D	38.84915446	120.44930112	E	D/D	Yes	F/F	4x36	Has bullet holes
12N30D	38.84901181	120.44908371	E	D/D	Yes	P/P	14x55	
12N30D	38.84899084	120.44907858	E	Other	Yes	G/G	16x18	
12N30D	38.85170301	120.45856956	M					Missing object marker at end of guardrail
12N30DB	38.85930907	120.44756983	E	D/D	Yes	G/G	4x36	
12N30DB	38.85933054	120.44751859	E	D/D	No	P/P	30x24	Broken support post
12N30DB	38.85919295	120.44760583	M					Missing stop sign
12N30E	38.85930907	120.44756983	E	D/D	Yes	G/G	4x36	

FS Road Number	Latitude (North coordinates)	Longitude (West coordinates)	Missing (M) or Existing (E)	Type[a]	Meets FS Sign Standards (Y/N)	Condition/ Structural Lifespan[b]	Size- width x length (inches)	Comments
12N30E	38.85933054	120.44751859	E	D/D	No	P/P	30x24	Broken support post
12N30E	38.85919295	120.44760583	M					Missing stop sign
12N30G	38.87092317	120.44190782	M					Missing road number sign
12N30G	38.88322273	120.43864087	E	D/D	Yes	F/F	4x36	
12N30H	38.86311160	120.43926603	M					Missing road number sign
12N30H	38.86317586	120.43930554						
12N30H	38.86310854	120.43926238	M					Missing stop sign
12N30L	38.86038288	120.44776945	M					Missing road number sign
12N30L	38.86044833	120.44783541	E	R	Yes	G/F	4x36	
12N30M	38.88888769	120.42564749	E	D/D	Yes	G/G	4x36	
12N30M	38.88348247	120.43799555	E	Other	Yes	F/G	4x36	
12N30MA	38.88707909	120.43552870	M					Missing road number sign
11N12D	38.81116982	120.62019584	M					Missing road number sign
11N12D	38.81118002	120.62011872	M					Missing object marker at guardrail
12N30Z	38.86413185	120.43902459	M					Missing road number sign
12N30Z	38.86429805	120.43909515	M					Missing stop sign
12N34A1	38.78194258	120.63669935	M					Missing road number sign
12N34B	38.78410263	120.62599498	E	D/D	No	P/P	4x36	Reset sign; sign is laying on ground
12N34HA	38.79090119	120.62554079	M					Missing road number sign
12N34J	38.78283085	120.62874008	E	D/D	Yes	G/F	4x36	Clear vegetation

FS Road Number	Latitude (North coordinates)	Longitude (West coordinates)	Missing (M) or Existing (E)	Type[a]	Meets FS Sign Standards (Y/N)	Condition/ Structural Lifespan[b]	Size- width x length (inches)	Comments
12N34N	38.79447318	120.62529895	M					Missing road number sign
12N34N	38.79467391	120.62396651	M					Missing object marker at guardrail
12N34P	38.79933420	120.62112266	M					Missing road number sign
12N34PA	38.79937344	120.62045255	M					Missing road number sign
12N34R	38.81930762	120.58444960	M					Missing road number sign
12N34S	38.80584665	120.60977321	M					Missing road number sign
11N12E	38.81111826	120.62004820	M					Missing road number sign
12N34U	38.82311719	120.57687331	M					Missing road number sign
12N34V	38.82508125	120.57630217	M					Missing road number sign
12N34W	38.80157389	120.62376005	M					Missing road number sign
12N34Z	38.78186156	120.63122824	M					Missing road number sign
12N34ZZ	38.79957746	120.61885735	M					Missing road number sign
12N37	38.83924546	120.45380230	E	D/D	Yes	G/G	4x36	
12N44	38.90290238	120.37653655	E	D/D	No	F/G	48x23	
12N44	38.90282425	120.37635059	M					Missing stop sign
12N44	38.90280193	120.37640100	M					Missing road number sign
12N44	38.89771000	120.37939922	E	D/D	No	G/G	48x24	
12N44	38.89730309	120.37922571	E	S	Yes	P/F	22x14	
12N54D	38.83248443	120.56229525	E	D/D	Yes	F/F	4x36	
12N54DA	38.83090109	120.56318955	M					Missing road number sign

FS Road Number	Latitude (North coordinates)	Longitude (West coordinates)	Missing (M) or Existing (E)	Type[a]	Meets FS Sign Standards (Y/N)	Condition/ Structural Lifespan[b]	Size- width x length (inches)	Comments
12N54E	38.83034084	120.56815042	M					Missing road number sign
11N37E	38.83014441	120.36712188	M					Missing road number sign
11N37E	38.83010160	120.36716649	M					Missing stop sign
12N76A	38.82380304	120.68434502	M					Missing road number sign
12N77A	38.89322237	120.27475780	M					Missing road number sign
12NY04	38.85235802	120.41096731	M					Missing road number sign
12NY04	38.85095291	120.40899083	M					Missing road number sign
12NY04A	38.85059244	120.41179311	M					Missing road number sign
12NY04D	38.85108902	120.40900685	M					Missing road number sign
12NY04D	38.85008958	120.40682898	M					Missing road number sign
12NY15	38.91597709	120.40357547	E	D/D	Yes	G/G	4x36	
12NY15E	38.90916115	120.40717100	E	R	Yes	G/G	4x36	
12NY15E	38.90914160	120.40721568	M					Missing road number sign
12NY15E	38.90872535	120.40774218	M					Missing road number sign
13N11	38.96664837	120.36398420	M					Stop sign at county road
13N11	38.96693975	120.36402524	E		Yes	G/G		
13N11	38.97479879	120.33368092	E		Yes	F/F		
13N11C	38.96692407	120.36412721	E	D/D	Yes	G/F		VRM needs new sticker
11N60	38.83604674	120.51846295	E	S	No	P/P	24x18	
11N60	38.83687382	120.52283321	E	S	No	P/P	18x12	

FS Road Number	Latitude (North coordinates)	Longitude (West coordinates)	Missing (M) or Existing (E)	Type[a]	Meets FS Sign Standards (Y/N)	Condition/ Structural Lifespan[b]	Size- width x length (inches)	Comments
11N60	38.83565882	120.53224618	E	S	Yes			Safety sign for stairs
11N60	38.83563466	120.53221748	M					Missing object markers
11N60	38.83490024	120.53182898	E	R	No	F/P	49x32	
11N60	38.83459524	120.53178882	E	Other	Yes	G/G	36x32	
13N11F	38.97740068	120.33951168	M					Missing road number sign
13N11G	38.97699496	120.34189208	M					Missing road number sign
13N11GA	38.97699496	120.34189208	M					Missing road number sign
13N11H	38.97635933	120.34671464	M					Missing road number sign
13N11HA	38.97655390	120.34686224	M					Missing road number sign
13N15	38.91716428	120.38659796	M					Missing stop sign
13N15	38.91701226	120.38645958	E	D/D	Yes	G/F	4x36	Replace stickers on VRM
13N15	38.91075215	120.37819911	M					Missing road number to identify intersection
13N15B	38.91148532	120.37973370	E	D/D	Yes	G/G		
13N15B	38.91887165	120.38213253	E	D/D	Yes	G/G		Need to install sign with correct road number.
13N15B	38.91893883	120.38210671	M					Needs stop sign
13N15D	38.91225106	120.38496474	M	D/D	No			Missing road number sign
13N15D	38.91306291	120.37986645	M					Missing road number sign
13N18A	38.98088403	120.32559928	E	D/D	No	G/G	4x48	Replace with appropriate road number sign

FS Road Number	Latitude (North coordinates)	Longitude (West coordinates)	Missing (M) or Existing (E)	Type[a]	Meets FS Sign Standards (Y/N)	Condition/ Structural Lifespan[b]	Size- width x length (inches)	Comments
13N19	38.98550610	120.32888985	E	D/D	No	F/F	24x36	
13N19	38.98540290	120.32883135	M					Stop sign
13N19	38.98545668	120.32900237	M					Missing road number sign
13N19	38.98419514	120.33118370	E	D/D	Yes	F/F		
12N22	38.91506642	120.38993662	M					Missing stop sign & stripe bar
12N22	38.91493861	120.39006954	E	D/D	Yes	F/G	4x36	Straighten post
12N30DB	38.85213261	120.45095372	M					Missing road number sign
12N30DB	38.85226922	120.45096204	E	R	Yes		4x36	

[a] D/D—Directional/Distance; S—Safety; R—Regulatory.

[b] Condition:

G= Good; fully functional, no work required

F= Fair; Functional but requires maintenance/repair to reduce risk of failure

P= Poor; Not functioning as designed, requires maintenance

Structural Lifespan:

G= Good; Structurally sound, expected lifespan >20 years

F= Fair; Functional, signs of fatigue or damage, expect replacement within 10 years

P= Poor; Functionality at risk, visual signs of fatigue or damage, needs replacement

Notes:

VRM—Vertical Route Marker

This page intentionally left blank.

5.0 CULVERT REPLACEMENT PLAN

SMUD reviewed the locations and existing conditions of the 57 undersized culverts, as determined by the Culvert Sizing Analysis (Appendix F). Thirty culverts cross perennial or intermittent streams and 27 cross ephemeral stream or are ditch relief culverts. Replacing the 27ditch relief culverts or culverts that cross ephemeral streams will be scheduled when conducting road maintenance activities (i.e., 5-year road maintenance plan).

Table 5.0-1 shows attributes that SMUD considered to develop replacement priority for culverts that convey perennial or intermittent streams and are not capable of passing flows for a 100-year flow event. Recognizing culvert failure on perennial streams has the greatest on the potential impact to the ecological value of the riparian resources affected, SMUD placed the highest replacement priority on these culverts. However, three of the culverts were assigned a medium priority because they are in fair condition and did not have other critical deficiencies such as fish passage. Conversely, culverts associated with intermittent streams were assigned medium priority but some were elevated to high priority if there were other concerns identified such as existing damage to the culvert. The lowest priority was assigned to culverts associated with intermittent streams that are in fair condition and have little blockage or appeared to be fully functional. SMUD will begin replacing all high priority culverts after approval of this TSMP and will make every effort to replace all of the high priority culverts within 5 years of plan approval. At the completion of this effort SMUD will begin replacing medium priority culverts followed by low priority culverts.

Some discrepancies in the classification of streams (primarily ephemeral vs. intermittent classifications) between the USGS database and the field assessment data have been noted. As a result, SMUD will work with the Forest Service when scheduling culvert replacements to determine the accurate classification of streams in Table 5.0-1. Additionally, priority for replacement will be re-evaluated using the following factors: (1) risk of failure (i.e., hydraulic capacity of the culvert, signs of plugging or aggradation, condition of drainage structure, potential for drainage diversion); (2) consequences of failure (i.e., potential road erosion or fill volume at risk and potential amount of sediment delivered); and (3) impacts of failure to beneficial uses, aquatic habitat or riparian habitat.

Because culvert replacement is a deferred maintenance activity, as defined above, all culvert replacements would be cost-shared with the Forest Service according to the Cooperative Maintenance Agreement. Regular maintenance activity to keep culverts clear and functioning will be performed by SMUD on all roads for which it has primary maintenance responsibility.

Table 5.0-1. Attributes of culverts scheduled for replacement (those that convey a perennial or intermittent stream).

Site ID[a]	Road or Trail Number	Existing Culvert Diameter (inches)	Size of Culvert Needed (inches or other as indicated)	Perennial or Intermittent Stream	Culvert Damaged (Yes/No)	Allows Passage for Fish or Wildlife (Yes/No)	Culvert Condition	Field Notes	Priority for Replacement
101	12N30D	24	30	Intermittent	No	No	Good, Fully functional		High
147	12N30E	24	36	Intermittent	Yes	N/A	Fair, <25% blockage	Inlet is damaged	Medium
191	12N30H	36	42	Intermittent	No	N/A	Poor, >25% blockage		Medium
407	12N34	24	42	Intermittent	No	N/A	Fair, <25% blockage		Low
413	12N34	24	30	Intermittent	No	N/A	Fair, <25% blockage		Low
416	12N34	24	30	Intermittent	No	N/A	Poor, >25% blockage	Minor damage to inlet	Medium
507	11N60	Other: Two culverts with 24"and 36" diameters	Two 36	Intermittent	Yes	N/A	Poor, >25% blockage		High
510	11N60	30	36	Intermittent	No	N/A	Good, Fully functional		Medium
614	13N11	18	24	Intermittent	No	No	Poor, >25% blockage		High
615	13N11	Other: Oval culvert with 28" height and 44" width	48	Perennial	No	Yes	Fair, <25% blockage	Needs replacement within 2 years	High
618	13N11	18	24	Intermittent	No	No	Poor, >25% blockage		High

Site ID[a]	Road or Trail Number	Existing Culvert Diameter (inches)	Size of Culvert Needed (inches or other as indicated)	Perennial or Intermittent Stream	Culvert Damaged (Yes/No)	Allows Passage for Fish or Wildlife (Yes/No)	Culvert Condition	Field Notes	Priority for Replacement
731	13N19A	Other: Oval culvert with 20" rise and 22" width	24	Intermittent	No	No	Good, Fully functional		Low
770	13N21	Other: Arch culvert with 7.3' height and 11.7' width	Arch culvert with 8' height and 18' width	Perennial	No	Yes	Fair, <25% blockage		Medium
825	ELD County-8014	Other: Two culverts with 64" diameter	Arch culvert with10' height and 20' width	Perennial	No	No	Fair, <25% blockage		High
866	Trail_2	18	30	Intermittent	No	N/A	Poor, >25% blockage		Medium
879	11N60BE	36	42	Intermittent	No	N/A	Poor, >25% blockage		Medium
898	11N60D	24	30	Intermittent	No	N/A	Good, Fully function		Low
899	11N60D	18	24	Intermittent	No	N/A	Fair, <25% blockage		Low
964	11N71	24	36	Intermittent	Yes	N/A	Poor, >25% blockage	Inlet is damaged	High
1051	11NY05	18	24	Intermittent	No	N/A	Poor, >25% blockage	Needs replacement	Medium
1113	11NY20A	24	30	Intermittent	No	No	Poor, >25% blockage	Needs replacement	High

Site ID[a]	Road or Trail Number	Existing Culvert Diameter (inches)	Size of Culvert Needed (inches or other as indicated)	Perennial or Intermittent Stream	Culvert Damaged (Yes/No)	Allows Passage for Fish or Wildlife (Yes/No)	Culvert Condition	Field Notes	Priority for Replacement
1115	11NY20A	36	42	Perennial	No	No	Good, Fully functional		Medium
1142	12N05Y	24	36	Intermittent	No	No	Fair, <25% blockage		Low
1144	11NY05	18	24	Intermittent	No	N/A	Poor, >25% blockage		Medium
1176	11N12	48	96	Perennial	No	No	Good, Fully functional		Medium
1214	12N21B	24	30	Intermittent	No	N/A	Poor, >25% blockage		Medium
1216	12N21B	36	48	Perennial	No	N/A	Poor, >25% blockage		High
1217	12N21B	24	36	Intermittent	No	N/A	Poor, >25% blockage		Medium
1218	12N21B	36	42	Perennial	No	N/A	Poor, >25% blockage		High
2000	12N22	Other: Oval culvert with 21” height and 29” width	60	Intermittent	No	N/A	Fair, <25% blockage	Signs of overflow	Medium

[a] Site identification numbers are cross references to culvert locations shown on maps in Appendix F.

Notes:

N/A—Not applicable

6.0 REFERENCES

CalTrans (California Department of Transportation). 2003. Storm Water Quality Handbooks: Construction Site Best Management Practices Manual. Sacramento, CA. March 2003.

Eldorado National Forest. 2014. Eldorado National Forest Standard Road Maintenance Specifications for Roads. Placerville, CA. March 2014.

Eldorado National Forest. 1989. Eldorado National Forest Land and Resource Management Plan, as amended. Eldorado National Forest, Placerville, CA. January.

Federal Highway Administration. 2012. Manual on Uniform Traffic Control Devices. 2009 Edition with Revisions 1 and 2 Incorporated. Washington, DC. May 2012.

Forest Service (U.S. Forest Service). 2013. Engineering Management Series 7100-15, Sign and Poster Guidelines for the Forest Service. October 2013.

Forest Service. 2011. Region 5 Forest Service Handbook 2509.22, Soil and Water Conservation Handbook, Chapter 10, Water Quality Management Handbook (Amendment No. 2509.22-2011-1). Vallejo, CA. December 2011.

Forest Service. 2009. Forest Service Handbook 7709.59, Road System Operations and Maintenance Handbook, Chapter 60—Road Maintenance. Washington, D.C. February 5, 2009.

Forest Service. 2008. Forest Service Manual 7700—Travel Management, Chapter 30—Road Operation and Maintenance. Washington, D.C. October 7, 2008.

Forest Service. 2005. Guidelines for Road Maintenance Levels. 7700-Transportation Management. December 2005.

Forest Service. 2004. Sierra Nevada Forest Plan Amendment. Final Supplemental Environmental Impact Statement. U.S. Department of Agriculture, Forest Service, Pacific Southwest Region. January 2004.

SMUD (Sacramento Municipal Utility District). 2007. Relicensing Settlement Agreement for the Upper American River Project and Chili Bar Hydroelectric Project. FERC Accession No. 20070201-4014. January 2007.

USDA (U.S. Department of Agriculture). 2012. National Best Management Practices for Water Quality Management on National Forest System Lands. Volume 1: National Core BMP Technical Guide. Forest Service, FS-990a. April 2012.

This page intentionally left blank.

Appendix A

License Conditions Related to the Transportation System Management Plan

This page intentionally left blank.

FERC LICENSE CONDITION NO. 15
Project Access Roads

The licensee shall, in consultation with FS, take appropriate measures to rehabilitate existing erosion damage and minimize further erosion of the non-public Project access roads on National Forest System lands. Gates or other vehicle control measures will be installed and maintained where necessary to achieve erosion protection or other resource protection needs.

FERC LICENSE CONDITION NO. 16
Traffic Safety

When construction for Project purposes is in progress adjacent to or on FS Service-controlled roads open to public travel, the licensee shall furnish, install, and maintain temporary traffic controls to provide the public with adequate warning and protection from hazardous or potentially hazardous conditions associated with the licensee's operations. Devices must be appropriate to current conditions and must be covered or removed when not needed. Except as otherwise agreed, flagmen and devices must be as specified in the "Manual on Uniform Traffic Control Devices."

FERC LICENSE CONDITION NO. 17
Access and Road Use by Licensee

The licensee shall confine all vehicles being used for Project purposes including, but not limited to, administrative and transportation vehicles and construction and inspection equipment, to roads or specifically designed access routes, as identified in the Transportation System Management Plan (refer to Condition No. 61, Transportation System Management Plan). FS reserves the right to close any and all such routes where damage is occurring to the soil or vegetation or, if requested by the licensee, to require reconstruction/construction by the licensee to the extent needed to accommodate the licensee’s use. FS agrees to provide notice to the licensee and FERC prior to road closures, except in an emergency, in which case notice will be provided as soon as practicable.

FERC LICENSE CONDITION NO. 18
Crossings

The licensee shall maintain existing crossings as required by FS for all FS roads and trails that intersect the right-of-way occupied by linear Project facilities (powerline, penstock, ditch, pipeline).

FERC LICENSE CONDITION NO. 19
Access and Road Use by Government

The United States shall have unrestricted use of any road over which the licensee has control within the Project area for all purposes deemed necessary and desirable in connection with the protection, administration, management, and utilization of Federal lands or resources. When needed for the protection, administration, and management of Federal lands or resources, the United States shall have the right to extend rights and privileges for use of the right-of-way and road thereon to States and local subdivisions thereof, as well as to other users. The United States shall control such use so as not to unreasonably interfere with the safety or security uses, or cause the licensee to bear a share of costs disproportionate to the licensee's use in comparison to the use of the road by others.

FERC LICENSE CONDITION NO. 20
Signs

The licensee shall consult with FS prior to erecting signs related to safety issues on National Forest System lands covered by the license. Prior to the licensee erecting any other signs or advertising devices on National Forest System lands covered by the license, the licensee must obtain the approval of FS as to location, design, size, color, and message. The licensee shall be responsible for maintaining all licensee-erected signs to neat and presentable standards.

The licensee shall participate in joint licensee and FS road and sign surveys to be conducted as frequently as needed, but at least annually. The licensee shall be responsible for replacing or repairing traffic safety and information signs damaged by Project operations.

FERC LICENSE CONDITION NO. 56
Transportation System Management (Section No. 1 of 3)

1. Transportation System Management Plan

a. Within 1 year of license issuance, the licensee shall file with FERC a Transportation System Management Plan that is approved by FS for roads on or affecting National Forest System lands. The plan shall establish the level of licensee responsibility for Project-related roads. The licensee shall have primary responsibility for non-system roads and for maintenance level 1 and 2 roads. There shall be shared levels of responsibility for maintenance level 3, 4, and 5 roads. FS shall make available to the licensee all information it has about these roads. The licensee shall implement the plan upon approval. At a minimum the Plan shall:

b Include a map showing all roads, both FS system roads (classified), and FS nonsystem (unclassified) roads associated with the Project.

c. Identify and list on a spreadsheet the Project-related uses of all roads described above, including an estimate of the amount of use by season of the year.

d. Identify and list the condition of the roads described above that are determined to be the primary responsibility of the licensee, including any construction or maintenance needs. Information shall include length and width of road, location and size of culverts, grade, slope position, hydrologic connectivity, surfacing, and jurisdiction sufficient for FS to complete the roads use permit Exhibit A and to complete any required Roads Analysis.

e. Include a map of a Traffic Safety and Signage plan for all roads described above that are determined to be the responsibility of the licensee. Include both safety and D/D information signs at major road intersections and features. An inventory of all signs, together with photographs of each sign, shall be included. Mapping shall be completed using global positioning system (GPS) instrumentation and made available as a digital format layer. Signs shall conform to FS Manual direction and the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD).

f. Include a map of all drainage crossings of bridges and culverts for all roads described above that are determined to be the responsibility of the licensee. Provide hydraulic calculations verifying that all intermittent and perennial stream crossings shall pass a 100-year storm event and associated bedload and debris, and allow fish passage through all culverts identified as fish habitat areas. The licensee shall develop a plan for FS approval to upgrade those culverts not meeting this standard. Priority for upgrading will be based on the potential impact to the ecological value of the riparian resources affected.

g. Address measures to control erosion related to Project facilities on or affecting National Forest System lands, including dams, roads, penstocks, powerlines, transformer sites, reservoirs, and reaches. Consider stream sedimentation, dust, and soil movement induced by Project roads and road maintenance activities, preventing loss of roads through ongoing hillside erosion, sediment management of roads within 150 feet of the river, and diversion prevention dips in specified areas to minimize damage from culvert failure.

h. Identify helispots routinely used to access Project facilities on National Forest System lands, including any staging areas and access roads. Include notification standards for FS (Camino dispatch), including radio frequencies and N (tail) numbers.

i. Include a map showing easements or other right of way agreements for all roads, associated with the Project and identify roads for which an easement or right of way is needed. Implementation shall include acquisition of any needed easements or right of ways.

Every 5 years, the licensee shall prepare a 5-year plan to identify the maintenance and reconstruction needs for roads associated with the Project. The licensee shall file the plan with FERC after approval by FS. All road maintenance and construction shall meet FS specifications and best management practices. The licensee shall construct, operate, and maintain Project facilities, including roads, parking and storage lots, reservoir shorelines, bridges, and culverts to maintain natural fluvial and colluvial sediment transport to the Project reaches, as far as feasible.

FERC LICENSE CONDITION NO. 57
Trails System Management (Section No. 1 of 2)

1. Trails System Management Plan

Within 1 year of license issuance, the licensee shall file with FERC a Trails System Management Plan that is approved by FS for the trails that are needed for Project operations and are located on or affect National Forest System lands. The licensee shall implement the plan upon approval. At a minimum the Plan shall:

a. Include a map showing the location of all trails, both FS system (classified) trails and FS non-system (unclassified) trails associated with the Project.

b. Map trail locations using a global positioning system (GPS), software, pre and post-processing standards, collection standards and data dictionary approved by FS, to ensure that data collected meet national standards.

c. Identify the season(s) of use and the amount of use by the licensee for each trail annually.

d. Identify the condition of the trails described above, including any construction or maintenance needs.

Every 5 years, the licensee shall prepare a 5-year plan identifying maintenance and reconstruction needs for trails required for Project operations. The licensee shall file the plan with FERC after approval by FS. All trail maintenance and construction shall meet FS specifications and best management practices.

401 WATER QUALITY CERTIFICATION CONDITION NO. 15
Transportation System Management Plan

Within one year of license issuance, the Licensee shall file with the Commission a Transportation System Management Plan (Transportation Plan) that is approved by USFS for roads on or affecting National Forest System lands. The Transportation Plan shall be updated every five years. The Transportation Plan shall identify: (1) the maintenance and reconstruction needs for roads associated with the UARP; and (2) those linear transportation projects for which the Licensee is responsible that are part of or support the UARP and that have the potential to cause a discharge to waters of the state or disturb the streambed. The Licensee shall consult with the State Water Board and Central Valley Water Board to determine whether a water quality certification or other permits or approvals are necessary, and shall obtain such certification, permit(s), or approval(s) before initiating construction activities.

All road maintenance and construction shall meet USFS and ACOE specifications and BMPs. The Licensee shall construct, operate, and maintain UARP facilities, including roads, parking and storage lots, reservoir shorelines, bridges, and culverts to maintain natural fluvial and colluvial sediment transport to the UARP reaches.

Within 30 days of USFS approval and prior to submission to the Commission, the Licensee shall submit the most current Transportation Plan to the Deputy Director for approval. The Licensee shall provide the Deputy Director with at least 60 days to review and approve the plan prior to submittal to the Commission, if applicable. The Deputy Director shall have the authority to make changes to the Transportation Plan to protect water quality, if reasonably necessary, beyond the requirements that maintenance and construction shall meet USFS and ACOE specifications and BMPs. The Licensee shall file the Deputy Director's approval, together with any required Transportation Plan modifications, with the Commission. The Licensee shall implement the Transportation Plan and any subsequent updates upon receiving all necessary approvals.

Appendix B

Consultation Record will be provided upon request.

This page intentionally left blank.

Appendix C

Data Dictionaries for Roads, Trails, and Helispots

This page intentionally left blank.

ROAD DATA DICTIONARY

Site ID:
Road Name
Date:

Features and Attributes			Notes		
Jurisdiction					
Forest Service				Road ownership-Forest Service	In drop down menu
Private				Road ownership is private entity	
Other			Comments section		
Mtc. Responsibility					
Forest Service				Primary road mtc. performed by Forest Service.	In drop down menu
Cooperator				Primary road mtc. performed by Cooperator.	
Private				Primary road mtc. performed by private entity.	
Shared Mtc.			Comments section	Primary road mtc. shared by two or more entities.	
Other			Comments section	Primary road mtc. performed by other entity.	
Road Prism					
Road Length					
	x.xx mi			Measured to one hundredth of a mile.	
	Average grade of road in %				In drop down menu
	Photo				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
Road Width					In drop down menu
	2', 4', 6', other		Comments section	Measured from toe of cut slope to top of fill slope.	
	Photo				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
Grade Pitch					In drop down menu

Features and Attributes			Notes		
	Pitches of grade in % slope			Identified pitches of grades steeper than average grade	
	Length of pitch slope	xx.xx mi			
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
Road Cross Slope	Cross slope of road	GPS ID		% of cross slope of road	In drop down menu
	Photograph				
	ID#	xxxxx		Photo number	
	ID#	xxxxx		Photo number	
Slope Position					In drop down menu
	Slope Location	GPS ID		Geographical location of road alignment to the ridge slope.	
	Top of Ridge			Road alignment located top of ridge slope.	
	Middle of Ridge			Road alignment located middle of ridge slope.	
	Bottom of Ridge			Road alignment located bottom of ridge slope.	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
Surface				Constructed structure feature GPS location.	In drop down menu
	Location	GPS ID			
	Type				
	Native	xx.xx mi		Natural surface material.	
	Spot aggregate	xx.xx mi, x" depth		Placed aggregate.	
	Aggregate	xx.xx mi, x" depth		Placed aggregate.	
	Oil treatment	xx.xx mi		Surface treatment for surface stabilization.	
	AC pavement	xx.xx mi, x" depth			
	Traffic striping				
	Condition				

Features and Attributes			Notes		
	Good			Surface fully functional, no work required.	In drop down menu
	Fair		Comments section	Functional but signs of fatigue, replace in two years	
	Poor		Comments section	Missing or faded needs restriping	
	ID#	xxxxx		Photo number	
	ID#	xxxxx		Photo number	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >7 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 3 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
Vegetation					
	Condition				
	Good			Meets F.S. standards, no clearing mtc. required.	In drop down menu
	Fair		Comments section	Some encroachment in trailway but passable possible blockage by downed trees.	
	Poor		Comments section	Restricts access, requires maintenance work to bring to FS standard.	
	Photo				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
Hazard Trees		Yes/No	Comments section		
	Photo				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
Misc. Prism Features					
Gate	Location	GPS ID		Constructed structure feature GPS location.	In drop down menu

Features and Attributes			Notes		
	Width	12', 14', 16', other		Size of gate.	
	Single lane	Yes/No		Located on single lane roadway	
	Double lane	Yes/No		Located on double lane roadway	
	Meets sign stds.	Yes/No		Signage meets Forest Service standards.	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Fully functional, no work required.	In drop down menu
	Fair		Comments section	Functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	Not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >20 yrs.	
	Fair			Functional, signs of fatigue or damage, expect replacement within 10 yrs	
	Poor			Functionality at risk, visual signs of fatigue or damage, needs replacement.	
Cattle Guard	Location	GPS ID		Constructed structure feature GPS location.	
	Width	12', 14', 16', other		Size of cattle guard.	
	Single lane	Yes/No		Located on single lane roadway.	
	Double lane	Yes/No		Located on double lane roadway.	
	Meets sign stds.	Yes/No	Comments section	Signage meets Forest Service standards.	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Fully functional, no work required.	In drop down menu
	Fair		Comments section	Functional but requires maintenance/repair to reduce risk of failure.	

Features and Attributes			Notes		
	Poor		Comments section	Not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >20 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 10 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
Road Barrier	Location	GPS ID		Constructed structure feature GPS location.	
	Width	12', 14', 16', other		Size of road barrier.	
	Material type.				
		Native		Constructed with natural features such as boulders or earth mounds.	
		Manufactured		Constructed with manufactured materials.	
	Single lane	Yes/No		Located on single lane roadway.	
	Double lane	Yes/No		Located on double lane roadway.	
	Meets sign stds.	Yes/No	Comments section	Signage meets Forest Service standards.	
	Photograph				
	ID#	xxxxxx		Photo number.	
	ID#	xxxxxx		Photo number.	
	Condition				
	Good			Fully Functional, no work required.	
	Fair		Comments section	Functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	Not functioning as designed, requires maintenance.	
Signs	Location	GPS ID		Constructed feature GPS location.	In drop down menu
	Missing	Yes/No			
	Size	xx" by xx"		Size of sign.	
	Licensee Maintained	Yes/No		Is licensee responsible for sign maintenance	
	Type				
		Safety			

Features and Attributes			Notes		
		Destination/ distance			
		Regulatory			
	Meets sign stds.	Yes/No	Comments section	Signage meets Forest Service standards.	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Fully Functional, no work required.	In drop down menu
	Fair		Comments section	Functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	Not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >20 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 10 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
Drainage Structures					
Culvert	Location	GPS ID		Installed drainage structure GPS location.	
	Crossing Type				
		Intermediate Crossing		Stream flows at intervals.	In drop down menu
		Perennial Crossing		Stream flows year round.	
		Ditch Relief Crossing		Removes water flow from ditch line.	
	Passage				
	Fish passage	Yes, No, n/a		Allows fish to pass through culvert without obstruction.	
	Aquatic Wildlife	Yes, No, n/a		Allows aquatic wildlife to pass through culvert without obstruction.	
	Type	Round, Helical,			In drop

Features and Attributes			Notes		
		Other			down menu
	Material Type	Corrugated Metal			In drop down menu
		Corrugated Plastic			
		Smooth Wall Metal			
		Smooth Wall Plastic			
		Concrete			
	Diameter Size	12", 18", 24", 36", 48", other			In drop down menu
	Length (feet)				
	Slope of Culvert	< 1%		Cross slope of culvert position.	In drop down menu
		1% - 5%			
		> 5%			
	Headwall Height (feet)			Measured from bottom of culvert to nearest relief point.	
	Rock Riprap	Yes/No		Energy dissipater for erosion control.	
	Inlet quantity	xx Cuyds		Measured in cubic yards	
	Outlet quantity	xx Cuyds		Measured in cubic yards	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Free flowing, fully Functional, no work required.	In drop down menu
	Fair		Comments section	<25% blockage, functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	>25% blockage, not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >20 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 10 yrs	

Features and Attributes			Notes		
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Hydro Connectivity				In drop down menu
	No	Yes		Connects water flow directly to natural stream course.	
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	
Culvert Attachments					
	End Section	Inlet, Outlet, Both		Installed drainage structure.	In drop down menu
	Rock Riprap	Yes/No		Energy dissipater for erosion control.	
	Inlet quantity	xx Cuyds		Measured in cubic yards	
	Outlet quantity	xx Cuyds		Measured in cubic yards	
	Photograph	Yes/No			
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Free flowing, fully Functional, no work required.	In drop down menu
	Fair		Comments section	<25% blockage, functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	>25% blockage, not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >20 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 10 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Hydro Connectivity				In drop down menu
	No	Yes		Connects water flow directly to natural stream course.	
		Perennial stream		Stream flows year round.	

Features and Attributes			Notes		
		Intermittent stream		Stream flows at intervals.	
	Drop inlet	Left, Right		Installed drainage structure.	In drop down menu
	Rock Riprap	Yes/No		Energy dissipater for erosion control.	
	Inlet quantity	xx Cuyds		Measured in cubic yards	
	Outlet quantity	xx Cuyds		Measured in cubic yards	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Free flowing, fully Functional, no work required.	In drop down menu
	Fair		Comments section	<25% blockage, functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	>25% blockage, not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >20 yrs.	In drop down menu
	Fair			Functional, signs of fatigue or damage, expect replacement within 10 yrs	
	Poor			Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Hydro Connectivity				In drop down menu
	No	Yes		Connects water flow directly to natural stream course.	
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	
	Trash Rack	xx' by xx'		Installed drainage structure.	
	Rock Riprap	Yes/No		Energy dissipater for erosion control.	
	Inlet quantity	xx Cuyds		Measured in cubic yards	
	Outlet quantity	xx Cuyds		Measured in cubic yards	
	Photograph				
	ID#	xxxxx		Photo number.	

Features and Attributes			Notes		
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Free flowing, fully Functional, no work required.	In drop down menu
	Fair		Comments section	<25% blockage, functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	>25% blockage, not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >20 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 10 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Hydro Connectivity				In drop down menu
	No	Yes		Connects water flow directly to natural stream course.	
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	
Inlet Assembly	Location	GPS ID		Installed drainage structure GPS location.	In drop down menu
	Orientation	Left ,Right		Drains to left or right side of trail way.	
	Rock Riprap	Yes/No		Energy dissipater for erosion control.	
	Outlet quantity	xx Cuyds		Measured in cubic yards	
	Flume	Yes/No			
	Length	xx feet			
	Photograph	Yes/No			
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Fully Functional, no work required.	In drop down menu
	Fair		Comments section	Functional but requires maintenance/repair to reduce risk of failure.	

Features and Attributes			Notes		
	Poor		Comments section	Not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >20 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 10 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Hydro Connectivity			Connects water flow directly to natural stream course.	In drop down menu
	No	Yes			
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	
Sub Drain	Location	GPS ID		Installed drainage structure GPS location.	
	Length	20', 40', 60' other		Drains subsurface water.	In drop down menu
	Orientation	Left ,Right		Drains the left or right side of roadway.	
	Cross drain	Yes/No		Energy dissipater for erosion control.	
	Length	20', 40', 60' other		Measured in linear feet.	In drop down menu
	Photograph				
	ID#	xxxxxx		Photo number.	
	ID#	xxxxxx		Photo number.	
	Condition				
	Good			Fully Functional, no work required.	In drop down menu
	Fair		Comments section	Functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	Not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >20 yrs.	In drop down menu
	Fair		Comments	Functional, signs of fatigue or damage, expect	

Features and Attributes			Notes		
			section	replacement within 10 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Hydro Connectivity			Connects water flow directly to natural stream course.	In drop down menu
	No	Yes			
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	
Inlet Basin	Location	Left, Right			
	Rock Riprap	Yes/No		Energy dissipater for erosion control.	In drop down menu
	Outlet quantity	xx Cuyds		Measured in cubic yards	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Fully Functional, no work required.	In drop down menu
	Fair		Comments section	Functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	Not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >5 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 2 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	

Features and Attributes			Notes		
	Hydro Connectivity			Connects water flow directly to natural stream course.	In drop down menu
	No	Yes			
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	
Catch Basin	Location	Left, Right			
	Rock Riprap	Yes/No		Energy dissipater for erosion control.	In drop down menu
	Outlet quantity	xx Cuyds		Measured in cubic yards	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Fully Functional, no work required.	In drop down menu
	Fair		Comments section	Functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	Not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >5 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 2 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Hydro Connectivity			Connects water flow directly to natural stream course.	In drop down menu
	No	Yes			
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	
Rolling Dip	Location	GPS ID		Installed drainage structure GPS location.	
	Critical	Yes/No		Located to address potential culvert failure.	
	Orientation	Left ,Right		Drains to left or right side of trail way.	
	Rock Riprap	Yes/No		Energy dissipater for erosion control.	In drop

Features and Attributes			Notes		
					down menu
	Outlet quantity	xx Cuyds		Measured in cubic yards	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Fully Functional, no work required.	In drop down menu
	Fair		Comments section	Functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	Not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >5 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 2 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Hydro Connectivity			Connects water flow directly to natural stream course.	In drop down menu
	No	Yes			
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	
Critical Rolling Dip	Location	GPS ID		Installed or proposed drainage structure GPS location.	
	Existing	Yes/No		Critical dip needed to address potential culvert failure or drainage control.	
	Orientation	Left ,Right		Drains to left or right side of trail way.	
	Rock Riprap	Yes/No		Energy dissipater for erosion control.	In drop down menu
	Outlet quantity	xx Cuyds		Measured in cubic yards	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				

Features and Attributes			Notes		
	Good			Fully Functional, no work required.	In drop down menu
	Fair		Comments section	Functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	Not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >5 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 2 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Hydro Connectivity			Connects water flow directly to natural stream course.	In drop down menu
	No	Yes			
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	
Water Bar	Location	GPS ID		Constructed drainage structure feature GPS location.	
	Drivable	Yes/No		Can be traversed by a high clearance vehicle.	
	Critical	Yes/No		Located to address potential culvert failure.	
	Orientation	Left ,Right		Drains to left or right side of trail way.	
	Rock Riprap	Yes/No		Energy dissipater for erosion control.	In drop down menu
	Outlet quantity	xx Cuyds		Measured in cubic yards	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Fully Functional, no work required.	In drop down menu
	Fair		Comments section	Functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	Not functioning as designed, requires maintenance.	
	Structural				

Features and Attributes			Notes		
	Lifespan				
	Good			Structurally sound, expected lifespan >5 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 2 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Hydro Connectivity			Connects water flow directly to natural stream course.	In drop down menu
	No	Yes			
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	
Other	Location	GPS ID		Constructed drainage structure feature GPS location.	
	Description		Comments section	For drainage structure features not listed.	
	Orientation	Left ,Right		Drains to left or right side of roadway.	
	Photograph	Yes/No			
	ID#	xxxxxx		Photo number	
	ID#	xxxxxx		Photo number	
	Condition				
	Good			Fully Functional, no work required.	In drop down menu
	Fair		Comments section	Functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	Not functioning as designed, requires maintenance.	
	Rock Riprap	Yes/No		Energy dissipater for erosion control.	In drop down menu
	Outlet quantity	xx Cuyds		Measured in cubic yards	
	Meets sign stds.	Yes/No	Comments section	Signage meets Forest Service standards.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >20 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 10 yrs	

Features and Attributes			Notes		
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Hydro Connectivity			Connects water flow directly to natural stream course.	In drop down menu
	No	Yes			
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	
Leadoff Ditch	Location	GPS ID		Constructed drainage structure feature GPS location.	
	Orientation	Left ,Right		Drains to left or right side of trailway.	
	Length	xx linear feet			
	Rock Riprap	Yes/No		Energy dissipater for erosion control.	In drop down menu
	Outlet quantity	xx Cuyds		Measured in cubic yards	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Fully functional, no work required.	In drop down menu
	Fair			Functional but requires maintenance/repair to reduce risk of failure.	
	Poor			Not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >5 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 2 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Hydro Connectivity			Connects water flow directly to natural stream course.	In drop down menu
	No	Yes			
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	
Drainage Ditch	Location	GPS ID		Constructed drainage structure feature GPS location.	

Features and Attributes			Notes		
	Orientation	Left ,Right		Drains to left or right side of trail way.	
	Length	Xx linear feet			
	Rock armored	Yes/No		Energy dissipater for erosion control	In drop down menu
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Fully Functional, no work required.	In drop down menu
	Fair		Comments section	Functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	Not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >20 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 10 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Hydro Connectivity			Connects water flow directly to natural stream course.	In drop down menu
	No	Yes			
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	

Trail Data Dictionary

Site ID:
Trail Name
Date:

Features and Attributes			Notes		
Jurisdiction					
Forest Service				Road ownership-Forest Service	In drop down menu
Private				Road ownership is private entity	
Other			Comments section		
Mtc. Responsibility					
Forest Service				Primary road mtc. performed by Forest Service.	In drop down menu
Cooperator				Primary road mtc. performed by Cooperator.	
Private				Primary road mtc. performed by private entity.	
Shared Mtc.			Comments section	Primary road mtc. shared by two or more entities.	
Other			Comments section	Primary road mtc. performed by other entity.	
Trail Prism					
Alignment					
	Location	GPS ID		Constructed feature GPS location	
	GPS linear alignment	Yes/No			
Trail Length					
	x.xx mi			Measured to one hundredth of a mile.	
	Photo				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Average grade of trail %			Average grade of trail	In drop down menu
Trail Width					
	2', 4', 6', other		Comments section	Measured from toe of cut slope to top of fill slope.	In drop down menu
	Photo				

Features and Attributes			Notes		
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
Grade					
	Pitches of grade in % slope			Identified pitches of grades steeper than average grade	
	Length of pitch slope	xx.xx mi			
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
Slope Position					
	Slope Location	GPS ID		Geographical location of road alignment to the ridge slope.	In drop down menu
	Top of Ridge			Road alignment located top of ridge slope.	
	Middle of Ridge			Road alignment located middle of ridge slope.	
	Bottom of Ridge			Road alignment located bottom of ridge slope.	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
Surface				Constructed structure feature GPS location.	
	Location	GPS ID			
	Type				
	Native	xx.xx mi		Natural surface material.	
	Spot aggregate	xx.xx mi, x” depth		Placed aggregate.	
	Aggregate	xx.xx mi, x” depth		Placed aggregate.	
	Oil treatment	xx.xx mi		Surface treatment for surface stabilization.	
	AC pavement	xx.xx mi, x” depth			
	Condition				
	Good			Surface fully functional, no work required.	In drop down menu
	Fair		Comments section	Surface drainage functional/minor pothole/rutting, requires repair to reduce risk of failure.	
	Poor		Comments section	Surface drainage not functioning as designed, requires maintenance repair.	

Features and Attributes			Notes		
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >20 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 10 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
Vegetation					
	Condition				
	Good			Meets F.S. standards, no clearing mtc. Required.	In drop down menu
	Fair		Comments section	Some encroachment in trailway but passable possible blockage by downed trees.	
	Poor		Comments section	Restricts access, requires maintenance work to bring to FS standard.	
	Photo				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
Hazard Trees		Yes/No	Comments section		
	Photo				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
Misc. Prism Features					
Gate	Location	GPS ID		Constructed structure feature GPS location.	In drop down menu
	Width	xx’		Size of gate.	
	Meets sign stds.	Yes/No		Signage meets Forest Service standards.	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Fully Functional, no work required.	In drop

Features and Attributes			Notes		
					down menu
	Fair		Comments section	Functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	Not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >20 yrs.	In drop down menu
	Fair			Functional, signs of fatigue or damage, expect replacement within 10 yrs	
	Poor			Functionality at risk, visual signs of fatigue or damage, needs replacement.	
Signs	Location	GPS ID		Constructed feature GPS location.	In drop down menu
	Missing	Yes/No			
	Size	xx" by xx"		Size of sign.	
	Licensee Maintained	Yes/No		Is licensee responsible for sign maintenance	
	Type				
		Safety			
		D/D			
		Regulatory			
	Meets sign stds.	Yes/No	Comments section	Signage meets Forest Service standards.	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Fully Functional, no work required.	In drop down menu
	Fair		Comments section	Functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	Not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >20 yrs.	In drop

Features and Attributes			Notes		
					down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 10 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
Drainage Structures					
Culvert	Location	GPS ID		Installed drainage structure GPS location.	
	Crossing Type				
		Intermediate Crossing		Stream flows at intervals.	In drop down menu
		Perennial Crossing		Stream flows year round.	
		Ditch Relief Crossing		Removes water flow from ditch line.	
	Passage				
	Fish passage	Yes, No, n/a		Allows fish to pass through culvert without obstruction.	
	Aquatic Wildlife	Yes, No, n/a		Allows aquatic wildlife to pass through culvert without obstruction.	
	Type	Round, Helical, Other			In drop down menu
	Material Type	Corrugated Metal			In drop down menu
		Corrugated Plastic			
		Smooth Wall Metal			
		Smooth Wall Plastic			
		Concrete			
	Diameter Size	12", 18", 24", 36", 48", other			In drop down menu
	Length (feet)				
	Slope of Culvert	< 1%		Cross slope of culvert position.	In drop down menu
		1% - 5%			
		> 5%			
	Headwall			Measured from bottom of culvert to nearest relief	

Features and Attributes			Notes		
	Height (feet)			point.	
	Rock Riprap	Yes/No		Energy dissipater for erosion control.	
	Inlet quantity	xx Cuyds		Measured in cubic yards	
	Outlet quantity	xx Cuyds		Measured in cubic yards	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Free flowing, fully Functional, no work required.	In drop down menu
	Fair		Comments section	<25% blockage, functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	>25% blockage, not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >20 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 10 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Hydro Connectivity				In drop down menu
	No	Yes		Connects water flow directly to natural stream course.	
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	
Culvert Attachments					
	End Section	Inlet, Outlet, Both		Installed drainage structure.	In drop down menu
	Rock Riprap	Yes/No		Energy dissipater for erosion control.	
	Inlet quantity	xx Cuyds		Measured in cubic yards	
	Outlet quantity	xx Cuyds		Measured in cubic yards	
	Photograph	Yes/No			
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	

Features and Attributes			Notes		
	Condition				
	Good			Free flowing, fully Functional, no work required.	In drop down menu
	Fair		Comments section	<25% blockage, functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	>25% blockage, not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >20 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 10 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Hydro Connectivity				In drop down menu
	No	Yes		Connects water flow directly to natural stream course.	
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	
	Drop inlet	Left, Right		Installed drainage structure.	In drop down menu
	Rock Riprap	Yes/No		Energy dissipater for erosion control.	
	Inlet quantity	xx Cuyds		Measured in cubic yards	
	Outlet quantity	xx Cuyds		Measured in cubic yards	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Free flowing, fully Functional, no work required.	In drop down menu
	Fair		Comments section	<25% blockage, functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	>25% blockage, not functioning as designed, requires maintenance.	
	Structural				

Features and Attributes			Notes		
	Lifespan				
	Good			Structurally sound, expected lifespan >20 yrs.	In drop down menu
	Fair			Functional, signs of fatigue or damage, expect replacement within 10 yrs	
	Poor			Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Hydro Connectivity				In drop down menu
	No	Yes		Connects water flow directly to natural stream course.	
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	
	Trash Rack	xx' by xx'		Installed drainage structure.	
	Rock Riprap	Yes/No		Energy dissipater for erosion control.	
	Inlet quantity	xx Cuyds		Measured in cubic yards	
	Outlet quantity	xx Cuyds		Measured in cubic yards	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				In drop down menu
	Good			Free flowing, fully Functional, no work required.	
	Fair		Comments section	<25% blockage, functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	>25% blockage, not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >20 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 10 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Hydro Connectivity				In drop down menu

Features and Attributes			Notes		
	No	Yes		Connects water flow directly to natural stream course.	
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	
Inlet Assembly	Location	GPS ID		Installed drainage structure GPS location.	In drop down menu
	Orientation	Left ,Right		Drains to left or right side of trail way.	
	Rock Riprap	Yes/No		Energy dissipater for erosion control.	
	Outlet quantity	xx Cuyds		Measured in cubic yards	
	Flume	Yes/No			
	Length	xx feet			
	Photograph	Yes/No			
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Fully Functional, no work required.	In drop down menu
	Fair		Comments section	Functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	Not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >20 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 10 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Hydro Connectivity			Connects water flow directly to natural stream course.	In drop down menu
	No	Yes			
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	
Inlet Basin	Location	Left, Right			
	Rock Riprap	Yes/No		Energy dissipater for erosion control.	In drop

Features and Attributes			Notes		
					down menu
	Outlet quantity	xx Cuyds		Measured in cubic yards	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Fully Functional, no work required.	In drop down menu
	Fair		Comments section	Functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	Not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >5 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 2 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Hydro Connectivity			Connects water flow directly to natural stream course.	In drop down menu
	No	Yes			
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	
Catch Basin	Location	Left, Right			
	Rock Riprap	Yes/No		Energy dissipater for erosion control.	In drop down menu
	Outlet quantity	xx Cuyds		Measured in cubic yards	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Fully Functional, no work required.	
	Fair		Comments section	Functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments	Not functioning as designed, requires maintenance.	

Features and Attributes			Notes		
			section		
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >5 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 2 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Hydro Connectivity			Connects water flow directly to natural stream course.	In drop down menu
	No	Yes			
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	
Rolling Dip	Location	GPS ID		Installed drainage structure GPS location.	
	Critical	Yes/No		Located to address potential culvert failure.	
	Orientation	Left ,Right		Drains to left or right side of trail way.	
	Rock Riprap	Yes/No		Energy dissipater for erosion control.	In drop down menu
	Outlet quantity	xx Cuyds		Measured in cubic yards	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Fully functional, no work required.	In drop down menu
	Fair		Comments section	Functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	Not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >5 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 2 yrs	
	Poor		Comments	Functionality at risk, visual signs of fatigue or	

Features and Attributes			Notes		
			section	damage, needs replacement.	
	Hydro Connectivity			Connects water flow directly to natural stream course.	In drop down menu
	No	Yes			
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	
Critical Rolling Dip	Location	GPS ID		Installed or proposed drainage structure GPS location.	
	Existing	Yes/No		Critical dip needed to address potential culvert failure or drainage control.	
	Orientation	Left ,Right		Drains to left or right side of trail way.	
	Rock Riprap	Yes/No		Energy dissipater for erosion control.	In drop down menu
	Outlet quantity	xx Cuyds		Measured in cubic yards	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Fully Functional, no work required.	In drop down menu
	Fair		Comments section	Functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	Not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >5 yrs.	
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 2 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Hydro Connectivity			Connects water flow directly to natural stream course.	In drop down menu
	No	Yes			
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	

Features and Attributes			Notes		
Water Bar	Location	GPS ID		Constructed drainage structure feature GPS location.	
	Drivable	Yes/No		Can be traversed by a high clearance vehicle.	
	Critical	Yes/No		Located to address potential culvert failure.	
	Orientation	Left ,Right		Drains to left or right side of trail way.	
	Rock Riprap	Yes/No		Energy dissipater for erosion control.	In drop down menu
	Outlet quantity	xx Cuyds		Measured in cubic yards	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Fully Functional, no work required.	In drop down menu
	Fair		Comments section	Functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	Not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >5 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 2 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Hydro Connectivity			Connects water flow directly to natural stream course.	In drop down menu
	No	Yes			
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	
Leadoff Ditch	Location	GPS ID		Constructed drainage structure feature GPS location.	
	Orientation	Left ,Right		Drains to left or right side of trailway.	
	Length	xx linear feet			
	Rock Riprap	Yes/No		Energy dissipater for erosion control.	In drop down menu
	Outlet quantity	xx Cuyds		Measured in cubic yards	
	Photograph				

Features and Attributes			Notes		
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Fully Functional, no work required.	In drop down menu
	Fair			Functional but requires maintenance/repair to reduce risk of failure.	
	Poor			Not functioning as designed, requires maintenance.	
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >5 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 2 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Hydro Connectivity			Connects water flow directly to natural stream course.	In drop down menu
	No	Yes			
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	
Other	Location	GPS ID		Constructed drainage structure feature GPS location.	
	Description			For drainage structure features not listed.	
	Orientation	Left ,Right		Drains to left or right side of trail way.	
	Photograph				
	ID#	xxxxx		Photo number.	
	ID#	xxxxx		Photo number.	
	Condition				
	Good			Fully Functional, no work required.	In drop down menu
	Fair		Comments section	Functional but requires maintenance/repair to reduce risk of failure.	
	Poor		Comments section	Not functioning as designed, requires maintenance.	
	Rock Riprap	Yes/No		Energy dissipater for erosion control.	
	Outlet quantity	xx Cuyds		Measured in cubic yards	
	Meets sign	Yes/No		Signage meets Forest Service standards.	

Features and Attributes			Notes		
	stds.				
	Structural Lifespan				
	Good			Structurally sound, expected lifespan >20 yrs.	In drop down menu
	Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 10 yrs	
	Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	
	Hydro Connectivity			Connects water flow directly to natural stream course.	In drop down menu
	No	Yes			
		Perennial stream		Stream flows year round.	
		Intermittent stream		Stream flows at intervals.	

Helispot Data Dictionary

Site ID:
Helispot Name
Date:

Features and Attributes		Notes		
Jurisdiction				
Forest Service			Road ownership-Forest Service	In drop down menu
Private			Road ownership-private entity	
Other		Comments section		
Mtc. Responsibility				
Forest Service			Primary road mtc. performed by Forest Service	In drop down menu
Cooperator			Primary road mtc. performed by Cooperator	
Private			Primary road mtc. performed by private entity	
Shared Mtc.		Comments section	Primary road mtc. Shared by two or more entities	
Other		Comments section	Primary road mtc. performed by other entity	
Vegetation				
Condition				
Good			No encroachment, no clearing mtc. required	
Fair		Comments section	Some encroachment in landing zone possible blockage by downed trees	
Poor		Comments section	Restricts access, requires maintenance work	
Photograph				
ID#	xxxxx		Photo number	
ID#	xxxxx		Photo number	
Hazard Trees	Yes/No	Comments section		
Photograph				
ID#	xxxxx		Photo number	
ID#	xxxxx		Photo number	
Type				
Signs				In drop down menu
Location	GPS ID		Constructed feature GPS location	
Missing	Yes/No			
Size	X" by X"		Size of sign	
Licensee Maintained	Yes/No		Is licensee responsible for sign maintenance.	
Type				
Meets sign stds.	Yes/No	Comments section	Signage meets Forest Service standards.	

Features and Attributes		Notes		
Photograph	Yes/No			
ID#	xxxxx		Photo number.	
ID#	xxxxx		Photo number.	
Condition				In drop down menu
Good			Fully Functional, no work required.	
Fair		Comments section	Functional but requires maintenance/repair to reduce risk of failure.	
Poor		Comments section	Not functioning as designed, requires maintenance.	
Structural Lifespan				In drop down menu
Good			Structurally sound, expected lifespan >20 yrs.	
Fair		Comments section	Functional, signs of fatigue or damage, expect replacement within 10 yrs	
Poor		Comments section	Functionality at risk, visual signs of fatigue or damage, needs replacement.	

This page intentionally left blank.

Appendix D

Hydrology Assessment—Culvert Assessment

This page intentionally left blank.

Stillwater Sciences

2855 Telegraph Ave, Suite 400, Berkeley, CA 94705
phone 510.848.8098 fax 510.848.8398

TECHNICAL MEMORANDUM

DATE: Thursday, November 13, 2014

TO: Carol Efird, Louis Berger

FROM: Stillwater Sciences

SUBJECT: UARP Culvert Sizing Analysis

1 INTRODUCTION

Stillwater Sciences performed culvert-sizing analysis to support development of a Transportation System Management Plan (TSMP) for SMUD's Upper American River Project (UARP). The project area lies within the National Forest System in the Sierra Nevada mountain range, generally located to the north of Highway 50 between Placerville and Lake Tahoe. Within the project area, hydrologic and hydraulic analyses were performed at 91 culvert crossings to determine if they were sufficiently sized to convey 100-year storm flows. Culvert crossings on perennial and intermittent drainages identified during a field survey were analyzed, as well as additional ditch relief culverts that were located adjacent to intermittent drainages.

This analysis is primarily based on field data collected by Steve Cowdrey of Louis Berger, but also includes observations made during a September 3, 2014 field visit that included Steve Cowdrey and Joel Monschke, hydrologist/civil engineer with Stillwater Sciences. The purpose of this field visit was to confirm hydrologic assumptions at typical culvert crossings. A summary of the culvert sizing results is presented in Table 1 and culvert locations are displayed on the maps attached to this memorandum.

2 HYDROLOGIC ANALYSIS

The Rational Method (also known as the Rational Formula) was used to calculate 100-year flows at 87 of the culvert-crossing locations, or culvert sites. This method is appropriate for determining flow rates for relatively small drainage areas of less than 320 acres according to the California Department of Transportation Highway Design Manual (Caltrans HDM) Section 819.2 (Caltrans 2014). The Rational Formula incorporates a combination of rainfall intensity, drainage area and runoff coefficient to estimate maximum flows at each culvert location, and is defined as follows:

$$Q = CIA$$

Where:

Q = Flow Discharge

C = Runoff Coefficient
I = Rainfall Intensity
A = Area

The other four culvert sites, which had drainage areas larger than 320 acres, were analyzed using the U.S. Geological Survey's (USGS) StreamStats website[1] to determine 100-year flows. This website provides site-specific flow estimates based on USGS regression equations.

3 GEOSPATIAL ANALYSIS

For the Rational Method analysis, a Geographic Information System (GIS; ESRI's ArcGIS version 10.2) was used to determine the contributing drainage area for each culvert site based on 10 meter Digital Elevation Models (DEMs). In addition, the longest flow path and maximum elevation change within each drainage area were measured in the GIS and used to calculate average slope along the longest flow path. Based on this slope, flow velocities within each drainage area were determined using the velocity-slope relationships published in the Caltrans HDM (Figure 1). Subsequently, these velocities were used to determine the "Time to Concentration" for each culvert site based on the time it takes runoff to flow along the longest flow path within the contributing watershed and arrive at the culvert crossing.

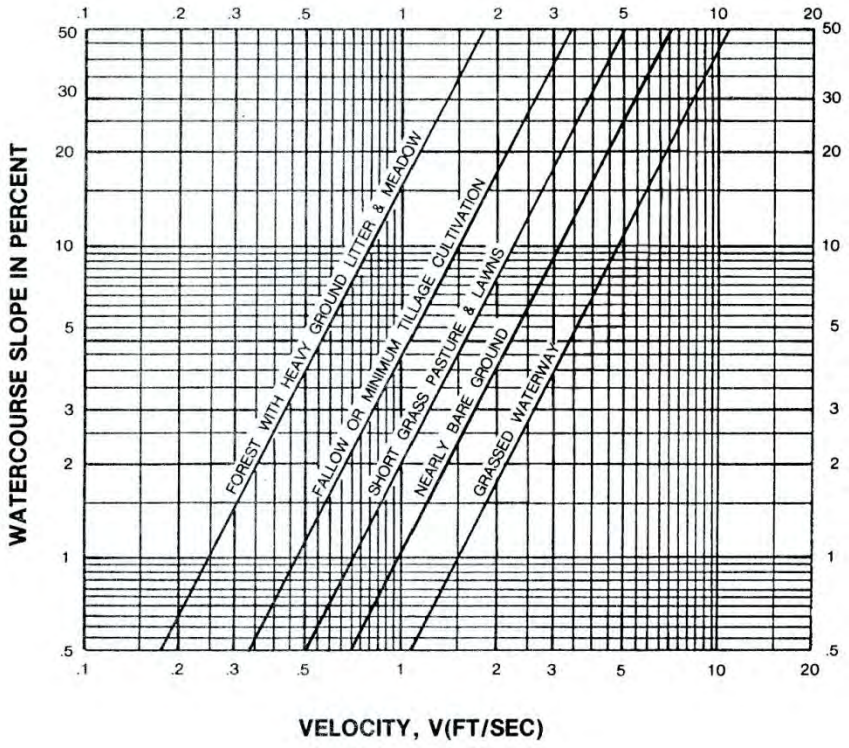


Figure 1. Velocities for upland method of estimating travel time for shallow concentrated flow (adopted from Figure 816.6 of the Caltrans HDM [2014]).

[1] http://water.usgs.gov/osw/streamstats/california.html

4 PRECIPITATION DATA

The intensity-duration-frequency (IDF) curves used for the Rational Method analysis came from NOAA's National Weather Service Hydrometeorological Design Studies Center Precipitation Frequency Data Server (PFDS).[2] For each of the 87 culvert sites, rainfall intensity was determined from the IDF curve for the storm duration equivalent to the "Time to Concentration" calculated from the GIS data. All culverts were screened based on the IDF curve with the maximum 100-year rainfall intensities for the entire project area (located at approximately Latitude: 38.8818 degrees, Longitude: -120.3604 degrees). Then, for culverts that were determined to have insufficient capacity based on the maximum rainfall intensities, a finer scale iteration was performed with site-specific IDF data taken from NOAA's PFDS.

5 RUNOFF COEFFICIENTS

The runoff coefficients used in the Rational Formula were determined using the method for un-developed areas in the Caltrans HDM (Figure 2). For this analysis, the soil infiltration, vegetation cover, and surface storage coefficients were all assumed to have a constant value of 0.08, indicating normal to high runoff rates. Therefore, the computed runoff coefficients ranged from 0.35 to 0.56 depending only on the relief (i.e., slope) of the contributing watershed.

6 RAIN-ON-SNOW RUNOFF CONSIDERATION

Considering that the project area is located in the Sierra Nevada mountain range, it is possible that the region could experience a rain-on-snow storm event that could increase runoff amounts. The Caltrans HDM does not explicitly describe a method to incorporate rain-on-snow events into hydrologic calculations using the Rational Method. However, the Washington State Department of Transportation Hydraulics Manual (2008) suggests a formula for calculating additional runoff from rain-on-snow events and states that this additional "snow water equivalent should not be greater than 1.5 in/day." This maximum additional runoff is equal to 0.06 in/hour, which is a small fraction of the rainfall intensities used in the Rational Formula calculations. In addition, this slight potential increase is balanced by the fact that the Rational Formula is generally considered to provide conservative (high) flow discharges and also that conservative runoff coefficients have been selected for this project.

In general, rain-on-snow events affect storm discharges for large (>320 acres) drainage areas during longer duration storms. Rain-on-snow events are incorporated into the USGS regression equations that were used to calculate flows at the four largest culvert sites within the project area.

7 CULVERT HYDRAULICS

Hydraulics for all 91 culvert sites were modeled using the U.S. Army Corps of Engineers' *Hydrologic Engineering Center's River Analysis System* (HEC-RAS). For this study, it was assumed that all culverts are operating under inlet-controlled conditions. This condition occurs when the culvert barrel is capable of carrying more flow than the inlet will accept and is true of most culverts in rural mountainous regions that are 40 to 100 feet in length and have slopes

[2] http://hdsc.nws.noaa.gov/hdsc/pfds/pfds_map_cont.html

greater than 0.5 percent. Under inlet-controlled conditions, as more water pressure or "head" is backed up behind the culvert, more flow is forced through the inlet. For the first iteration of the culvert sizing analysis, it was assumed that each specific culvert diameter could handle flows with a head height that was 1.5 times higher than the culvert diameter before overtopping the road. That is, the road fill on top of the culvert was assumed to have a minimum thickness of half the diameter of the culvert, which is the case for approximately 80% of the sites. For culverts that were determined to have insufficient capacity based on this default headwall height, or for sites where less road fill was present based on field measurements of headwall height, a second culvert sizing iteration was performed. This second iteration allowed for reduced or increased build-up of upstream flow depths based on the on-the-ground conditions. However, the second iteration affected results at less than 5% of the culvert sites because increased flow build-up behind a culvert does not lead to significant increases in flow capacity and most culverts with thin road-fill thicknesses were already determined to be significantly undersized.

Watershed Types

	Extreme	High	Normal	Low
Relief	.28 -.35 Steep, rugged terrain with average slopes above 30%	.20 -.28 Hilly, with average slopes of 10 to 30%	.14 -.20 Rolling, with average slopes of 5 to 10%	.08 -.14 Relatively flat land, with average slopes of 0 to 5%
Soil Infiltration	.12 -.16 No effective soil cover, either rock or thin soil mantle of negligible infiltration capacity	.08 -.12 Slow to take up water, clay or shallow loam soils of low infiltration capacity, imperfectly or poorly drained	.06 -.08 Normal; well drained light or medium textured soils, sandy loams, silt and silt loams	.04 -.06 High; deep sand or other soil that takes up water readily, very light well drained soils
Vegetal Cover	.12 -.16 No effective plant cover, bare or very sparse cover	.08 -.12 Poor to fair; clean cultivation crops, or poor natural cover, less than 20% of drainage area over good cover	.06 -.08 Fair to good; about 50% of area in good grassland or woodland, not more than 50% of area in cultivated crops	.04 -.06 Good to excellent; about 90% of drainage area in good grassland, woodland or equivalent cover
Surface Storage	.10 -.12 Negligible surface depression few and shallow; drainageways steep and small, no marshes	.08 -.10 Low; well defined system of small drainageways; no ponds or marshes	.06 -.08 Normal; considerable surface depression storage; lakes and pond marshes	.04 -.06 High; surface storage, high; drainage system not sharply defined; large floodplain storage or large number of ponds or marshes

Figure 2. Runoff coefficients for undeveloped areas (adopted from Figure 819.2A of the Caltrans HDM [2014]).

8 CULVERT CAPACITY SUMMARY

A summary of the culvert sizing analysis and results is presented in Table 1, with culvert locations shown on the nine maps attached to this memorandum. Of the 91 sites analyzed, 57 culverts were found to be undersized and should be upgraded in order to provide 100-year flow conveyance. Based on field observations, additional site-specific recommendations for upgrading several of the larger culverts and one critical road segment are discussed below:

- Site 514: A large boulder should be removed from the culvert inlet to insure full flow capacity.
- Site 770: The existing crossing structure does not have capacity to carry the 100-year flow. However, there is a critical dip located along the road on the north side of the culvert with minimal road fill and gentle vegetated side slopes, so overtopping of the culvert would cause minimal damage.
- Road Number 11NY05: During field surveys, this road segment was identified as one of the highest priority targets for maintenance. Results from the culvert sizing analysis confirmed that most of the culverts on this road are undersized. The recommended culvert diameters for each site are listed in Table 1. However, another potential option would be to leave some of the existing culverts in place and install new culverts to increase flow conveyance. However, for this type of project, additional field reconnaissance and hydrologic analysis would be required.

9 LIMITIATIONS OF THIS ANALYSIS

It is important to note that the geospatial data used for culvert sizing analysis with the Rational Method is based on 10 meter Digital Elevation Models (DEMs), which provide useful planning assistance but lack precision. At locations where the DEMs did not align with field data, engineering judgment was used to fine-tune the drainage areas and flow paths. In addition, the accuracy of this analysis is limited by on-the-ground anthropogenic disturbances, such as road and timber harvest activities which have altered natural drainage patterns, especially in areas that have numerous spur roads and/or switchbacks in close proximity.

Therefore, additional field measurements may be needed prior to final project design to fully capture all on-the-ground drainage intricacies.

10 REFERENCES

Caltrans (California Department of Transportation). 2014. Highway Design Manual. Available at: http://www.dot.ca.gov/hq/oppd/hdm/hdmtoc.htm [Accessed September 1, 2014].

Washington State Department of Transportation. 2010. Hydraulics Manual. Available at: http://www.wsdot.wa.gov/publications/manuals/fulltext/m23-03/hydraulicsmanual.pdf [Accessed September 1, 2014].

Table 1. Summary of culvert sizing analysis results.

Method[1]	Q100 Site ID#	Road or Trail Number	Existing Culvert Diameter (inches)	Drainage Area (acres)	Longest Flow Path (ft)	Maximum Elevation Change (ft)	Slope (%)	Velocity from Figure 1 (ft/s)	Time to Concen-tration (minutes)	Intensity (from NOAA IDF Curve) (in/hr)	Runoff Coefficient from Figure 2	Flow from Rational Method or USGS Stream-stats (cfs)	Passes 100-year Flow?	Culvert Diameter Required (inches)
RM+HR	62	12N23Y	18	7	924	150	16.2	1.1	14.0	3.3	0.41	9.0	YES	
RM+HR	95	12N30D	24	9	1,200	190	15.8	1.1	18.2	3.5	0.48	15.2	YES	
RM+HR	95	12N30D	24	2	513	161	31.4	1.45	5.9	10.1	0.56	9.8	YES	
RM+HR	96	12N30D	18	5	882	225	25.5	1.35	10.9	5.3	0.48	12.4	NO	24
RM+HR	100	12N30D	24	13	1,761	486	27.6	1.35	21.7	3.5	0.48	21.9	NO	30
RM+HR	101	12N30D	24	11	1,328	485	36.5	1.55	14.3	4.3	0.56	26.8	NO	30
RM+HR	141	12N30E	24	4	458	58	12.6	0.9	8.5	7.8	0.48	13.2	YES	
RM+HR	147	12N30E	24	30	1,713	388	22.7	1.25	22.8	3.5	0.48	51.1	NO	36
RM+HR	190	12N30H	18	51	1,386	170	12.3	0.9	25.7	3.0	0.35	53.8	NO	36
RM+HR	191	12N30H	36	59	1,921	296	15.4	1.1	29.1	2.7	0.41	66.3	NO	42
RM+HR	249	12N30M	18	22	1,321	106	8.0	0.75	29.3	2.7	0.35	20.9	NO	30
RM+HR	260	12N34B	18	4	500	25	5.0	0.55	15.2	5.2	0.35	6.4	YES	
RM+HR	269	11N37E	24	6	723	116	16.1	1.1	11.0	6.5	0.48	19.0	YES	
RM+HR	286	12N34P	36	32	2,149	718	33.4	1.45	24.7	2.2	0.56	39.7	YES	
RM+HR	400	12N34_S1	24	38	3,000	1,450	48.3	1.75	28.6	2.0	0.56	42.9	NO	36
RM+HR	401	12N34_S1	24	30	3,000	1,450	48.3	1.75	28.6	2.0	0.56	33.9	NO	30
RM+HR	402	12N34_S1	24	8	1,700	1,000	58.8	1.8	15.7	2.7	0.56	12.2	YES	
RM+HR	405	12N34_S1	36	68	3,018	1,148	38.0	1.55	32.5	2.0	0.56	76.8	NO	48
RM+HR	407	12N34_S1	24	51	2,978	1,101	37.0	1.55	32.0	2.0	0.56	57.7	NO	42
RM+HR	411	12N34_S1	30	24	1,999	834	41.7	1.65	20.2	2.5	0.56	33.3	YES	
RM+HR	412	12N34_S1	18	23	1,949	776	39.8	1.55	21.0	2.5	0.56	33.1	NO	30
RM+HR	413	12N34_S1	24	13	1,521	716	47.1	1.75	14.5	2.8	0.56	21.1	NO	30
RM+HR	414	12N34_S1	36	32	2,054	671	32.7	1.45	23.6	2.4	0.56	42.8	YES	
RM+HR	416	12N34_S1	24	15	763	397	52.0	1.8	7.1	3.8	0.56	32.5	NO	30
RM+HR	417	12N34_S1	24	5	831	347	41.7	1.65	8.4	3.8	0.56	11.1	YES	
RM+HR	419	12N34_S1	24	4	825	139	16.9	1.1	12.5	2.8	0.48	5.5	YES	
RM+HR	489	11N60	18	4	702	152	21.7	1.25	9.4	4.4	0.48	8.4	YES	
RM+HR	491	11N60	36	107	5,429	478	8.8	0.75	120.6	1.2	0.41	52.6	YES	
RM+HR	493	11N60	24	3	622	264	42.4	1.65	6.3	9.6	0.56	14.0	YES	

Method[1]	Q100 Site ID#	Road or Trail Number	Existing Culvert Diameter (inches)	Drainage Area (acres)	Longest Flow Path (ft)	Maximum Elevation Change (ft)	Slope (%)	Velocity from Figure 1 (ft/s)	Time to Concen-tration (minutes)	Intensity (from NOAA IDF Curve) (in/hr)	Runoff Coefficient from Figure 2	Flow from Rational Method or USGS Stream-stats (cfs)	Passes 100-year Flow?	Culvert Diameter Required (inches)
RM+HR	507	11N60	Other: Two culverts with 24"and 36" diameters	171	7,877	1,619	20.6	1.25	105.0	1.2	0.48	99.1	NO	Other: Two culverts with 36" diameter
RM+HR	510	11N60	30	32	2,801	1,416	50.6	1.8	25.9	2.5	0.56	45.2	NO	36
RM+HR	511	11N60	Other: Three culverts with 24", 30", and 36" diamter	73	3,237	1,503	46.4	1.75	30.8	2.3	0.56	94.2	YES	
GS+HR	514	11N60	Other: Box culvert with 10' height and 11.5' width	1728								1140.0	YES	
RM+HR	515	11N60	18	28	2,599	1,458	56.1	1.8	24.1	2.5	0.56	40.1	NO	36
RM+HR	613	13N11	Other: Oval culvert with 25" height and 40" width	56	3,038	230	7.6	0.7	72.3	1.7	0.35	33.7	YES	
RM+HR	614	13N11	18	8	1,165	101	8.6	0.75	25.9	3.5	0.41	12.1	NO	24
RM+HR	615	13N11	Other: Oval culvert with 28" height and 44" width	217	6,613	772	11.7	0.9	122.5	1.2	0.35	90.2	NO	48
RM+HR	616	13N11	Other: Oval culvert with 28" height and 40" width	10	1,500	215	14.3	0.9	27.8	3.4	0.48	16.3	YES	
RM+HR	618	13N11	18	50	4,500	130	2.9	0.4	187.5	0.8	0.35	13.5	NO	24
RM+HR	620	13N11	24	16	1,699	368	21.7	1.25	22.7	3.9	0.48	29.5	NO	30
RM+HR	731	13N19A	Other: Oval culvert with 20" rise and 22" width	6	650	190	29.2	1.35	8.0	6.0	0.48	17.4	NO	24
RM+HR	732	13N19A	18	45	2,695	419	15.6	1.1	40.8	2.4	0.48	52.8	NO	36
RM+HR	766	13N21	Other: Oval culvert with 46" height and 72" width	71	2,389	314	13.1	0.9	44.2	2.4	0.48	83.1	YES	

Method[1]	Q100 Site ID#	Road or Trail Number	Existing Culvert Diameter (inches)	Drainage Area (acres)	Longest Flow Path (ft)	Maximum Elevation Change (ft)	Slope (%)	Velocity from Figure 1 (ft/s)	Time to Concen-tration (minutes)	Intensity (from NOAA IDF Curve) (in/hr)	Runoff Coefficient from Figure 2	Flow from Rational Method or USGS Stream-stats (cfs)	Passes 100-year Flow?	Culvert Diameter Required (inches)
RM+HR	767	13N21	24	4	1,000	200	20.0	1.1	15.2	5.2	0.48	9.8	YES	
RM+HR	768	13N21	18	4	1,034	204	19.8	1.1	15.7	5.0	0.48	9.5	YES	
GS+HR	770	13N21	Other: Arch culvert with 7.3' height and 11.7' width	1792								1150.0	NO	Other: Arch with 8' height and 18' width
RM+HR	783	11N60B	18	15	1,806	107	5.9	0.6	50.2	1.7	0.35	8.9	YES	
RM+HR	784	13N23	18	3	752	53	7.0	0.65	19.3	4.4	0.41	4.8	YES	
GS+HR	825	ELD_8014	Other: Two culverts with 64" diameter	4928								2450.0	NO	Other: Arch with 10' height and 20' width
RM+HR	826	ELD_8014	18	4	800	210	26.3	1.35	9.9	3.1	0.48	5.3	YES	
RM+HR	865	Trail_2	24	2	350	190	54.3	1.8	3.2	4.3	0.56	4.9	YES	
RM+HR	866	Trail_2	18	18	1,725	976	56.6	1.8	16.0	2.5	0.56	26.0	NO	30
RM+HR	874	Trail_2a	24	9	1,433	859	59.9	1.8	13.3	2.5	0.56	13.4	YES	
RM+HR	875	Trail_2a	18	4	600	250	41.7	1.65	6.1	4.3	0.56	8.5	YES	
RM+HR	879	11N60BE	36	100	3,500	290	8.3	0.75	77.8	1.6	0.41	64.1	NO	42
RM+HR	898	11N60D	24	16	1,386	307	22.1	1.25	18.5	2.9	0.48	23.1	NO	30
RM+HR	899	11N60D	18	7	933	253	27.1	1.35	11.5	4.3	0.48	15.0	NO	24
RM+HR	910	11N60DB	24	5	875	251	28.7	1.35	10.8	4.3	0.48	10.1	YES	
RM+HR	963	11N71	24	11	1,350	291	21.5	1.25	18.0	3.7	0.48	19.5	YES	
RM+HR	964	11N71	24	37	1,946	365	18.8	1.1	29.5	2.4	0.48	42.6	NO	36
RM+HR	965	11N71	24	7	1,764	502	28.5	1.35	21.8	4.0	0.48	12.7	YES	
RM+HR	1038	11NY05	18	22	2,252	589	26.1	1.35	27.8	2.0	0.48	21.0	NO	30
RM+HR	1039	11NY05	18	5	1,074	516	48.1	1.75	10.2	4.1	0.56	11.4	NO	24
RM+HR	1040	11NY05	18	9	1,057	573	54.2	1.8	9.8	4.1	0.56	21.5	NO	30
RM+HR	1041	11NY05	18	12	1,149	657	57.2	1.8	10.6	4.1	0.56	28.4	NO	30
RM+HR	1042	11NY05	18	8	1,108	534	48.2	1.75	10.6	4.1	0.56	17.4	NO	24
RM+HR	1043	11NY05	18	14	1,008	530	52.5	1.8	9.3	4.1	0.56	33.0	NO	30
RM+HR	1044	11NY05	18	6	1,272	554	43.6	1.65	12.8	4.1	0.56	12.9	NO	24
RM+HR	1045	11NY05	18	9	1,367	517	37.8	1.55	14.7	2.9	0.56	14.0	NO	24
RM+HR	1046	11NY05	18	17	2,128	621	29.2	1.35	26.3	2.0	0.48	16.6	NO	24
RM+HR	1048	11NY05	18	18	1,943	717	36.9	1.55	20.9	2.6	0.56	26.8	NO	30

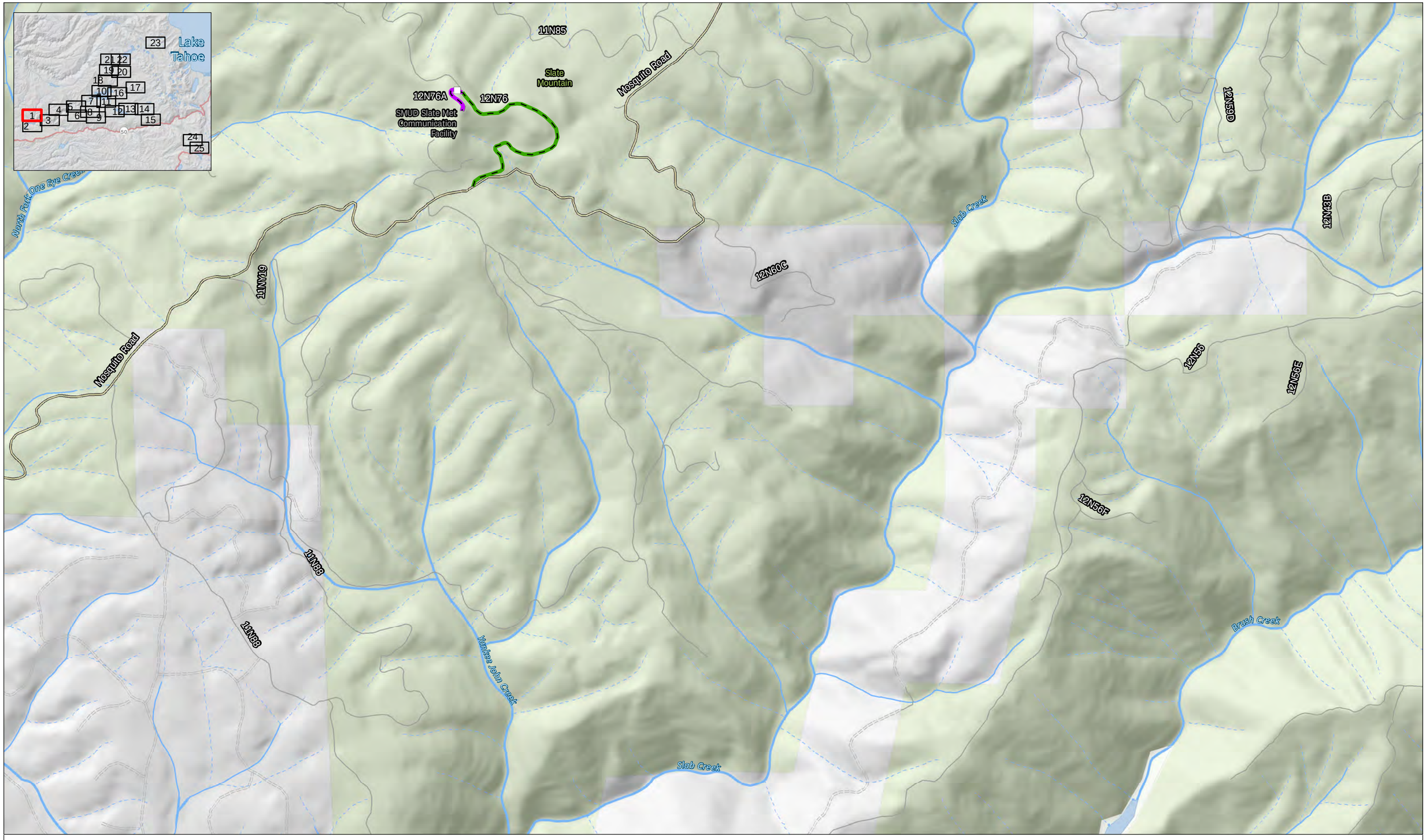
Method[1]	Q100 Site ID#	Road or Trail Number	Existing Culvert Diameter (inches)	Drainage Area (acres)	Longest Flow Path (ft)	Maximum Elevation Change (ft)	Slope (%)	Velocity from Figure 1 (ft/s)	Time to Concen-tration (minutes)	Intensity (from NOAA IDF Curve) (in/hr)	Runoff Coefficient from Figure 2	Flow from Rational Method or USGS Stream-stats (cfs)	Passes 100-year Flow?	Culvert Diameter Required (inches)
RM+HR	1049	11NY05	18	4	848	595	70.2	1.8	7.9	4.1	0.56	8.3	YES	
RM+HR	1051	11NY05	18	6	1,027	753	73.3	1.8	9.5	4.1	0.56	14.0	NO	24
RM+HR	1053	11NY05	18	5	1,297	977	75.3	1.8	12.0	4.1	0.56	11.3	NO	24
RM+HR	1054	11NY05	18	31	1,520	1,036	68.2	1.8	14.1	2.9	0.56	51.5	NO	36
RM+HR	1055	11NY05	18	33	1,870	1,249	66.8	1.8	17.3	2.9	0.56	54.2	NO	36
RM+HR	1056	11NY05	18	25	2,247	1,195	53.2	1.8	20.8	2.6	0.56	36.1	NO	36
RM+HR	1057	11NY05	18	6	1,280	973	76.0	1.8	11.9	4.1	0.56	14.7	NO	24
RM+HR	1113	11NY20A	24	42	2,417	281	11.6	0.9	44.8	1.6	0.48	32.5	NO	30
RM+HR	1115	11NY20A	36	120	4,116	397	9.6	0.78	88.0	1.2	0.41	59.4	NO	42
RM+HR	1116	11NY20A	42	110	4,685	397	8.5	0.75	104.1	1.3	0.41	60.3	YES	
RM+HR	1142	12N05Y	24	35	2,705	560	20.7	1.25	36.1	2.8	0.48	47.7	NO	36
RM+HR	1143	12N05Y	18	3	545	69	12.7	0.9	10.1	6.9	0.48	8.5	YES	
RM+HR	1144	11NY05	18	9	1,050	130	12.4	0.9	19.4	3.7	0.48	16.1	NO	24
RM+HR	1175	11N12	24	9	1,227	286	23.3	1.25	16.4	2.8	0.48	12.1	YES	
GS+HR	1176	11N12	48	640								511.0	NO	96
RM+HR	1179	11N12	24	16	1,469	548	37.3	1.55	15.8	2.8	0.56	25.3	NO	30
RM+HR	1214	12N21B	24	14	1,611	359	22.3	1.25	21.5	3.6	0.48	24.5	NO	30
RM+HR	1215	12N21B	18	4	1,400	180	12.9	0.9	25.9	3.5	0.48	6.8	YES	
RM+HR	1216	12N21B	36	66	2,692	638	23.7	1.25	35.9	2.7	0.48	85.8	NO	48
RM+HR	1217	12N21B	24	22	1,971	505	25.6	1.35	24.3	3.6	0.48	37.7	NO	36
RM+HR	1218	12N21B	36	71	2,893	562	19.4	1.1	43.8	2.1	0.48	72.2	NO	42
RM+HR	2000	12N22	Other: Oval culvert with 21" height and 29" width	202	5,956	1,028	17.3	1.1	90.2	1.5	0.48	146.4	NO	60

[1] Culvert sizing method abbreviations: RM+HR = Rational Method and HEC-RAS; GS+HR = USGS Streamstats and HEC-RAS

Appendix E

Transportation System Maps

This page intentionally left blank.



UARP PROJECT RELATED ROADS

Sources:
Roads (USFA, FS, 2014); Streams (NHD 24k); Hillshade (NED 10m); Facilities (SMUD); Ownership (USFS, 2011)

- Reference points
- Transmission Structures
- Transmission Line
- FERC boundary
- Facilities
- Helispot
- SMUD administrative trails
- Adit
- Canal
- Channel
- Penstock
- Tunnel

Gates
- SMUD (existing)
- Private (existing)
- USFS (existing)
- SMUD (proposed)

UARP Project Related Roads*
- SMUD (2)
- SMUD (3)
- SMUD (4)
- USFS (1)
- USFS (2)
- USFS (3)
- USFS (4)

Other Roads
- USFS
- SMUD
- County
- Highways
- Private (other)

Rivers & Streams
- Perennial
- Intermittent
- Ephemeral

- California Waterbodies
- Township & Range

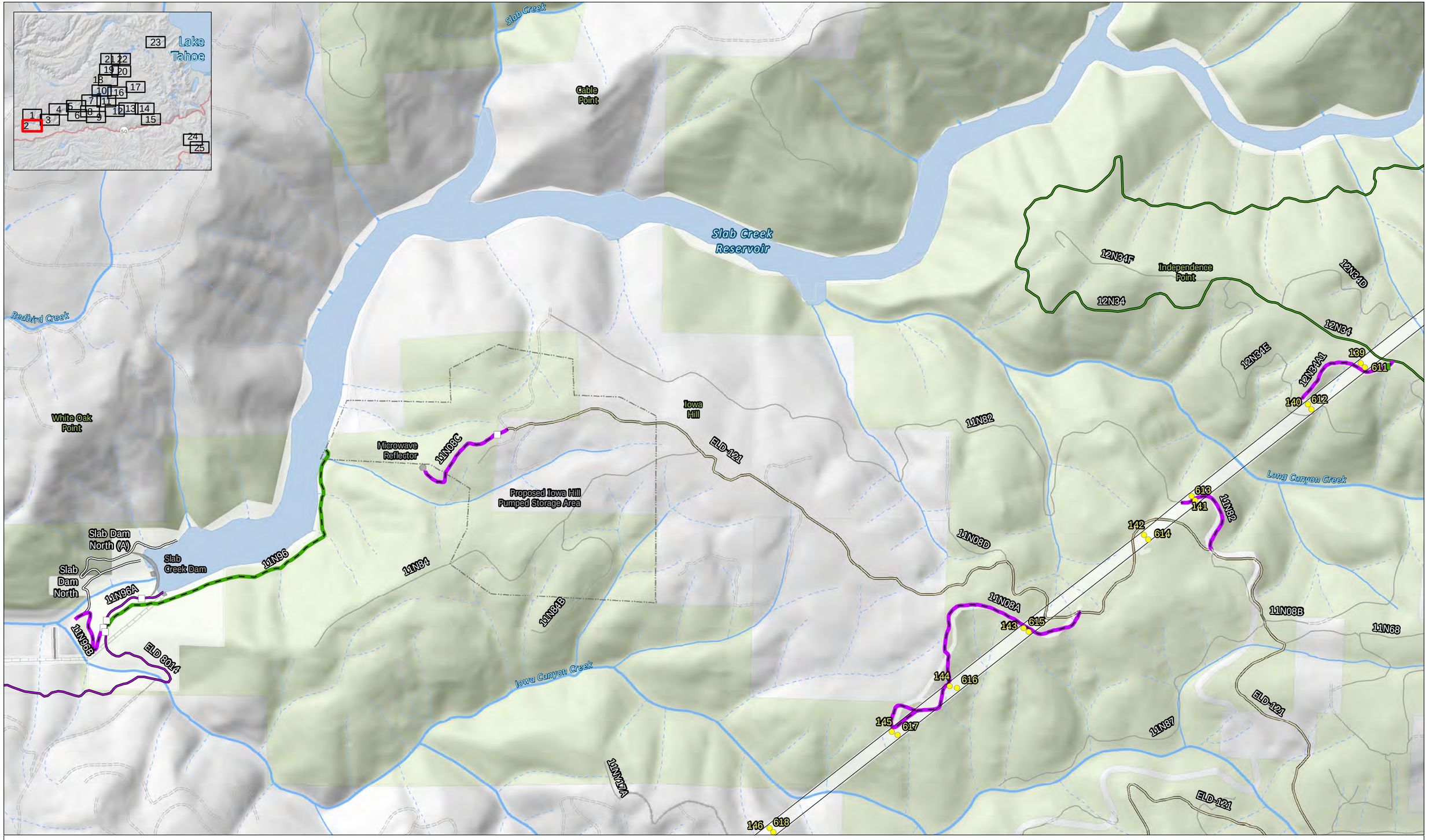
Ownership
- US Forest Service
- Private

* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

0 500 1,000 2,000 Feet

Stillwater Sciences
9/30/2015 RRA

Z:\Data\575.00_LCFRB\Arcmap\Work\RoadMapbook_v7.mxd_9/30/2015_RRA



UARP PROJECT RELATED ROADS

Sources:
Roads (USFA, FS, 2014); Streams (NHD 24k); Hillshade (NED 10m); Facilities (SMUD); Ownership (USFS, 2011)

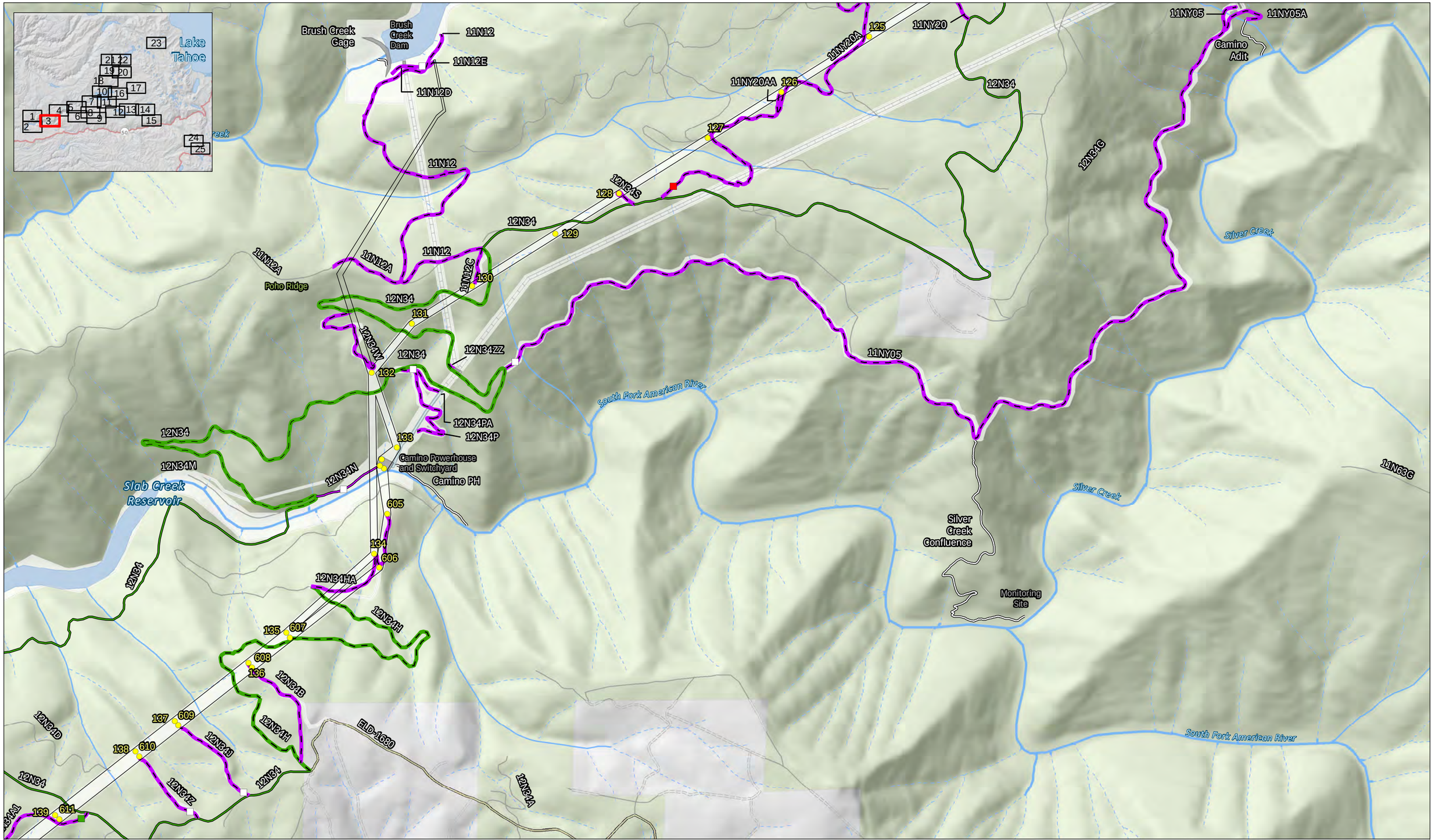
- Reference points
- Transmission Structures
- Transmission Line
- FERC boundary
- Facilities
- Helispot
- SMUD administrative trails
- Adit
- Canal
- Channel
- Penstock
- Tunnel
- Gates
  - SMUD (existing)
  - Private (existing)
  - USFS (existing)
  - SMUD (proposed)
- UARP Project Related Roads*
  - SMUD (2)
  - SMUD (3)
  - SMUD (4)
  - USFS (1)
  - USFS (2)
  - USFS (3)
  - USFS (4)
- Other Roads
  - USFS
  - SMUD
- County
- Highways
- Private (other)
- Rivers & Streams
  - Perennial
  - Intermittent
  - Ephemeral
- California Waterbodies
- Township & Range
- Ownership
  - US Forest Service
  - Private

* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

0 500 1,000 2,000 Feet

Stillwater Sciences
9/30/2015 RRA

Z:\Data\575.00_LCFRB\Arcmap\Work\RoadMapbook_v7.mxd_9/30/2015_RRA



UARP PROJECT RELATED ROADS

Sources:
Roads (USFA, FS, 2014); Streams (NHD 24k); Hillshade (NED 10m); Facilities (SMUD); Ownership (USFS, 2011)

Reference points
Transmission Structures
Transmission Line
FERC boundary

Facilities
Helispot
SMUD administrative trails

Adit
Canal
Channel
Penstock
Tunnel

Gates
SMUD (existing)
Private (existing)
USFS (existing)
SMUD (proposed)

UARP Project Related Roads*
SMUD (2)
SMUD (3)
SMUD (4)

USFS (1)
USFS (2)
USFS (3)
USFS (4)

Other Roads
USFS
SMUD

County
Highways
Private (other)

Rivers & Streams
Perennial
Intermittent
Ephemeral

California Waterbodies
Township & Range

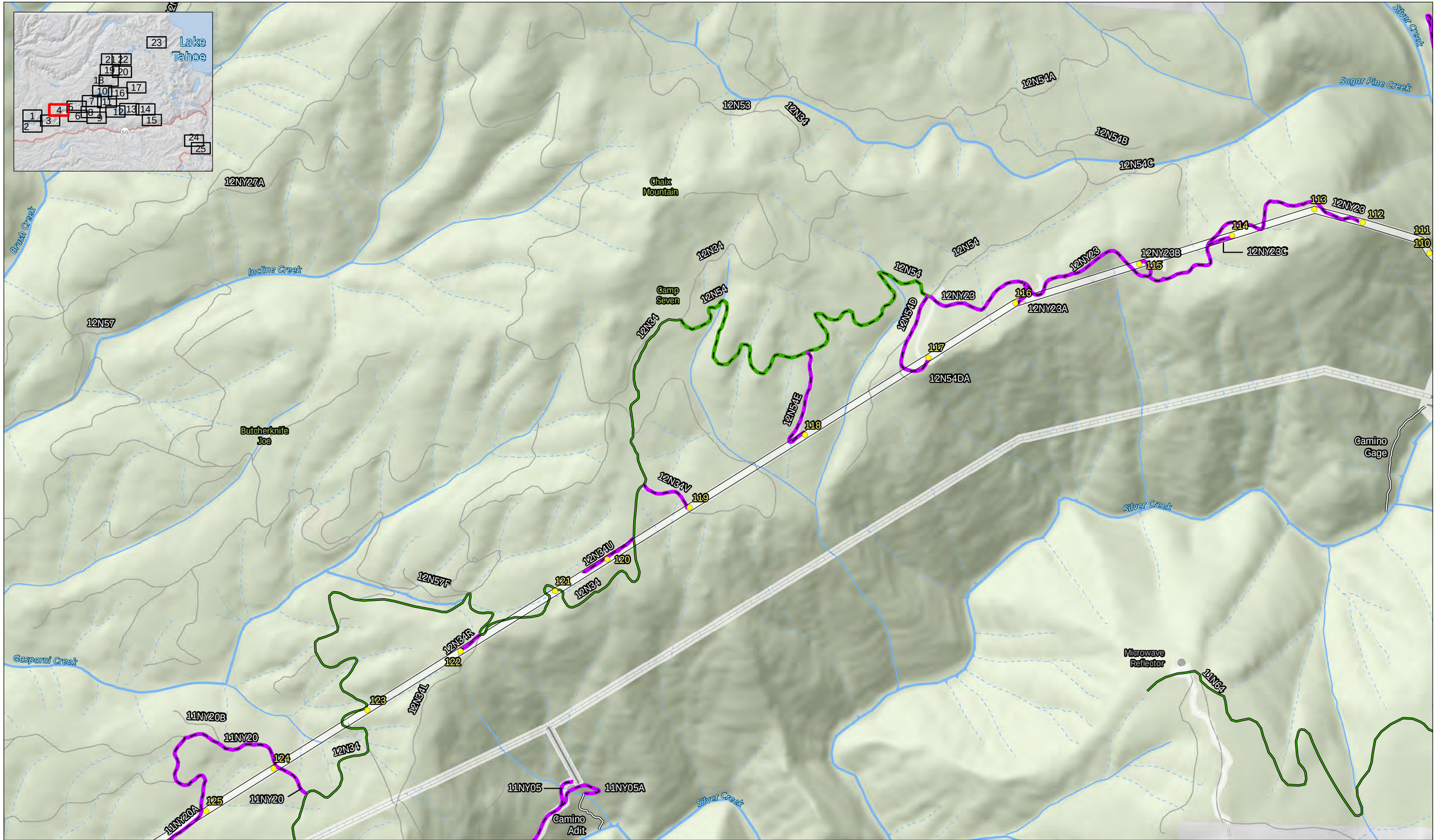
Ownership
US Forest Service
Private

* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

0 500 1,000 2,000 Feet

Stillwater Sciences
9/30/2015_RRA

Z:\Data\575.00_LCFRB\Arcmap\Work\RoadMapbook_v7.mxd_9/30/2015_RRA



UARP PROJECT RELATED ROADS

Sources:
Roads (USFA, FS, 2014); Streams (NHD 24k); Hillshade (NED 10m); Facilities (SMUD); Ownership (USFS, 2011)

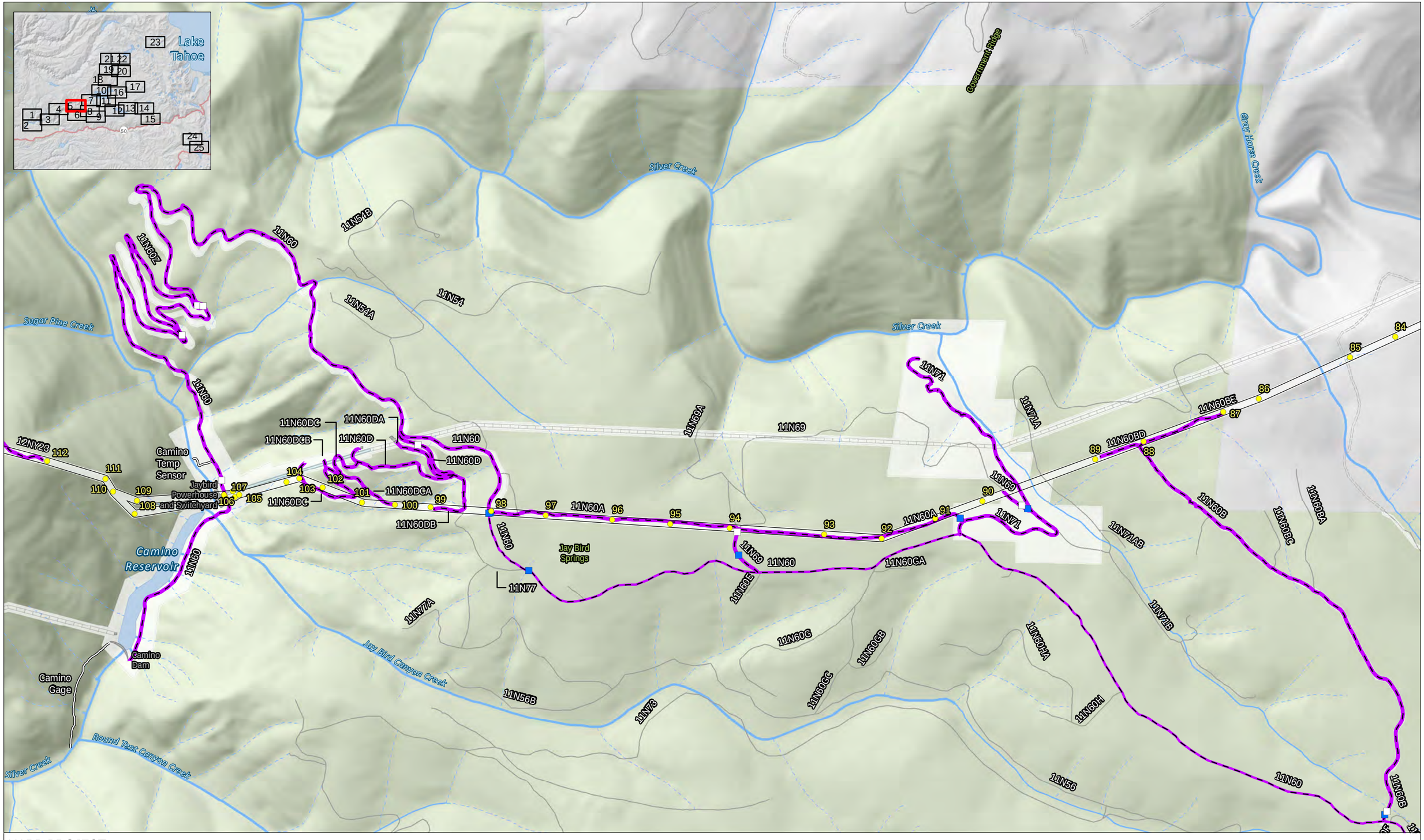
- Reference points
- Transmission Structures
- Transmission Line
- FERC boundary
- Facilities
- Helispot
- SMUD administrative trails
- Adit
- Canal
- Channel
- Penstock
- Tunnel
- Gates
  - SMUD (existing)
  - Private (existing)
  - USFS (existing)
  - SMUD (proposed)
- UARP Project Related Roads*
  - SMUD (2)
  - SMUD (3)
  - SMUD (4)
- USFS (1)
- USFS (2)
- USFS (3)
- USFS (4)
- Other Roads
  - USFS
  - SMUD
- County
- Highways
- Private (other)
- Rivers & Streams
  - Perennial
  - Intermittent
  - Ephemeral
- California Waterbodies
- Township & Range
- Ownership
  - US Forest Service
  - Private

* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

0 500 1,000 2,000 Feet

Stillwater Sciences
9/30/2015 RRA

Z:\Data\575.00_LCFRB\ArcmapWork\RoadMapbook_v7.mxd_9/30/2015_RRA



UARP PROJECT RELATED ROADS

Sources:
Roads (USFA, FS, 2014); Streams (NHD 24k); Hillshade (NED 10m); Facilities (SMUD); Ownership (USFS, 2011)

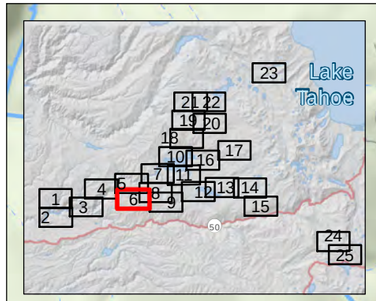
- Reference points
- Transmission Structures
- Transmission Line
- FERC boundary
- Facilities
- Helispot
- SMUD administrative trails
- Adit
- Canal
- Channel
- Penstock
- Tunnel
- Gates
  - SMUD (existing)
  - Private (existing)
  - USFS (existing)
  - SMUD (proposed)
- UARP Project Related Roads*
  - SMUD (2)
  - SMUD (3)
  - SMUD (4)
  - USFS (1)
  - USFS (2)
  - USFS (3)
  - USFS (4)
- Other Roads
  - USFS
  - SMUD
- County
- Highways
- Private (other)
- Rivers & Streams
  - Perennial
  - Intermittent
  - Ephemeral
- California Waterbodies
- Township & Range
- Ownership
  - US Forest Service
  - Private

* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

0 500 1,000 2,000 Feet

Stillwater Sciences
9/30/2015 RRA

Z:\Data\575.00_LCFRB\ArcmapWork\RoadMapbook_v7.mxd_9/30/2015_RRA



11N56B
Jay Bird Canyon Creek
11N78
11N60C
11N60H
11N56
11N60
11N60B
11N72
11N60F
11N60
11N57B
11N56A
11N56CA
11N64F
11N64E
11N64
11N57
Round Tent Canyon Creek
11N64
11N57
Cedar Springs
Peavine Ridge
Little Soldier Creek
Telephone Ridge

UARP PROJECT RELATED ROADS

Sources:
Roads (USFA, FS, 2014); Streams (NHD 24k); Hillshade (NED 10m); Facilities (SMUD); Ownership (USFS, 2011)

- Reference points
- Transmission Structures
- Transmission Line
- FERC boundary
- Facilities
- Helispot
- SMUD administrative trails
- Adit
- Canal
- Channel
- Penstock
- Tunnel
- Gates
  - SMUD (existing)
  - Private (existing)
  - USFS (existing)
  - SMUD (proposed)
- UARP Project Related Roads*
  - SMUD (2)
  - SMUD (3)
  - SMUD (4)
  - USFS (1)
  - USFS (2)
  - USFS (3)
  - USFS (4)
- Other Roads
  - USFS
  - SMUD
- County
- Highways
- Private (other)
- Rivers & Streams
  - Perennial
  - Intermittent
  - Ephemeral
- California Waterbodies
- Township & Range
- Owernship
  - US Forest Service
  - Private

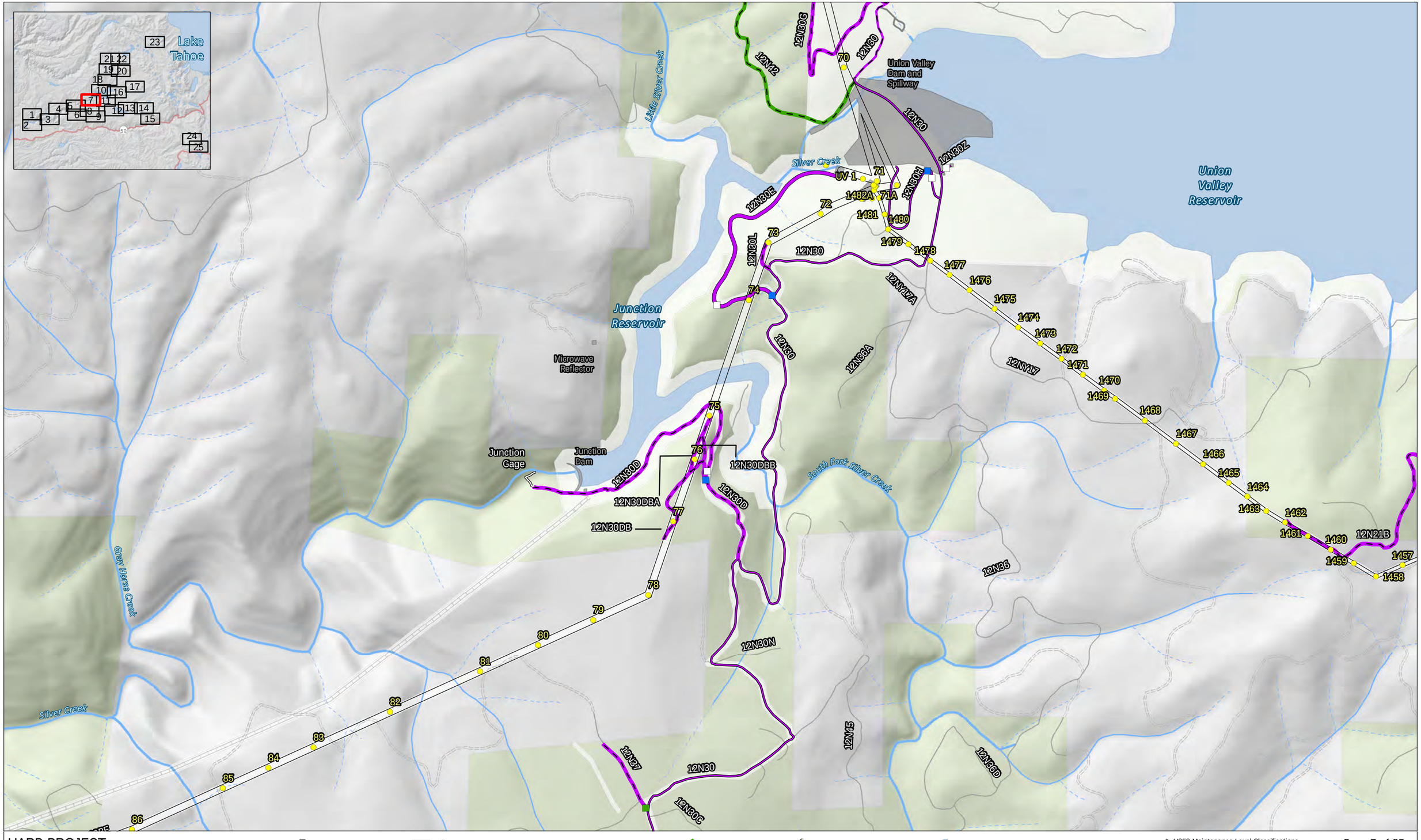
* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

N

0 500 1,000 2,000 Feet

Stillwater Sciences
9/30/2015 RRA

Z:\Data\575.00_LCFRB\Arcmap\Work\RoadMapbook_v7.mxd_9/30/2015_RRA



UARP PROJECT RELATED ROADS

Sources:
Roads (USFA, FS, 2014); Streams (NHD 24k); Hillshade (NED 10m); Facilities (SMUD); Ownership (USFS, 2011)

- Reference points
- Transmission Structures
- Transmission Line
- FERC boundary
- Facilities
- Helispot
- SMUD administrative trails
- Adit
- Canal
- Channel
- Penstock
- Tunnel
- Gates
  - SMUD (existing)
  - Private (existing)
  - USFS (existing)
  - SMUD (proposed)
- UARP Project Related Roads*
  - SMUD (2)
  - SMUD (3)
  - SMUD (4)
- USFS (1)
- USFS (2)
- USFS (3)
- USFS (4)
- Other Roads
  - USFS
  - SMUD
- County
- Highways
- Private (other)
- Rivers & Streams
  - Perennial
  - Intermittent
  - Ephemeral
- California Waterbodies
- Township & Range
- Ownership
  - US Forest Service
  - Private

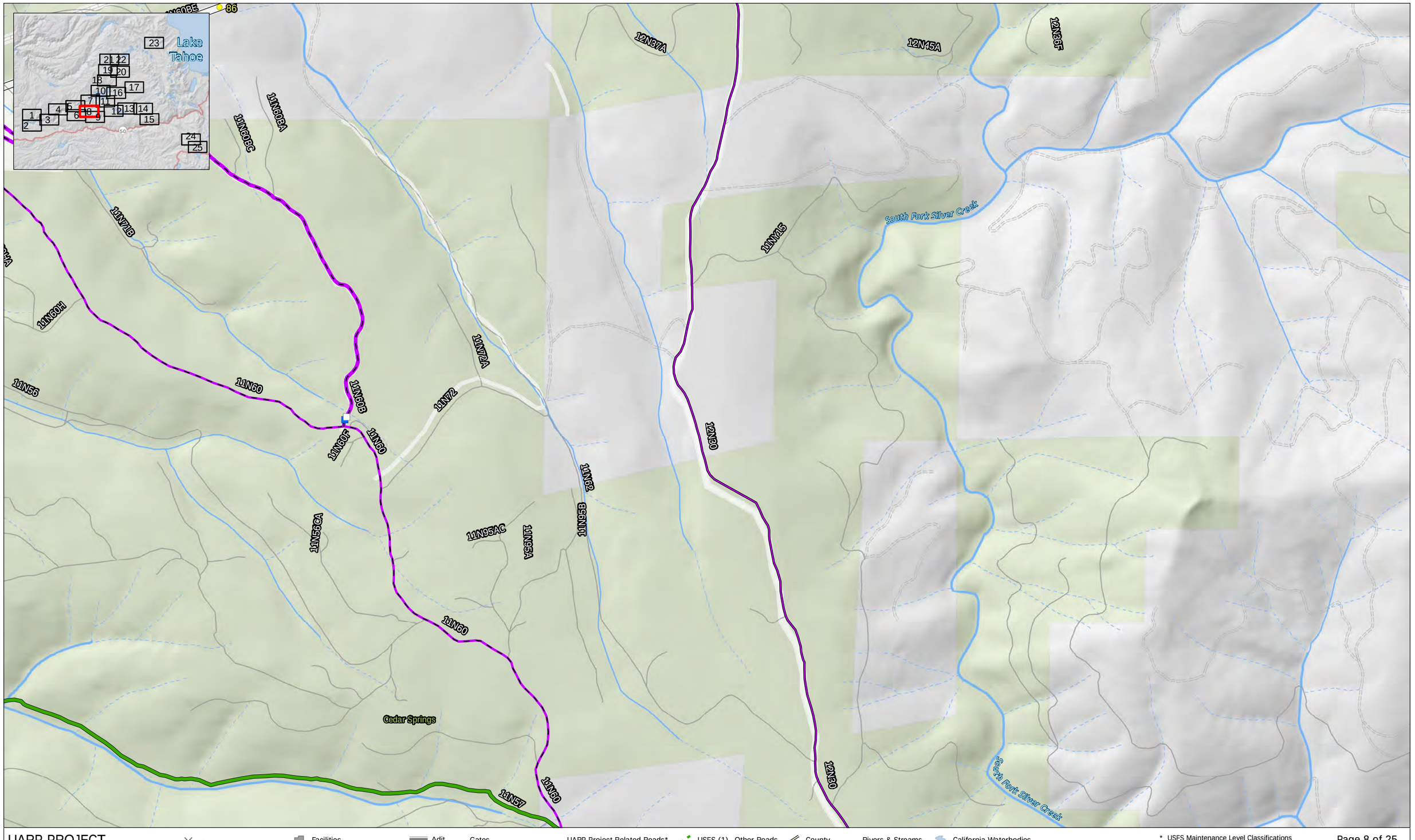
* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

N

0 500 1,000 2,000 Feet

Stillwater Sciences
9/30/2015 RRA

Z:\Data\575.00_LCFRB\ArcmapWork\RoadMapbook_v7.mxd_9/30/2015_RRA



UARP PROJECT RELATED ROADS

Sources:
Roads (USFA, FS, 2014); Streams (NHD 24k); Hillshade (NED 10m); Facilities (SMUD); Ownership (USFS, 2011)

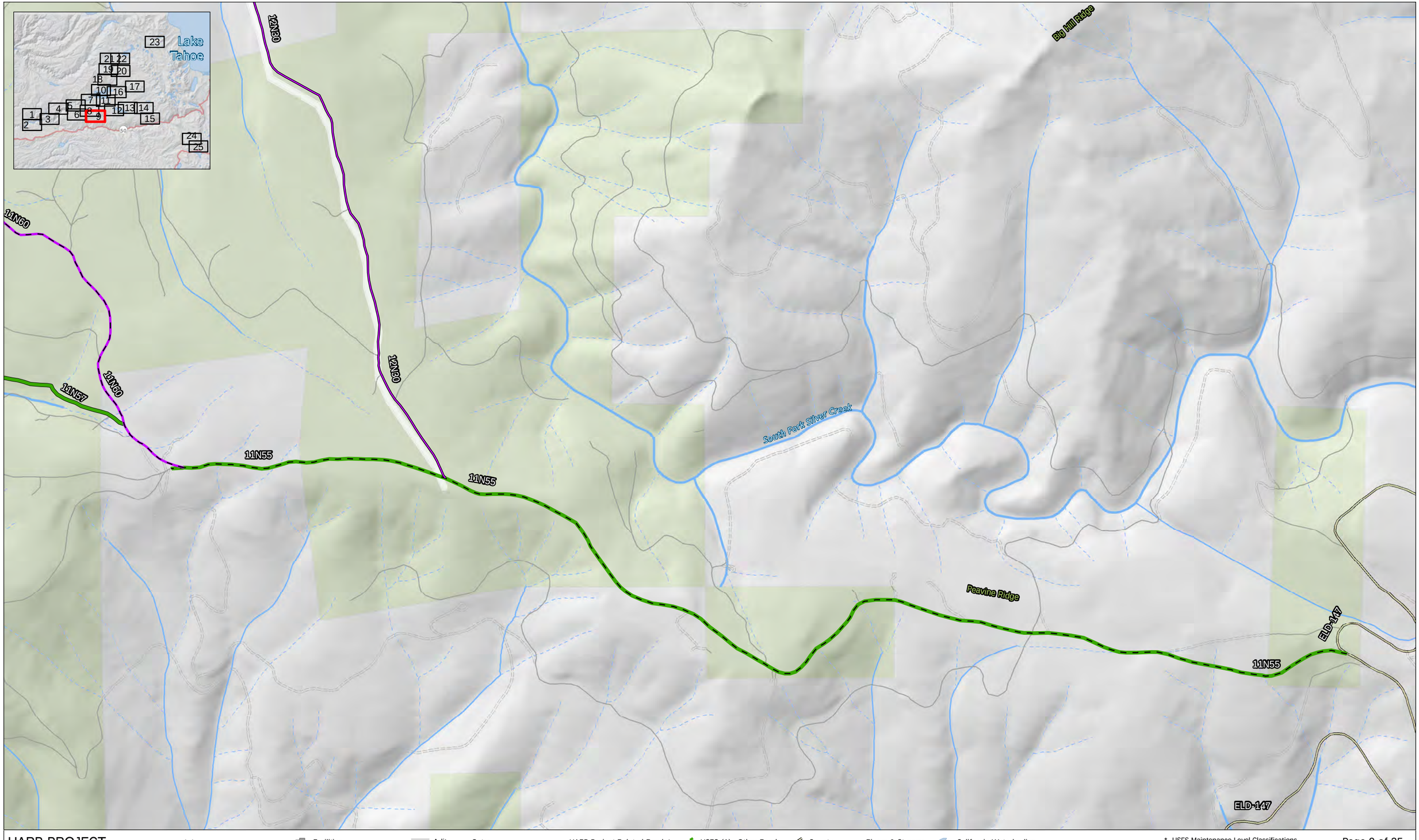
- Reference points
- Transmission Structures
- Transmission Line
- FERC boundary
- Facilities
- Helispot
- SMUD administrative trails
- Adit
- Canal
- Channel
- Penstock
- Tunnel
- Gates
  - SMUD (existing)
  - Private (existing)
  - USFS (existing)
  - SMUD (proposed)
- UARP Project Related Roads*
  - SMUD (2)
  - SMUD (3)
  - SMUD (4)
- USFS (1)
- USFS (2)
- USFS (3)
- USFS (4)
- Other Roads
  - USFS
  - SMUD
- County
- Highways
- Private (other)
- Rivers & Streams
  - Perennial
  - Intermittent
  - Ephemeral
- California Waterbodies
- Township & Range
- Ownership
  - US Forest Service
  - Private

* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

0 500 1,000 2,000 Feet

Stillwater Sciences
9/30/2015 RRA

Z:\Data\575.00_LCFRB\ArcmapWork\RoadMapbook_v7.mxd_9/30/2015_RRA



UARP PROJECT RELATED ROADS

Sources:
Roads (USFA, FS, 2014); Streams (NHD 24k); Hillshade (NED 10m); Facilities (SMUD); Ownership (USFS, 2011)

Reference points
Transmission Structures
Transmission Line
FERC boundary

Facilities
Helispot
SMUD administrative trails

Adit
Canal
Channel
Penstock
Tunnel

Gates
SMUD (existing)
Private (existing)
USFS (existing)
SMUD (proposed)

UARP Project Related Roads*
SMUD (2)
SMUD (3)
SMUD (4)

USFS (1)
USFS (2)
USFS (3)
USFS (4)

Other Roads
USFS
SMUD

County
Highways
Private (other)

Rivers & Streams
Perennial
Intermittent
Ephemeral

California Waterbodies
Township & Range
Ownership
US Forest Service
Private

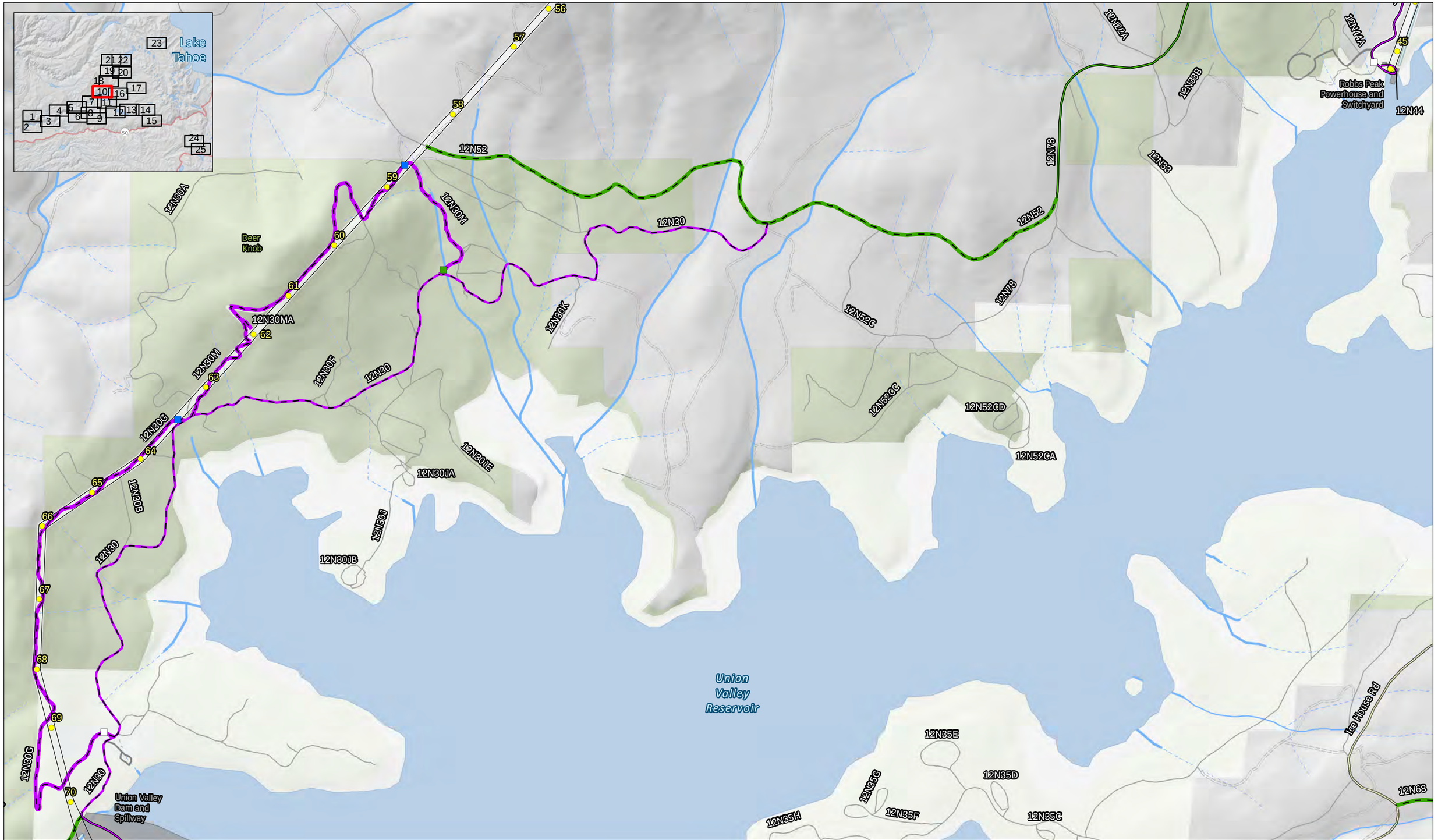
* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

N

0 500 1,000 2,000 Feet

Stillwater Sciences
9/30/2015 RRA

Z:\Data\575.00_LCFRB\Arcmap\Work\RoadMapbook_v7.mxd_9/30/2015_RRA



UARP PROJECT RELATED ROADS

Sources:
Roads (USFA, FS, 2014); Streams (NHD 24k);
Hillshade (NED 10m); Facilities (SMUD);
Ownership (USFS, 2011)

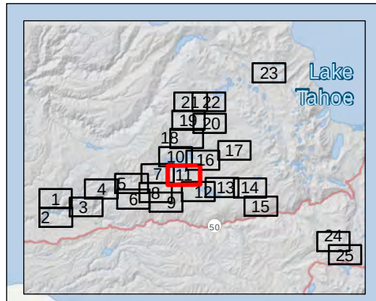
- Reference points
- Transmission Structures
- Transmission Line
- FERC boundary
- Facilities
- Helispot
- SMUD administrative trails
- Adit
- Canal
- Channel
- Penstock
- Tunnel
- Gates
  - SMUD (existing)
  - Private (existing)
  - USFS (existing)
  - SMUD (proposed)
- UARP Project Related Roads*
  - SMUD (2)
  - SMUD (3)
  - SMUD (4)
- USFS (1)
- USFS (2)
- USFS (3)
- USFS (4)
- Other Roads
  - USFS
  - SMUD
- County
- Highways
- Private (other)
- Rivers & Streams
  - Perennial
  - Intermittent
  - Ephemeral
- California Waterbodies
- Township & Range
- Ownership
  - US Forest Service
  - Private

* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

0 500 1,000 2,000 Feet

Stillwater Sciences
9/30/2015 RRA

Z:\Data\575.00_LCFRB\ArcmapWork\RoadMapbook_v7.mxd_9/30/2015_RRA



Union Valley Reservoir

12N35H
12N35F
12N35C
12N35I
12N35BA
12N35
17N12QB
17N12QA
17N12Q
Ice House Rd
12N21
12N21B
12N21D
12N21E
12N21C
12N21A
12NY05A
12NY05
12NY05D
12NY05B
12NY05X
12NY05C
12NY04
12NY04A
12NY04D
12NY04C
12NY06
12NY06B
1468
1467
1466
1465
1464
1463
1462
1461
1460
1459
1458
1457
1456
1455
1454
1453
1452
1451
1450
1449
1448
1447
1446
1445
1444
1443
1442
1441
1440
1439
1438
1437
1436
1435
1434
1433
Jones Fork Powerhouse
12NY05X
Jones Fork Silver Creek
Driscoll Creek
12N26
17NY12H
Big Hill
11N53
ELD-147

UARP PROJECT RELATED ROADS

Sources:
Roads (USFA, FS, 2014); Streams (NHD 24k); Hillshade (NED 10m); Facilities (SMUD); Ownership (USFS, 2011)

Reference points
Transmission Structures
Transmission Line
FERC boundary

Facilities
Helispot
SMUD administrative trails

Adit
Canal
Channel
Penstock
Tunnel

Gates
SMUD (existing)
Private (existing)
USFS (existing)
SMUD (proposed)

UARP Project Related Roads*
SMUD (2)
SMUD (3)
SMUD (4)

USFS (1)
USFS (2)
USFS (3)
USFS (4)

Other Roads
USFS
SMUD

County
Highways
Private (other)

Rivers & Streams
Perennial
Intermittent
Ephemeral

California Waterbodies
Township & Range

Ownership
US Forest Service
Private

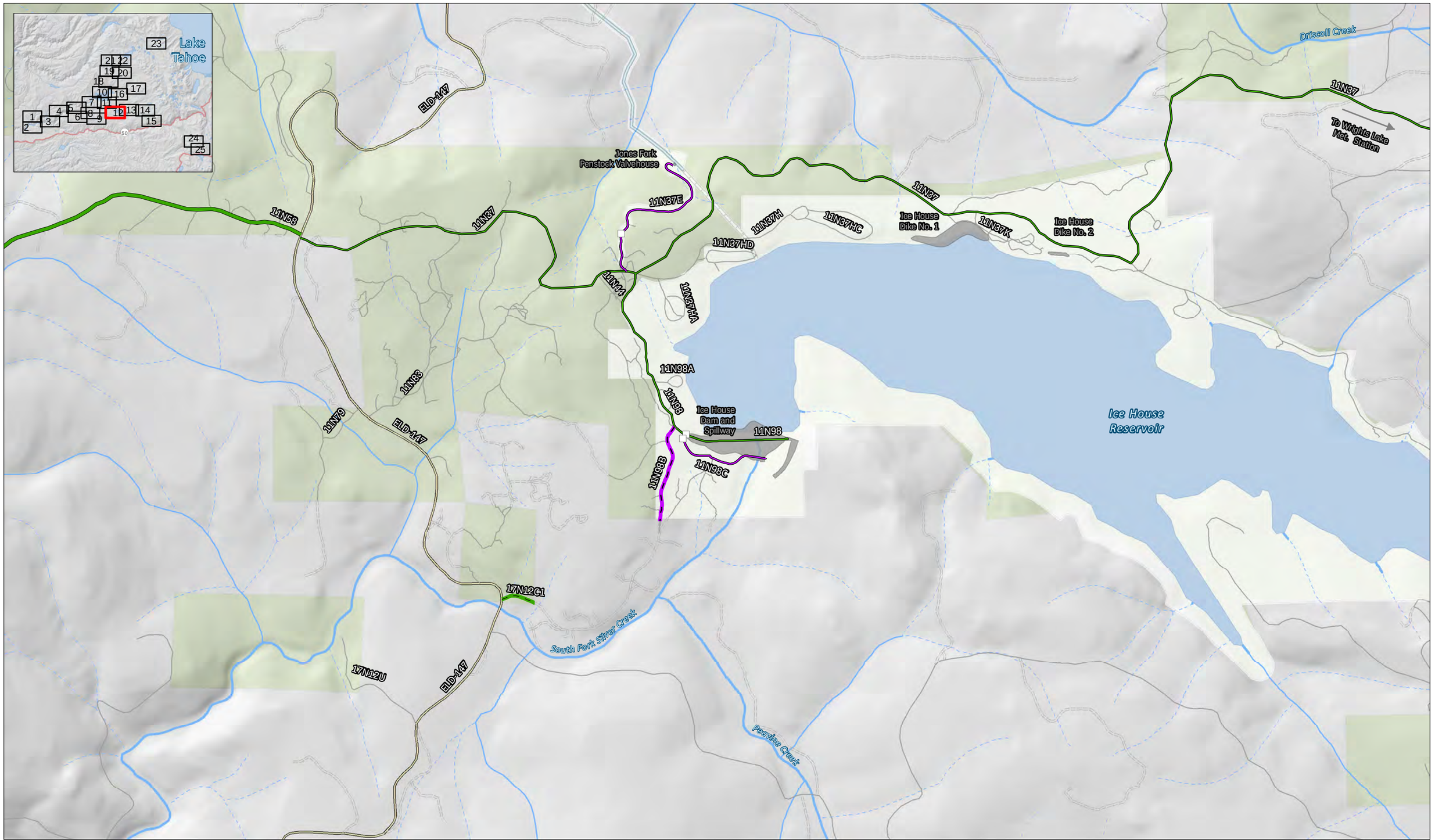
* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

N

0 500 1,000 2,000 Feet

Stillwater Sciences
9/30/2015 RRA

Z:\Data\575.00_LCFRB\Arcmap\Work\RoadMapbook_v7.mxd_9/30/2015_RRA



UARP PROJECT RELATED ROADS

Sources:
Roads (USFA, FS, 2014); Streams (NHD 24k);
Hillshade (NED 10m); Facilities (SMUD);
Ownership (USFS, 2011)

- Reference points
- Transmission Structures
- Transmission Line
- FERC boundary
- Facilities
- Helispot
- SMUD administrative trails
- Adit
- Canal
- Channel
- Penstock
- Tunnel
- Gates
  - SMUD (existing)
  - Private (existing)
  - USFS (existing)
  - SMUD (proposed)
- UARP Project Related Roads*
  - SMUD (2)
  - SMUD (3)
  - SMUD (4)
  - USFS (1)
  - USFS (2)
  - USFS (3)
  - USFS (4)
- Other Roads
  - USFS
  - SMUD
- County
- Highways
- Private (other)
- Rivers & Streams
  - Perennial
  - Intermittent
  - Ephemeral
- California Waterbodies
- Township & Range
- Ownership
  - US Forest Service
  - Private

* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

0 500 1,000 2,000 Feet

Stillwater Sciences
9/30/2015 RRA

Z:\Data\575.00_LCFRB\Arcmap\Work\RoadMapbook_v7.mxd_9/30/2015_RRA

UARP PROJECT RELATED ROADS

Sources:
Roads (USFA, FS, 2014); Streams (NHD 24k); Hillshade (NED 10m); Facilities (SMUD); Ownership (USFS, 2011)

- Reference points
- Transmission Structures
- Transmission Line
- FERC boundary
- Facilities
- Helispot
- SMUD administrative trails
- Adit
- Canal
- Channel
- Penstock
- Tunnel
- Gates
  - SMUD (existing)
  - Private (existing)
  - USFS (existing)
  - SMUD (proposed)
- UARP Project Related Roads*
  - SMUD (2)
  - SMUD (3)
  - SMUD (4)
  - USFS (1)
  - USFS (2)
  - USFS (3)
  - USFS (4)
- Other Roads
  - USFS
  - SMUD
  - County
  - Highways
  - Private (other)
- Rivers & Streams
  - Perennial
  - Intermittent
  - Ephemeral
- California Waterbodies
- Township & Range
- Owernship
  - US Forest Service
  - Private

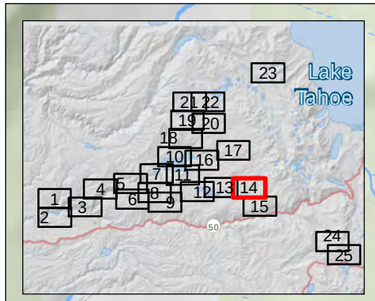
* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

N

0 500 1,000 2,000 Feet

Stillwater Sciences
9/30/2015 RRA

Z:\Data\575.00_LCFRB\Arcmap\Work\RoadMapbook_v7.mxd_9/30/2015_RRA



Wrights Lake

11N37

11N37

To Wrights Lake Met. Station

11N28

South Fork Silver Creek

11N28B

11N28

11N28A

11N26

11N28

Wilson Ranch

Lyons Creek

South Fork Silver Creek

Lyons Creek

UARP PROJECT RELATED ROADS

Sources:
Roads (USFA, FS, 2014); Streams (NHD 24k); Hillshade (NED 10m); Facilities (SMUD); Ownership (USFS, 2011)

- Reference points
- Transmission Structures
- Transmission Line
- FERC boundary
- Facilities
- Helispot
- SMUD administrative trails
- Adit
- Canal
- Channel
- Penstock
- Tunnel
- Gates
  - SMUD (existing)
  - Private (existing)
  - USFS (existing)
  - SMUD (proposed)
- UARP Project Related Roads*
  - SMUD (2)
  - SMUD (3)
  - SMUD (4)
  - USFS (1)
  - USFS (2)
  - USFS (3)
  - USFS (4)
- Other Roads
  - USFS
  - SMUD
- County
- Highways
- Private (other)
- Rivers & Streams
  - Perennial
  - Intermittent
  - Ephemeral
- California Waterbodies
- Township & Range
- Ownership
  - US Forest Service
  - Private

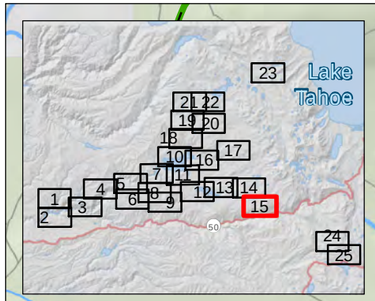
* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

N

0 500 1,000 2,000 Feet

Stillwater Sciences
9/30/2015 RRA

Z:\Data\575.00_LCFRB\ArcmapWork\RoadMapbook_v7.mxd_9/30/2015_RRA



Lyons Creek

11N26

11NY28

11NY28B

Chimney Flat

US HWY 50

South Fork American River

UARP PROJECT RELATED ROADS

Sources:
Roads (USFA, FS, 2014); Streams (NHD 24k); Hillshade (NED 10m); Facilities (SMUD); Ownership (USFS, 2011)

- Reference points
- Transmission Structures
- Transmission Line
- FERC boundary
- Facilities
- Helispot
- SMUD administrative trails
- Adit
- Canal
- Channel
- Penstock
- Tunnel

Gates
- SMUD (existing)
- Private (existing)
- USFS (existing)
- SMUD (proposed)

UARP Project Related Roads*
- SMUD (2)
- SMUD (3)
- SMUD (4)
- USFS (1)
- USFS (2)
- USFS (3)
- USFS (4)

Other Roads
- USFS
- SMUD
- County
- Highways
- Private (other)

Rivers & Streams
- Perennial
- Intermittent
- Ephemeral
- California Waterbodies
- Township & Range

Ownership
- US Forest Service
- Private

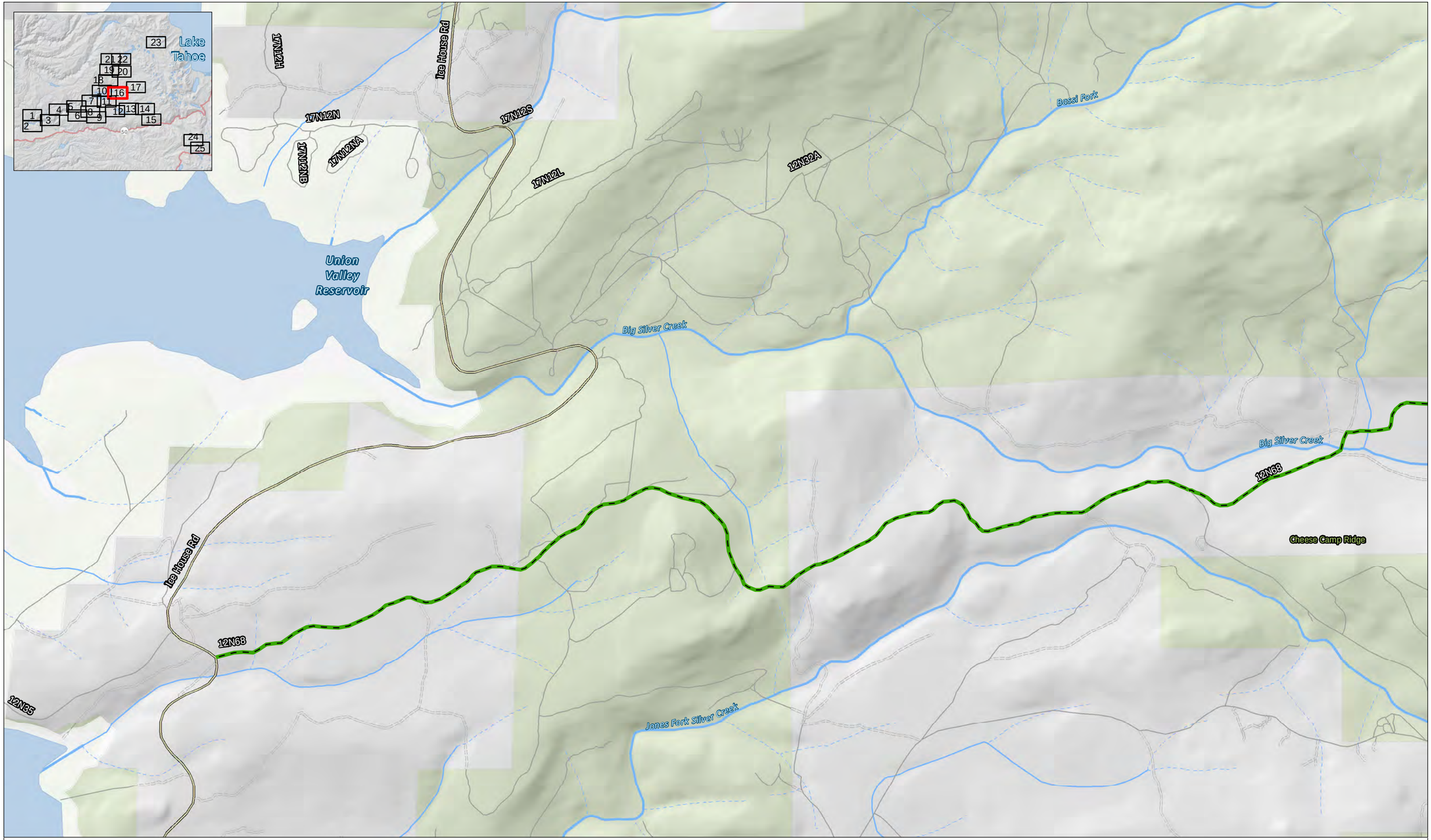
* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

N

0 500 1,000 2,000 Feet

Stillwater Sciences
9/30/2015 RRA

Z:\Data\575.00_LCFRB\ArcmapWork\RoadMapbook_v7.mxd_9/30/2015_RRA



UARP PROJECT RELATED ROADS

Sources:
Roads (USFA, FS, 2014); Streams (NHD 24k); Hillshade (NED 10m); Facilities (SMUD); Ownership (USFS, 2011)

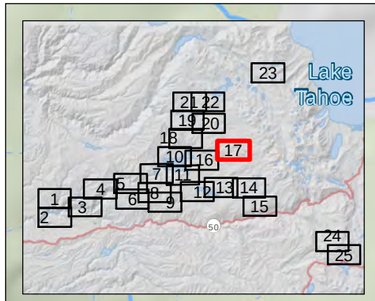
- Reference points
- Transmission Structures
- Transmission Line
- FERC boundary
- Facilities
- Helispot
- SMUD administrative trails
- Adit
- Canal
- Channel
- Penstock
- Tunnel
- Gates
  - SMUD (existing)
  - Private (existing)
  - USFS (existing)
  - SMUD (proposed)
- UARP Project Related Roads*
  - SMUD (2)
  - SMUD (3)
  - SMUD (4)
  - USFS (1)
  - USFS (2)
  - USFS (3)
  - USFS (4)
- Other Roads
  - USFS
  - SMUD
- County
- Highways
- Private (other)
- Rivers & Streams
  - Perennial
  - Intermittent
  - Ephemeral
- California Waterbodies
- Township & Range
- Ownership
  - US Forest Service
  - Private

* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

0 500 1,000 2,000 Feet

Stillwater Sciences
9/30/2015 RRA

Z:\Data\575.00_LCFRB\Arcmap\Work\RoadMapbook_v7.mxd_9/30/2015_RRA



12N77

Two Peaks

SMUD Morattini Met Facility

12N77A

12N77

Pearl Lake

Big Silver Creek

Big Silver Creek

UARP PROJECT RELATED ROADS

Sources:
Roads (USFA, FS, 2014); Streams (NHD 24k); Hillshade (NED 10m); Facilities (SMUD); Ownership (USFS, 2011)

- Reference points
- Transmission Structures
- Transmission Line
- FERC boundary
- Facilities
- Helispot
- SMUD administrative trails
- Adit
- Canal
- Channel
- Penstock
- Tunnel
- Gates
  - SMUD (existing)
  - Private (existing)
  - USFS (existing)
  - SMUD (proposed)
- UARP Project Related Roads*
  - SMUD (2)
  - SMUD (3)
  - SMUD (4)
  - USFS (1)
  - USFS (2)
  - USFS (3)
  - USFS (4)
- Other Roads
  - USFS
  - SMUD
  - County
  - Highways
  - Private (other)
- Rivers & Streams
  - Perennial
  - Intermittent
  - Ephemeral
- California Waterbodies
- Township & Range
- Ownership
  - US Forest Service
  - Private

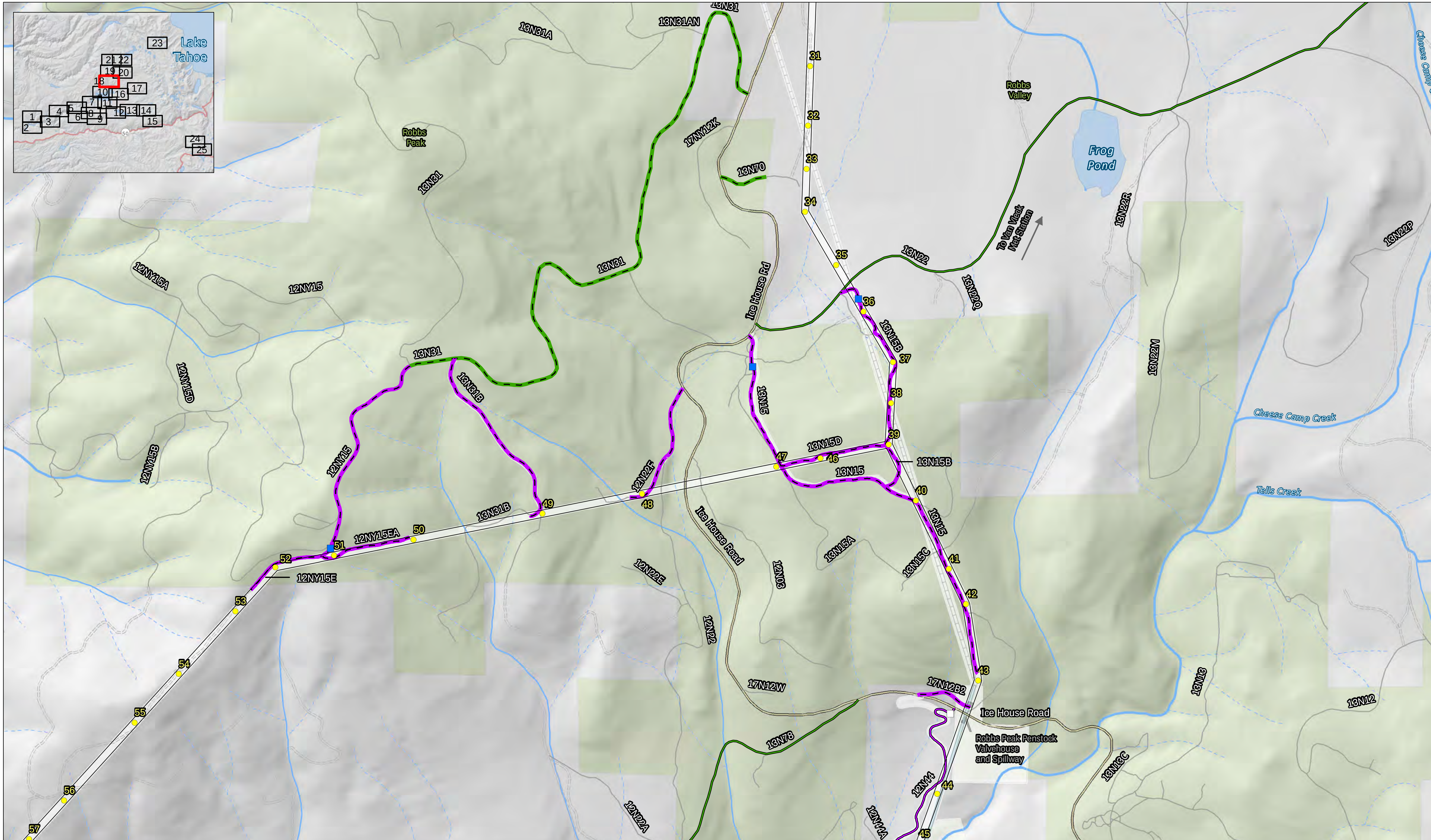
* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

N

0 500 1,000 2,000 Feet

Stillwater Sciences
9/30/2015 RRA

Z:\Data\575.00_LCFRB\Arcmap\Work\RoadMapbook_v7.mxd_9/30/2015_RRA



UARP PROJECT RELATED ROADS

Sources:
Roads (USFA, FS, 2014); Streams (NHD 24k); Hillshade (NED 10m); Facilities (SMUD); Ownership (USFS, 2011)

Reference points
Transmission Structures
Transmission Line
FERC boundary
Facilities
Helispot
SMUD administrative trails
Adit
Canal
Channel
Penstock
Tunnel
Gates
SMUD (existing)
Private (existing)
USFS (existing)
SMUD (proposed)
UARP Project Related Roads*
SMUD (2)
SMUD (3)
SMUD (4)
USFS (1)
USFS (2)
USFS (3)
USFS (4)
Other Roads
USFS
SMUD
County
Highways
Private (other)
Rivers & Streams
Perennial
Intermittent
Ephemeral
California Waterbodies
Township & Range
Ownership
US Forest Service
Private

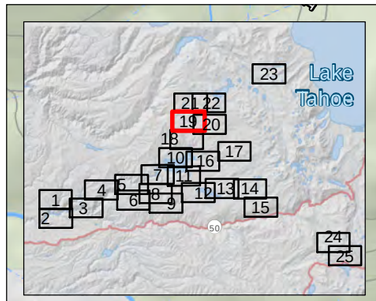
* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

N

0 500 1,000 2,000 Feet

Stillwater Sciences
9/30/2015 RRA

Z:\Data\575.00_LCFRB\Arcmap\Work\RoadMapbook_v7.mxd_9/30/2015_RRA



Gerle Gage North
Gerle Creek
Gerle Gage South
13N28L
13N29A
13N29D
ELD-147F
Wentworth Springs Rd
Ice House Rd
13N20
13N20A
13N61
13N61C
13N61B
13N57
13N22CB
13N22CB1
South Fork Rubicon River
13N28
13N86
South Fork Campground
13N28B
13N29C
13N23D
Ice House Rd
Robbs Peak Dam
Robbs Peak Reservoir
17N12A2
13N57
13N22C
13N22AB
13N25
13N25A
13N22CA
13N21B
13N21A
13N21
Ice House Rd
ELD-147F
Wentworth Springs Rd
12N29B
12N29Q
12NY30
Gerle Canal
Ice House Rd
13N22CC
Chagga Camp Creek
13N98
17N12Z
To Van Vleck Met Station
13N22
13N31
13N31AN
13N31A

18 19 20 21 22 23 24 25 26 27 28 29 30

UARP PROJECT RELATED ROADS

Sources:
Roads (USFA, FS, 2014); Streams (NHD 24k);
Hillshade (NED 10m); Facilities (SMUD);
Ownership (USFS, 2011)

Z:\Data\575.00_LCFRB\Arcmap\Work\RoadMapbook_v7.mxd_9/30/2015_RRA

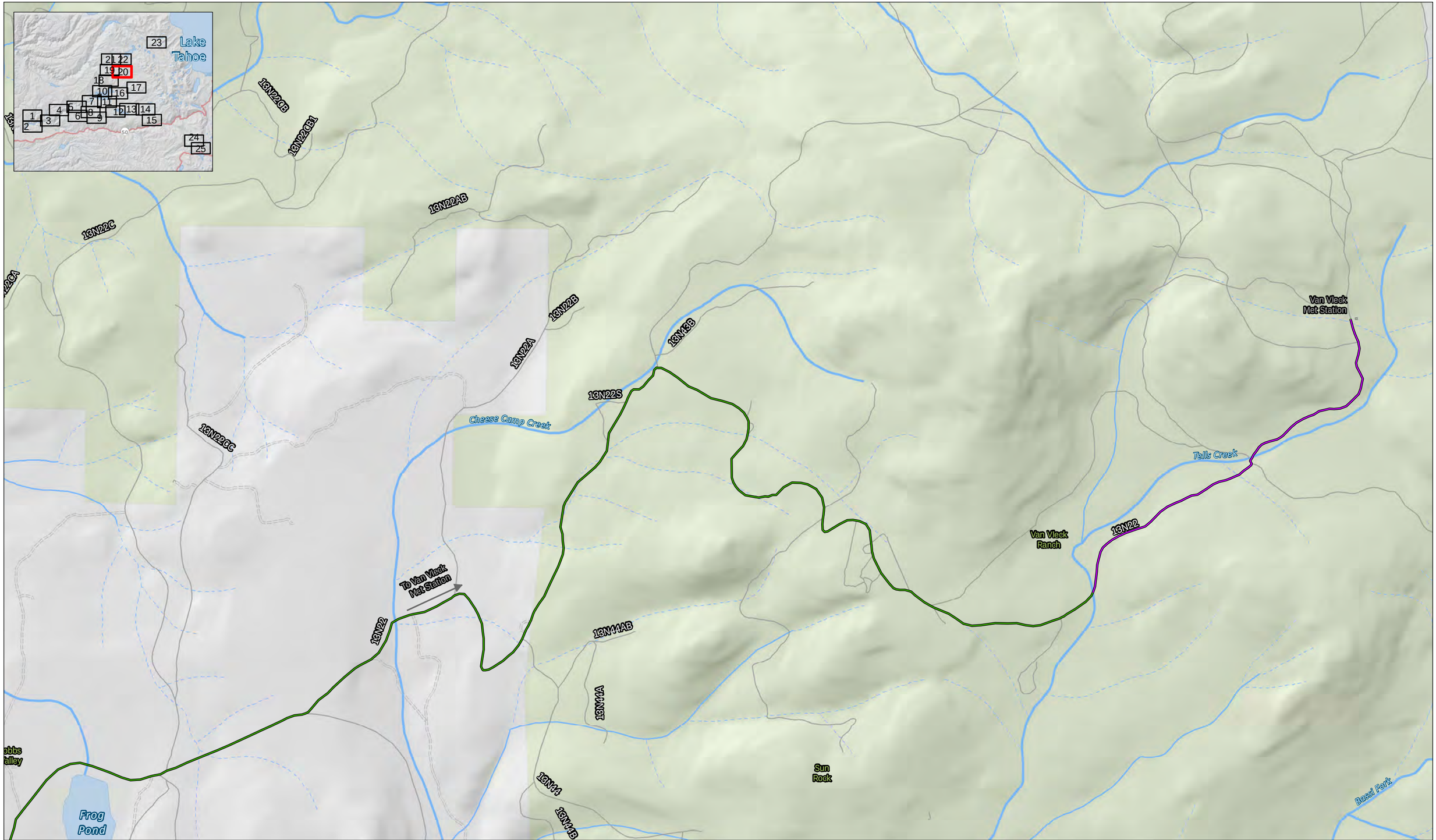
- Reference points
- Transmission Structures
- Transmission Line
- FERC boundary
- Facilities
- Helispot
- SMUD administrative trails
- Adit
- Canal
- Channel
- Penstock
- Tunnel
- Gates
  - SMUD (existing)
  - Private (existing)
  - USFS (existing)
  - SMUD (proposed)
- UARP Project Related Roads*
  - SMUD (2)
  - SMUD (3)
  - SMUD (4)
  - USFS (1)
  - USFS (2)
  - USFS (3)
  - USFS (4)
- Other Roads
  - USFS
  - SMUD
- County
- Highways
- Private (other)
- Rivers & Streams
  - Perennial
  - Intermittent
  - Ephemeral
- California Waterbodies
- Township & Range
- Ownership
  - US Forest Service
  - Private

* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

N

0 500 1,000 2,000 Feet

Stillwater Sciences
9/30/2015 RRA



UARP PROJECT RELATED ROADS

Sources:
Roads (USFA, FS, 2014); Streams (NHD 24k); Hillshade (NED 10m); Facilities (SMUD); Ownership (USFS, 2011)

- Reference points
- Transmission Structures
- Transmission Line
- FERC boundary
- Facilities
- Helispot
- SMUD administrative trails
- Adit
- Canal
- Channel
- Penstock
- Tunnel

Gates
- SMUD (existing)
- Private (existing)
- USFS (existing)
- SMUD (proposed)

UARP Project Related Roads*
- SMUD (2)
- SMUD (3)
- SMUD (4)
- USFS (1)
- USFS (2)
- USFS (3)
- USFS (4)

Other Roads
- USFS
- SMUD
- County
- Highways
- Private (other)

Rivers & Streams
- Perennial
- Intermittent
- Ephemeral

- California Waterbodies
- Township & Range

Ownership
- US Forest Service
- Private

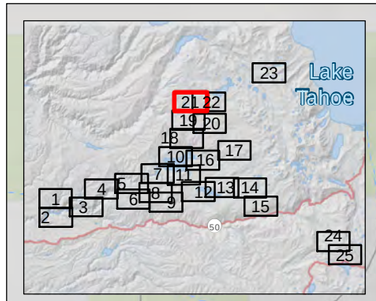
* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

N

0 500 1,000 2,000 Feet

Stillwater Sciences
9/30/2015 RRA

Z:\Data\575.00_LCFRB\Arcmap\Work\RoadMapbook_v7.mxd_9/30/2015_RRA



Rocky Basin Creek
Francis Cow Camp
Garle Creek
Wentworth Springs Rd
13N52
13N26
13N69B
13N69
13N69A
13N69D
13N69E
13N26B
13N26BA
13N26B-B
17N12V
17N12K
13N72A
13N72AW
13N72B
13N72C
13N72
13N11A
13N11H
13N11HA
13N11
13N11C
Gerle Canal
Angel Creek
14N01D
14N01A
14N01E
Gerle Creek Reservoir
Gerle Creek Dam
13N23
13N23B
13N23A
13N23C
13N23D
13N85
13N28V1
Ice House Road
7
8
9
10
11
12
13
14
15
16
17
18

UARP PROJECT RELATED ROADS

Sources:
Roads (USFA, FS, 2014); Streams (NHD 24k); Hillshade (NED 10m); Facilities (SMUD); Ownership (USFS, 2011)

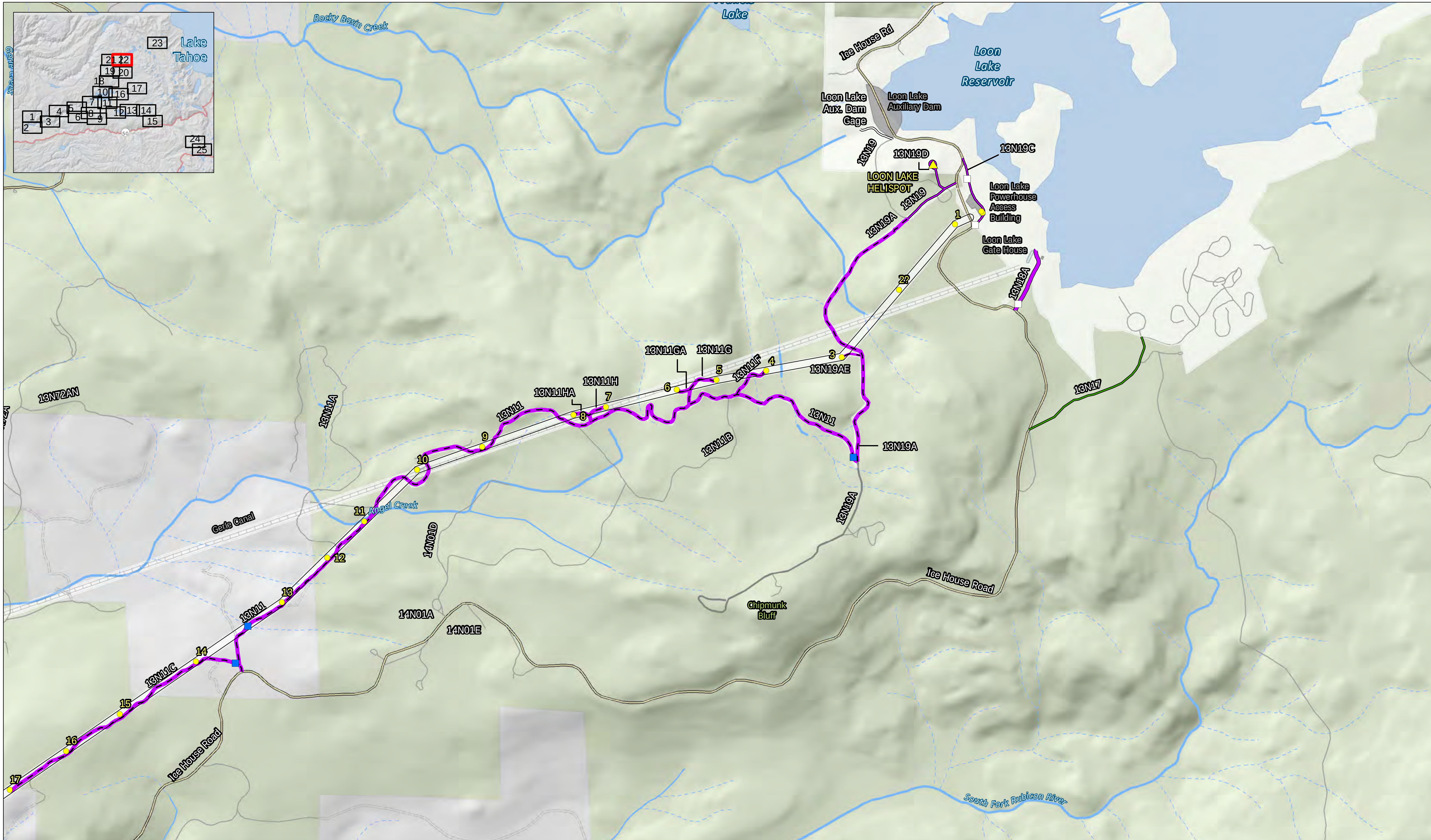
- Reference points
- Transmission Structures
- Transmission Line
- FERC boundary
- Facilities
- Helispot
- SMUD administrative trails
- Adit
- Canal
- Channel
- Penstock
- Tunnel
- Gates
  - SMUD (existing)
  - Private (existing)
  - USFS (existing)
  - SMUD (proposed)
- UARP Project Related Roads*
  - SMUD (2)
  - SMUD (3)
  - SMUD (4)
- USFS (1)
- USFS (2)
- USFS (3)
- USFS (4)
- Other Roads
  - USFS
  - SMUD
- County
- Highways
- Private (other)
- Rivers & Streams
  - Perennial
  - Intermittent
  - Ephemeral
- California Waterbodies
- Township & Range
- Ownership
  - US Forest Service
  - Private

* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

0 500 1,000 2,000 Feet

Stillwater Sciences
9/30/2015 RRA

Z:\Data\575.00_LCFRB\ArcmapWork\RoadMapbook_v7.mxd_9/30/2015_RRA



UARP PROJECT RELATED ROADS

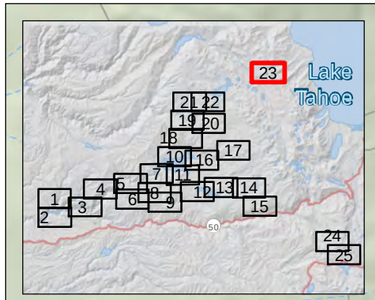
Sources: Roads (USFA, FS, 2014); Streams (NHD 24k); Hillshade (NED 10m); Facilities (SMUD); Ownership (USFS, 2011)

Reference points
Transmission Structures
Transmission Line
FERC boundary
Facilities
Helispot
SMUD administrative trails
Adit
Canal
Channel
Penstock
Tunnel
Gates
SMUD (existing)
Private (existing)
USFS (existing)
SMUD (proposed)
UARP Project Related Roads*
SMUD (2)
SMUD (3)
SMUD (4)
USFS (1)
USFS (2)
USFS (3)
USFS (4)
Other Roads
USFS
SMUD
County
Highways
Private (other)
Rivers & Streams
Perennial
Intermittent
Ephemeral
California Waterbodies
Township & Range
Ownership
US Forest Service
Private

* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

0 500 1,000 2,000 Feet

Stillwater Sciences 9/30/2015 RRA



UARP PROJECT RELATED ROADS

Sources:
Roads (USFA, FS, 2014); Streams (NHD 24k);
Hillshade (NED 10m); Facilities (SMUD);
Ownership (USFS, 2011)

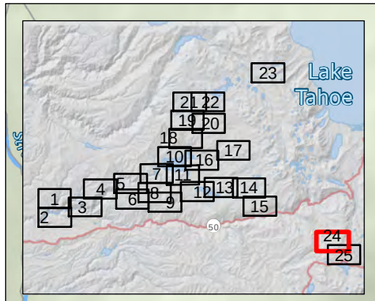
- Reference points
- Transmission Structures
- Transmission Line
- FERC boundary
- Facilities
- Helispot
- SMUD administrative trails
- Adit
- Canal
- Channel
- Penstock
- Tunnel
- Gates
  - SMUD (existing)
  - Private (existing)
  - USFS (existing)
  - SMUD (proposed)
- UARP Project Related Roads*
  - SMUD (2)
  - SMUD (3)
  - SMUD (4)
  - USFS (1)
  - USFS (2)
  - USFS (3)
  - USFS (4)
- Other Roads
  - USFS
  - SMUD
  - County
  - Highways
  - Private (other)
- Rivers & Streams
  - Perennial
  - Intermittent
  - Ephemeral
- California Waterbodies
- Township & Range
- Ownership
  - US Forest Service
  - Private

* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

0 500 1,000 2,000 Feet

Stillwater Sciences
9/30/2015 RRA

Z:\Data\575.00_LCFRB\Arcmap\Work\RoadMapbook_v7.mxd_9/30/2015_RRA



10N13A

10N13C

SMUD
Schneider's
Met Facility

10N13

10N13B

Little
Round Top

10N13

UARP PROJECT RELATED ROADS

Sources:
Roads (USFA, FS, 2014); Streams (NHD 24k);
Hillshade (NED 10m); Facilities (SMUD);
Ownership (USFS, 2011)

- Reference points
- Transmission Structures
- Transmission Line
- FERC boundary

- Facilities
- Helispot
- SMUD administrative trails

- Adit
- Canal
- Channel
- Penstock
- Tunnel

Gates
- SMUD (existing)
- Private (existing)
- USFS (existing)
- SMUD (proposed)

UARP Project Related Roads*
- SMUD (2)
- SMUD (3)
- SMUD (4)

- USFS (1)
- USFS (2)
- USFS (3)
- USFS (4)

Other Roads
- USFS
- SMUD

- County
- Highways
- Private (other)

Rivers & Streams
- Perennial
- Intermittent
- Ephemeral

- California Waterbodies
- Township & Range

Ownership
- US Forest Service
- Private

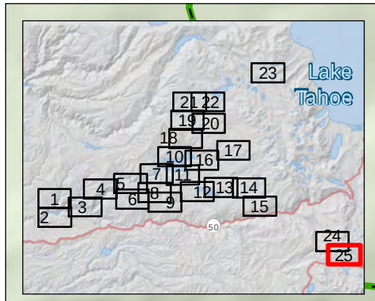
* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

0 500 1,000 2,000 Feet

N

Stillwater Sciences
9/30/2015 RRA

Z:\Data\575.00_LCFRB\Arcmap\Work\RoadMapbook_v7.mxd_9/30/2015_RRA



10N13

ALP-164

US HWY 88

Caples
Lake

UARP PROJECT RELATED ROADS

Sources:
Roads (USFA, FS, 2014); Streams (NHD 24k); Hillshade (NED 10m); Facilities (SMUD); Ownership (USFS, 2011)

- Reference points
- Transmission Structures
- Transmission Line
- FERC boundary
- Facilities
- Helispot
- SMUD administrative trails
- Adit
- Canal
- Channel
- Penstock
- Tunnel
- Gates
  - SMUD (existing)
  - Private (existing)
  - USFS (existing)
  - SMUD (proposed)
- UARP Project Related Roads*
  - SMUD (2)
  - SMUD (3)
  - SMUD (4)
  - USFS (1)
  - USFS (2)
  - USFS (3)
  - USFS (4)
- Other Roads
  - USFS
  - SMUD
- County
- Highways
- Private (other)
- Rivers & Streams
  - Perennial
  - Intermittent
  - Ephemeral
- California Waterbodies
- Township & Range
- Ownership
  - US Forest Service
  - Private

* USFS Maintenance Level Classifications
(1) Basic custodial care (closed)
(2) High clearance vehicles
(3) Suitable for passenger cars
(4) Moderate degree of user comfort

N

0 500 1,000 2,000 Feet

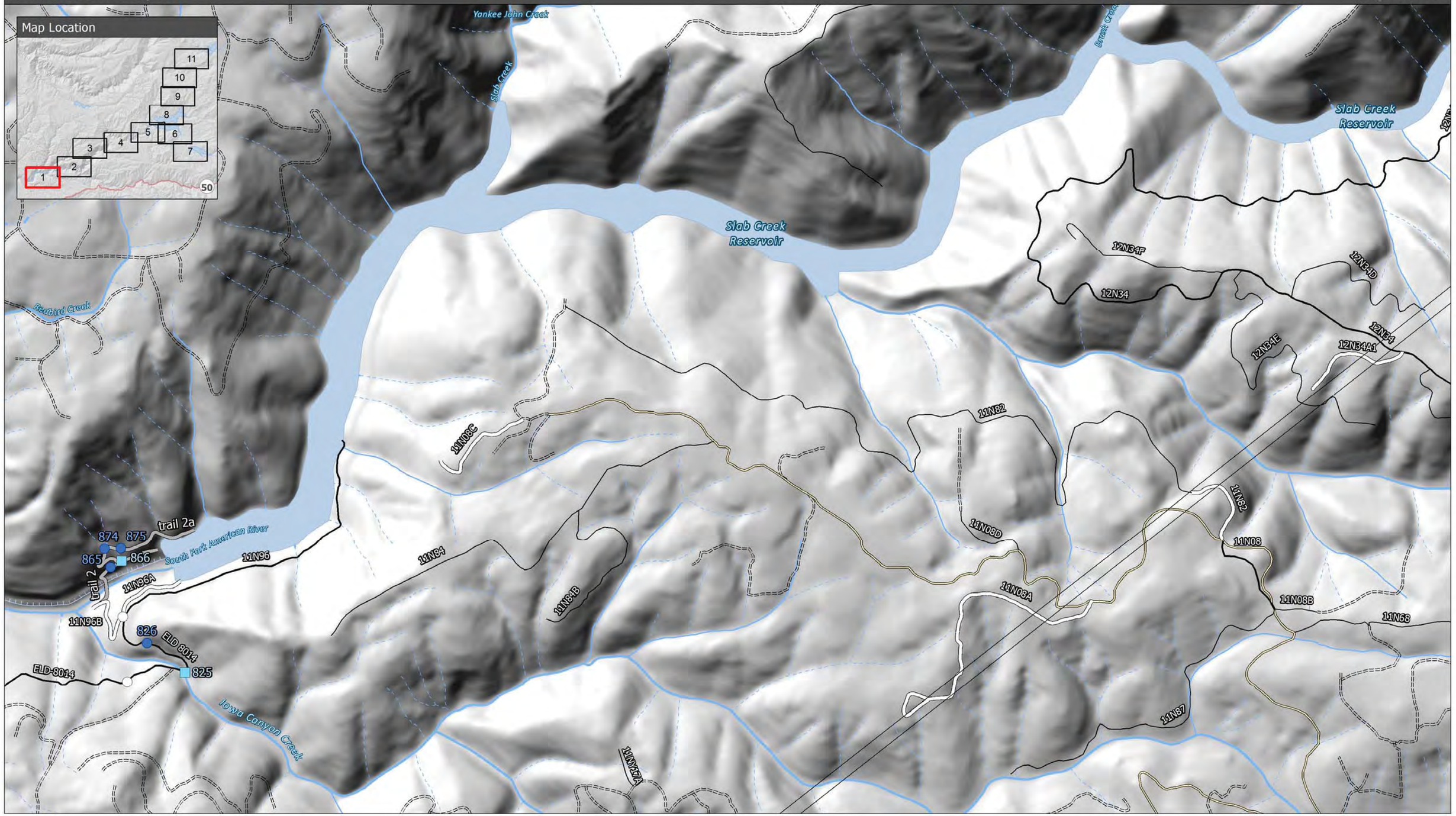
Stillwater Sciences
9/30/2015 RRA

Z:\Data\575.00_LCFRB\ArcmapWork\RoadMapbook_v7.mxd_9/30/2015_RRA

Appendix F

Culvert Analysis Maps

This page intentionally left blank.



Surveyed Culverts

Culverts
- Undersized Culvert
- Culvert Passes 100-year Flow
- Ditch Relief Culvert – No Analysis Performed

- Transmission Line
- SMUD administrative trails
- UARP Project Related Roads

Non-Project Related Roads
- Private (other)
- SMUD

- USFS
- County
- State

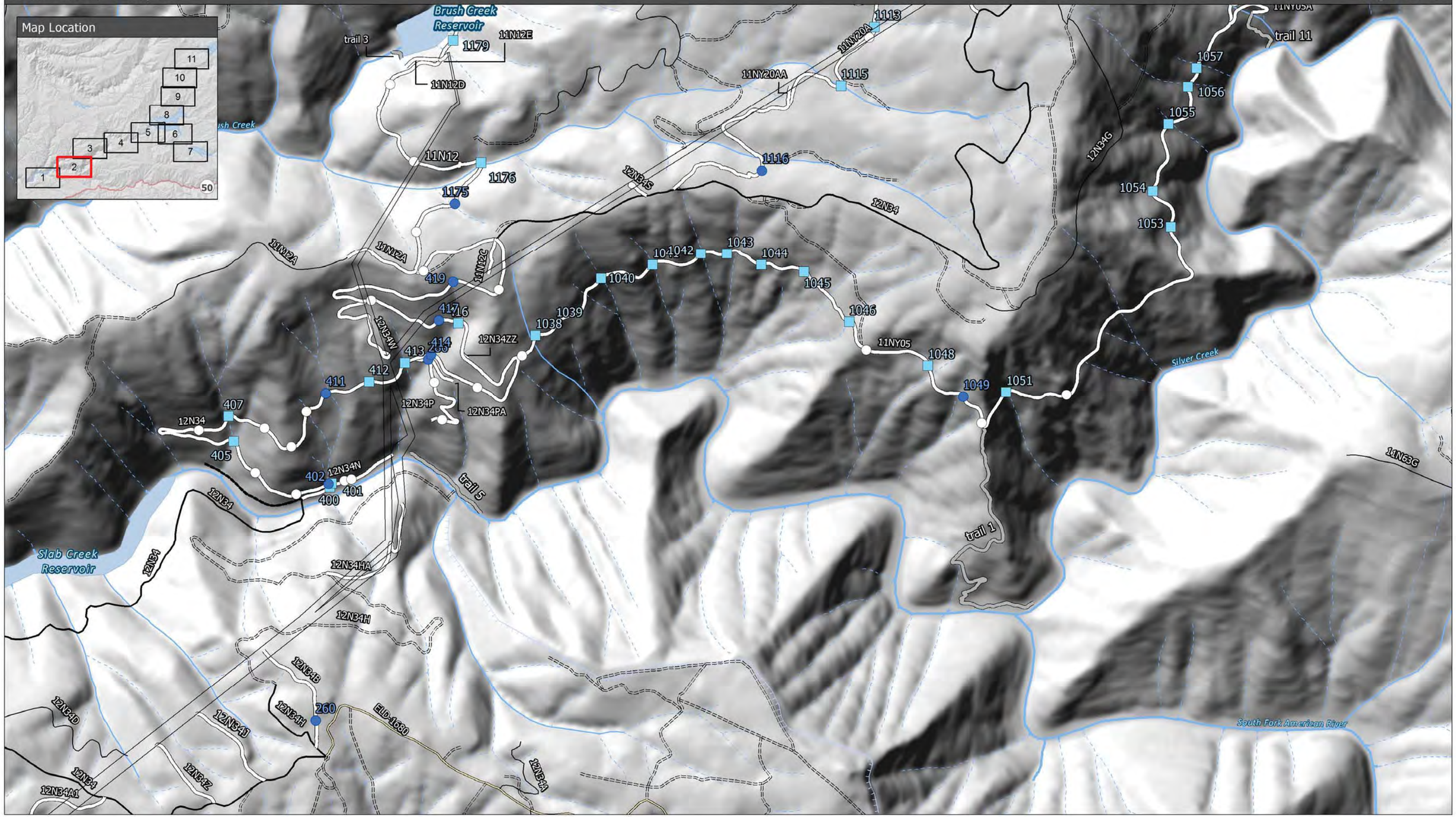
Rivers & Streams
- Perennial
- Intermittent
- Ephemeral
- Canals
- California Waterbodies

Sources:
Streams: NHD 24k
Hillshade: NED 10m
Transmission line: SMUD

0 500 1,000 2,000 Feet

N

Stillwater Sciences
www.stillwatersci.com



Surveyed Culverts

Culverts
- Undersized Culvert
- Culvert Passes 100-year Flow
- Ditch Relief Culvert – No Analysis Performed

- Transmission Line
- SMUD administrative trails
- UARP Project Related Roads

Non-Project Related Roads
- Private (other)
- SMUD

- USFS
- County
- State

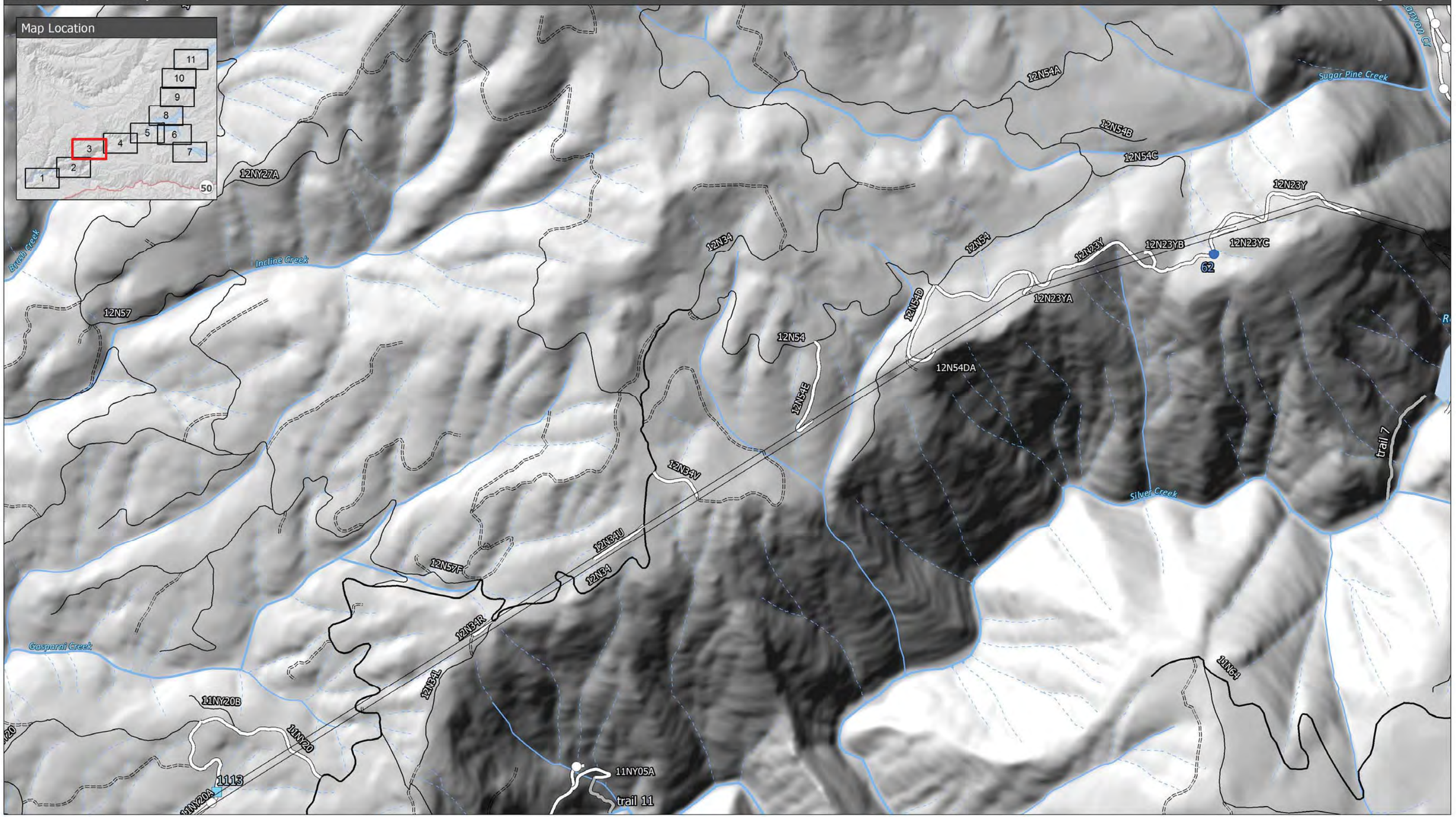
Rivers & Streams
- Perennial
- Intermittent
- Ephemeral
- Canals
- California Waterbodies

Sources:
Streams: NHD 24k
Hillshade: NED 10m
Transmission line: SMUD

0 500 1,000 2,000 Feet

N

Stillwater Sciences
www.stillwatersci.com



Surveyed Culverts

Culverts
- Undersized Culvert
- Culvert Passes 100-year Flow
- Ditch Relief Culvert – No Analysis Performed

- Transmission Line
- SMUD administrative trails
- UARP Project Related Roads

Non-Project Related Roads
- Private (other)
- SMUD
- USFS
- County
- State

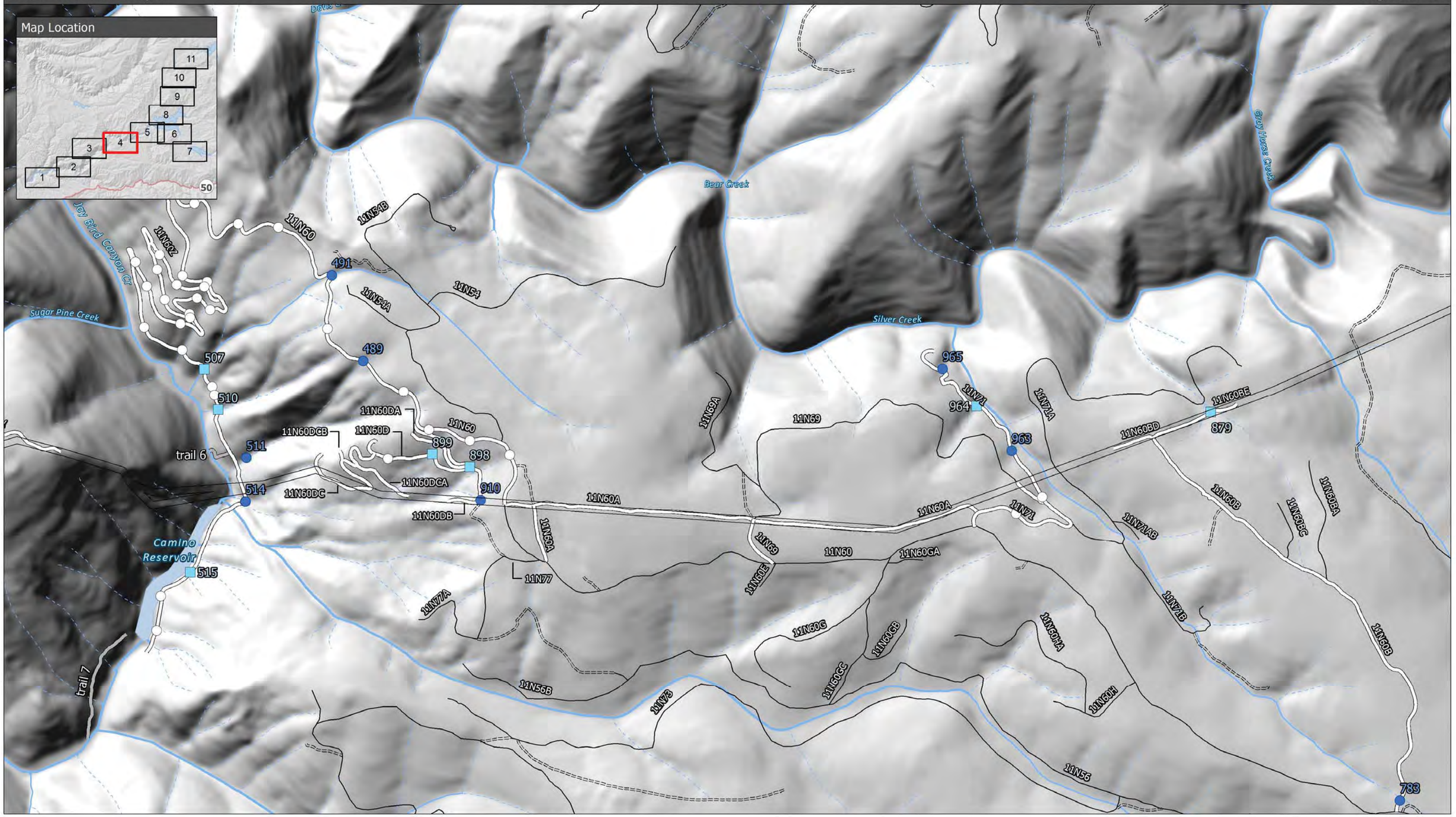
Rivers & Streams
- Perennial
- Intermittent
- Ephemeral
- Canals
- California Waterbodies

Sources:
Streams: NHD 24k
Hillshade: NED 10m
Transmission line: SMUD

0 500 1,000 2,000 Feet

N

Stillwater Sciences
www.stillwatersci.com



Surveyed Culverts

Culverts
- Undersized Culvert
- Culvert Passes 100-year Flow
- Ditch Relief Culvert – No Analysis Performed

- Transmission Line
- SMUD administrative trails
- UARP Project Related Roads

Non-Project Related Roads
- Private (other)
- SMUD

- USFS
- County
- State

Rivers & Streams
- Perennial
- Intermittent

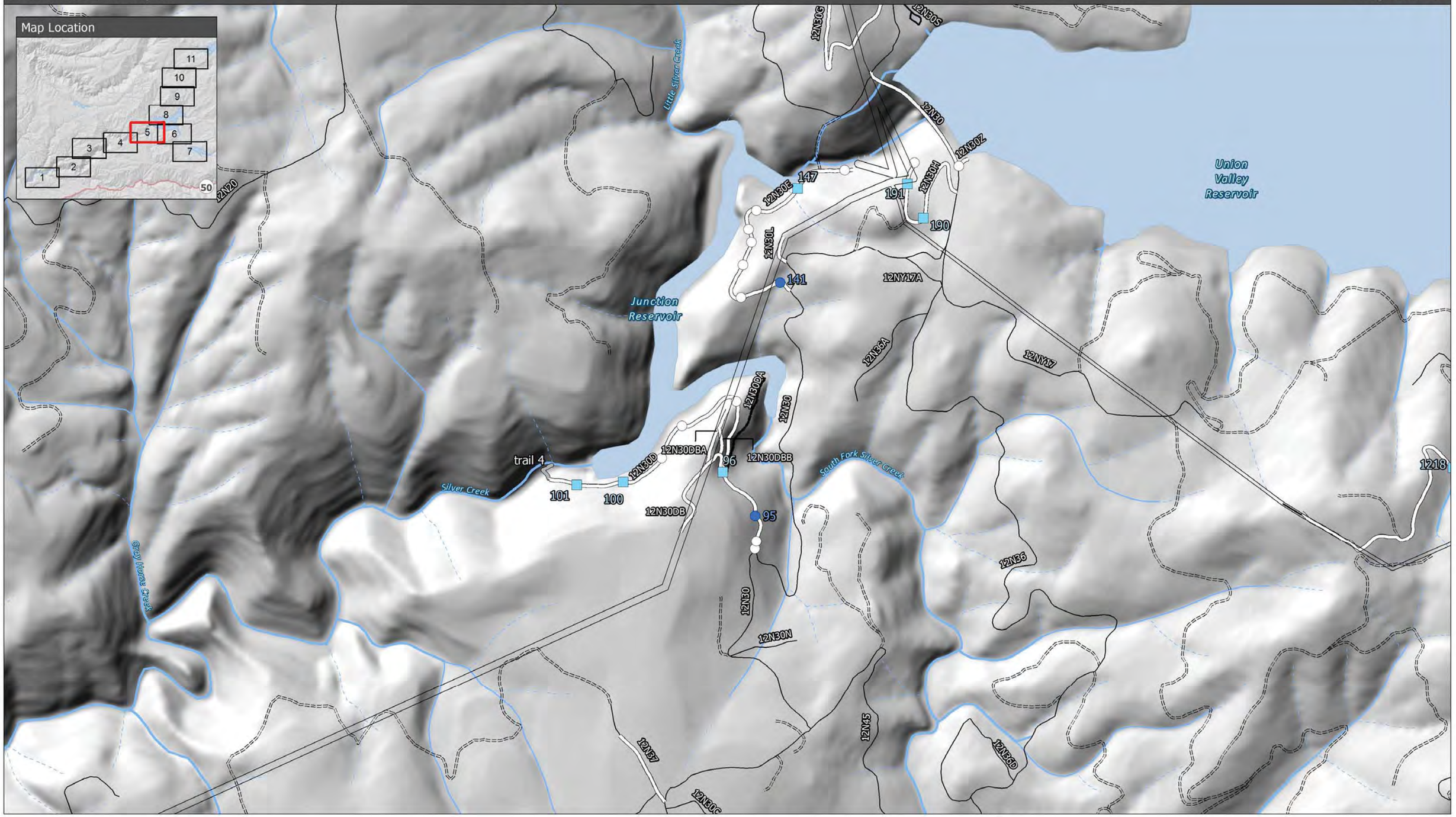
- Ephemeral
- Canals
- California Waterbodies

Sources:
Streams: NHD 24k
Hillshade: NED 10m
Transmission line: SMUD

0 500 1,000 2,000 Feet

N

Stillwater Sciences
www.stillwatersci.com



Surveyed Culverts

Culverts
- Undersized Culvert
- Culvert Passes 100-year Flow
- Ditch Relief Culvert – No Analysis Performed

- Transmission Line
- SMUD administrative trails
- UARP Project Related Roads

Non-Project Related Roads
- Private (other)
- SMUD

- USFS
- County
- State

Rivers & Streams
- Perennial
- Intermittent

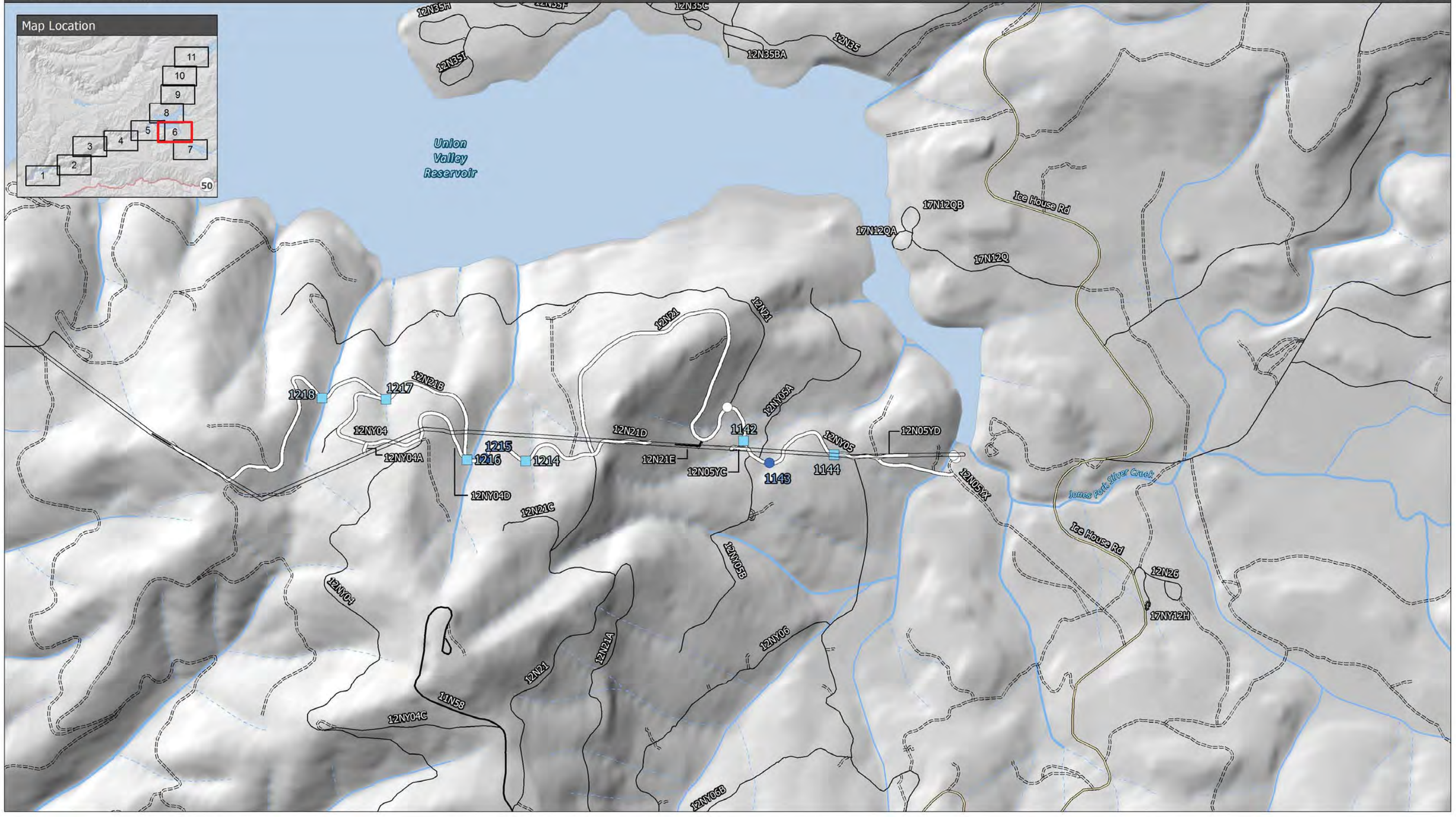
- Ephemeral
- Canals
- California Waterbodies

Sources:
Streams: NHD 24k
Hillshade: NED 10m
Transmission line: SMUD

0 500 1,000 2,000 Feet

N

Stillwater Sciences
www.stillwatersci.com



Surveyed Culverts

Culverts
- Undersized Culvert
- Culvert Passes 100-year Flow
- Ditch Relief Culvert – No Analysis Performed

- Transmission Line
- SMUD administrative trails
- UARP Project Related Roads

Non-Project Related Roads
- Private (other)
- SMUD

- USFS
- County
- State

Rivers & Streams
- Perennial
- Intermittent

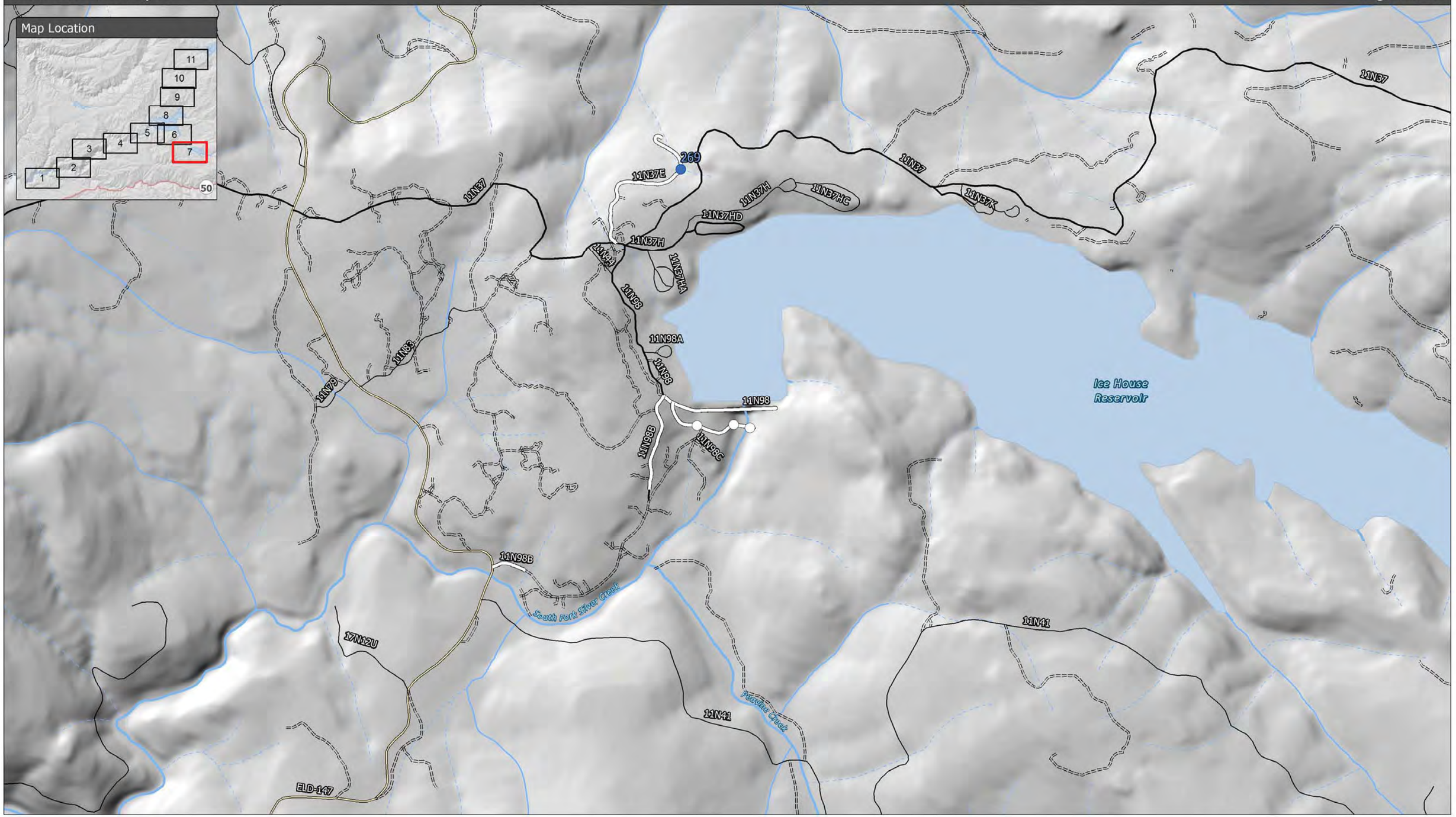
Ephemeral
Canals
California Waterbodies

Sources:
Streams: NHD 24k
Hillshade: NED 10m
Transmission line: SMUD

0 500 1,000 2,000 Feet

N

Stillwater Sciences
www.stillwatersci.com



Surveyed Culverts

Culverts
- Undersized Culvert
- Culvert Passes 100-year Flow
- Ditch Relief Culvert – No Analysis Performed

- Transmission Line
- SMUD administrative trails
- UARP Project Related Roads

Non-Project Related Roads
- Private (other)
- SMUD

- USFS
- County
- State

Rivers & Streams
- Perennial
- Intermittent

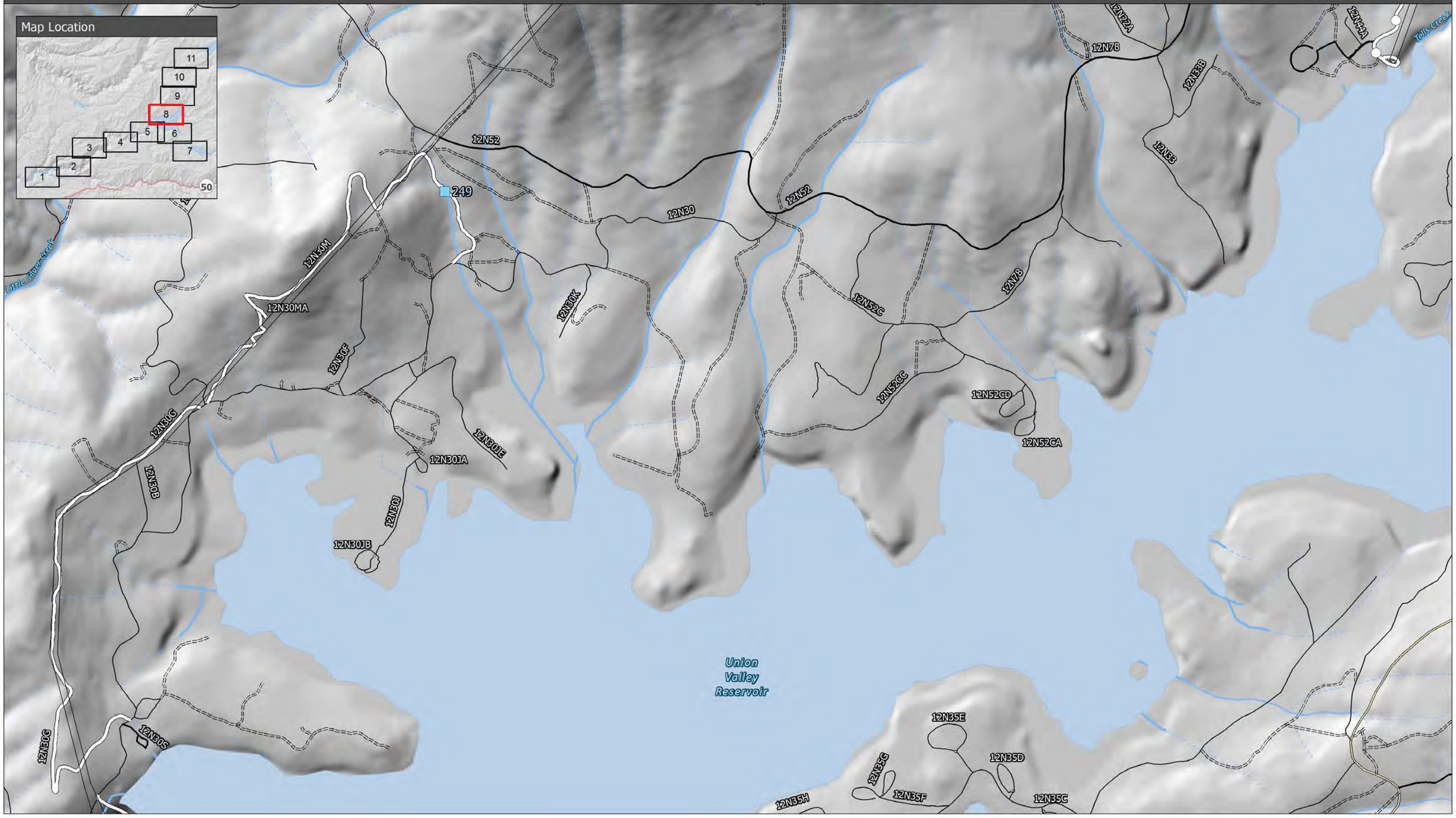
Ephemeral
Canals
California Waterbodies

Sources:
Streams: NHD 24k
Hillshade: NED 10m
Transmission line: SMUD

0 500 1,000 2,000 Feet

N

Stillwater Sciences
www.stillwatersci.com



Surveyed Culverts

Culverts
- Undersized Culvert
- Culvert Passes 100-year Flow
- Ditch Relief Culvert – No Analysis Performed

- Transmission Line
- SMUD administrative trails
- UARP Project Related Roads

Non-Project Related Roads
- Private (other)
- SMUD

- USFS
- County
- State

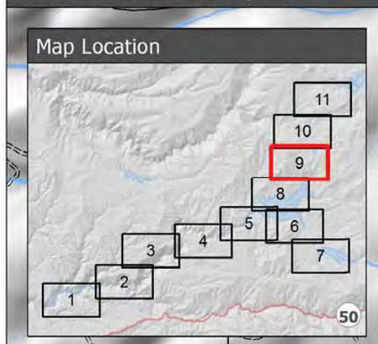
Rivers & Streams
- Perennial
- Intermittent
- Ephemeral
- Canals
- California Waterbodies

Sources:
Streams: NHD 24k
Hillshade: NED 10m
Transmission line: SMUD

0 500 1,000 2,000 Feet

N

Stillwater Sciences
www.stillwatersci.com



13N31A
13N31AN
13N31
17NY12K
13N70
13N31
12NY15A
12NY15
Ice House Rd
13N22
13N22Q
13N22R
13N22P
13N15B
12NY15D
13N31B
2000
12N21
13N15
12NY15B
12NY15
12N22F
13N15D
Cheese Camp Creek
Tells Creek
13N31B
12NY15E
12NY15EA
Ice House Road
12N03
13N15A
13N15C
12N22E
12N22
17N12W
17N12B2
13N13
13N12
13N13C
12N44
12N22A
12N44A
12N31

Surveyed Culverts

Culverts
- Undersized Culvert
- Culvert Passes 100-year Flow
- Ditch Relief Culvert – No Analysis Performed

- Transmission Line
- SMUD administrative trails
- UARP Project Related Roads

Non-Project Related Roads
- Private (other)
- SMUD

- USFS
- County
- State

Rivers & Streams
- Perennial
- Intermittent

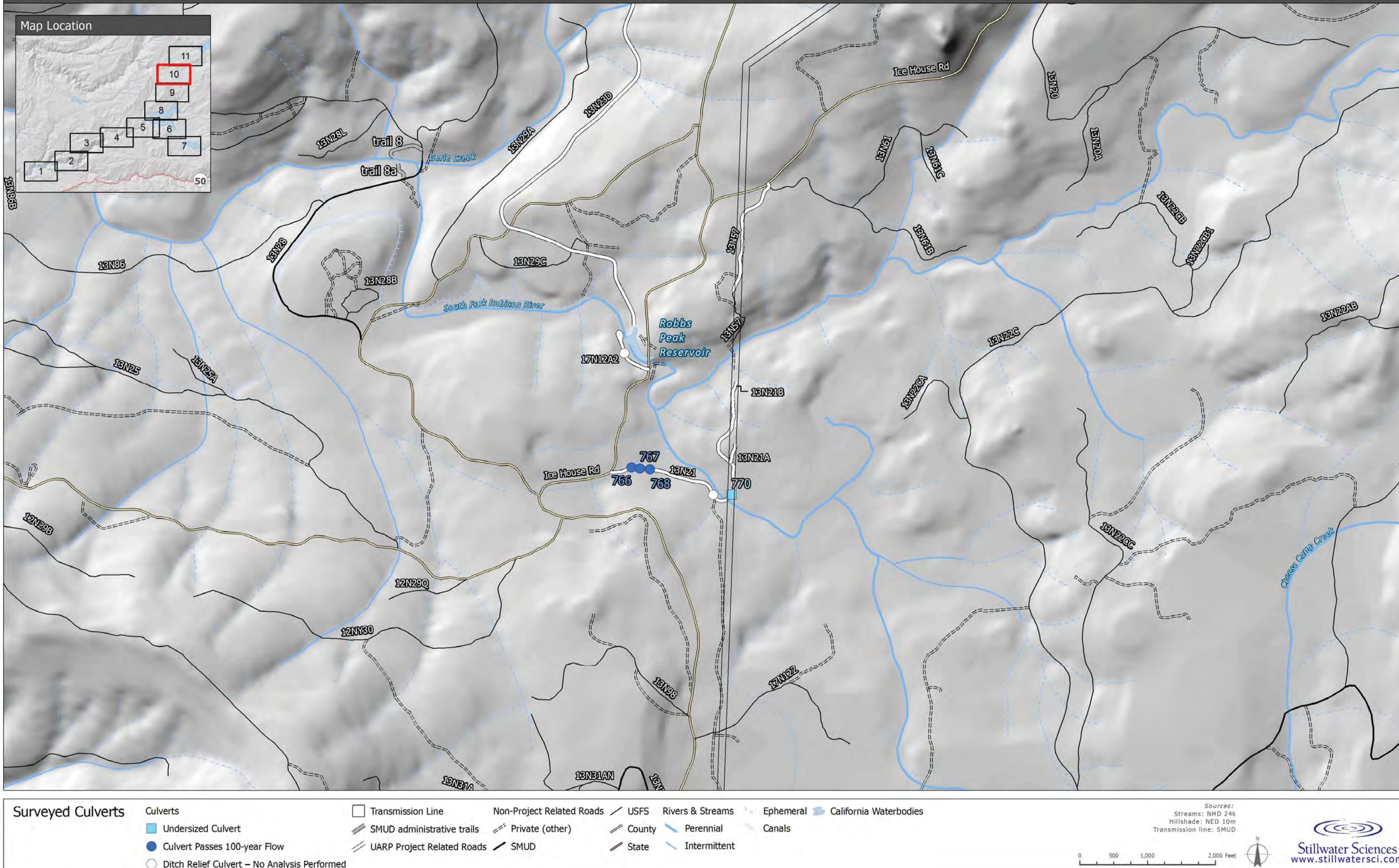
- Ephemeral
- Canals
- California Waterbodies

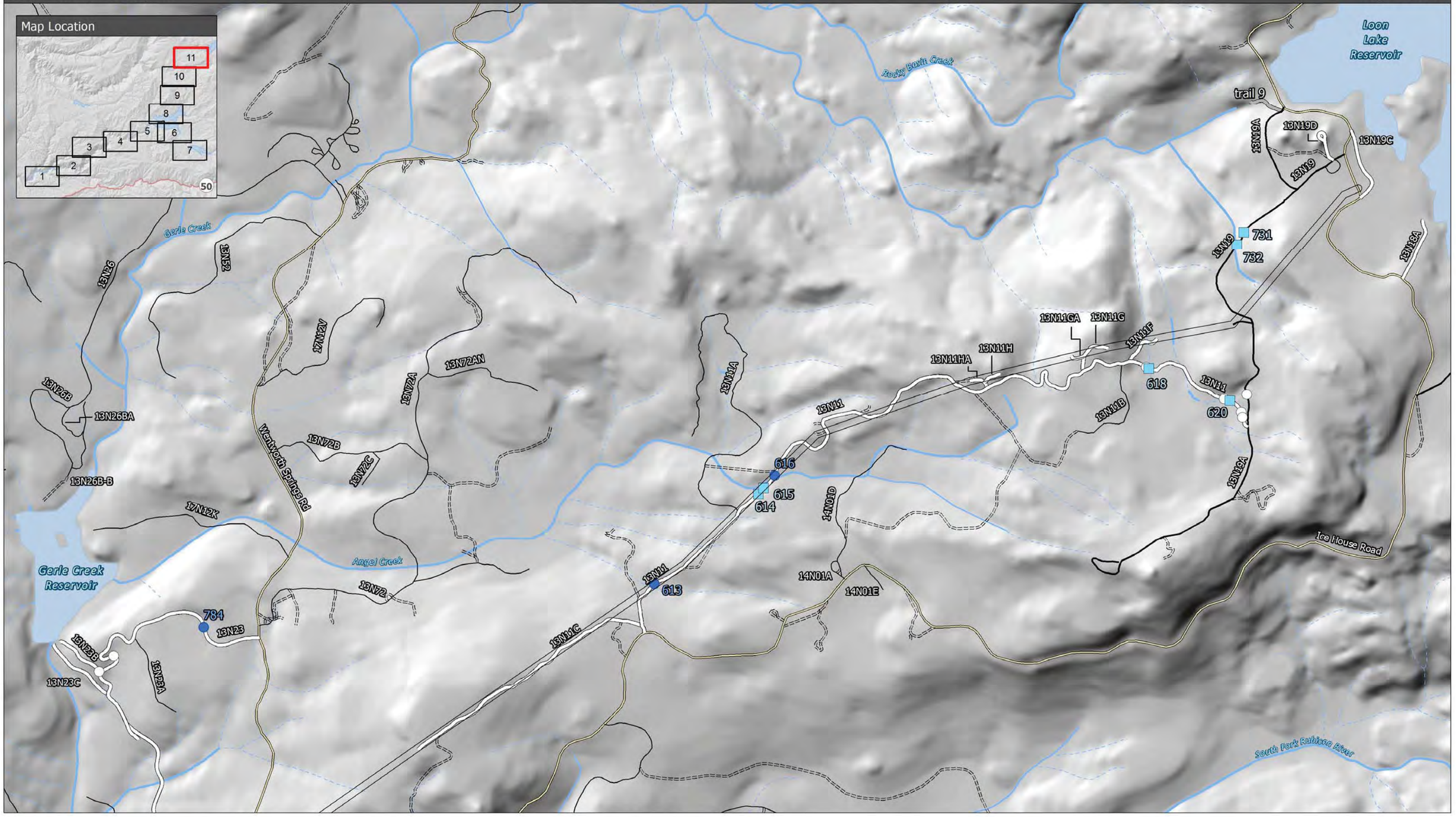
Sources:
Streams: NHD 24k
Hillshade: NED 10m
Transmission line: SMUD

0 500 1,000 2,000 Feet

N

Stillwater Sciences
www.stillwatersci.com


Map Location
11
10
9
8
5
6
7
4
3
2
1
50
trail 8
trail 8a
Gerle Creek
13N28L
13N29A
13N23D
Ice House Rd
13N20
13N61
13N61C
13N20A
13N22CB
13N22CB1
13N61B
13N57
13N86B
13N86
13N28
13N28B
13N29C
South Fork Rubicon River
Robbs
Peak
Reservoir
17N12A2
13N25
13N25A
13N21B
13N22CA
13N22C
13N22AB
767
766
768
13N21
770
13N21A
Ice House Rd
12N29B
12N29Q
12NY30
13N22CC
Cheese Camp Creek
13N98
17N12Z
13N31AN
13N31A
Surveyed Culverts
Culverts
Undersized Culvert
Culvert Passes 100-year Flow
Ditch Relief Culvert – No Analysis Performed
Transmission Line
SMUD administrative trails
UARP Project Related Roads
Non-Project Related Roads
Private (other)
SMUD
USFS
County
State
Rivers & Streams
Perennial
Intermittent
Ephemeral
Canals
California Waterbodies
Sources:
Streams: NHD 24k
Hillshade: NED 10m
Transmission line: SMUD
0 500 1,000 2,000 Feet
N
Stillwater Sciences
www.stillwatersci.com



Surveyed Culverts

Culverts
- Undersized Culvert
- Culvert Passes 100-year Flow
- Ditch Relief Culvert – No Analysis Performed

- Transmission Line
- SMUD administrative trails
- UARP Project Related Roads

Non-Project Related Roads
- Private (other)
- SMUD

- USFS
- County
- State

Rivers & Streams
- Perennial
- Intermittent

- Ephemeral
- Canals
- California Waterbodies

Sources:
Streams: NHD 24k
Hillshade: NED 10m
Transmission line: SMUD

0 500 1,000 2,000 Feet

N

Stillwater Sciences
www.stillwatersci.com

Appendix G

Eldorado National Forest
Standard Road Maintenance Specifications

This page intentionally left blank.

Eldorado National Forest

Standard Road Maintenance

Specifications for Roads

(March 2014)

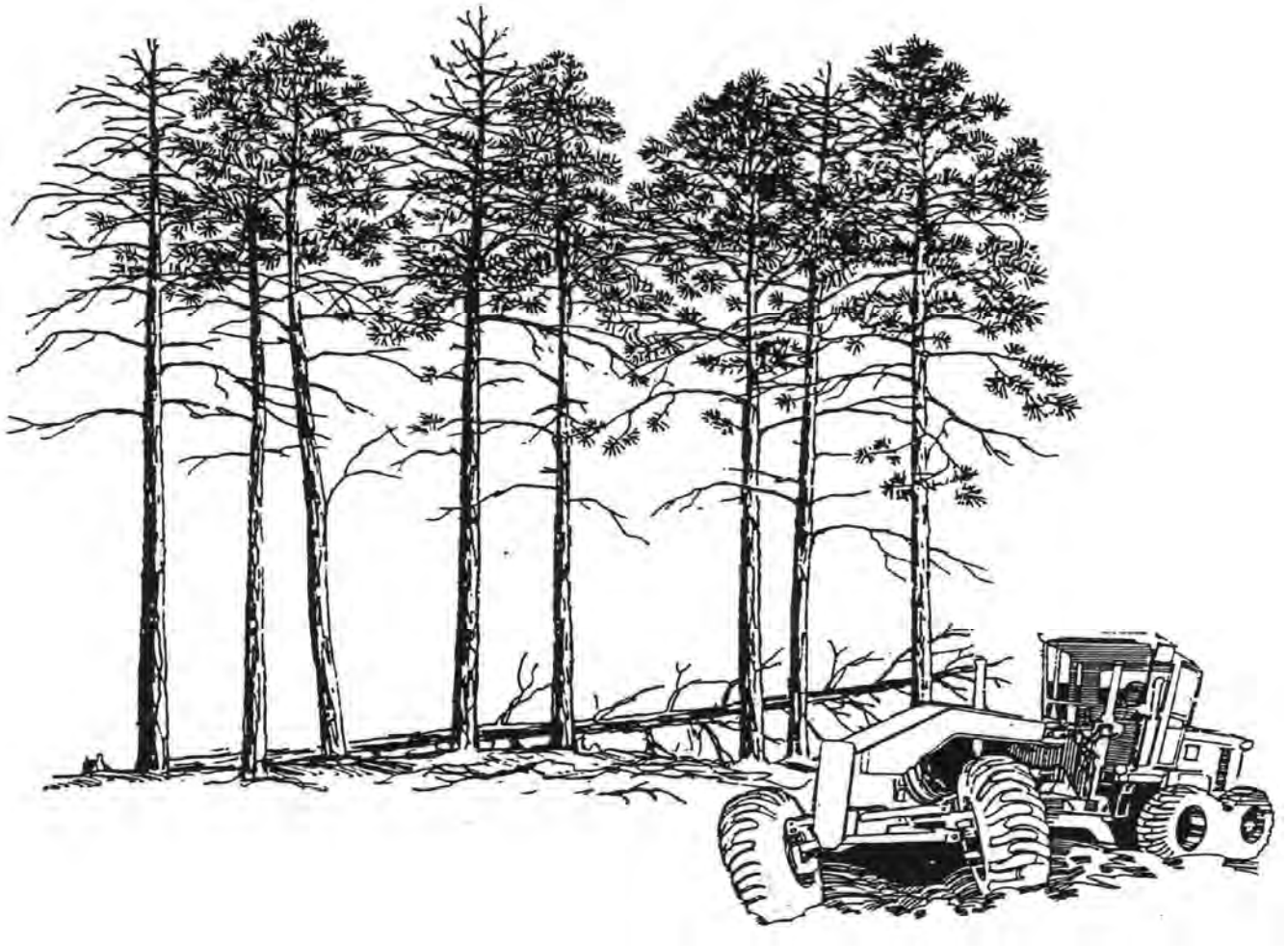


Table of Contents

Table of Contents 2
800 ABBREVIATIONS AND DEFINITIONS (7/12) 4
QUANTITY MEASUREMENT TERMS 4
DEFINITIONS 5
806 - WEED AND DISEASE PREVENTION (7/2009) 7
1. DESCRIPTION 7
2. REQUIREMENTS 7
808 WORK AREA MANAGEMENT (5/97) 8
1. DESCRIPTION 8
2. REQUIREMENTS 8
809 WATERBARS (7/12) 9
1. DESCRIPTION 9
2. REQUIREMENTS 9
810 SLIDE AND SLUMP REPAIR(7/12) 10
1. DESCRIPTION 10
2. REQUIREMENTS 10
811 BLADING (7/12) 11
1. DESCRIPTION 11
2. MAINTENANCE REQUIREMENTS 11
812 DUST ABATEMENT (7/12) 13
1. DESCRIPTION 13
2. MATERIALS 13
3. WEATHER LIMITATIONS 13
4. EQUIPMENT 13
5. MAINTENANCE REQUIREMENTS 13
815 PAVED SURFACE CLEANING (7/12) 14
1. DESCRIPTION 14
2. EQUIPMENT 14
3. MAINTENANCE REQUIREMENTS 14
816 MAINTENANCE OF UNPAVED SHOULDERS (7/12) 15
1. DESCRIPTION 15
2. MAINTENANCE REQUIREMENTS 15
831 DITCH MAINTENANCE AND CONSTRUCTION (7/12) 16
1. DESCRIPTION 16
2. MAINTENANCE REQUIREMENTS 16
832 REMOVE AND END HAUL MATERIALS (7/12) 17
832 REMOVE AND END HAUL MATERIALS (7/12) 17
1. DESCRIPTION 17
2. MAINTENANCE REQUIREMENTS 17
834 DRAINAGE STRUCTURE MAINTENANCE (7/12) 18
1. DESCRIPTION 18
2. MAINTENANCE REQUIREMENTS 18
835 ROADWAY DRAINAGE MAINTENANCE (7/12) 19
1. DESCRIPTION 19
2. MAINTENANCE REQUIREMENTS 19
837 DRAINAGE DIP MAINTENANCE (7/12) 21
1. DESCRIPTION 21
2. MATERIALS 21

3. MAINTENANCE AND CONSTRUCTION REQUIREMENTS....21
838 MAINTENANCE FOR LIMITED USE (7/12) 22
1. DESCRIPTION 22
2. MAINTENANCE REQUIREMENTS....22
DRAWING 838-1....24
DRAWING 838-2....25
DRAWING 838-3DRAWING 838-4 DRAWING 838-5....26
DRAWING 838-4 DRAWING 838-5 27
DRAWING 838-5....28
842 CUTTING ROADWAY VEGETATION (7/12)....29
1. DESCRIPTION 29
2. MAINTENANCE REQUIREMENTS....29
851 LOGGING OUT (7/12)....31
1. DESCRIPTION 31
2. MAINTENANCE REQUIREMENTS....31
853 REMOVAL OF STRUCTURES AND OBSTRUCTIONS (7/12)....32
1. DESCRIPTION 32
2. MAINTENANCE REQUIREMENTS....32
854 HAZARD REMOVAL AND CLEANUP (7/12)....33
1. DESCRIPTION 33
2. MAINTENANCE REQUIREMENTS....33
862 MAINTENANCE OF TRAFFIC GATES AND BARRIERS (7/12) 34
1. DESCRIPTION 34
2. MATERIALS 34
3. MAINTENANCE REQUIREMENT 34
891 WATER SUPPLY AND WATERING (7/12)....35
1. DESCRIPTION 35
2. MATERIALS 35
3. EQUIPMENT 35

800 ABBREVIATIONS AND DEFINITIONS (7/12)

Whenever in these specifications, or in other contract documents, the following terms, or pronouns in place of them, are used, the intent and meaning shall be interpreted as follows: (Reference to a specific standard or specification shall mean the latest addition or amendment thereto in effect on date of Invitation for Bids.)

1. AASHTO - American Association of State Highway and Transportation Officials.
2. CS - Commercial Standard Issued by U.S. Department of Commerce.
3. EPA - Environmental Protection Agency.
4. FAR - Federal Acquisition Regulation System.
5. FED SPEC - Federal Specifications.
6. FSS - Federal Specifications and Standards.
7. MSHA - Mine Safety Health Administration.
8. MUTCD - Manual of Uniform Traffic Control Devices.
9. NBS - National Bureau of Standards.
10. OSHA - Occupational Safety and Health Act.
11. PS - Product Standard issued by the U.S. Department of Commerce.
12. UL - Underwriter's Laboratories, Inc.

QUANTITY MEASUREMENT TERMS

1. Measurement , when specified under the contract, shall be according to the United States standard measure.
2. The methods of measurement and computation will be those necessary to accurately determine the quantities of materials furnished and work performed.
3. All items that are measured by the linear foot will be measured parallel to its longitudinal centerline, unless otherwise shown on the drawings.
4. A station when used as a definition of term or measurement will be 100 linear feet.
5. Miles will, in the absence of known distances from existing plans or surveys, be determined by the Government using a calibrated survey odometer or equal substitute operated on the traveled way at or parallel to road centerline.
6. Single lane mile measurement will mean the product of the road length in miles times the equivalent number of continuous traveled way lanes on the road. On two (2) lane roads, the lane miles will be twice the length of the road segment maintained. On one- (1) lane roads, the added length of turnouts will be determined by using a factor that includes the cumulative length of the turnouts. Unless a different factor is established in Special Project Specifications or listed for each affected one (1) lane road in the Road Listing, forty percent (40%) of the road will be considered as having turnouts; this yields a factor of one point four (1.4) times the length in miles of the road segment maintained. This adjustment applies only to work performed under Section 811.
7. The term "ton" will mean the short ton consisting of 2,000 pounds avoirdupois. Trucks used to haul material measured by truck weight shall be weighed empty at least once daily, and each truck shall bear a plainly legible identification mark. Weigh tickets furnished by the Contractor from certified scales will be used to determine weight measurements.
8. Materials measured by the cubic yard in the hauling vehicle shall be measured therein at the point of delivery. Vehicles may be of any size or type, provided that the box is of such shape that the actual volume may be readily and accurately determined.
9. Measurement by the acre will use the length and width treated. Measurement of width will approximate significant slope breaks, but will not include minor deviations along the slopes. The measured slope distance for width will be multiplied by the length treated and converted to a standard 43560 square foot acreage value of the surface area treated.

DEFINITIONS

Wherever in these specifications, or in other contract documents, the following terms, or pronouns in place of them, are used, the intent and meaning shall be interpreted as follows:

1. Agreed or Approved - Official agreement or approval by use of a written document issued by the Government. Agreements also require signature of Contractor's Representative and are dated.
2. Base Course - The layer or layers of specified or selected material of designed thickness placed on a subbase or a subgrade to support a surface course. (See Illustration of Road Maintenance Terms.)
3. Berm - A curb or dike which controls roadway runoff water, or delineates traffic direction. Berms commonly parallel road centerline; however, on Limited Use Roads (Section 838) may be placed diagonally across the roadbed. (See Illustration of Road Maintenance Terms.)
4. Channel - A natural waterway leading into or away from a culvert or bridge.
5. Contract Amendment - A bilateral written supplemental agreement between the Government and the Contractor, documenting a modification outside the scope of the contract and establishing an equitable adjustment.
6. Contractor - The individual, partnership, joint venture, or corporation undertaking the execution of the work under the terms of the contract.
7. Culvert (CMP) - Any structure which provides a passageway, drain, or waterway under a road or embankment.
8. Cross ditch - A shallow ditch placed across the roadbed to remove water from the roadbed surface which can be driven across by full-size pickups or other high clearance vehicles; usually placed diagonal to the centerline. (See Section 838.)
9. Lead-off ditch - A ditch used to remove water from roadside drainage ditches, the roadway, cattleguards, or drainage structures such as culverts and drainage dips.
10. Ditch - A relatively long narrow excavation placed to collect or disperse water.
11. Drainage dip - A drainage structure which was previously constructed within the roadbed surface to form a uniform depression which allows routine passage of vehicles while diverting water from the traveled way. (See Drawing 837-1, Typical Rolling Dip.)
12. Drainage ditch - A ditch located parallel to and abutting the roadbed. (See Illustration of Road Maintenance Terms.)
13. Drainage structure - A term identifying man-made devices placed to control water movements.
14. Drawings - Illustrations showing detailed maintenance required.
15. Equipment - All machinery, operating supplies and tools necessary for the proper performance and acceptable completion of the work.
16. Excess Material - Material from the roadway excess to that needed for maintenance of roadway.
17. Fore slope - The slope of the ditch section nearest to the traveled way. (See Illustration of Road Maintenance Terms.)
18. Government - The Contracting Officer or the duly authorized Contracting Officer's Representative (COR) with authority to sign orders.
19. Grade - The vertical alignment of the top surface of the road.
20. Inspector - The Government's authorized representative designated in writing, assigned to make detailed inspections of contract performance, but not to sign orders to the Contractor.
21. Materials - Any substances specified for use in the performance of the work.
22. Measurement - Method of determining and expressing the quantities of work.
23. Nominal Dimensions or Weights - The numerical values shown on the drawings or in the specifications as measurements for the work.
24. Order - A written order by the Government directing fulfillment of work requirements under the terms of the contract.
25. Original Contract Quantities - Those estimated quantities shown in the SCHEDULE OF ITEMS as awarded.
26. Patching - Minor repairs.
27. Paved Surface or Pavement - Denotes asphalt, concrete, or other stabilized materials excluding natural aggregates. Dust palliative treatments are not considered as pavement.
28. Reasonably Close Conformity - Means compliance with customary maintenance tolerances where working tolerances are not specified.
29. Right-of-Way - A general term denoting land, property, or interest therein acquired for or devoted to a road.
30. Roadbed - The portion of a road between the intersection of the subgrade and side slopes, excluding that portion of the ditch below the subgrade. (See Illustration of Road Maintenance Terms.)
31. Road Listing - A preliminary listing of road locations and any established work priorities.

32. Roadside - (See Illustrations of Road Maintenance Terms).
33. SCHEDULE OF ITEMS- Schedule, when included, contains a listing and description of maintenance items, quantities, units of measure, methods of measurement, unit price, and amount.
34. Shoulder - As used in this contract, the term is restricted to roads having a paved surfacing. (See Illustrations of Road Maintenance Terms.)
35. Slough or Slide - Material deposited on the roadway which may need to be repositioned or removed.
36. Slump - A localized portion of the roadbed which has slipped or otherwise become lower than that of the adjacent roadbed and constitutes a hazard to traffic.
37. Special Project Specifications - Specifications which detail conditions and requirements peculiar to the individual project.
38. Standard Specifications - Specifications for specific divisions of work.
39. Subgrade - Top surface of roadbed upon which subbase, base course, or surface course was constructed. (See Illustration of Road Maintenance Terms.)
40. Traveled Way - The portion of the roadway for the movement of vehicles. For purpose of this contract, traveled way includes turnouts and curve widening. (See Illustration of Road Maintenance Terms.)
41. Turnouts - A short auxiliary lane on a one-lane road provided for passage of meeting vehicles.
42. Unit of Measure - The unit and fractions of units shown in the Schedule of Items.
43. Unsuitable Material - Material removed during maintenance which must be disposed of in designated locations. Includes material with substantial amounts of vegetation or other objectionable material.
44. Waterbar - A deeper type cross ditch which is not intended for passage of traffic.
45. Work Schedule - The Contractor's current schedule for work progression.

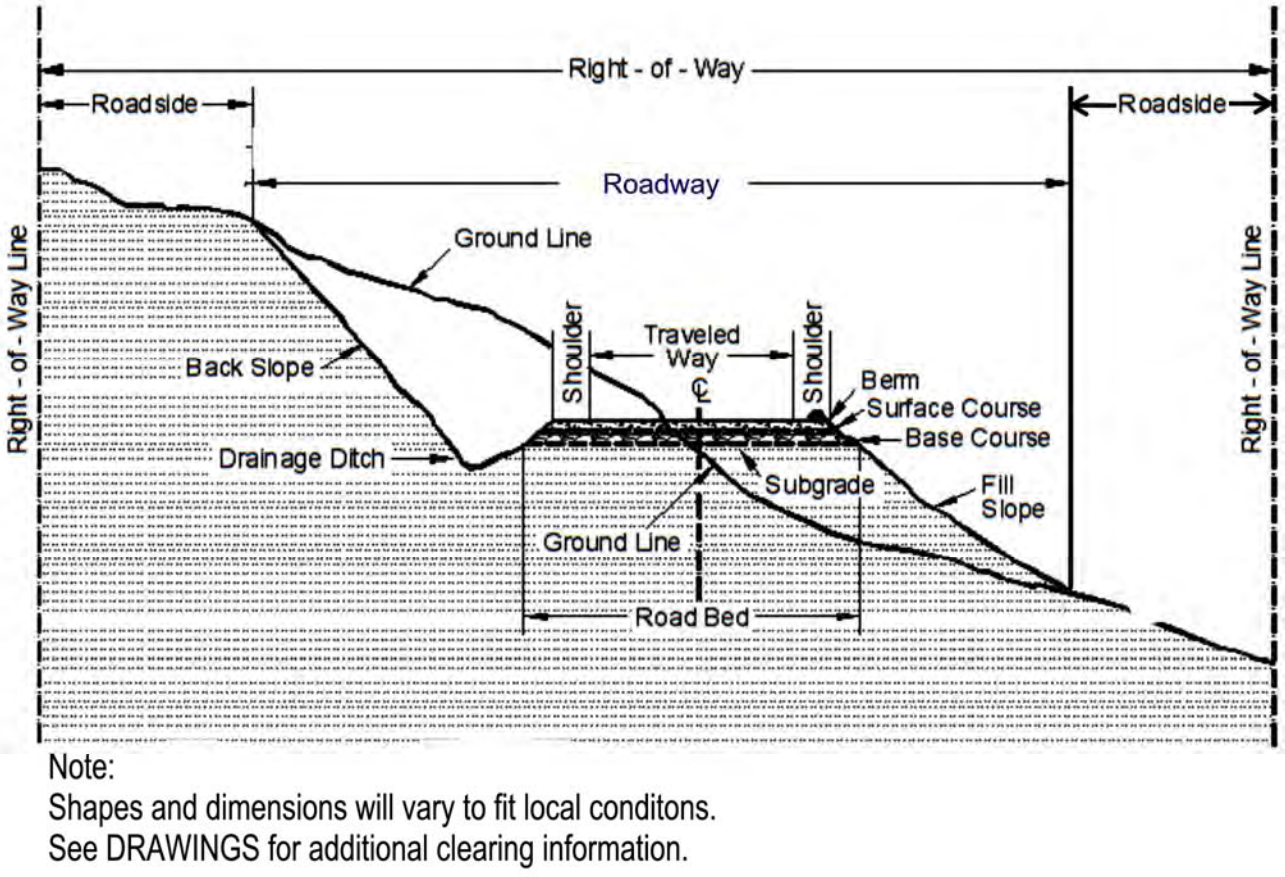


Figure 800-1 - Illustration of road structure terms

806 - WEED AND DISEASE PREVENTION (7/2009)

1. DESCRIPTION

This work consists of washing and treating construction equipment to remove seeds, plants, and plant fragments from the equipment before the equipment is used on National Forest System lands.

2. REQUIREMENTS

a. Notify the CO in writing at least 15 days before moving any construction equipment onto National Forest System lands. Construction equipment does not include cars, pickup trucks, and other vehicles that regularly travel between the construction site and areas outside of National Forest System lands.

b. Perform all work at a location designated on the plans or other locations approved in writing. Provide the CO with an opportunity to monitor the washing and inspection.

c. Equipment

   1. Use a high pressure washing system

   2. For work on National Forest System lands, use a washing system that traps all wash water and either stores it for removal from National Forest System lands or recycles the water for continued use. If the equipment recycles the water, provide adequate filters for seed removal. Dispose of the filter material and removed seeds in an approved manner. Do not mix soaps, detergents, or other chemicals with the wash water.

   3. For work at a commercial washing facility, use an approved facility.

d. Washing - Wash the sides, tops, and undercarriages of all construction equipment. Remove all seeds, plants, plant fragments, dirt, and debris from the construction equipment.

e. Inspection - Inspect the washed construction equipment, including the undercarriage, to ensure that the washing removed the dirt, debris, and seeds from the construction equipment. Rewash the construction equipment as necessary or as directed.

808 WORK AREA MANAGEMENT (5/97)

1. DESCRIPTION

This Section establishes Contractor responsibilities for traffic control and equipment requirements in work areas.

2. REQUIREMENTS

a. Traffic Conditions - Roads other than those listed for work under Section 835 shall be open to traffic with not more than fifteen (15) minutes maximum delay time unless otherwise provided in Special Project Specifications.
b. Work which interferes with use of traveled roadways shall not be initiated or performed until a plan for satisfactory handling of traffic has been approved by the Government.
c. Traffic Control Devices

    1. The Contractor shall provide signs and other devices complying with National Standards as contained in Part VI of the Manual of Uniform Traffic Control Devices (MUTCD). Traffic control for occupied work areas shall be in accordance with these specifications. All signs and devices remain the property of the Contractor.
    2. Traffic devices shall be kept current with maintenance operation and removed upon its completion.
    3. Traffic approaching the work area from either direction and side accesses having standard Government rectangular -or trapezoidal- shaped route markers with horizontal numbering shall be warned by signing.
    4. Required signs may be mounted on portable or temporary mountings. Standard MUTCD shapes, colors, sizes, and legends shall be used.
    5. Hazards incidental to the work within or on the traveled way, shoulders, or turnouts shall be marked with hazard identification markers, illuminated beacons, and other MUTCD devices to safely guide road users through the area. Work segments not completed on a daily basis shall be marked appropriately for night travel. Contractor shall obtain authorization before commencing work at night.
    6. Advisory speed plates may be used to control traffic through the work area.

d. Flaggers - Properly equipped flag person(s) shall be provided where the traffic is required to stop before proceeding. Traffic shall be stopped in locations which provide width enough for passage of traffic and reasonable protection for vehicles. When flag control is used, advance warning signs are required.
e. Contractor's Equipment

    1. All vehicles and machinery operating on or from the traveled way or road shoulder shall have flashing lights, strobes, or rotary beacons operated continuously while work is in progress. Truck headlights shall be on while operating. Back-up horns shall be required on all self-propelled equipment in excess of 10,000 lbs. gross weight.
    2. Vehicles and machinery not currently used in the maintenance operation shall be parked off the traveled way at approved locations to minimize interference with normal use.

809 WATERBARS (7/12)

1. DESCRIPTION

This work consists of installing or removing Waterbars in the Roadbed.

2. REQUIREMENTS

a. Waterbars shall be installed on roads where staked on the ground by the Forest Service.
b. All material excavated shall be used in the installation of the Waterbar. Bermed material shall be compacted by operating heavy equipment over the length and width of the Waterbar.
c. Waterbars removed for haul by blading the berm into the adjacent depression to form a smooth transition along the Traveled Way. The length and width of the fill material shall be compacted by the equipment performing the work.
d. Waterbars may be required to be installed between seasons of use and then removed when haul is resumed. Waterbar installation will also be required when use of a road has been completed.

810 SLIDE AND SLUMP REPAIR(7/12)

1. DESCRIPTION

a. Slide removal is the removal from Roadway and disposal of any material, such as soil, rock, and vegetation that cannot be routinely handled by a motor grader during Ditch Maintenance, Section 831, and Blading, Section 811.
b. Slump repair is the filling of depressions or washouts in Roadway which cannot be routinely filled by a motor grader during Blading, Section 811.
c. Slide removal and slump repair includes excavation, loading, hauling, placing, and compacting of waste or replacement material and the development of disposal or borrow areas.

2. REQUIREMENTS

a Slide material, including soil, rock and vegetative matter which encroaches into the Roadway, shall be removed. The slope which generated the slide material shall be reshaped during the removal of the slide material with the excavation and loading equipment. Slide material deposited on the fill slope and below the Traveled Way will not be removed unless needed for slope stability or to protect adjacent resources.
b. Surface and Base Courses shall not be excavated during slide removal operations.
c. Slide material which cannot be used for other beneficial purposes shall be disposed of at disposal sites SHOWN ON THE CONTRACT AREA MAP or SALE AREA MAP. Material placed in disposal sites will not require compaction unless compaction is SHOWN ON THE ROAD MAINTENANCE REQUIREMENTS SUMMARY or as directed by the Forest Service.
d. When filling slumps or washouts, material shall be moved from agreed locations or borrow sites SHOWN ON CONTRACT AREA MAP or SALE AREA MAP, placed in layers, and compacted by operating the hauling and spreading equipment uniformly over the full width of each layer.
e. Existing aggregate surfacing shall be salvaged when practical and relaid after depressions have been filled.
f. The repaired areas of the slump shall conform to the cross section which existed prior to the slump and shall blend with the adjacent undisturbed Traveled Way.
g. The maximum volume of Purchaser responsibility for slide and slump repair is SHOWN ON ROAD MAINTENANCE REQUIREMENTS SUMMARY. Greater volumes of slide and slump repair not qualifying as Catastrophic Damage are Forest Service responsibility.

811 BLADING (7/12)

1. DESCRIPTION

This work consists of surface blading native or aggregate roadbed where shown in the ROAD MAINTENENCE REQUIREMENT SUMMARY, or SHOWN ON THE CONTRACT AREA MAP or SALE AREA MAP, to a condition to facilitate traffic and provide proper drainage. Blading includes watering, shaping the crown or outsloping and compaction of traveled way, road side ditches, swales, shoulders, berms, and drainage dips in accordance with this specification. Work shall also include the maintenance of culverts, catch basins, and inlet basins.

2. MAINTENANCE REQUIREMENTS

a. Timing- Routine surface blading shall be performed during the contract period as ordered by the Government. Contractor shall commence surface blading within two (2) contract days after receipt of written order unless otherwise stated in the order.

b. General

1. The existing traveled way and shoulders, including turnouts unless otherwise ordered, shall be bladed and shaped to produce a surface which is uniform, consistent to grade, and crowned or cross-sloped as indicated by the character of the existing surface unless otherwise shown in the ROAD MAINTENENCE REQUIREMENT SUMMARY or SHOWN ON THE CONTRACT AREA MAP or SALE AREA MAP, to at least one half inch (1/2") per foot of width, but not more than three quarter inch (3/4") per foot of width. Surfacing materials shall be thoroughly loosened to no less than 2 inch depth or the depth of potholes or corrugations. Scarification to facilitate cutting to the full depth of potholes or corrugations may be elected by the Contractor but will be considered incidental to blading. Scarification shall not go deep enough to cause contamination of the surfacing.
2. Contractor shall apply water prior to and during blading when sufficient moisture is not present to obtain the required compaction and prevent segregation. Water supply, hauling, and application shall be in accordance with Section 891 and shall be incidental to blading.
3. Existing native, rock or aggregate surfaced drainage dips shall be shaped incidental to blading to divert surface runoff to existing outlet devices, ditches and discharge locations.
4. The Contractor shall establish a blading pattern which provides a uniform driving surface, retains the surfacing on the roadbed and provides a thorough mixing of the materials within the completed surface width. Upon final blading, no disturbed rock shall protrude more than two (2) inches above the adjacent surface unless otherwise provided in the contract. Material not meeting this dimension shall be removed and placed outside the roadbed so as not to obstruct drainage ways or structures. This material may be scattered off the roadbed if there is free drainage.

c. Routine Blading

1. Upon completion of blading, the surfaces shall conform to the original road dimensions.
2. Roadbed width in excess of the dimensions shown shall be shaped only as needed to provide drainage away from the traveled way. Established grasses and other vegetation shall not be removed from the excess width except as incidental to providing drainage or unless otherwise provided in the contract.

d. Compaction

Unless Compaction Method B is included in the ROAD MAINTENENCE REQUIREMENT SUMMARY, all traveled ways requiring compaction shall be compacted by Method A. Compaction shall commence immediately following blading. Contractor shall apply water prior to and during blading when sufficient moisture is not present to obtain the required compaction and prevent segregation

Compaction methods are:

Compaction Method A: By breaking track while operating equipment on the traveled way.

Compaction Method B: 8-10 ton pneumatic, steel or equivalent vibrating roller, operated to cover the full width five (5) times.

e. Intrusions - Where a safe minimum width is not available, the Contractor will construct berms where ordered and marked on the ground. Material to provide berms will come from the roadway or sources designated in the SHOWN ON THE CONTRACT AREA MAP or SALE AREA MAP.

f. Undercutting - Roadway back slope shall not be undercut.

g. Intersections

1. At intersections, the roadbeds of side roads which are not closed or restricted from vehicular use shall be bladed to assure smooth transitions.
2. Field evidence of closure or restrictions shall be considered to be signing, cross ditching in the road surface (traveled way), earth berms or other devices placed to discourage or eliminate use by passenger cars, also roads listed for work under Sections 835 or 838 shall be considered restricted.
3. Side roads listed for work under this Section shall be considered as not restricted.

h. Cleaning of Structures - Materials resulting from work under this Section shall not be allowed to remain on or in structures, such as bridges, culverts, cattleguards, or drainage dips. See the following Sections for additional requirements:

831 – Ditch Maintenance
834 – Drainage Structures
835 – Roadway drainage Maintenance
877 – Drainage Dip Maintenance

i. Berms - Existing berms shall be maintained to the condition of adjacent segments when ordered by the Government.

812 DUST ABATEMENT (7/12)

1. DESCRIPTION

This work shall consist of preparing Traveled Way and furnishing and applying materials to abate dust. The roads requiring dust abatement, type of dust abatement material to be used, the rates of application, and frequency of applications will be shown in the ROAD MAINTENENCE REQUIREMENT SUMMARY may be changed by written agreement.

2. MATERIALS

The dust palliative materials shall be as shown in the road listing unless shown as an option for Contractor's election from the following materials:

a. Water (H2O) for dust abatement will be incidental to hauling under this contract and shall be obtained from sources shown on the SALE AREA MAP OR CONTRACT MAP, unless otherwise agreed.

3. WEATHER LIMITATIONS

a. Water applications are not limited by weather forecast or temperature.

4. EQUIPMENT

a. Equipment shall meet the requirements in Section 891 WATER SUPPLY AND WATERING.

5. MAINTENANCE REQUIREMENTS

a. Water applications shall be limited to abatement for hauling vehicles under this contract and shall be provided at a frequency and rate which controls dust such that vehicle tail lights and turn signals remain visible. Rates of application shall be varied as needed but shall be low enough to avoid forming rivulets. Frequency of application shall be sufficient to accomplish the abatement without saturating and softening the traveled way. Compacted or glazed road surface or wheel tracks may be loosened as needed for water penetration.
b. Prior to initial application, when needed the road will be ordered bladed and shaped under Section 811, Blading.
c. Required subsequent applications may be applied to the existing road surface without blading unless it is ordered.
d. Dust abatement material shall be discharged only on roads approved by the Government.

815 PAVED SURFACE CLEANING (7/12)

1. DESCRIPTION

When required this work consists of removing loose material from paved, traveled way, including bridge decks and paved shoulders where shown in the Drawings.

2. EQUIPMENT

a. Equipment shall have the capability of removing all loose material from paved surfaces without damage to the surface.
b. Use of hydraulic flushing equipment will not be permitted within a horizontal distance of two hundred (200) feet from a live stream, unless approved by the Government.

3. MAINTENANCE REQUIREMENTS

The paved surface shall be cleaned to the existing road width. Materials shall be moved away from road centerline on double-lane roads. Bridge deck cleaning shall require all materials be moved longitudinally off the deck.

816 MAINTENANCE OF UNPAVED SHOULDERS (7/12)

1. DESCRIPTION

This work consists of maintaining unpaved shoulders adjacent to a paved traveled way. Work area will be identified by the Government or shown in the ROAD MAINTENENCE REQUIREMENT SUMMARY , CONTRACT AREA MAP or SALE AREA MAP

2. MAINTENANCE REQUIREMENTS

Existing shoulder material shall be bladed and shaped the entire width to drain away from the traveled way. Vegetative or other unsuitable materials may be bladed onto slopes adjacent to the roadbed unless otherwise shown in the DRAWINGS. The shoulder material shall be moistened if necessary for compaction. The shoulder shall be compacted adjacent to paved surface edge prior to final shaping. Grader wheels may be used for this compaction. Final shaping shall provide a smooth transition to the paved surface edge. Upon completion, the paved surface shall be cleaned of loose materials in accordance with Section 815.

831 DITCH MAINTENANCE AND CONSTRUCTION (7/12)

1. DESCRIPTION

This Section provides for routine maintenance of various types of ditches to provide a waterway that is unobstructed, as shown in the ROAD MAINTENENCE REQUIREMENT SUMMARY or marked on the ground. Drainage ditch maintenance is limited to materials contained within the ditch below the elevation of the adjacent edge of the traveled way or shoulder.

2. MAINTENANCE REQUIREMENTS

a. During ditch maintenance care shall be taken to retain existing low growing vegetative cover (primarily grasses and forbs).
b. Ditches shall be maintained by removing rock, soil, wood, and other materials. Upon completion the maintained ditch shall be of the same character as abutting segments that were not required to be maintained.
c. Back slopes shall not be undercut by removal operations.
d. Suitable material up to four (4) inches in greatest dimension removed from the ditches may be blended into existing native road surface and shoulder or placed in designated berm.
e. Material from ditch cleaning operations shall not be blended into or bladed across aggregate surfaced roads nor bladed onto or across bituminous surfaced roads.
f. Material in excess of 2(d) or subject to 2(e) will be ordered hauled to a designated waste area under Section 832. Excess materials temporarily stored on the ditch slope or edge of the shoulder shall be removed daily.
g. Limbs and wood chunks in excess of one (1) foot in length or three (3) inches in diameter shall be removed from ditches and placed outside the roadway.
h. Paved surfaces shall be cleaned of all materials resulting from Contractor's ditch maintenance work. Paved surface cleaning shall be in accordance with Section 815.
i. Lead-off ditches shall be shaped to drain away from the traveled way.

832 REMOVE AND END HAUL MATERIALS (7/12)

1. DESCRIPTION

Work consists of ordered loading, hauling, and placing of slide, slough, or excess materials such as rock, soil, vegetation, and other materials to designated disposal sites.

2. MAINTENANCE REQUIREMENTS

a. Excess materials generated by work under other Sections of this contract may be ordered for removal, haul, and disposal under this Section. Removal and disposal under all Sections will be ordered without haul when a distance of less than two hundred (500) feet is involved.

b. Slide and slough materials to be removed shall include those in the area extending approximately six (6) feet vertically above the road surface and that area extending not more than four (4) feet down slope from the roadbed. Material shall be disposed of at designated sites as shown on SALE AREA MAP OR CONTRACT MAP.

   The slope which generated the slide material shall be reshaped as nearly as practical to its original condition by equipment operating from road surface. Reshaping of roadside ditches in slide area shall be in accordance with Section 831.

c. When ordered by the Government, slumps shall be filled by compacting selected materials into roadway depressions. Compaction shall be by Method (2).

d. All materials removed and placed in disposal sites shall be placed by Method 1 unless shown otherwise in the ROAD MAINTENENCE REQUIREMENT SUMMARY.

   1. Method 1 - Side Casting and End Dumping. Material may be placed by side casting and end dumping. Where materials include large rocks, a solid fill shall be provided by working smaller pieces and fines into voids. The finished surfaces shall be shaped to drain.
   2. Method 2 - Layer Placement - Surfaces on which materials are to be placed shall be stepped or roughened prior to placing any material. Materials shall be placed in approximately horizontal layers no more than twelve (12) inches thick. Each layer shall be compacted by operating hauling and spreading equipment over the full width of each layer.

834 DRAINAGE STRUCTURE MAINTENANCE (7/12)

1. DESCRIPTION

This work consists of cleaning and reconditioning culverts and other drainage structures specified in the ROAD MAINTENENCE REQUIREMENT SUMMARY

2. MAINTENANCE REQUIREMENTS

a. Drainage structures, inlet structures, culverts, catch basins, and outlet channels shall be cleaned when required by the Government. Catch basins shall be cleaned by removing the material within the catch basin structure to top of cut bank.
b. The transition from the ditch line to the catch basin shall be cleaned a distance of ten (10) feet. Outlet channels and lead-off ditches shall be cleaned a distance of six (6) feet. Debris and vegetation shall be removed and placed so as to not enter the channel or ditch or obstruct traffic. Debris and vegetation ordered to be hauled shall be hauled to a designated disposal area in accordance with Section 832.
c. Hydraulic flushing of drainage structures is not allowed unless provided for in Project Specifications.
a. Cleaning and reconditioning is limited to the first four (4) feet of inlet and outlet determined along the top of the structure. Ordered reconditioning of culvert inlet or outlet shall be by field methods such as jacking out or cutting away damaged metal which obstructs flow. All cut edges and damage to galvanized coating shall be cleaned and treated with zinc rich coating. Damage or obstructions which are not field corrected under the requirements of this Section shall be reported to the Government.
b. Cleaning and reconditioning of channels beyond four feet shall be agreed upon in writing.

835 ROADWAY DRAINAGE MAINTENANCE (7/12)

1. DESCRIPTION

This work consists of providing drainage on roads that have been physically closed to traffic.

2. MAINTENANCE REQUIREMENTS

a. Access

1. The Government will provide for access through locked gates and also provide any special devices other than standard wrenches or tools, required for removal or replacement of fabricated barricades.
2. Other work associated with Contractor's access shall be the responsibility of the Contractor. The entrance shall not be left available for access to persons not associated with this contract; temporary barricades shall be used during the active performance of work.

b. Drainage

1. Upon completion of work, the roadway shall be shaped to provide for the removal of surface water, but need not be passable to vehicles. Waterbars, barriers or berms existing prior to the Contractors operation shall be repaired or reinstalled. Areas where water is ponded by existing centerline profile sags in through cuts may be left untreated.
2. Continuous blade shaping of the roadbed is not required under this specification.
3. Work to be done at staked locations shall be as indicated on the stake and/or stated in Special Project Specifications.
4. In not otherwise specified any of the following methods are acceptable for use at eroded or rutted locations.

   (a) Method A: Outsloping the roadbed at not less than one-half (1/2) inch per foot.
   (b) Method B: Insloping the roadbed at not less than one-half (1/2) inch per foot of width.
   (c) Method C: Water bar roadbed at locations staked on the ground or shown in Special Project Specifications. Construct in accordance with DRAWINGS included with the Special Project Specifications.

5. Drainage structures located in through fills and natural watercourses shall be fully functional without obstructions, including inlet and outlet channel within twenty (20) feet of the structure.
6. Culverts and other fabricated structures providing drainage from road ditches shall either be cleaned and the ditch made functional or waterbar(s) shall be provided across the roadbed. Fabricated drainage structures discharging on natural ground within three (3) feet of roadbed elevation may be removed at Government's option to provide the waterbar. Removed structures shall become Contractor's property to be removed from National Forest. Contractor-installed temporary drainage structures, if any, shall be removed and replaced with a water bar.

c. Slides, Slumps and Slough

1. Slides and slough may be left in place provided they do not potentially impound water or divert water from watercourses. Reshaping of the various surfaces shall be done as necessary to provide drainage.
2. Drainage shall be provided to effectively decrease or eliminate the entry of surface water into slides, slumps, and roadbed surface cracks. The Contractor shall place berms, waterbars or ditches as needed to intercept and remove runoff water from the roadbed. Cracks shall be surface sealed by covering over with native soil materials to prevent additional water entry and compacting with equipment tires.

d. Entrance Devices - Upon completion of work, entrance devices shall be replaced to effectively eliminate access by motorized vehicles having four (4) wheels and a width in excess of fifty (50) inches.

837 DRAINAGE DIP MAINTENANCE (7/12)

1. DESCRIPTION

This work consists of separately ordered maintenance of existing drainage dips and special outlet structures on all types of roads. Included in this are rolling dips on native, aggregate, and paved roads.

2. MATERIALS

Materials used in maintenance shall conform to the requirements of the applicable Sections for the materials within the structure.

3. MAINTENANCE AND CONSTRUCTION REQUIREMENTS

a. Special outlet structures such as aprons, culverts, and flumes shall be removed if necessary prior to maintaining the drainage dip, or the finished dip shall be oriented to the structure for alignment and gradient.
b. Hand work may be necessary to obtain a smooth surface and uniform cross section. Any special outlet structure removed shall be reinstalled to the flow line grade established by the completed drainage dip. The first thirty (30) feet of any lead-off ditch or channel shall be cleaned incidental to this Section.
c. Native material drainage dips shall be shaped to reasonably conform with the lines, grades, and cross sections staked on the ground. Removed materials shall be distributed uniformly over the downgrade road surface adjacent to the dip. Rocks shall not project more than two (2) inches above the final surface.
d. Aggregate or rock surfaced drainage dips shall be cleaned. When the Government determines the drainage dip requires shaping, existing surfacing materials shall be conserved for reuse upon completion of shaping. Conserved surfacing shall be placed and compacted with equipment prior to reinstalling any special outlet structures.
e. Compaction shall be as specified in Section 811.
a. Bituminous surfaced drainage dips shall be cleaned.

.

838 MAINTENANCE FOR LIMITED USE (7/12)

1. DESCRIPTION

This work consists of making the roadway passable for use by full-size pickups and providing drainage from the traveled way and roadbed.

2. MAINTENANCE REQUIREMENTS

a. Timing - Maintenance shall be performed during the contract period as often as indicated by the accepted schedule or subsequently ordered by the Government. The Contractor shall commence maintenance within two (2) weeks after receipt of written order unless otherwise stated in the order.

b. Drainage

1. Drainage shall be provided at existing drainage structures. Culverts providing drainage from road ditches shall have at least two thirds of the end area usable. Culverts in live streams or natural watercourses requiring cleaning shall have the end area fully usable.
2. Cross ditches conforming to the DRAWINGS shall be placed at staked locations to provide drainage across the full width of the roadbed. Except as provided in 2.c herein, materials removed from cross ditches and cleaning of existing drainage dips shall be bermed downgrade on the roadbed. Cross ditches shall be angled and shall discharge at points of least fill height or on natural ground.

c. Intersections (See Drawing 838-2)

Intersections shown in the Road Listing for work under this Section shall be cross ditched to drain over the full width of the listed road and define the traveled way of the adjacent road. Material removed from this cross ditch shall be placed as a berm on the roadbed and traveled way away from the intersection. A second cross ditch conforming to Drawing 838-1 shall be placed within sight of the intersection when possible, but in no case more than one hundred feet (100') from the intersection.

d. Objects on Roadbed (See Drawing 838-3)

a. Upon completion, no object extending over four (4) inches above the road surface shall remain within ten (10) foot usable traveled way width. Larger objects shall be selectively removed or repositioned to provide the usable width and lateral clearance required (See Drawing 838-3). The usable width shall be centered on the roadbed or positioned away from the fill slope.
b. Logs and down trees shall be cut to provide not less than twelve (12) feet of opening for vehicle passage provided the remaining ends are in ground contact and do not interfere with drainage. The portion to be removed may be cut into chunks or left as one piece and placed in a stable position where it will not restrict drainage or vehicle passage. Limbs shall be selectively removed to provide stability or ground contact and shall be scattered down slope outside of the roadbed and drainage ways.
c. Rocks and other objects outside the ten (10) foot usable width may remain if drainage is provided from the road surfaces.

e. Slough and Slides (See Drawing 838-4)

1. Slough and slides may be left in place when surface drainage is provided for and at least ten (10) feet of width is available for vehicle passage. The roadbed immediately upgrade shall be cross ditched. Any roadside ditch between the cross ditch and the remaining materials shall be filled and shaped to drain.
2. The Contractor may reposition or ramp over slides and slough when the traveled way is less than ten (10) feet (See Drawing 838-4), providing the material is capable of supporting vehicles. Ramp profile gradient shall not exceed twelve (12) percent nor have an out slope exceeding six (6) percent. Ramped

crossings shall be drained and bermed to a height of at least six (6) inches on the outside of the ramped area.

3. Slough or slide materials which are not capable of supporting a vehicle shall be repositioned on the roadbed to provide the ten (10) foot width unless the Government orders it removed under Section 832.

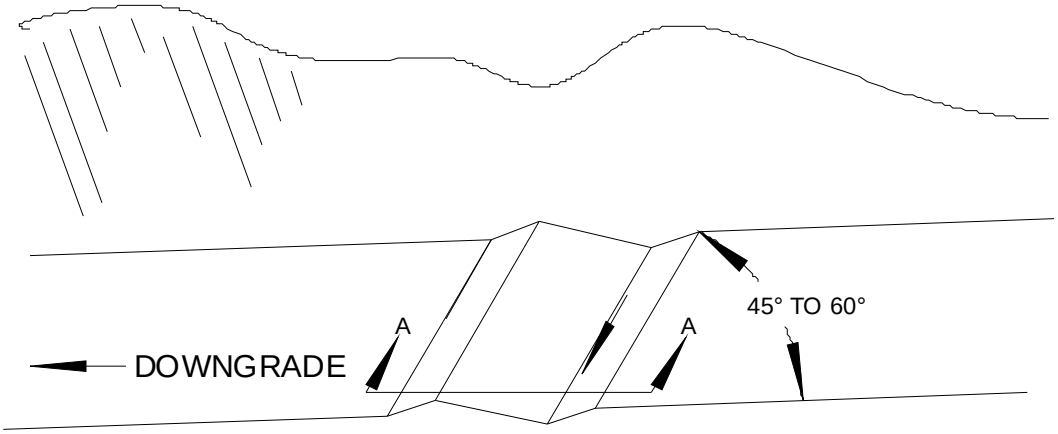
f. Slumps (See Drawing 838-5)

1. The roadbed immediately upgrade of slumps shall be cross-ditched (See Section A-A of Drawing 838-1).
2. Slumps at the edge of the roadbed shall not be considered a part of the usable width. Usable width may be reduced to eight (8) feet provided a berm of at least six (6) inches in height is placed on the undisturbed roadbed to divert surface water and provide a curb on the downhill side.
3. Roadbed slumps shall be ramped on both ends onto undisturbed roadbed to provide at least eight (8) foot usable width. No material shall be placed on the slumped area. Removed materials shall be bermed on the roadbed to guide vehicles to the ramp location, used to block any abutting ditches, and to divert water from entering the slump area. Ramp profile gradient shall not exceed twelve (12) percent. Areas within the slumps that could pond water shall be drained.
4. Roadbed cracks shall be sealed with native soil and wheel or tamper compacted to reduce the introduction of surface water.

g. Cutting Vegetation

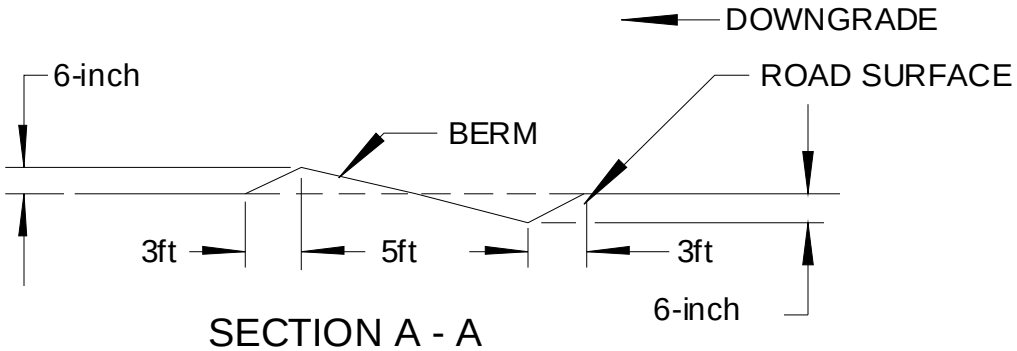
1. Trees, brush and limbs shall be cut and removed to provide at least twelve (12) feet of usable width centered on the existing usable road surface.
2. Encroaching limbs shall be removed to a height of ten (10) feet above the traveled way surface extending into the passageway from the side. Limbs extending laterally into the twelve (12) foot width shall be cut within six (6) inches of the trunk. Limbs extending down into the ten (10) foot height limitation may be cut or lopped as needed to meet the height requirement.
3. Brush and trees within the twelve (12) foot usable width corridor shall be cut parallel to and within two (2) inches of the traveled way surface.
4. Materials shall be scattered down slope outside the roadway.

DRAWING 838-1

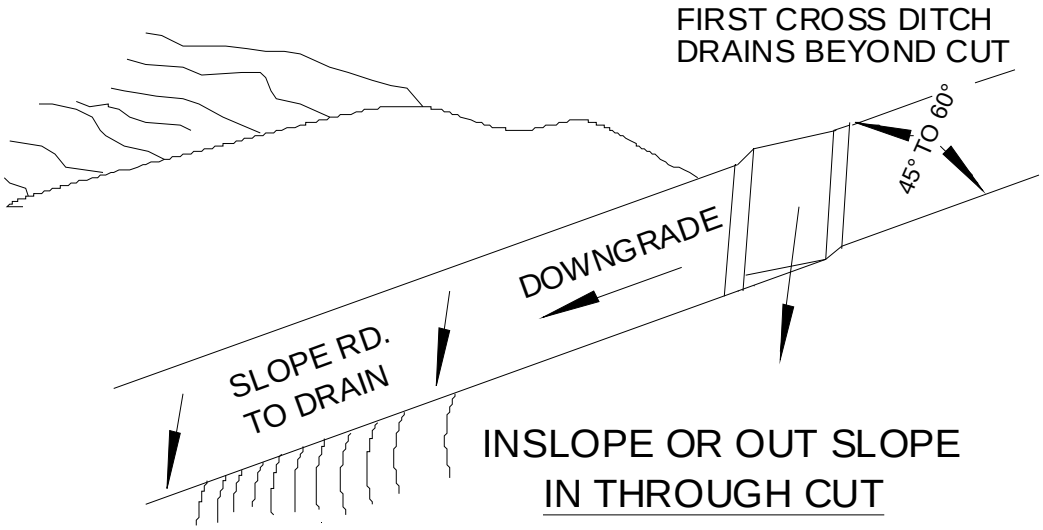


TYPICAL CROSS DITCH

NO SCALE



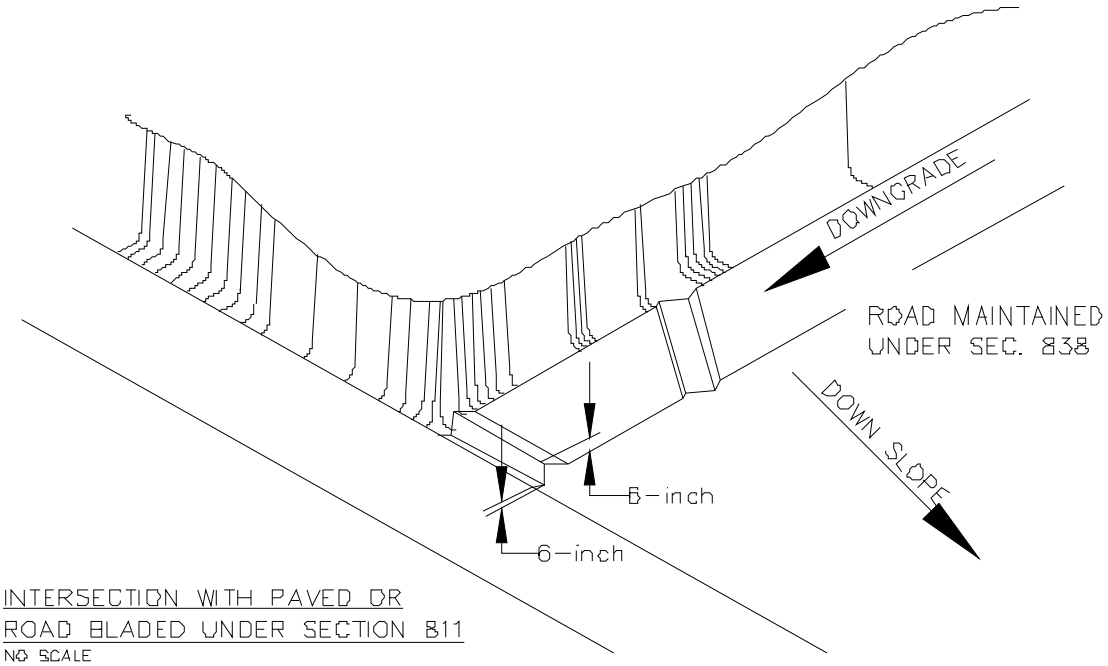
SECTION A - A



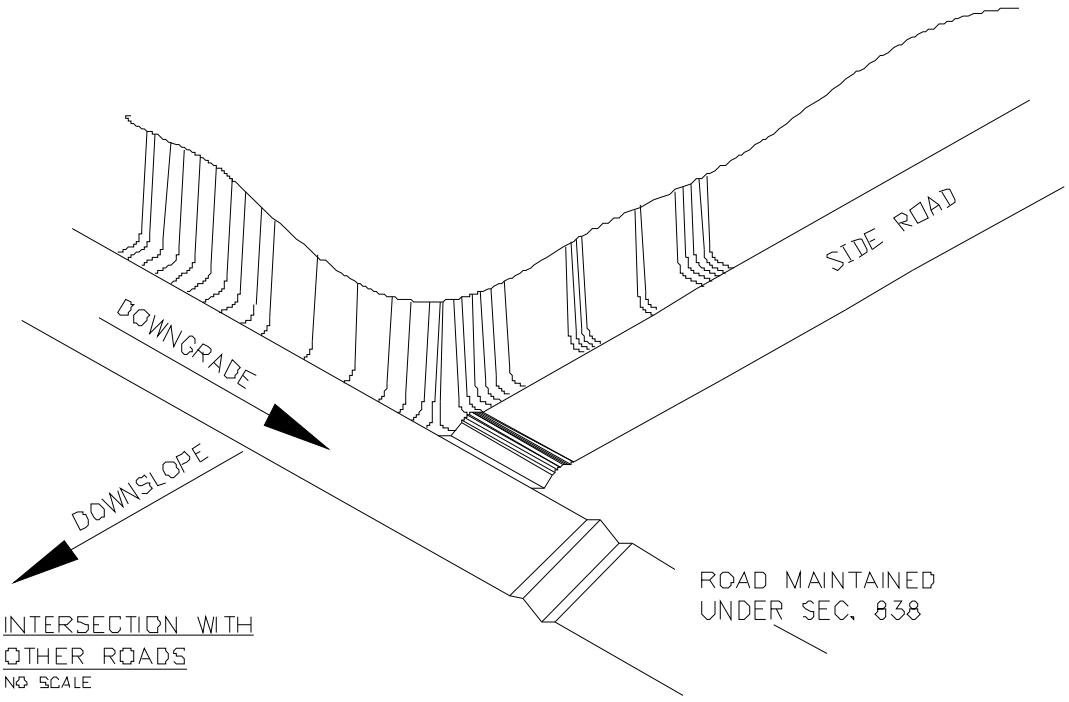
INSLOPE OR OUT SLOPE
IN THROUGH CUT

	TITLE CROSS DITCHING OF LIMITED USE ROADS	
	DRAWING 838-1	APPROVED

DRAWING 838-2



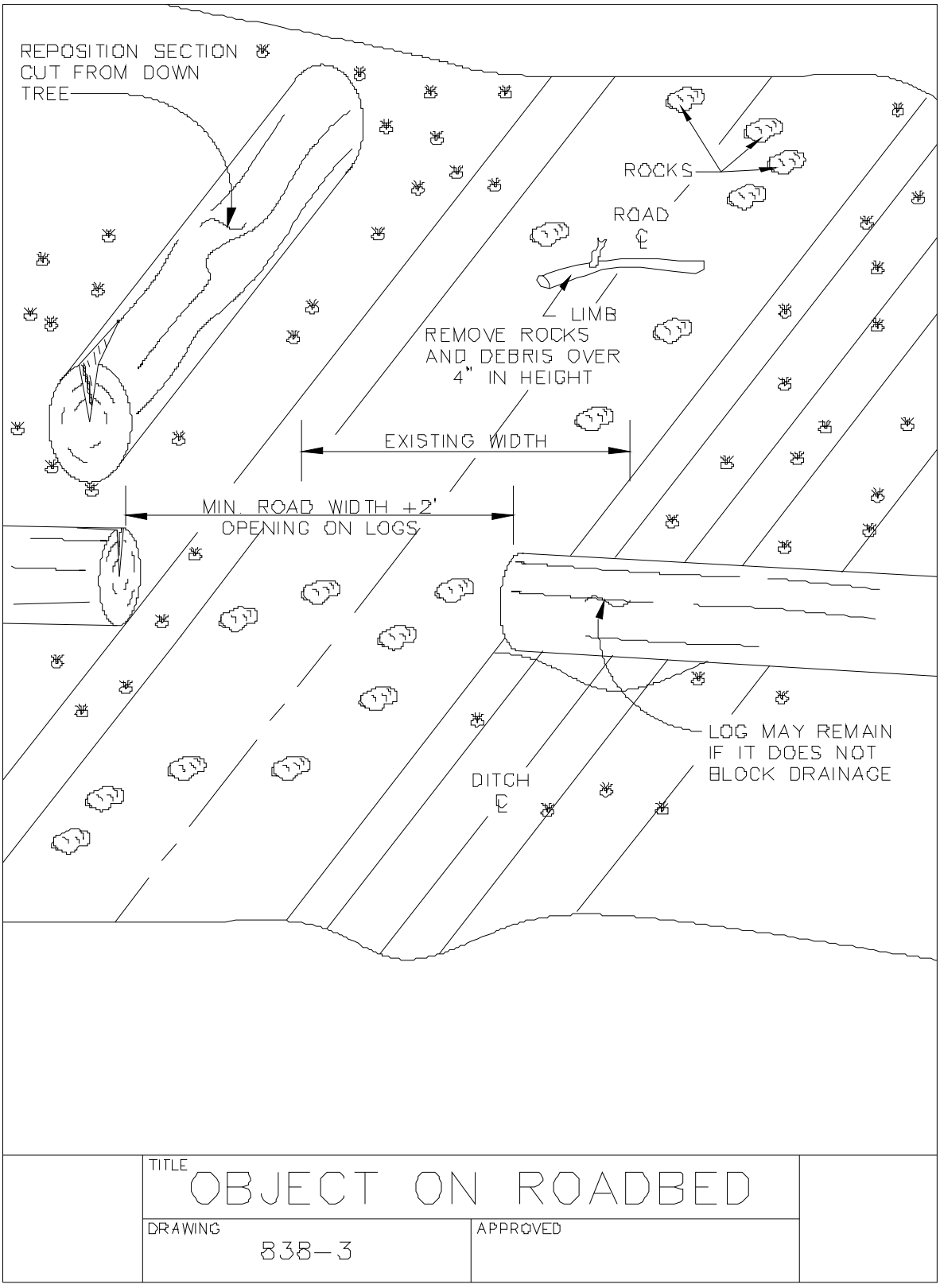
INTERSECTION WITH PAVED OR
ROAD BLADED UNDER SECTION 811
NO SCALE



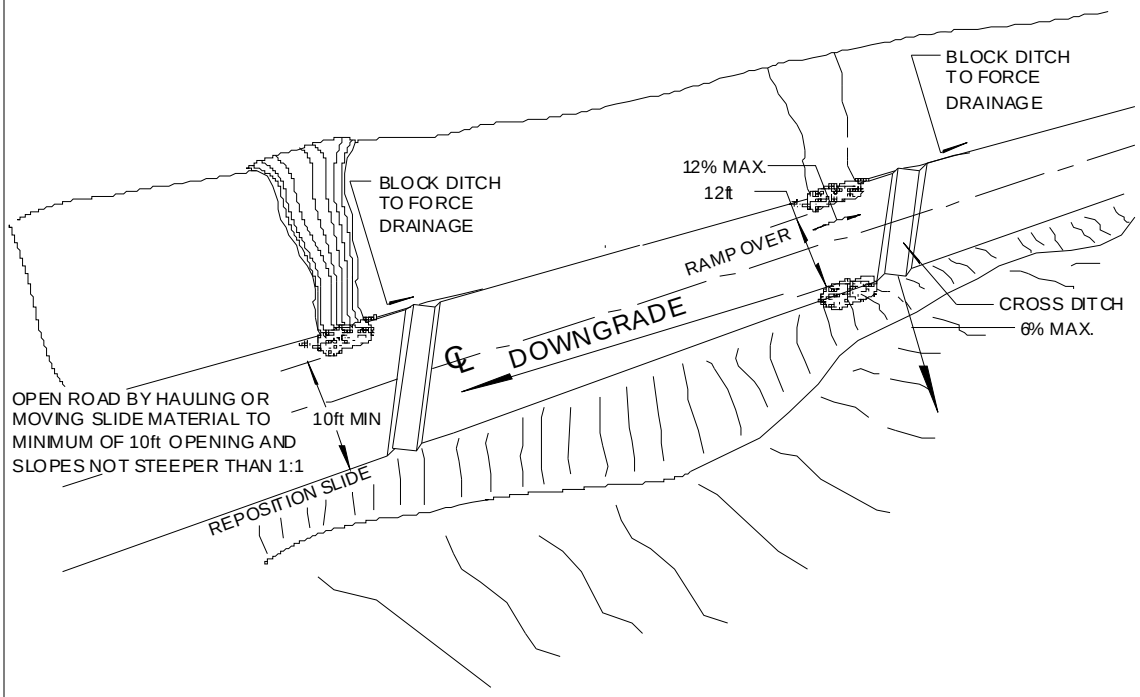
INTERSECTION WITH
OTHER ROADS
NO SCALE

TITLE	TREATMENT OF INTERSECTIONS ON LIMITED USE ROADS	
DRAWING 838-2	APPROVED	

DRAWING 838-3

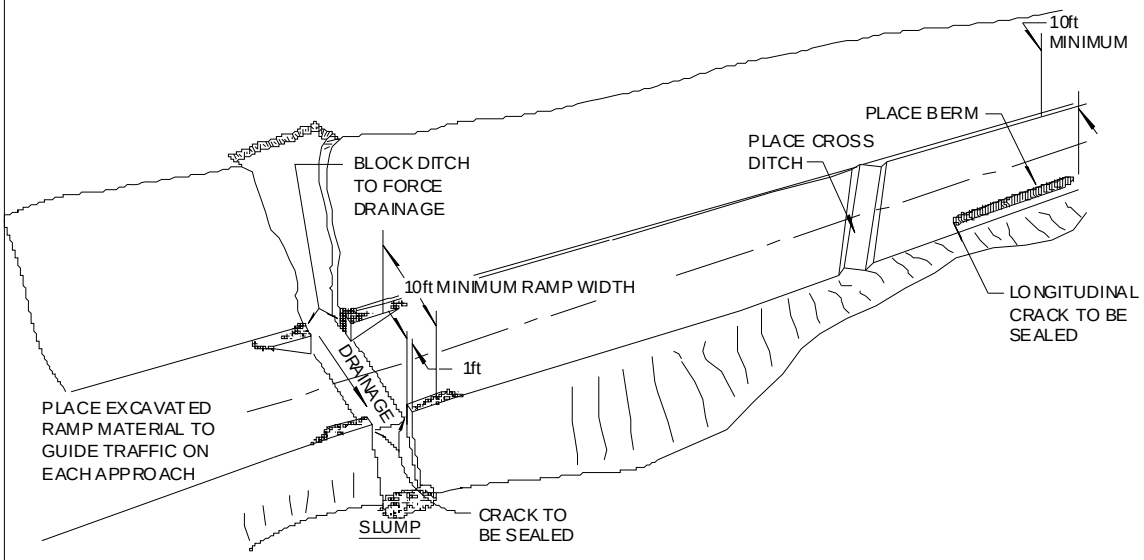


DRAWING 838-4



	TITLE TREATMENT OF SLIDES AND SLOUGH		
	DRAWING 838-4	APPROVED	

DRAWING 838-5



	TITLE TREATMENT OF SLUMPS AND ROADBED CRACKS		
	DRAWING 838-5	APPROVED	

842 CUTTING ROADWAY VEGETATION (7/12)

1. DESCRIPTION

This work consists of cutting all vegetative growth including trees and other vegetation less than ten (10) inches in diameter within the roadway when directed by the Contracting Officer.

2. MAINTENANCE REQUIREMENTS

a. General

1. Clearing debris shall be treated as directed by the CO by one or more of the methods described in paragraph 13 below.
2. Brush, trees, and other vegetation less than ten (10) inches in diameter within each area treated shall be cut to a maximum height of six (6) inches above the ground surface or obstruction such as rocks or existing stumps.
3. When work is performed under this Section, the Contractor shall remove all limbs which extend into the treated area or over the roadbed to a height of 16 lf. See Section 851 for additional requirements.
4. The width and height of the vegetation cutting shall be:

Road No.	From MileTo Mile	Width Heigh
All Roads	Will designated On the ground	16'

5. Signs, markers, and other road appurtenances are designated to be retained. Other items to remain will be marked on the ground.
6. The clearing width shall be as agreed upon in writing.
7. Work may be performed either by hand or mechanically. Self-propelled equipment shall not be allowed on cut and fill slopes or in ditches.
8. Damage to trunks of standing trees caused by Contractor's operation shall be corrected by Contractor, either by treatment with a commercial nursery sealer or by removing the tree as directed by the Government.
9. Mechanical brush cutters shall not be operated when there are non-Contractor personnel or occupied vehicles within a hazardous distance of immediate operating area.
10. Trees within the cutting limits which are over ten (10) inches in diameter may be limbed in lieu of cutting. Limbs of trees shall be cut to within one (1) inch of the bole of the tree when limbing is done by hand. If limbing is completed mechanically, stobs longer than 1" shall be hand trimmed to within one (1) inch of the bole of the tree.
11. Cutting Vegetation Clearing Limits – Shall be as needed for haul or as directed by the CO.
12. Transitions between differing increments of cutting width shall be provided. Transitions shall be accomplished in a taper length of not less than fifty (50) nor more than seventy (70) feet.
13. Road Clearing Slash Treatment Method Specifications:

a) Chipping	Clearing Slash up to 6 inches in diameter shall be processed through a chipping machine. Chips shall be scattered to a loose depth not exceeding 6 inches. The remainder of the material shall be cut into three (three) foot lengths and scattered.
b) Deck	Clearing Slash 10 inches or larger in large end diameter and 10 feet or more in length shall be Decked for disposal by Forest Service by piling pieces parallel to each other at agreed upon locations.
c) Scatter	Clearing Slash shall be scattered to reduce slash concentrations with slash being generally left within 18 of the ground. Logging Slash shall be scattered into openings away from and without unnecessary damage to residual trees. All scattered logs shall be limbed, placed away from trees and positioned so they will not roll. When Scattering is specified, another method may be used by agreement. See Remove.
d) Remove	Clearing Slash shall be moved or hauled to locations shown on CONTRACT or SALE AREA MAP, or as agreed and designated on the ground where it shall be piled for disposal by Forest Service. This also refers to Scatter In Units where treatments includes haul to units and scatter. See Scatter Treatment for details.

e) Pile — Clearing Slash smaller than 10 inches in large end diameter and 10 feet long shall be hand piled for disposal by Forest Service. A 3 ft wide fire line cleared to mineral soil will be constructed around and immediately adjacent to each pile.

f) Masticate — Clearing Slash <10 inches stump diameter and greater than 1 foot in height shall be masticated (shredded, mulched, chipped). See paragraph 10 above for trees greater than 10"dbh.

1. All masticated vegetation shall have a stump height generally no greater than 6 inches above ground level as measured on the uphill side or 6 inches above obstacles (i.e. large rocks and other non-vegetative material not suitable for mastication).

2. Unless otherwise agreed, residual masticated vegetative debris resulting from contractor's operations shall lie flat on the ground and generally not exceed 12 inches in height. Individual pieces of vegetative debris shall generally not exceed 3 feet in length.

g) Lop and Scatter — Lop and Scatter for roadway clearing typically refers to roads with minor clearing requirements where most limbing may be done by hand. In this case material may be side cast onto fill slopes beyond the road bed limits with a final slash height of eighteen (18) inches or less and no concentrations of clearing slash.

14. Materials resulting from the cutting operation in excess of one (1) foot in length or one (1) inches in diameter, shall not be allowed to remain in roadway ditches, or within water courses.
15. Limbs and chunks in excess of one (1) inches in any dimension shall be removed from the traveled way and shoulders.
16. Materials may be scattered down slope from the roadbed, outside of the work area and drainages. Concentrations shall be rescattered or removed.
17. Chip material shall be removed from roadway surface by surface blading. This blading, is included in cost for brush removal and is separate from work specified in Section 811 – Blading.

851 LOGGING OUT (7/12)

1. DESCRIPTION

This work consists of ordered removal of fallen trees, snags and trees greater than ten (10) inches in diameter which encroach into the roadway or as directed by the Contracting Officer.

2. MAINTENANCE REQUIREMENTS

a. Fallen timber, when marked with paint, shall be limbed and cut into standard log lengths. Resulting logs shall be decked at designated locations.
b. Unmarked materials shall be limbed and may be cut into lengths for handling and shall be decked outside ditches and drainage's, off of the traveled way and turnouts or at staked locations.
c. Unmarked materials and any remaining trunks from marked materials shall be cut at the toe of the fill and two feet above the top of cut slope.
d. All materials remain the property of the Government, unless otherwise stated in the contract.
e. Woody debris and slash in excess of one (1) foot in length or three (3) inches in diameter shall not remain in ditches, drainage channels, or on back slopes, traveled way, shoulders or turnouts. Accumulations of debris may be ordered hauled and paid under Section 832. Materials not ordered hauled shall be scattered down slope from the roadbed, avoiding any drainage ways or concentrations.

853 REMOVAL OF STRUCTURES AND OBSTRUCTIONS (7/12)

1. DESCRIPTION

This work includes the salvage, remove, and/or dispose of buildings, fences, structures, pavements, culverts, utilities, curbs, gates, and other obstructions. Salvage designated materials and backfill the resulting trenches, holes, pits.

2. MAINTENANCE REQUIREMENTS

a. Use reasonable care to salvage all material designated to be salvaged. Salvage in readily transportable sections or pieces. Replace or repair all members, pins, nuts, plates, and related hardware damaged, lost, or destroyed during the salvage operations. Wire all loose parts to adjacent members or pack them in sturdy boxes with the contents clearly marked. Stockpile salvaged material in a designated area.

c. When culverts are to be re-used, carefully remove culvert, taking precautions to avoid damage. Store culverts to be re-laid, when necessary, to prevent loss or damage before relaying. Replace without additional compensation all sections lost from storage or damaged by use of improper methods.

d. When culverts are to be removed and replaced, remove the existing cmp down to the natural stream bottom, and remove the parts outside of a stream down to at least 12 inches below natural ground surface or finished ground line, whichever is lower. Remove portions of existing structures that lie wholly or in part within the limits for a new structure to accommodate construction of the proposed structure.

e. Remove structures and obstructions in the roadbed to 12 inches below subgrade elevation. Remove structures and obstructions outside the roadbed to 12 inches below finished ground.

f. Except in excavation areas, fill cavities left by structure removal with material to the level of the finished ground, and compact. Place and compact the type of backfill material that is consistent with adjacent undisturbed areas.

g. Disposing of Material or Structures Not Designated for Salvage - Unless agreed to in writing all structures and obstructions shall be disposed of by Removal From project. Otherwise, dispose of material and structures using one or more of the following methods:

1. Removal From Project**.** Make necessary arrangements with property owners, and haul debris to suitable disposal locations as approved by the CO. Furnish a signed copy of the disposal agreement. Hazardous materials must be properly disposed of.

2. Burning**.** Burn debris using high-intensity burning processes that produce few emissions. Examples include incinerating, high stacking, or pit and ditch burning. Provide a watchperson during burning operations.

   When burning is complete, extinguish the fire so no smoldering debris remains. Dispose of unburned material in accordance to Drawings or Special Project Specifications.

3. Burying. Bury debris in trenches or pits in approved areas within the right-of-way. Do not bury debris inside the roadway prism limits, beneath drainage ditches, or in any riparian areas. Place debris with earth material in alternating layers consisting of 3 feet of debris covered by 2 feet of earth. Distribute stumps, logs, and other large pieces to form a compact mass and minimize air voids. Fill all voids. Cover the top layer of buried debris with at least 12 inches of compacted earth. Grade and shape the area.

854 HAZARD REMOVAL AND CLEANUP (7/12)

1. DESCRIPTION

This work consists of removing and disposing of marked hazards such as danger trees, rocks, and stumps.

2. MAINTENANCE REQUIREMENTS

a. Removal of trees shall include the felling and subsequent treatment of danger trees designated by the Government.

   1. Trees and snags felled away from and at right angles to the road centerline and resting entirely beyond the roadside limits of five (5) feet beyond roadway slopes shall be limbed to provide ground contact over two-thirds (2/3) or more of its length. When the ground contact condition cannot be met, additional bucking will be done to achieve the two-thirds (2/3) contact control. Trees and snags falling cross slope shall be limbed and bucked into manageable lengths, and re-oriented at right angles to the road centerline.
   2. Trees or snags falling into the roadway shall be limbed, bucked, and decked off of the roadbed.
   3. All materials remain the property of the Government unless otherwise provided in the contract.
   4. Woody debris and slash in excess of one (1) foot in length or one (1) inches in diameter shall not remain in ditches, drainage channels, or on back slopes, traveled way, shoulders or turnouts. Large accumulations of materials may be ordered hauled under 832. Materials not ordered hauled shall be hand piled or scattered down slope from the roadbed, avoiding any concentrations or drainage's.

b. Marked rocks and stumps shall be removed.

   1. Resulting holes outside the roadbed shall be back filled with native materials and mounded to drain after settlement.
   2. Removed rocks and stumps shall be hauled to the disposal site designated in the contract.

862 MAINTENANCE OF TRAFFIC GATES AND BARRIERS (7/12)

1. DESCRIPTION

When required this work consists of cleaning and restoring existing traffic gates and appurtenances, and the installation of new gates and road barriers.

2. MATERIALS

a. The Government may furnish replacements for damaged or defective gates components which can be replaced. Government-furnished materials and location are shown in the SALE AREA MAP OR CONTRACT MAP.
b. Paint, welding materials, tools, fasteners, cleaning materials, and other materials shall be incidentally furnished by Contractor.
c. Road barriers - Contractor shall supply, deliver and install new road barriers at locations shown in the SALE AREA MAP OR CONTRACT MAP.

3. MAINTENANCE REQUIREMENT

a. Loose fasteners on the rigid gates shall be tightened. Ruptured welds shall be rewelded and localized cracks welded.
b. Each gate must be cleaned and painted with a commercial rust inhibitor paint. Color shall match existing color..
c. The Contractor shall inspect the gates and report remaining deficiencies to the Government.
d. Government will furnish component replacements as follows:

    1. Components will be available at the local Ranger District Monday through Friday, between the hours of 8:00 a.m. and 4:30 p.m. except on legal holidays. Contractor shall give 48 hours notice before obtaining materials.
    2. Contractor shall be responsible for loading and transport of the furnished components and removal and disposal of old components.

891 WATER SUPPLY AND WATERING (7/12)

1. DESCRIPTION

This work consists of providing facilities to furnish an adequate water supply, hauling and applying water, including times outside normal work hours.

2. MATERIALS

Suitable and adequate water sources and use restrictions are designated in the SALE AREA MAP or CONTRACT MAP. If the Contractor elects to provide water from other than designated sources, the Contractor shall be responsible to obtain the right to use the water including any cost for royalties involved. The rate of applications shall be based on the gallons per mile ordered by the Government.

3. EQUIPMENT

a. Mobile watering equipment shall have watertight tanks of known capacity. If tank capacity is not known, it shall be measured and certified by the Contractor prior to use.
b. Positive control of water application is required. Equipment shall provide uniform application of water without ponding or washing.
c. An air gap or positive anti-siphon device shall be provided between the water source and the vehicle being loaded if the vehicle has been used for other than water haul if the source is a domestic potable water supply, or the water is used for tank mixing with any other materials.
h. The designated water sources may require some work prior to their use. Such work may include cleaning ponded areas, installing temporary weirs, or sandbags, pipe repair, pump installation or other items appropriate to the Contractor's operations. Flowing streams may be temporarily sandbagged or a weir placed to pond water. Contractor shall obtain written approval on improvements for sandbags or weirs prior to placement.
i. Drafting devices must have screens with sieve holes 2 mm or less and avoid drafting from the deepest part of the pool. Drafting sites will be constructed so that oil, diesel fuel, or other pollutants will not enter the stream.

Appendix H

Five-Year Road and Trail Maintenance Plan

This page intentionally left blank.

Five-Year Maintenance Plan

The 5-year maintenance plan will address existing maintenance issues identified in the 2014 road condition inventory. The 5-year period will begin upon approval of this plan by FERC. The scheduled actions identified in the table below address existing problems that cause roads to be in poor (requires road maintenance activities or repair to support Project use and/or protect resources) or fair (requires annual routine road maintenance activities to support Project use and/or protect resources) condition and bring them up to standard. Specific locations of the maintenance actions are provided in the 2014 road inventory geo-database, which is Attachment 1 of this plan. Maintenance actions for roads in poor condition are the first priority and will be addressed as soon as practicable after plan approval; maintenance items on roads in fair condition will be addressed thereafter. Priority will be placed on roads that have erosion problems and are located within 150 feet of a river. SMUD will consult with the Forest Service to revise the 5-year maintenance plan and before beginning the work identified in the plan. Implementing the 5-year maintenance plan will: (1) address the maintenance issues of immediate concern first; (2) provide a balanced road maintenance work load over the first 5-year period following approval of the plan; and (3) result in most roads for which SMUD has primary maintenance responsibility being in good condition by the next road assessment in 5 years. SMUD would implement annual maintenance actions for all of the roads for which it has primary maintenance responsibility that would consist of taking the following actions to address needs identified each year, including:

- Clearing timber from roads and ditches;
- Blading and shaping of road surface, rolling dips and shoulders;
- Cleaning ditches and culverts;
- Repairing road surface;
- Maintaining running surfaces on bridges;
- Removing or repairing minor slides or washouts;
- Maintaining road signs;
- Abating dust when necessary (i.e., to provide for public safety when dust limits visibility such that tail lights and turn signals are obscured); and
- Controlling brush and removing hazard trees.

Note:

Only includes roads for which SMUD has primary maintenance responsibility.
Maintenance Level 2 Roads shown in unshaded rows.
Maintenance Level 3, 4, and 5 roads shown in shaded rows.

FS Road Number	Start	End	Distance (miles)	Condition[a]	Needed Maintenance[b]
LOON LAKE DEVELOPMENT					
13N11	Ice House Road	13N19A	2.3	Poor	Install new culvert at drainage crossing; rock 200' at wet area; replace 18" culvert; remove vegetation from travel way; grade road; repair/install rolling dips.
13N11C	Ice House Road	T17	0.7	Fair	Replace at-risk culvert; Grade road; repair/install rolling dips
13N11F	13N11	T4	0.1	Poor	Reconstruct road template; repair/install rolling dips; grade road surface; install rock-bottomed dip; remove vegetation from travel way
13N11G	13N11	T5	0.1	Fair	Grade road surface
13N11GA	13N11G	T6	0.1	Fair	Grade road surface
13N11H	13N11	T7	0.1	Fair	
13N11HA	13N11H	T8	0.1	Fair	
13N15	Ice House Road	T43	1.55	Fair	Remove vegetation from travel way
13N15B	Cheese Camp Road	Ice House Road	0.82	Poor	Remove vegetation from travel way
13N15D	13N15	13N15B	0.33	Poor	Grade road; repair/install rolling dips; Remove vegetation from travel way
13N18A	Ice House Road	Intake Housing	0.2	Good	

FS Road Number	Start	End	Distance (miles)	Condition[a]	Needed Maintenance[b]
13N19	Ice House Road	13N19A	0.2	Fair	
13N19A	13N19	13N11	0.8	Fair	Construct rock-bottomed dip; grade road; repair/install rolling dips; construct rock-bottomed dip; install CMP with catch basin and construct 100' ditch on each side of inlet
13N19AE	13N19A	T3	0.1	Fair	
13N19C	Ice House Road	Access Building	0.2	Good	Crack seal
13N19D	13N19	Heliport	0.1	Good	Crack seal
13N21	Ice House Road	T24	0.4	Fair	Grade road; repair/install rolling dips
13N21A	13N21	T25	0.06	Fair	
13N21B	13N21	T24	0.04	Fair	Grade road; repair/install rolling dips
13N57	Ice House Road	T23	0.43	Fair	Grade road; repair/install rolling dips; rock low point
ROBBS PEAK DEVELOPMENT					
12NY15	13N31 Robbs Peak	T-Line	0.63	Fair	
12NY15E	12NY15 West Robbs Peak	USFS Boundary	0.41	Fair	
12NY15EA	12NY15E	T-50	0.25	Poor	Grade road; repair/install rolling dips
12N22	Ice House Road	12N22F	0.27	Fair	

FS Road Number	Start	End	Distance (miles)	Condition[a]	Needed Maintenance[b]
12N22F	12N22	T48	0.21	Fair	
12N30G	12N30	T62	1.87	Poor	Grade road; repair/install rolling dips; remove vegetation from travel way
12N30M	12N30	T-line	0.40	Fair	Grade road; repair/install rolling dips
12N30M	T-line	12N30	1.83	Poor	Grade road; repair/install rolling dips; remove vegetation from travel way
12N30MA	12N30M	T61	0.05	Poor	Remove vegetation from travel way
13N23	Wentworth Springs road	Spoils area	1.09	Fair	Crack seal
13N23B	13N23	Dam	0.1	Fair	Repair inlet of 24” culvert; crack seal
13N23C	13N23	Dam	0.21	Fair	
13N23D	13N23	Robbs Reservoir	1.59	Fair	
13N31B	13N31 Robbs Peak	T49	0.55	Fair	
17N12A2	Ice House Road	Met Station	0.2	Fair	Crack seal
17N12B2	Ice House Road	Surge Shaft	0.16	Fair	
12N44	Robbs Power-house	Ice House Road	1.1	Good	Clean culverts; repair culvert outlet; crack seal

FS Road Number	Start	End	Distance (miles)	Condition[a]	Needed Maintenance[b]
Union Valley Development					
12N30	Peavine Ridge Road	Union Valley Dam near Valve House	3.45		
12N30	SE end of dam	NW end of dam/ spillway	0.39	Fair	Crack seal; repair AC edges
12N30E	Bryant Springs Road	Power-house	1.02	Fair	Rip-rap shotgun culvert at outlet
12N30H	Bryant Springs Road	Switchyard	0.77	Fair	Repair inlet on 18” culvert; crack seal; repair AC edges
12N30Z	12N30	Gatehouse	0.04	Good	Crack seal; repair AC edges
12N30L	12N30	T73	0.09	Fair	
ICE HOUSE DEVELOPMENT					
11N37E	11N37	Valvehouse	0.58	Poor	Reconstruct AC intersection; repair subgrade; repair AC edging; repair potholes
11N98	11N98	East end of dam/spillway	0.38	Fair	
11N98B	11N98	Forest Service Bdy	0.35	Fair	Crack seal; repair AC edging
11N98C	11N98	Outlet Facilities	0.44	Fair	Crack seal;
12NY05X	USFS Property	Powerhouse	0.08	Fair	

FS Road Number	Start	End	Distance (miles)	Condition[a]	Needed Maintenance[b]
17N12C1	Ice House Road	Forest Service Bdy	0.1	Fair	
12NY04	12NY04D	12N21B	0.57	Poor	Grade road; repair/install rolling dips
12NY04A	12NY04	T1454	0.04	Poor	Grade road; repair/install rolling dips
12NY04D	12NY04	12N21B	0.31	Poor	Grade road; repair/install rolling dips
12NY05	12N21	Jones Fork Powerhouse Rd.	0.82	Fair	Grade road; repair/install rolling dips
12NY05C	12NY05	T1441	0.05	Poor	Grade road; repair/install rolling dips
12NY05D	12NY05	T1434	0.09	Fair	
12N21	12N21B	12YN05	1.32	Fair	Grade road; repair/install rolling dips
12N21B	12N21	T1462	2.04	Fair	
12N21D	12N21	T1444	0.22	Poor	Grade road; repair/install rolling dips
12N21E	12N21	T1443	0.09	Poor	Grade road; repair/install rolling dips

FS Road Number	Start	End	Distance (miles)	Condition[a]	Needed Maintenance[b]
JAYBIRD DEVELOPMENT					
12N34N	12N34	Powerhouse	0.42	Good	
11N60	T-Line Crossover	Camino Dam	4.8	Fair	Crack seal; repair inlet of 18” culvert; repair damage to inlets and outlets of multiple culverts; grade road surface from powerhouse to dam
11N60A	11N60 Jaybird Spring	Jaybird Springs Road	1.41	Poor	Grade road; repair/install rolling dips
11N60B	11N60	T-line	1.47	Fair	Grade road; repair/install rolling dips
11N60BD	12N60B	T89	0.13	Poor	Grade road; repair/install rolling dips
11N60BE	12N60B	T87	0.41	Poor	Grade road; repair/install rolling dips
11N60D	11N60	Gate House	0.64	Fair	Repair inlet of 18” culvert; construct critical dip
11N60DA	11N60D	Surge Shaft	0.23	Fair	
11N60DB	11N60D	T99	0.22	Poor	Grade road; repair/install rolling dips; install culvert at intermediate drainage (est. 36” diameter); replace plugged and damaged 24” culvert remove vegetation from travel way
11N60DC	11N60D	Penstock	0.6	Fair	Grade road; repair/install rolling dips
11N60DCA	11N60DC	T100	0.23	Poor	Install culvert at intermediate drainage (est. 36” diameter); remove vegetation from travel way; grade road; repair/install rolling dips
11N60DCB	11N60DC	Penstock	0.02	Fair	
11N60Z	11N60	11N60	0.79	Fair	Crack seal; repair AC dike; remove rock slide blocking inlet of 18” culvert

FS Road Number	Start	End	Distance (miles)	Condition[a]	Needed Maintenance[b]
11N69	11N60	T94	0.2	Fair	Remove vegetation from travel way; repair/install rolling dips; grade road surface
11N69	11N71 Jaybird Canyon Springs	T-line	0.11	Fair	Repair/install rolling dips; grade road surface
11N71	11N60 Jaybird Spring	Adit	1.19	Fair	Replace 24” culvert
12N30D	12N30	Junction Dam	1.53	Fair	Crack seal; repair AC edging; repair damaged inlet on 18” culvert;
12N30DB	12N30D	USFS Boundary	0.44	Fair	Grade road; repair/install rolling dips
12N30DBA	12N30DB	T75	0.2	Poor	Grade road; repair/install rolling dips
12N30DBB	12N30DB	12N30DBA	0.09	Fair	
12N37	12N30	USFS Boundary	0.23	Fair	
CAMINO DEVELOPMENT					
11NY05	12N34	Adit	3.5	Poor	Install culvert with double catch basin; repair 4 damaged 18” culvert inlets; repair fill slope at culvert outlet
11NY05A	11NY05	Pit	0.18	Fair	
11N12	12N34	Brush Creek Reservoir	1.64	Fair	Repair inlet on 24” culvert
11N12A	11N12	T14502	0.23	Fair	Repair/install rolling dips; grade road surface
11N12C	11N12	T130	0.13	Poor	Grade road; repair/install rolling dips
11N12D	11N12	Brush Creek Dam	0.1	Good	

FS Road Number	Start	End	Distance (miles)	Condition[a]	Needed Maintenance[b]
11N12E	11N12	Pole	0.03	Fair	Repair/install rolling dips; grade road surface
11NY20	12N34	11NY20A	0.46	Fair	
11NY20A	11NY20	12N34	1.68	Fair	Grade road; repair/install rolling dips; rip-rap outlet of 36” culvert
11NY20AA	11NY20A	T126	0.02	Poor	Grade road; repair/install rolling dips
12NY23	12N54	T112	1.92	Fair	Grade road; repair/install rolling dips; install 18”x60’ CMP
12NY23A	12NY23	T116	0.1	Poor	Grade road; repair/install rolling dips
12NY23B	12NY23	T115	0.15	Fair	
12NY23C	12NY23	T114	0.09	Poor	Grade road; repair/install rolling dips
12N34	SFAR bridge	11N12	3.69	Fair	Crack seal; repair AC edging repair; subgrade repair; repair damage to inlet of 24” culvert; repair fill around culvert outlet
12N34P	12N34	Penstock	0.46	Fair	Grade road; repair/install rolling dips; rip-rap outlet of 18” culvert
12N34PA	12N34P	Penstock valvehouse	0.12	Fair	
12N34R	12N34	T122	0.07	Fair	
12N34S	12N34	T128	0.07	Fair	
12N34U	12N34	T120	0.17	Fair	Grade road; repair/install rolling dips
12N34V	12N34	T119	0.17	Fair	
12N34W	12N34	T132	0.41	Poor	Grade road; repair/install rolling dips

FS Road Number	Start	End	Distance (miles)	Condition[a]	Needed Maintenance[b]
12N34ZZ	12N34	Surge Chamber	0.02	Good	
12N54D	12N54	12N54DA	0.14	Fair	
12N54DA	12N54D	T117	0.17	Fair	Grade road; repair/install rolling dips
12N54E	12N54	T118	0.04	Fair	Grade road; repair/install rolling dips
WHITE ROCK DEVELOPMENT					
11N08A	11N08	T145/617	1.05	Poor	Grade road; repair/install rolling dips; remove vegetation from travel way
11N08C	11N08	Communi-cation Repeater	0.35	Poor	Grade road; repair/install rolling dips; remove vegetation from travel way
11N82	11N08	T141/613	0.28	Good	
ELD County-8014	USFS boundary	11N96A/ 11N96B	0.52	Good	Remove board at bottom of culvert inlet; construct critical dip
11N96A	11N96	Slab Creek Dam	0.21	Good	
11N96B	11N96	Tunnel Adit	0.24	Fair	
12N34A1	12N34	T140/612	0.35	Fair	Grade road; repair/install rolling dips
12N34B	12N34H	T136/608	0.4	Good	Grade road; repair/install rolling dips
12N34HA	12N34H	T134/605	0.48	Poor	Grade road; repair/install rolling dips Install 100'; rock filter blanket over wet area; remove vegetation from travel way
12N34J	12N34	T137/609	0.32	Fair	Grade road; repair/install rolling dips

FS Road Number	Start	End	Distance (miles)	Condition[a]	Needed Maintenance[b]
12N34Z	12N34	T138/610	0.3	Fair	Grade road; repair/install rolling dips
HYDRO METEOROLOGICAL STATIONS					
10N13 Sneider Camp 4WD	ALP-164	10N13C	3.9		
10N13C	10N13	Hydro Met Station	1.3	Poor	Reconstruct template; grade road; repair/install rolling dips **or** consider converting to OHV trail
12N76A	12N76 Slate Mountain Road	Hydro Met Station	0.11	Fair	
12N77A	12N77	Hydro Met Station	0.05	Poor	Grade road; repair/install rolling dips
14N39B	14N39	Hydro Met Station	0.14	Poor	4WD road. Install drivable water bars (no grading) up to PCT; eliminate motorized traffic on PCT

[a] Condition as reported in 2014 road condition inventory

[b] Refer to 2014 road condition inventory geodatabase for locations of maintenance needs.

This page intentionally left blank.

Appendix I

Hydro Safety Procedure: Helicopter Flight Communications

This page intentionally left blank.

1.0 PURPOSE

Define proper communications and responsibilities needed to setup flights and communicate during flights over the UARP.

2.0 SCOPE

This procedure is applicable to all personnel who are involved with helicopter flights.

3.0 RESPONSIBILITIES

3.1 The Weather Shop and Maintenance Planner are responsible for coordinating and administering all helicopter flights.

3.2 The Weather Shop Foreman is responsible for filing a flight plan with Fresh Pond Administrative staff prior to flight. Filing of a flight plan also applies to flights with outside agencies.

3.2.1 SMUD Personnel are responsible for calling Fresh Pond on the radio to report their arrival and departure of specific areas in the UARP.

3.2.2 If the flight will be set down at a specific location for a long period of time, the SMUD Personnel should notify Fresh Pond of the amount of time on the ground. Once the specified time has lapsed, personnel need to check in with Fresh Pond to inform staff of departure or report additional time they will remain on the ground.

3.2.3 If the flight is scheduled to take off before Fresh Pond's normal starting time or continue past quitting time, the SMUD Personnel should check in with PSO and notify the On Call Supervisor. This also applies to normal days off.

3.2.4 SMUD Personnel are responsible for ensuring that survival packs are taken during inclement weather and back country flights. Hand held radios should be tested prior to flights to ensure radios are working properly.

3.2.5 If a continuous flight is taking place, the SMUD Personnel should radio in to Fresh Pond Headquarters every 20 minutes to give their location and destination.

3.3 Front desk Administrative staff at Fresh Pond are responsible for tracking the helicopter flight using form FP 114 (Attachment I).

3.3.1 If the Flight Crew has made no contact within 35 minutes of their last check-in time, the Front Desk will radio the helicopter to get the fight status. If the Front Desk is unable to contact the Flight Crew after repeated efforts (15 minutes) they will notify Supervision immediately.

3.4 Multi-day work planned for the Back Country shall utilize the UARP Flight and Back Country Plan (Attachment II).

3.4.1 The attached worksheet shall be completed and filed with the front desk and the Planners at least three days before the trip begins.

3.4.2 UARP Flight and Back Country Plan (Attachment II) shall be utilized to generate a Power Systems Operations (PSO) Transmission Outage Application (TOA) if required before the trip begins.

4.0 ATTACHMENTS

4.1 FP 114 Weather Shop Flight Log

4.2 UARP Flight and Back Country Plan

ATTACHMENT I:

ADMINISTRATIVE OFFICE POLICY
POWER GENERATION, FRESH POND

HELICOPTER FLIGHTS

PURPOSE: To track helicopter flights in order to provide prompt dispatching of safety and rescue Personnel in the event of an emergency.

INSTRUCTIONS: The Weather Shop Foreman will provide information regarding the flight schedules. In the event of an emergency flight, Fresh Pond Admin or Supervision will be notified of the flight and phone or radio communication will be used to relay flying and landing times as defined in 3.2.1.

With each departure and landing, you will receive a call on the radio announcing the destination and the number of travelers. You will respond via radio by repeating the announcement and the time. Example: 900 (message received): In route to Loon Lake, pilot and 2 passengers, the time is 14:40, Fresh Pond clear.

Log all flight departures and landings using form FP-114

WEATHER SHOP FLIGHT LOG

DATE _____

LOCATION	LAND	COMMENTS/ Down time	LEAVE	# on board (not incl. Pilot)
Loon Lake	Jaybird	1 hour	14:40	Pilot plus 2

ATTACHMENT II:

UARP Flight and Back Country Plan

Dates of Operation:

Helicopter Company:

Helicopter Company Contact:

Helicopter Pilot:

Helicopter Type:

Fuel Truck Location:

Start Location:

Crew 1:
Responsible foremen (if applicable):

Crew 2:
Responsible Foremen (if applicable):

Schedule:

Charge #:

Scope of Work:

SMUD Radio Information (Give this information to helicopter for direct contact with SMUD personnel on ground):

Satellite Telephone:

FAA emergency contact 1-866-469-7828 (Oakland Flight Center)

Landing coordinates #1: Lat Lon

Landing coordinates #2: Lat Lon

Landing coordinates #3: Lat Lon

Version History

VERSION	CHANGE	BY	DATE
0	New Procedure		
1	Added sections 3.4, 3.4.1, 3.4.2, Attachment I & Attachment II	Bret Gwaltney	03/14/08
2	Change Procedure No. 5-16 to No. 5-15	Dena Young	10/29/08

Prepared By: Bret Gwaltney	**Reviewed By: Brad Jones**

APPROVED BY: JIM CARPENTER **Superintendent, Hydro Generation Maintenance**	**DATE:**
APPROVED BY: GALE HIGGINS **Superintendent, Hydro Generation Assets**	**DATE:**

Appendix J

Maintenance Level 1 Roads to Change in Forest Service Database

This page intentionally left blank.

By definition, Maintenance Level 1 (ML1) roads are “placed in storage with all vehicular traffic eliminated” for a period exceeding 1 year (Forest Service 2009). Because SMUD uses all of the Project-related roads at least once a year, none of the Project-related roads technically qualify as ML 1 roads. At the time the Transportation System Management Plan was prepared, the following roads were identified in the Eldorado National Forest road database as ML1 roads and should be changed to ML2.

- 13N11C
- 13N21
- 12N30G
- 12NY23
- 12N34B
- 12N54D
- 12N34H
- 12N34J
- 11NY28
- 11NY28B

This page intentionally left blank.

Appendix K

Additional Applicable Best Management Practices from Region 5 Forest Service Handbook 2509.22, Chapter 10, Water Quality Management Handbook

This page intentionally left blank.

Attachment to Forest Service Comments on UARP TSMP, August 2015 Draft

R5 WQMH Road Management BMPs

2.1 Travel Management Planning and Analysis (See also National BMP Road 1)
2.2 General Guidelines for the Location and Design of Roads (See also National BMP Road 2)
2.3 Road Construction and Reconstruction
2.4 Road Maintenance and Operations
2.5 Water Source Development and Utilization
2.6 Road Storage (See also National BMP Road-6)
2.7 Road Decommissioning (See also National BMP Road-6) – *[No road decommissioning was seen in the plan, but included this one because of licensee responsibility for non-system roads under Condition 56, Item 1A]*
2.8 Stream Crossings (See also National BMP Road-7)
2.9 Snow Removal and Storage (See also National BMP Road-8)
2.10 Parking and Staging Areas (See also National BMP Road-9)
2.12 Aggregate Borrow Areas
Additional National Core BMPs
Road 10. Equipment Refueling and Servicing
Road 11. Road Storm Damage Surveys

R5 WQMH Recreation BMPs

4.7 Off-Highway Vehicle Facilities and Use (Use Regional BMPs for OHVs)
- 4.7.1 Planning
- 4.7.2 Location and Design
- 4.7.3 Watercourse Crossings
- 4.7.4 Construction, Reconstruction
- 4.7.5 Monitoring
- 4.7.6 Maintenance and Operations
- 4.7.7 Wet Weather Operations
- 4.7.8 Restoration of Off-Highway Vehicle-Damaged Areas
- 4.7.9 Concentrated-Use Area Management

Additional National BMPs
Rec-1 Recreation Planning
Rec 2 Developed Recreation Sites
Rec-4 Motorized and Nonmotorized Trails (Use Regional BMPs for OHVs, Rec-4 for Nonmotorized Trails)
Rec-7 Over-Snow Vehicle Use *[Not sure if any OSV use on trails within the area covered]*
Rec-9 Recreation Special Use Authorizations
Fac-5 Solid Waste Management

R5 WQMH Vegetation Manipulation BMPs

5.1 Soil-disturbing Treatments on the Contour
5.2 Slope Limitations Mechanical Equipment Operations
5.3 Tractor Operation Limitations in Wetlands and Meadows
5.4 Revegetation of Surface Disturbed Areas
5.5 Disposal of Organic Debris
5.6 Soil Moisture Limitations for Tractor Operations
5.7 Pesticide Use Planning Process
5.8 Pesticide Application According to Label Directions and Applicable Legal Requirements
5.9 Pesticide Application Monitoring and Evaluation
5.10 Pesticide Spill Contingency Planning
5.11 Cleaning and Disposal of Pesticide Containers and Equipment
5.12 Streamside Wet Area Protection During Pesticide Spraying
5.13 Controlling Pesticide Drift During Spray Application

R5 WQMH Watershed Management BMPs

7.1 Watershed Restoration
7.2 Conduct Floodplain Hazard Analysis and Evaluation
7.3 Protection of Wetlands
7.4 Forest Hazardous Substance Spill Prevention and Countermeasures Plan
7.5 Control of Activities under Special Use Permit
7.7 Management by Closure to Use (Seasonal, Temporary, and Permanent)
7.8 Cumulative Off-site Watershed Effects

155 FERC ¶ 62,173
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Sacramento Municipal Utility District Project No. 2101-123

ORDER APPROVING TRAILS SYSTEM MANAGEMENT PLAN

(Issued June 3, 2016)

1. On November 20, 2015, Sacramento Municipal Utility District (SMUD), licensee for the Upper American River Hydroelectric Project No. 2101, filed a trails system management plan as required by Article 401 of the project's license.[1] Article 401 requires specific plans found in the U.S. Forest Service's (Forest Service) 4(e) conditions to be filed for Commission approval; Forest Service 4(e) condition No. 57 requires a Trails System Management Plan. The Upper American River Project consists of eight developments located on the Rubicon River, Silver Creek, and South Fork American River in El Dorado and Sacramento counties, California. The project occupies, in part, federal lands within the Eldorado National Forest, managed by the U.S. Department of Agriculture, Forest Service, and federal lands administered by the U.S. Department of Interior, Bureau of Land Management (BLM).

2. The Forest Service 4(e) conditions 56 and 57 call for two separate plans to be developed for both transportation (other than trails) and trails.[2] In consultation with the approving agencies, SMUD combined the two plans into one Transportation and Trails System Management Plan.

[1] Order Issuing New License, issued July 23, 2014 (148 FERC ¶ 62,070).

[2] Forest Service 4(e) condition No. 56 requires a Transportation System Management Plan. While the project license states that Commission staff supported almost all of the Forest Service 4(e) conditions in the final environmental impact statement, staff did not recommend, in pertinent part, implementing a Transportation System Management Plan for roads on or affecting National Forest System lands as described in Forest Service 4(e) condition 56; nevertheless, all of the Forest Service's final conditions were included in the license because they are mandatory under section 4(e) of the FPA.

Background

3. In pertinent part, Forest Service 4(e) condition No. 57 requires SMUD file a Trails System Management Plan that is approved by Forest Service for the trails that are needed for project operations and are located on or affect National Forest System lands.

4. At a minimum, the plan must include: a map showing the location of all trails, both Forest Service system (classified) and Forest Service non-system (unclassified), associated with the project; trail locations using a global positioning system (GPS); the season(s) of use and the amount of use by the licensee for each trail annually; and the condition of the trails, including any construction or maintenance needs.

Proposed Trails System Management Plan

5. SMUD identified all roads and trails on Forest Service land necessary for project operation and maintenance, including access for project recreation, without regard to which entity undertook historical operation and maintenance responsibility.[3] SMUD and the Forest Service then identified whether the maintenance would be (1) primarily SMUD's responsibility; (2) a shared responsibility; or (3) if additional information or more discussion (i.e., information from the inventory) would be needed to determine appropriate responsibility. SMUD's field inventory effort was based on discussions with the Forest Service and limited to the roads for which SMUD would have primary maintenance responsibility.

6. SMUD inventoried 64 miles of roads, four miles of trails, and conditions at four helispots; all information collected is contained in a geodatabase that SMUD will update as work is performed. The inventory provided GIS data that SMUD used to assess the adequacy of culverts, determine maintenance needs, and create GIS maps of the roads and trails systems showing the locations of routes, signs, and culverts.

7. SMUD developed a comprehensive set of GIS maps with base-layer information showing roads (project-related and National Forest System), streams, reservoirs, transmission lines, project boundaries, recreation developments, place names, and landmarks. The maps depict road maintenance levels, ownership and responsibility (primary or shared), culvert locations, sign and missing sign locations (safety and directional), gate locations (existing and proposed), helispot locations, and trail locations. These maps are included in the plan.

[3] The plan excludes roads and trails that do not serve a project purpose; roads and trails that are associated with developed recreation sites and within the project boundary but also serve an operation and maintenance purpose (e.g., boat launch) will be addressed during the implementation of Forest Service 4(e) conditions 44, 45 and 46.

8. The plan details the condition, purpose, annual vehicle use, and maintenance needs for each trail. Maintenance falls into four categories: recurrent (primary) maintenance, deferred (heavy) maintenance, extraordinary repairs, and capital improvements, which are defined in the plan. Extraordinary repairs and capital improvements responsibilities would be shared with the Forest Service. Annual maintenance would be performed to avoid more extensive maintenance.

Agency Consultation

9. Section 4.12.1 of the project's Settlement Agreement for Relicensing (Settlement Agreement) requires SMUD to submit plans to the Consultation Group for a 30 day review and comment period prior to agency approval.[4]

10. Due to the complexity of the plan, SMUD initiated consultation with the Forest Service in December of 2013, to determine the scope of the roads and trails to be covered by this plan. Consultation continued through 2015 to: refine the list of roads and trails for completing an inventory, obtain resource information (GIS files), and provide clarification about conditions encountered during the inventory.

11. The plan was released to the Consultation Group for review on March 24, 2015, and to the Forest Service for approval on October 1, 2015. The Forest Service approved the plan November 12, 2015.

Discussion

12. As required by Forest Service 4(e) condition No. 57, the plan includes: trail location maps, trail locations using GPS, trail usage data, and trail conditions, and should be approved.

13. SMUD is reminded that Article 308 requires, within 90 days of completion of construction activities authorized by the license, including construction of any trails

[4] The Consultation Group consists of all parties to the Settlement Agreement (SMUD; Pacific Gas and Electric Company; U.S. Department of the Interior, Fish and Wildlife Service, National Park Service, and BLM; U.S. Department of Agriculture, Forest Service; California Department of Fish and Wildlife; California Department of Parks and Recreation; Friends of the River; American Whitewater; California Sportfishing Protections Alliance; American River Recreation Association and Camp Lotus; Foothill Conservancy; California Outdoors; Hilde Schweitzer; Theresa Simsiman; and Richard C. Platt), and invited participants including the Water Board, Regional Water Quality Control Board, and El Dorado County. The information and advice provided by the members of the Consultation Group are advisory only.

required by the Trails System Management Plan, revised exhibits drawings be filed for Commission approval. SMUD is also reminded that all administrative-use trails should be located within the project boundary.

The Director orders:

(A) Sacramento Municipal Utility District's Trails System Management Plan, filed November, 20, 2015, pursuant to Article 401 of the license for the Upper American River Hydroelectric Project No. 2101, is approved.

(B) This order constitutes final agency action. Any party may file a request for rehearing of this order within 30 days from the date of its issuance, as provided in section 313(a) of the Federal Power Act, 16 U.S.C. § 825*l* (2012), and the Commission's regulations at 18 CFR § 385.713 (2015). The filing of a request for rehearing does not operate as a stay of the effective date of this order, or of any other date specified in this order. The licensee's failure to file a request for rehearing shall constitute acceptance of this order.

Robert J. Fletcher
Land Resources Branch
Division of Hydropower Administration
and Compliance

Document Content(s)

P-2101-123.DOC.....1-4