PLACER COUNTY WATER AGENCY
MIDDLE FORK AMERICAN RIVER PROJECT
(FERC PROJECT NO. 2079)

Sediment Management Plan

Placer County Water Agency
144 Ferguson Road
Auburn, CA 95604

February 2011

TABLE OF CONTENTS

Page

List of Tables

List of Figures

List of Maps

List of Attachments

List of Acronyms

ac-ft	acre-feet
AP	Avoidance and protection
BLM	Bureau of Land Management
BMPs	Best Management Practices
CDFG	California Department of Fish and Game
cfs	cubic feet per second
Commission	Federal Energy Regulatory Commission
EAP	Emergency Action Plan
ENF	Eldorado National Forest
FERC	Federal Energy Regulatory Commission
FPA	Federal Power Act
FR	Forest Route
FYLF	foothill yellow-legged frog
GPS	Global Positioning System
HPMP	Historic Properties Management Plan
MFP	Middle Fork American River Project
mm	millimeter
MW	megawatts
NGO	non-governmental organization
NTU	Nephelometric Turbidity Unit
PCWA	Placer County Water Agency
Project	Middle Fork American River Project
SD	Supporting Document
SMP	Sediment Management Plan
SPCCP	Spill Prevention Control and Countermeasure Plan
SPT	sediment pass through
State Water Board	State Water Resources Control Board
TNF	Tahoe National Forest
USDA-FS	United States Department of Agriculture-Forest Service
VIPMP	Vegetation and Integrated Pest Management Plan
WQPP	Water Quality Protection Plan

1.0 INTRODUCTION

This Sediment Management Plan (SMP) has been developed for the Placer County Water Agency (PCWA) Middle Fork American River Project (MFP or Project) located on the west slope of the Sierra Nevada range primarily within Placer County, California. The MFP is almost entirely in the Tahoe National Forest (TNF) and the Eldorado National Forest (ENF), with a small portion on PCWA-owned property. The MFP consists of two large storage reservoirs—French Meadows and Hell Hole (with a combined gross storage capacity of 342,583 acre-feet [ac-ft]); two medium reservoirs—Middle Fork Interbay and Ralston Afterbay; three small diversion pools—Duncan Creek, North Fork Long Canyon, and South Fork Long Canyon; and five powerhouses (SMP Map 1). The Project began operations in 1967 and has a generating capacity of approximately 224 megawatts (MW). The Project also includes 21 developed recreation facilities concentrated near its storage reservoirs and diversion pools.

The SMP was developed during the relicensing of the MFP in consultation with representatives of federal and state resource agencies, Native American tribes, local and regional authorities, non-governmental organizations (NGOs), and members of the public (collectively referred to as relicensing participants). A draft SMP was distributed to the relicensing participants in Supporting Document (SD) A of the Draft Application for New License on September 28, 2010 for a 90-day comment period. Three comment letters were received.

Sediment management is necessary at the Project's three small diversion pools and two medium reservoirs over the term of the new Federal Energy Regulatory Commission (FERC or Commission) license to maintain and protect system reliability including: preserving full diversion capabilities, preventing damage to the turbines caused by coarse sediments entering the tunnels, and preventing sediment accumulation in the tailraces of powerhouses. SMP Table 1 summarizes existing Project facility infrastructure specifications at locations where sediment management will occur.

The SMP includes a description of sediment management activities necessary for continued operations of the Project at three small diversion pools and two medium reservoirs, and associated measures to avoid and protect environmental resources. Sediment management activities described in this SMP include activities that are currently implemented by PCWA and future activities (e.g., gravel augmentation and sediment pass through) to be implemented during the term of the new license. This SMP replaces the Ralston Afterbay Sediment Management Project Indian Bar Pilot Project and assumes any obligations associated with the pilot project (Jones and Stokes 2002).

Measures to protect cultural resources at locations where sediment management activities are to be implemented are provided in the Draft Historic Properties Management Plan (HPMP) (PCWA 2011a; SD E). Measures to prevent the spread or introduction of noxious weeds during sediment management activities are provided in the Vegetation and Integrated Pest Management Plan (VIPMP) (PCWA 2011b; SD A).

1.1 SMP ORGANIZATION

The SMP is organized into the following sections:

Section 2.0 SMP Objective: This section defines the purpose of the SMP.

Section 3.0 Sediment Management: This section defines sediment management activities to be implemented over the term of the new license.

Section 4.0 Avoidance and Protection Measures: This section describes the approach for avoiding potential effects to environmental resources during implementation of sediment management activities.

Section 5.0 Monitoring, Reporting, and Agency Consultation: This section outlines monitoring and associated reporting that will be required over the term of the new license and describes agency consultation that would be conducted on an annual basis.

Section 6.0 Literature Cited: This section provides a list of documents or other resources that are referenced in the SMP.

2.0 SMP OBJECTIVE

The objective of the SMP is to define routine sediment management activities (including measures to avoid and protect environmental resources and monitoring during sediment activities) that will be carried out for the MFP during the term of the new license. Benefits of implementing the SMP include:

- Improved MFP system reliability;
- Reduced MFP facility maintenance;
- Increased natural delivery and transport of sediment (bedload and suspended load) downstream of Project diversions (small diversion pools and medium reservoirs); and
- Enhanced aquatic and riparian habitat downstream of Project diversions and medium reservoirs.

3.0 SEDIMENT MANAGEMENT

Sediment management at the small diversion pools (Duncan Creek, North Fork Long Canyon, and South Fork Long Canyon) and the medium reservoirs (Middle Fork Interbay and Ralston Afterbay) involves distinct approaches based on the feasibility of passing sediment downstream (SMP Figure1).

At the small diversion pools, infrastructure modifications that will allow bedload and suspended load to naturally be transported past the diversion facilities during high-flow

events will be completed within four years following issuance of the new license. During the interim years between license issuance and completion of the infrastructure modifications, active sediment removal by heavy equipment during the low-flow period (late summer or fall) will be implemented on an as-needed basis (interim sediment management). Although considered to be unlikely after completion of the infrastructure modifications, any accumulated sediment, woody debris, or vegetation within the existing diversion pools that restrict or threaten operations of the diversion facility or natural transport of sediment downstream will be removed on an as-needed basis (contingency sediment management). Accumulated sediment within the existing diversion pools may also be re-contoured to facilitate sediment transport or maintain facility function. All sediment removed during interim and contingency activities will be transported and stored at approved disposal areas (sediment disposal).

At the medium reservoirs, infrastructure modifications to allow bedload material to pass naturally downstream are infeasible. Therefore, as part of routine sediment management, active sediment removal by heavy equipment is periodically necessary to allow safe and reliable operations of the Project during the term of the new license. During these removal activities, a portion of the sediment removed from the medium reservoirs will be placed at approved sites downstream of the dams within the high-water channel to allow subsequent high-flow events to transport the material naturally downstream (sediment augmentation). The excess sediment will be transported and stored at approved disposal areas (sediment disposal).

Detailed descriptions of sediment management activities at each of the diversion facilities are provided in Sections 3.1 and 3.2. Specific Avoidance and Protection (AP) measures, including Best Management Practices (BMPs), are contained in Section 4.0. Monitoring, reporting, and agency consultation associated with sediment management activities are described in Section 5.0.

3.1 SMALL DIVERSION POOLS

Sediment has been routinely excavated on an as-needed basis (generally after episodic high-flow events) from the three small diversion pools at Duncan Creek, North Fork Long Canyon Creek, and South Fork Long Canyon Creek. A summary of historic sediment management activities at the diversion pools is provided in SMP Table 2 and in Section 3.0. The following describes the activities that are to be implemented over the term of the new license including: (1) interim sediment management; (2) infrastructure modifications and maintenance; and (3) contingency sediment management. The timing for implementation of each sediment management activity is provided in SMP Figure 1.

3.1.1 Interim Sediment Management

Interim sediment management may be necessary at the three small diversion pools prior to completion of the infrastructure modifications. The frequency of interim activities is dependent upon hydrological events, but could be expected to occur at least once at each of the small diversions based on Project history (SMP Table 2). The interim

sediment management activities are focused on removing sediments that are directly impacting the function of the Project diversion intakes, not removing accumulated sediment from the entire diversion pool. Therefore, the amount of material removed during interim sediment management is expected to be considerably less than historical sediment removal. Interim sediment removal activities are summarized in SMP Table 3. Interim sediment management activities are as follows:

- Diversion intake structures will be inspected each year to determine whether sediment removal is required.

- Planned sediment removal will occur during dry non-storm periods, typically in the late summer or fall. If a storm does occur, the work site will be secured and maintained to prevent erosion and discharge of sediment to the downstream channel.

- Temporary staging and non-construction vehicle parking will be at the existing diversion access roads. For Duncan Creek, this staging and parking area will be located between the bridge and disposal area. For North Fork and South Fork Long Canyon creeks it will be located on the northwest side of their respective diversion (SMP Maps 2 and 3).

- Traffic control will consist of temporary construction signs, trucks entering roadway signs, and flaggers, as needed. No road closures will be required.

- Trucks and construction equipment will be refueled, as needed, from crew truck bed-mounted fuel tanks or a fuel truck. No on-site fuel tanks will be used. All fueling operations and stationary gasoline or diesel-powered equipment (e.g., pumps) will have adequate local containment to protect against accidental spills or leaks.

- Prior to sediment removal activities, the diversion pools will be dewatered. A gravity-fed streamflow bypass system will be installed to capture and divert flow around the work area and discharge water downstream of the dam to comply with minimum instream flow requirements. Seepage pumps will be placed in the diversion pools to keep the work area free from ponded water. The capacity of each bypass system will be designed to handle up to 150% of the flow anticipated during sediment removal activities.

- If fish are present within the small diversion pools during dewatering, they will be rescued and transported downstream of the diversion. A record will be maintained of all fish rescued, including survey personnel names, date captured and relocated, and method of capture. The complete record will be provided to resources agencies in the report described in Section 5.2.2.

- Any vegetation directly impacting the function of the Project diversion intakes will be removed as part of interim sediment management. After the bypass is installed and operable, excavation of sediment will begin. Equipment access will

be via the existing access ramps. The amount of equipment used depends on the amount of material to be moved. Typical equipment to be used includes an excavator (e.g., Hitachi EX 550 or John Deere JD690), loader (e.g., Cat 966), and a small bulldozer (e.g., Cat D4). The excavator and loader will be used for primary excavating and loading equipment, and the small bulldozer will perform the more intricate grading and re-contouring work. A large bulldozer will also be likely used at the sediment disposal area to place, spread, and compact the sediment. Hauling will be done with on-road dump trucks.

- Temporary access roads exist at all three diversions, but will require minor grading to improve the road surface for ingress and egress of excavation and hauling equipment.

- An Emergency Action Plan (EAP), required under 18 CFR Part 12, and a Spill Prevention Control and Countermeasure Plan (SPCCP) and Fire Plan, required under Section 10(c) of the Federal Power Act (FPA), will be prepared prior to implementation of sediment removal.

- Secondary containment will be provided for diesel and gas-powered equipment. Containment will be provided by installation of an oil absorbent boom downstream of the dam.

- Sediment excavated from the diversions will be hauled to approved disposal areas. Sediment placed on United States Department of Agriculture Forest Service (USDA-FS) lands will be graded to allow for easy access as borrow material by UDA-FS or PCWA, or will be contoured to a natural grade with erosion control measures consistent with USDA-FS BMPs (USDA-FS 2000). The location and available capacities of the disposal areas are summarized in SMP Table 3.

- Interim sediment management activities will be carried out at each of the small diversions, on an as-needed basis, until the infrastructure modifications are fully implemented as depicted in SMP Figure 1.

3.1.2 Infrastructure Modifications and Maintenance

Infrastructure modifications at the small diversions will include retrofitting the existing structures with self-cleaning, wedge-wire screen intakes. The wedge-wire screen intake is a stream bottom intake screen that allows water to be diverted and mobilized sediments to be naturally transported downstream. A detailed description of the infrastructure modifications and operations and maintenance is provided in the Exhibit E, Section 4.0 – Proposed Action.

3.1.3 Contingency Sediment Management

Although considered to be unlikely once infrastructure modifications are fully operational, contingency sediment management activities may be required during the

term of the new license. Contingency sediment removal activities are summarized in SMP Table 3.

Contingency sediment management activities are as follows:

- The diversion facilities will be inspected annually to determine if contingency activities are required.

- Accumulated sediment, woody debris, and/or vegetation within the existing diversion pool that restricts or threatens operations of the diversion facility or natural sediment transport downstream will be removed or re-contoured on an as-needed basis during the dry non-storm periods (typically in the late summer or fall).

- Heavy equipment will be used within the diversion pool boundary to re-contour sediments within the existing diversion pool, to facilitate sediment transport, and/or maintain facility function. These activities will be conducted consistent with the methods described above under Interim Sediment Management (Section 3.1.1).

- Sediment excavated from the diversions will be hauled to an approved disposal area. After placing and compacting the sediment, erosion control measures consistent with USDA-FS BMPs will be implemented. The locations of the disposal areas and available capacities are summarized in SMP Table 3.

- Large woody debris removed during contingency activities will either be placed downstream of the diversion or disposed of at an approved sediment disposal area in consultation with the resource agencies. Movement of large woody debris placed downstream of the diversion will be monitored as described in Section 5.1.1.

3.2 MEDIUM RESERVOIRS

Sediment has been routinely excavated on an as-needed basis (generally after episodic high-flow events) from the two medium reservoirs, Middle Fork Interbay and Ralston Afterbay. Accumulated sediment not immediately affecting Project operations is typically removed during scheduled maintenance outages, which generally occur from late September through October. A summary of historic sediment management activities at these reservoirs is provided in SMP Table 2 and described in the Exhibit E, Section 3.0 – No-Action Alternative. Refer to SMP Figure 1 for the timing for implementation of these activities. Past removal actions have included excavation of accumulated sediment using heavy equipment and disposal at approved disposal areas. The following describes routine sediment management activities to be implemented at medium reservoirs during the term of the new license.

3.2.1 Middle Fork Interbay

Routine sediment management activities in Middle Fork Interbay are required over the term of the new license to allow for continued operations of the MFP. These activities include:

- Physical removal of accumulated sediment within the reservoir using heavy equipment;
- Placement of sediment downstream of the dam to enhance natural sediment delivery and transport (augmentation); and
- Disposal of the remaining sediment at an approved disposal area.

In addition, spillway gates will be opened in anticipation of, and during high-flow events, to prevent overtopping, facility damage, and facilitate passage of floating debris and suspended sediment. The following describes each component of routine sediment management at Middle Fork Interbay.

3.2.1.1 Sediment Removal

Routine sediment removal activities in Middle Fork Interbay will be necessary on an as-needed basis to allow for safe and reliable operations of the MFP. Expected removal volumes, as well as, timing, duration, and other specific details associated with removal activities are summarized in SMP Table 4. Routine sediment removal activities at Middle Fork Interbay are as follows:

- Temporary staging and non-construction vehicle parking will be located at existing Project parking areas adjacent to the Middle Fork – Ralston Tunnel Intake and Gatehouse, and the Middle Fork Powerhouse and Upper and Lower Switchyards (SMP Map 4). Equipment will be parked within the work area, out of the active river channel.
- Trucks and equipment will be refueled, as needed, from crew truck bed-mounted fuel tanks or a fuel truck. A temporary fuel tank, meeting all state and federal regulations, will be placed near the Middle Fork Interbay Sediment Disposal Area (SMP Map 4). All fueling operations and stationary compressors or generators will have adequate local containment to protect against accidental spills or leaks.
- At the start of the maintenance outage period, the reservoir will be partially drained by shutting down generation at the Middle Fork Powerhouse and continuing to generate at Ralston Powerhouse. The remaining water will be drained to the spillway crest via a radial gate.
- A temporary instream flow bypass system designed for 150% of the flow anticipated during sediment removal activities will be installed. The bypass

system will accommodate all minimum instream flow requirements. The system will include:

  - Removal of the log boom;
  - Installation of submersible pumps and generators;
  - Installation of a small diversion upstream of the powerhouse tailrace, where year-round streamflows enter the reservoir; and
  - Installation of approximately 2,000 feet of bypass pipe along Middle Fork Interbay Dam and Powerhouse Road to divert streamflow around the work area.

- To ensure reliability of the stream diversion system, a backup pump and backup generator will be provided. An automatic transfer switch will be installed, to allow the backup generator to start automatically, if the primary generator fails. Also, the work area will be manned 24 hours per day, during operation of the bypass system.

- When the bypass system is operational, the permanent instream flow bypass pipe in the dam will be shut off, and the remaining water in the reservoir will be drained into the Middle Fork – Ralston Tunnel at the tunnel intake structure. A submersible pump will be installed at the lowest point of the reservoir to pump any leakage water into the tunnel and keep the work area as dry as possible. Leakage water will be pumped into a settlement basin or filtration device, prior to being pumped into the tunnel.

- If fish are present within Middle Fork Interbay during dewatering, they will be rescued and transported downstream of the sediment augmentation area and associated silt fence. In addition, any fish present at the sediment augmentation area will be rescued and transported downstream of the silt fence. A record will be maintained of all fish rescued including survey personnel names, date captured and relocated, and method of capture. The complete record will be provided to resources agencies in the report described in Section 5.5.5.

- After the bypass is installed and operable, excavation of sediment will begin. Equipment access will be via the existing access ramp at the north end of the dam. Secondary access will be just downstream of the powerhouse. The extent of equipment to be used depends on the amount of material to be moved. Typical construction equipment to be used includes excavators (e.g., Hitachi EX 550 or John Deere JD690), loaders (e.g., Cat 966), large bulldozer (e.g., Cat D8), and small bulldozers (e.g., Cat D4). The large excavators, bulldozers, and loaders will be used for excavating and loading equipment, and the small bulldozers will be used for the more intricate grading and slope work.

- Prior to hauling on public roads, traffic control consisting of active flagging and road warning signs will be installed. During hauling activities, the sediment disposal routes as shown on SMP Map 4 will be closed. This route includes Middle Fork Interbay Dam and Powerhouse Road from the Middle Fork Interbay Sediment Disposal Area to the Middle Fork Powerhouse (SMP Map 4).

- Sediment will be hauled to the approved disposal area by articulated 25- to 35-ton haulers (e.g., Volvo A35-C) or off-highway rock haulers (e.g., CAT 769C). Traffic patterns will be optimized to most efficiently and safely handle sediment loads. A large bulldozer will likely be used at the sediment disposal area to place, spread, and compact the sediment.

- Sediment excavated from the reservoirs will be hauled to an approved disposal area or placed downstream of the dam (see Sediment Augmentation below). Sediment placed on USDA-FS lands will be graded to allow for easy access as borrow material by USDA-FS or PCWA, or will be contoured to a natural grade with erosion control measures consistent with USDA-FS BMPs (USDA-FS 2000). Existing sediment disposal area locations and available capacities are summarized in SMP Table 4.

- Upon completion of work activities in the reservoir, all disturbed areas will be re-graded and all equipment will be removed. The reservoir water level will be brought up slowly, using inflow from the Middle Fork American River and water passed through the Middle Fork Powerhouse. After the clarity of the water is determined to be acceptable, as described in Section 5.1.2, the permanent instream flow valves will be opened. At this point, the temporary bypass system will be dismantled and removed.

- The duration of the sediment removal activities will depend on the volume of sediment to be removed. However, work associated with sediment removal is expected to be completed within four to eight weeks.

3.2.1.2 Sediment Augmentation

Sediment augmentation into the Middle Fork American River downstream of Middle Fork Interbay is extremely challenging because of the steep canyon walls and limited access. Construction of an access ramp from Middle Fork Interbay Dam and Powerhouse Road to the river is not feasible. As a result, sediment augmentation will be accomplished by releasing material from the Middle Fork Interbay Dam and Powerhouse Road, just downstream of the north dam abutment, allowing it to accumulate in the river channel (SMP Map 4). The two augmentation areas are approximately 150 feet downstream of the dam and were selected because of their sediment transport potential, proximity to sediment removal activities, and proximity to road access.

Use of these two augmentation areas will follow a phased approach in consultation with the resource agencies. The site closest to the dam will be the primary sediment

augmentation area. The second, downstream area will only be used after the primary area is full and monitoring has confirmed that sediment has successfully been recruited. Both areas have similar capacities and sediment transport capabilities.

During the initial sediment removal action following issuance of the new license, approximately 5,000–8,000 cubic yards of removed sediment will be placed in the river at the primary sediment augmentation area. This method of augmentation simulates small slides that occur naturally in the watershed both upstream and downstream of the dam.

Selection of sediment for placement downstream (augmentation) will be based on particle size analysis completed in the field prior to sediment removal activities. Field samples will be collected using hand tools and a backhoe as necessary at a minimum of five locations within the removal area. The material in the pits will be photographed and visually catalogued. Representative samples will be placed on tarps and allowed to drain for approximately one hour, then sieved to determine particle size characteristics. Sampling will be supervised by a qualified geotechnical professional, and results will be used to identify the appropriate size material to be used for augmentation.

Using the information from the gradation tests and visual inspection, sediment will be preferentially selected within the preferred spawning particle size requirements as follows:

- Percentage finer than 1 millimeter (mm) should be less than 14%; and
- Percentage finer than 6.4 mm should be less than 30%.

All large cobble and boulders in excess of 7 inches will be removed to ensure that the material placed in the downstream channel will be mobilized during moderate to high flow events. Sediment in excess of 7 inches, or with excessive fines, will be hauled to an approved disposal area.

To protect the roadway and embankment from damage, rubber matting or metal plates will be used at the augmentation area, extending approximately 20 to 30 feet down the slope. During the placement of material, instream flows and water quality will be protected by installing a temporary bypass from the dam to a point downstream of the augmentation area. A silt screen will also be placed downstream of the augmentation area to capture any fine sediment. Once augmentation is complete, the bypass pipe will remain in place for three days, or until water quality in the adjacent channel meets background levels, whichever comes first. At that time, the silt screen will be removed along with any captured sediment, followed by removal of the bypass pipe.

The secondary, downstream augmentation area will be used after monitoring of the primary sediment augmentation area has been completed (described in Section 5.1.3), and agency consultation has confirmed that augmentation material has mobilized to downstream reaches. If approved, both augmentation areas would be used in

subsequent removal actions. Similar monitoring and reporting requirements will be implemented for both sites, as described in Section 5.0.

Vegetation near the toe of the augmentation areas will be removed annually to allow for mobilization of augmentation material. Vegetation removal will be completed as described in the VIPMP.

3.2.1.3 Sediment Disposal

Sediment removed from Middle Fork Interbay that is not placed at the augmentation area will be transported to an approved disposal area. The designated disposal area for Middle Fork Interbay is the Middle Fork Interbay Sediment Disposal Area located 2.8 miles from Middle Fork Interbay on Middle Fork Interbay Dam and Powerhouse Road (SMP Map 4). The remaining capacity at this site is approximately 20,000 cubic yards (SMP Table 4). The average volume of sediment removed per sediment management activity at Middle Fork Interbay is expected to be approximately 36,000 cubic yards (SMP Table 2). Therefore, additional disposal area(s) will be identified and developed in consultation with the resource agencies.

3.2.2 Ralston Afterbay

Routine sediment management activities in Ralston Afterbay are required over the term of the new license to allow for continued operations of the MFP. These activities include:

- Physical removal of accumulated sediment within the reservoir using heavy equipment;
- Placement of sediment downstream of the dam to enhance natural sediment delivery and transport (augmentation); and
- Disposal of the remaining sediment at an approved disposal area.

In addition, spillway gates are opened in anticipation of, and during high-flow events, to prevent overtopping, facility damage, and facilitate passage of floating debris and suspended sediment. Further, the low-level outlet may be opened to allow suspended sediment to be transported naturally downstream when the following conditions are met:

- Flow past the Ralston Afterbay Dam plus flow through Oxbow Powerhouse exceeds approximately 3,500 cubic feet per second (cfs); and
- PCWA staff has determined that the flow will be sustained for more than 24 hours (based on weather forecasts).

The following describes routine sediment management activities at Ralston Afterbay.

3.2.2.1 Sediment Removal

Routine sediment removal activities in Ralston Afterbay will occur on an as-needed basis over the term of the new license. Expected removal volumes, as well as timing, duration, and other specific details associated with removal activities are summarized in SMP Table 4. Routine sediment removal activities at Ralston Afterbay are as follows:

- Temporary staging and non-construction vehicle parking will be located at the Ralston Powerhouse Switchyard, Ralston Ridge Sediment Disposal Area, or at the Parking area north of Ralston Afterbay Dam. Equipment will be parked within these areas outside of the active river channel (SMP Map 5).

- Trucks and equipment will be refueled, as needed, from crew truck bed-mounted fuel tanks or a fuel truck. A temporary fuel tank, meeting all state and federal regulations, will be located at the staging area north of Ralston Afterbay Dam (SMP Map 5). All fueling operations and stationary compressors or generators will have adequate local containment to protect against accidental spills or leaks.

- At the start of the maintenance outage period, the reservoir will be partially drained by shutting down generation at the Ralston Afterbay Powerhouse and continuing generation at Oxbow Powerhouse. The remaining water will be drained to the spillway crest via a radial gate.

- Once dewatered, large areas with accumulated sediment will be exposed throughout the reservoir and a low-flow channel will naturally develop in the reservoir. Due to the meandering nature of the low flow channel, the distance from the equipment access location, and the natural sediment size class distribution (sediment size generally decreases upstream to downstream), sediment will be removed from only the upper approximately one-half of Ralston Afterbay.

- A minimum of two river crossings, using large corrugated metal or plastic culverts backfilled with gravel and river sediments, will be established in the upper reservoir to allow sediment removal on both sides of the low-flow channel. These culverts will allow equipment to cross the active channel, to complete sediment removal activities, without diverting or pumping the low-flow channel. A medium-sized excavator (e.g., JD 690) will be used to install culvert crossings. The culverts will be designed for 150% of the flow anticipated during sediment management activities, and will meet minimum instream flow requirements.

- After the culverts have been installed, excavation of sediment will begin. A small bulldozer (e.g., CAT D4) will be used for access road construction within the dewatered portions of the reservoir. A large excavator (e.g., Komatsu 750), supported by a large loader (e.g., Cat980), will remove the sediment and load it into the haul trucks.

- Sediment excavated from the reservoir will be hauled to an approved disposal area or placed downstream of the dam (see Sediment Augmentation below). Sediment placed on USDA-FS lands will be graded to allow for easy access as borrow material by USDA-FS or PCWA or will be contoured to a natural grade with erosion control measures consistent with USDA-FS BMPs (USDA-FS 2000). Existing sediment disposal area locations and available capacities are summarized in SMP Table 4.

- Prior to hauling on public roads, traffic control consisting of active flagging and road warning signs will be installed. During hauling activities, the sediment disposal routes as shown on SMP Map 5 will be closed. This route includes Ralston Ridge Road (Forest Route [FR] 23) from the Ralston Ridge Sediment Disposal Area to the intersection with FS 23.2 (road to the Indian Bar Sediment Disposal Area), and FS 23.2 to Indian Bar Sediment Disposal Area (SMP Map 5).

- Sediment will be hauled to an approved disposal area by articulated 25- to 35-ton haulers (e.g., Volvo A35-C) or off-highway rock haulers (e.g., CAT 769C). Traffic patterns will be optimized to most efficiently and safely handle the loads.

- Upon completion of work activities in the reservoir, all disturbed areas will be re-graded. The reservoir water level will be brought up slowly using inflow from Middle Fork American and Rubicon rivers and water passing through Ralston Powerhouse.

- The duration of the sediment removal activities will depend on the volume of sediment to be removed. However, work associated with sediment removal is expected to be completed within four to eight weeks.

3.2.2.2 Sediment Augmentation

A portion of the sediment removed from Ralston Afterbay will be transported and placed at the existing Indian Bar Sediment Augmentation Area downstream of Ralston Afterbay Dam (SMP Map 5). The amount transported to this augmentation area will depend on the available capacity of the site at the time sediment removal activities are implemented.

A portion of Junction Bar will also be used for sediment augmentation (SMP Map 5). Junction Bar is located just north (downstream) of Indian Bar on the west bank on Bureau of Land Management (BLM) land. Junction Bar will be accessed via a temporary construction bridge that will be placed at the north end of Indian Bar, and span the active channel and Willow Bar. The bridge will be a railcar type structure, with a span of approximately 90 to 120 feet. The temporary bridge and abutments will be designed to withstand construction and hauling loads and include side rails and closed decking. A temporary haul road will be constructed to connect the western bridge abutment to the augmentation area. After sediment placement, the temporary haul road, bridge and abutments will be removed and graded to match natural contours.

Further development of this site will be done through consultation with the resource agencies.

Selection of sediment for placement downstream (augmentation) will follow a similar procedure as described for Middle Fork Interbay (Section 3.2.1). Gradation testing will be done at each gravel bar to confirm size characterization, as well as visual inspection by a qualified geotechnical professional. Using the information from the gradation tests and visual inspection, sediment will be preferentially selected within the preferred spawning particle size requirements as follows:

- Percentage finer than 1 mm should be less than 14%; and
- Percentage finer than 6.4 mm should be less than 30%.

All large cobble and boulders in excess of 7 inches will be removed to ensure that the material placed in the downstream channel will be mobilized during moderate to high-flow events. Sediment in excess of 7 inches, or with excessive fines, will be hauled to an approved disposal area.

Augmentation material will be placed close to the low-flow edge of the river in a manner that will maximize sediment transport during high-flow events. At the Indian Bar Sediment Augmentation Area, the sediment will be placed on the bar and then graded to the river's edge. Compaction will be kept to a minimum and end dumping will be avoided. Following high-flow events greater than 3,500 cfs, field observations will be conducted to estimate the volume of sediment transported from the site. If a substantial amount of sediment has been mobilized from the site (based on agency consultation), re-grading will be scheduled to facilitate sediment transport during subsequent high-flow events.

Augmentation replenishment is using previously removed and temporarily stored sediment to backfill augmentation areas where sediment has been recruited during high flow events. Replenishment will be developed through consultation with the resource agencies. Replenishment frequency and volume will be based on sediment transport monitoring of the augmentation areas (Section 5.1.2.2). Replenishment material will have been previously sorted based on gradation testing and visual inspection by a qualified geotechnical professional during sediment removal. The sediment appropriate for replenishment will be set aside at approved disposal areas for future use. Sediment replenishment will be placed at the augmentation areas as previously described.

Cultural and biological resource surveys have been completed at the augmentation areas. The augmentation activities will not impact any cultural resources or special-status species. However, removal of riparian habitat is required during placement of the temporary bridge to access Junction Bar, during initial development of the Junction Bar Augmentation Area, and during removal of vegetation at Indian Bar that has become established since 2002. The following describes the removal of riparian habitat during sediment augmentation activities.

A total of approximately 0.04 acre of riparian habitat on Junction Bar (0.01 acre), Indian Bar (0.01 acre), and Willow Bar (0.02 acre) will be affected by the placement of the temporary bridge necessary to provide access to Junction Bar during sediment augmentation activities. Vegetation will continue to be removed periodically for installation of the temporary bridge during sediment augmentation activities over the term of the new license.

A total of approximately 0.87 acre of riparian vegetation that is established along the channel margins of Junction and Indian bars will be removed to maximize the potential for sediment transport during high-flow events and to prevent berm formation (0.34 acre at Junction Bar and 0.53 acre at Indian Bar). At Indian Bar, this vegetation has become established since the last sediment augmentation activity in 2002 (Jones and Stokes 2002). Routine annual vegetation management at the sediment augmentation areas will prevent future establishment of riparian vegetation. Vegetation removal will be completed as described in the Vegetation and Integrated Pest Management Plan (PCWA 2011b; SD A).

3.2.2.3 Sediment Disposal

Sediment removed from Ralston Afterbay and not suitable for augmentation will be transported to an approved disposal area. The current designated disposal area for Ralston Afterbay is the Ralston Ridge Sediment Disposal Area located approximately three miles from Ralston Afterbay via FR 23 (SMP Map 5). The site is an engineered basin prepared for sediment disposal associated with operations and maintenance of the MFP. The remaining capacity at this site is approximately 20,000–25,000 cubic yards. The average volume of sediment removed per sediment management activity at Ralston Afterbay is expected to be approximately 48,700 cubic yards. Sediment in excess of the remaining capacity at the existing disposal area will be disposed of at an approved sediment disposal area(s) to be developed in consultation with the resource agencies.

4.0 AVOIDANCE AND PROTECTION MEASURES

AP measures were developed to address potential Project-related effects resulting from implementation of sediment management activities including potential effects to water quality (including erosion, sedimentation, or hazardous materials) and biological resources (including riparian habitats and sensitive plants and wildlife species). This section also includes measures to prevent fires and to protect public/worker health and safety. In general, the approach for avoiding potential effects to resources during implementation of sediment management activities was to develop measures that:

- Define limited operating periods for special-status resources;
- Incorporate fish and foothill yellow-legged frog (FYLF) protective measures;
- Incorporate appropriate USDA-FS BMPs;

- Incorporate additional resource-specific measures; and
- Establish contingency plans in the event of hazardous spills or fires.

Refer to SMP Table 5 for a list of AP measures to be implemented for sediment management activities at small diversion pools and medium reservoirs. If appropriate, measures to be implemented during sediment management to protect cultural resources are defined in the Draft HPMP (PCWA 2011a; SD E). Measures to prevent the spread or introduction of noxious weeds during sediment management activities are defined in the VIPMP (PCWA 2011b; SD A).

5.0 MONITORING, REPORTING, AND AGENCY CONSULTATION

The following section describes monitoring, reporting, and agency consultation requirements.

5.1 MONITORING

Several types of monitoring will be implemented as part of this SMP. This includes monitoring the effectiveness of small diversions to pass sediment following infrastructure modifications and monitoring associated with sediment management activities. Monitoring associated with sediment management activities includes turbidity monitoring at small diversion pools and medium reservoirs, methylmercury monitoring at Ralston Afterbay, and sediment transport and channel sediment condition monitoring associated with the augmentation areas. Each of these is described below.

5.1.1 Post-Construction Effectiveness Monitoring at Small Diversions

Post-construction effectiveness monitoring will be conducted at the small diversions once the diversion modifications have been completed. The goal of the monitoring will be to document the ability of structures to pass bedload sediment and large woody debris. Effectiveness monitoring will be accomplished through visual observations and photo documentation to verify that, once the impoundment is full of sediment, bedload material mobilized during high-flow events passes over the wedge-wire screen intake to downstream reaches. This monitoring effort will also document the movement of large woody debris placed downstream of the diversion during contingency sediment activities and large woody debris movement over the wedge-wire screen (i.e., verify that structure is not an impediment to large woody debris movement).

This monitoring will be completed in the summer, in years when flows during the winter/spring exceed the initiation of motion estimates in the associated channel (29 cfs in North Fork Long Canyon, 40 cfs in South Fork Long Canyon, and 149 cfs in Duncan Creek). Effectiveness monitoring will conclude after three monitoring events, in consultation with the resource agencies.

5.1.2 Monitoring Associated with Sediment Management Activities

5.1.2.1 Turbidity Monitoring at Small Diversion Pools

Turbidity sampling will be conducted during both interim and contingency sediment removal activities at each of the small diversion pools according to the following protocols.

- Turbidity sampling will be initiated at least two hours prior to setting up the streamflow bypass or initiating any ground disturbing activities within the diversion pool. Sampling will continue for six hours after completion of the sediment removal event, including after removal of the streamflow bypass system.

- Turbidity grab samples will be collected at one location immediately upstream and one location downstream of the diversion pools (i.e., within 200 feet) during sediment removal activities.

- Three grab samples will be collected at each location at a frequency of once every two hours during sediment removal activities.

- Grab samples will be labeled and tested immediately following collection using a hand-held meter (e.g., Hach 2100p turbidimeter). Results will be recorded on data sheets including date, time, identification number, turbidity reading, name of sampling personnel, weather conditions, and other pertinent information as required.

- Should the average of the downstream turbidity samples exceed 25 Nephelometric Turbidity Units (NTU) or exceed the upstream measurements by more than 20% (whichever is higher), work will cease and an immediate site evaluation will be completed to assess the cause and need for implementation of any additional measures to reduce turbidity levels. If necessary, additional BMPs (e.g., silt screens) will be installed.

- Work will resume after NTUs are less than 25 or are within 20% of the upstream measurements. Turbidity sampling will occur once every 30 minutes for three hours after work resumes, to ensure compliance. After which, sampling will return to once every two hours.

5.1.2.2 Turbidity Monitoring at Medium Reservoirs

Turbidity sampling will be conducted during routine sediment removal activities at each of the medium reservoirs according to the following protocols.

- Turbidity sampling will be initiated at least two hours prior to installation of the streamflow bypass system or culverts (Middle Fork Interbay and Ralston Afterbay, respectively) or prior to initiating any ground disturbing activities.

Sampling will continue for six hours after completion of the sediment removal event, including after removal of the streamflow bypass system or culverts.

- Turbidity grab samples will be collected upstream and downstream of each medium reservoir during sediment removal activities including:
  - Middle Fork Interbay
    - In the Middle Fork American River immediately upstream of the streamflow bypass system; and
    - In the Middle Fork American River immediately downstream of the streamflow return system and sediment augmentation areas.
  - Ralston Afterbay
    - In the Middle Fork American River adjacent to the Ralston Picnic Area;
    - In the Rubicon River immediately upstream of Ralston Powerhouse;
    - In the Middle Fork American River immediately upstream of the Indian Bar Sediment Augmentation Area (augmentation area);
    - In the Middle Fork American River immediately downstream of the Indian Bar Sediment Augmentation Area; and
    - Immediately upstream and downstream of any future sediment augmentation area, including Junction Bar.
- At each location, three grab samples will be collected at a frequency of once every two hours during sediment removal or augmentation activities.
- Grab samples will be labeled and tested immediately following collection using a hand-held meter (e.g., Hach 2100p turbidimeter). Results will be recorded on data sheets including date, time, identification number, turbidity reading, name of sampling personnel, weather conditions, and other pertinent information as required.
- Should the average of the downstream turbidity samples exceed 25 NTU or exceed the upstream measurements by more than 20% (whichever is higher), work will cease and an immediate site evaluation will be completed to assess the cause and need for implementation of any additional measures to reduce turbidity levels. If necessary, additional BMPs (e.g., silt screens) will be installed.
- Work will resume after NTUs are less than 25 or are within 20% of the upstream measurements. Turbidity sampling will occur once every 30 minutes for three hours after work resumes ensuring compliance. After which, sampling will return to once every two hours.

As part of the Ralston Afterbay Sediment Management Project Indian Bar Pilot Project (Jones and Stokes 2002), turbidity monitoring is to be conducted in conjunction with the sediment pass through (SPT) component. PCWA will initiate turbidity monitoring for SPT as described in Attachment A. Real-time SPT turbidity monitoring will conclude after three events, in consultation with the resource agencies.

5.1.2.3 Ralston Afterbay Methylmercury Monitoring

PCWA will conduct mercury monitoring associated with sediment management activities at Ralston Afterbay. Prior to sediment removal activities, three bulk samples will be collected during drawdown in conjunction with the collection of gradation samples at each of the gravel bars as described in Section 3.2.2.2. Additionally, a total of three water samples will be collected at each of the five turbidity monitoring locations listed in Section 5.1.2.2 over the course of sediment removal activities at Ralston Afterbay. Three water samples will also be collected immediately downstream of Ralston Afterbay associated with the SPT turbidity monitoring, described above. These samples will be analyzed for methylmercury using EPA Method 1630, as well as total mercury using EPA Method 1631. Mercury monitoring will conclude after three events, in consultation with the resource agencies.

5.1.2.4 Ralston Afterbay Hardhead Monitoring

Hardhead will be tagged in Ralston Afterbay prior to the first sediment removal event and their movements will be monitored during the sediment removal event. Results from the study will be provided to the USDA-FS (TNF and ENF), California Department of Fish and Game (CDFG), and the State Water Resources Control Board (State Water Board) (Section 5.2 Reporting).

PCWA will capture and tag (radio or acoustic) up to 20 hardhead in Ralston Afterbay the month preceding the sediment removal event. Hardhead movements will be continuously monitored through the subsequent sediment removal event and for at least two weeks following the sediment removal event using a combination of stationary tag receivers (remote receivers with data loggers and a power source) and a portable receiver.

Stationary receivers will be installed to detect fish movement at: Middle Fork American River near Foresthill Gage (USGS Gage No. 11433300), Ralston Afterbay at Ralston Afterbay Dam, Middle Fork American River upstream of Ralston Afterbay (at the streamflow gage), and Rubicon River immediately above Ralston Afterbay (at the streamflow gage).

A mobile survey with a portable receiver will also be used to supplement the remote monitoring. A team will make observations using the portable receiver to more accurately locate tagged fish following tagging. The team will survey the entire length of Ralston Afterbay from the floating debris boom upstream to Ralston Powerhouse and survey approximately 0.5 mile in the Middle Fork American River upstream to the impassible upstream fish barrier, and approximately 1 mile upstream in the Rubicon

River. A team will also survey from Ralston Dam to Tunnel Chute. Locations of fish observations will be recorded using a Global Positioning System (GPS) unit. A minimum of five relocations of fish will be conducted during the sediment management activities.

5.1.2.5 Sediment Transport Monitoring at Augmentation Areas

Monitoring of sediment mobilized during high flows will be conducted at the sediment augmentation areas on the Middle Fork American River below Middle Fork Interbay and Ralston Afterbay. The purpose of the monitoring is to characterize the amount of sediment that was mobilized from the augmentation area downstream, and to monitor any potential build-up of boulders or sediment in the adjacent low-flow channel. The monitoring will be conducted according to the following protocols.

- After completion of sediment augmentation activities, the amount of sediment present at each location will be estimated based on: (1) records of truck trips during sediment removal activities; and (2) visual estimates below Middle Fork Interbay (due to access limitations) and physical measurements below Ralston Afterbay. Photo documentation will also be completed at each augmentation area.

- The amount of sediment mobilized from the augmentation areas during high-flow events will be determined by comparing estimates of the remaining sediment at each site (using visual and physical measurement) with previous estimates. These surveys will be completed in the summer, in years when flows below the reservoir exceed the initiation of motion estimates in the channel (550 cfs below Middle Fork Interbay and 7,000 cfs below Ralston Afterbay).

5.1.2.6 Channel Sediment Conditions Monitoring Associated with Augmentation Areas

PCWA will monitor pool sediment conditions following sediment augmentation activities in the Middle Fork American River below Middle Fork Interbay and Ralston Afterbay. Baseline surveys will be conducted prior to or immediately after placement of sediment in an augmentation area (before potential subsequent winter flows) (Section 3.2). These locations will be re-surveyed, as soon as feasible after transport of approximately 30% of placed sediment material from the augmentation areas is detected, to measure any fine sediment accumulation in the pools downstream. The monitoring will conclude after three placement/mobilization events, in consultation with the resource agencies.

Channel sediment conditions will be monitored in five pools within reaches downstream of each of the sediment augmentation areas (one mile downstream of Middle Fork Interbay Dam and one mile downstream of Ralston Afterbay Dam augmentation areas) with a combination of V* measurements (Hilton and Lisle 1993) and channel cross-section surveys, as follows.

- Residual fine sediment will be monitored in each of the five pools using visual V* estimates (Hilton and Lisle, 1993). The methods are described in detail in the Geomorphology/Riparian Monitoring Plan (PCWA 2011c; SD A).

    - The monitoring pools will be selected within one year of new license issuance in consultation with the USDA-FS, State Water Board, and CDFG. The locations will be documented with a Trimble® GeoXT GPS unit, or similar (sub-meter accuracy) and mapped for use in locating pools through the new license term.

- Channel cross-section monitoring will be conducted in each of the five V* monitoring pools to detect potential deposition of sediments in pools downstream of the sediment augmentation areas. At least one cross-section will be established within each pool. The end points of the cross-sections locations will be marked with permanent markers and documented with a Trimble® GeoXT GPS unit, or similar (sub-meter accuracy) and mapped for use in locating the cross-sections for future monitoring. Bed elevations will be measured at a minimum of every 2 feet along the cross-section to produce detailed topography of the channel at each location. In some cases, measurements will be taken at more frequent intervals to accurately depict the channel topography.

5.2 REPORTING

5.2.1 Post-Construction Effectiveness Monitoring at Small Diversions

PCWA will prepare reports after each monitoring event and sediment management activity describing the following:

- Location, date, and relevant flow data;

- Photo documentation upstream and downstream of the structure showing evidence of transport, aggradation or degradation, bed material characteristics, and large woody debris; and

- Assessment of sediment passage effectiveness.

The report will be submitted to State Water Board, CDFG, TNF, and ENF within four months of completion of the monitoring event for a 60-day comment period. Comments received from the agencies will be incorporated, as appropriate, in a draft final report. The draft final report will be submitted to FERC for approval.

5.2.2 Monitoring Associated with Sediment Management Activities

After each sediment management activity, a report will be prepared describing the following:

- Sediment management activity implemented;

- Sediment disposal volumes (including augmentation volume if applicable), disposal location, and haul routes;
- Turbidity or sediment transport monitoring results;
- Methylmercury and total mercury monitoring results;
- FYLF survey and translocation results (SMP Table 5);
- Fish rescue and translocation results (SMP Table 5); and
- Channel sediment conditions monitoring results.

After the first sediment management activity at Ralston Afterbay, a report will be prepared describing the hardhead monitoring results (SMP Table 5).

All reports will be submitted to the State Water Board, CDFG, TNF, and ENF within four months of completion of the sediment management activity for a 60-day comment period. Comments received from the resource agencies will be incorporated, as appropriate, in a draft final report and submitted to FERC.

5.3 CONSULTATION

PCWA will conduct annual consultation with the resource agencies. The purpose of this consultation will be to review and discuss the following:

- Discuss planned sediment management activities;
- Identify new sediment disposal and/or augmentation areas;
- Review and discuss agency comments on draft monitoring reports;
- Review and discuss any new records of special-status species where sediment management is implemented; and
- Evaluate the need to modify AP measures.

Following completion of annual consultation, a letter will be prepared and submitted to FERC showing proof of consultation.

In addition, prior to implementation of sediment management activities, PCWA will consult with the resource agencies and obtain appropriate permits. This may include a CDFG Streambed Alteration Agreement, U.S. Army Corps of Engineers Section 404 Permit, RWQCB 401 Certification, or a USDA-FS Special Use Authorization, etc.

PCWA anticipates that preparation of a project-specific Water Quality Protection Plan (WQPP) will be a condition of the State Water Board 401 Certification. PCWA will

develop a WQPP in consultation with the State Water Board prior to commencement of any construction activities.

6.0 LITERATURE CITED

Hilton, S, and T.E. Lisle. 1993. Measuring the fraction of pool volume filled with fine sediment. Res. Note PSW-RN-414. Albany, CA. Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture.

Jones and Stokes. 2002. Ralston Afterbay Sediment Management Project Indian Bar Pilot Project. Prepared for PCWA, August.

Placer County Water Agency (PCWA). 2011a. Draft Historic Properties Management Plan. Available in PCWA's Application for New License – Supporting Document E.

____. 2011b. Vegetation and Integrated Pest Management Plan. Available in PCWA's Application for New License – Supporting Document A.

____. 2011c. Geomorphology/Riparian Monitoring Plan. Available in PCWA's Application for New License – Supporting Document A.

USDA-FS. 2000. Water Quality Management for Forest System Lands in California, Best Management Practices.

TABLES

SMP Table 1. Project Facility Infrastructure Specifications at Locations where Sediment Management Activities are Implemented.

Duncan Creek Diversion	
Dam	
Type	Gravity
Material	Concrete
Height of Dam Crest above Streambed	32 ft
Dam Crest Length	165 ft
Volume	1,750 cu yd
Elevation of Dam Crest	5,275 ft
Elevation of Streambed	5,243 ft
Elevation of Spillway Crest	5,265 ft
Stream Maintenance Pipe Capacity (10-in pipe)	8 cfs
Maximum Low-Level Outlet Capacity (60-in pipe)	310 cfs
Spillway	
Type	Uncontrolled Overflow
Width	100 ft
Capacity	7,200 cfs
Reservoir	
Gross Storage	20 ac-ft
Duncan Creek – Middle Fork Tunnel	
Nominal Size/Shape	9 ft x10 ft/Horseshoe
Length:	
Total	7,864 ft or 1.5 mi
Concrete Lined (Est.)	300 ft
Maximum Diversion Capacity	400 cfs
Invert Gradient	0.0029
French Meadows Dam (*L L Anderson Dam*) and Reservoir	
Dam	
Type	Composite
Material	Rock and Gravel Fill
Height of Dam Crest above Streambed	231 ft
Dam Crest Length	2,700 ft
Dam Crest Width	32 ft
Elevation of Dam Crest	5,273 ft
Elevation of Streambed	5,040 ft
Elevation of Spillway Crest	5,244.5 ft
Volume	3,510,000 cubic yards
Slopes – Upstream	2:1
Slopes - Downstream	1.8:1 and 2.0:1
Stream Maintenance Pipe Capacity	8 cfs
Maximum Low-Level Outlet Capacity at Water Surface 5,262 (full reservoir)	1,430 cfs

SMP Table 1. Project Facility Infrastructure Specifications at Locations where Sediment Management Activities are Implemented (continued).

French Meadows Dam (*L L Anderson Dam*) and Reservoir (continued)	
Spillway	
Type	Gated Ogee Crest
Type of Gates	Radial
Number of Gates	2
Size of Gates	36.5 ft x 18.5 ft
Capacity (Res. Water Surface 5,271, 2 ft freeboard)	39,957 cfs
Reservoir	
Maximum Operating Water Surface	5,262.0 ft
Minimum Operating Water Surface	5,125 ft
Gross Storage	134,993 ac-ft
Dead Storage (as constructed), at Tunnel Intake Lip	7,635 ac-ft
Active Storage (as constructed)	127,358 ac-ft
Area at Maximum Operating Water Surface	1,408 acres
Area at Minimum Operating Water Surface	434 acres
Depth at Minimum Operating Water Surface	77 ft
Shoreline at Maximum Operating Water Surface	9 mi
French Meadows – Hell Hole Tunnel	
Nominal Size/Shape	12 ft 4 in/Horseshoe
Length:	
Total	13,694 ft or 2.6 mi
Concrete Lined (Est.)	1,617 ft
Steel Lined (Est.)	317 ft
Maximum Discharge	400 cfs[1]
Invert Gradient	0.0025
French Meadows Powerhouse	
Penstock	
Length	691 ft or 0.1 mi
Diameter	6 ft 3 in O.D.
Powerhouse	
Installed Capacity, Generator	15.3 MW
Type of Turbine	Francis
Maximum Tail Water Surface	4,630 ft
Minimum Tail Water Surface	4,608 ft
Maximum Static Head	654 ft
Minimum Static Head	517 ft
Elevation Runner	4,612 ft
Minimum Estimated Hydraulic Capacity	50 cfs
Maximum Estimated Hydraulic Capacity	400 cfs
R.P.M.	450

[1]As constructed tunnel capacity is approximately 800 cfs, maximum discharge is limited to 400 cfs in French Meadows Powerhouse.

SMP Table 1. Project Facility Infrastructure Specifications at Locations where Sediment Management Activities are Implemented (continued).

Hell Hole Dam and Reservoir	
Dam	
Type	Rock Fill
Height of Dam Crest above Streambed	410 ft
Dam Crest Length	1,570 ft
Dam Crest Width	35 ft
Elevation of Dam Crest	4,650 ft
Elevation of Streambed	4,240 ft
Volume	8,440,000 cu yd
Slopes - Upstream	2.5:1
Slopes - Downstream	1.4:1
Stream Maintenance Pipe Capacity	20 cfs
Maximum Low-Level Outlet Capacity at Water Surface 4,630 (full reservoir)	852 cfs
Spillway	
Type	Uncontrolled
Elevation of Spillway Crest	4,630 ft
Width at Lip	350 ft
Capacity (Water Surface 4,647, 2.8 ft freeboard)	89,500 cfs
Reservoir	
Maximum Operating Water Surface	4,630 ft
Minimum Operating Water Surface	4,340 ft
Gross Storage	207,590 ac-ft
Dead Storage (as constructed), at Tunnel Intake Lip	2,533 ac-ft
Active Storage (as constructed)	205,057 ac-ft
Area at Maximum Operating Water Surface	1,253 acres
Area at Minimum Operating Water Surface	185 acres
Depth at Minimum Operating Water Surface	88 ft
Shoreline at Maximum Operating Water Surface	11 mi
Hell Hole Powerhouse	
Installed Capacity, Generator	0.73 MW
Normal Operating Tail Water Surface	4,240 ft
Maximum Static Head	391 ft
Minimum Static Head	101 ft
Minimum Estimated Hydraulic Capacity	10 cfs
Maximum Estimated Hydraulic Capacity	35 cfs
R.P.M.	1,200
Hell Hole – Middle Fork Tunnel	
Nominal Size/Shape	13 ft 5 in/Horseshoe
Length:	
Total	55,006 ft or 10.4 mi
Concrete Lined (Est.)	6,780 ft
Steel Lined (Est.)	5,180 ft
Nominal Maximum Discharge, at full reservoir	920 cfs
Invert Gradient	0.0035 and 0.0077

SMP Table 1. Project Facility Infrastructure Specifications at Locations where Sediment Management Activities are Implemented (continued).

North Fork Long Canyon Diversion	
Dam	
Type	Gravity
Material	Concrete
Height of Dam above Streambed	10 ft
Dam Crest Length	120 ft
Elevation of Dam Crest	4,720 ft
Elevation of Streambed	4,710 ft
Volume	636 cu yd
Stream Maintenance Pipe Capacity (12-in pipe)	2 cfs
Maximum Low-Level Outlet Capacity (36-in pipe)	100 cfs
Spillway	
Type	Uncontrolled Overflow
Elevation of Spillway Crest	4,716 ft
Width of Spillway Crest	95 ft
Capacity	3,000 cfs
Reservoir	
Gross Storage	<1 ac-ft
North Fork Long Canyon Diversion Pipe and Drop Inlet	
Pipe	
Diameter	36 in
Length	3,530 ft or 0.7 mi
Shaft	
Diameter	6 ft
Depth without 6 ft x 20 ft Standpipe	403 ft
Capacity	100 cfs
Invert Gradient	Vertical
South Fork Long Canyon Diversion	
Dam	
Type	Gravity
Material	Concrete
Height of Dam Crest above Streambed	27 ft
Dam Crest Length	145 ft
Elevation of Dam Crest	4,650 ft
Elevation of Streambed	4,623 ft
Volume	1,341 cu yd
Stream Maintenance Pipe Capacity (12-in pipe)	5 cfs
Maximum Low-Level Outlet Capacity (36-in pipe)	140 cfs
Spillway	
Type	Uncontrolled Overflow
Width of Spillway Crest	60 ft
Elevation of Spillway Crest	4,640 ft
Capacity	4,000 cfs
Reservoir	
Gross Storage	<1 ac-ft

SMP Table 1. Project Facility Infrastructure Specifications at Locations where Sediment Management Activities are Implemented (continued).

South Fork Long Canyon Diversion Pipe and Drop Inlet	
Diameter	6 ft
Depth without 6 ft x 6 ft Standpipe	387 ft
Capacity	200 cfs
Invert Gradient	Vertical
Middle Fork Powerhouse (*L.J. Stephenson Powerhouse*)	
Penstock	
Length	3,653 ft or 0.7 mi
Diameter: Above Bifurcation	7 ft 6 in to 9 ft O.D.
Diameter: Below Bifurcation	5 ft 6 in O.D.
Powerhouse	
Number of Units	2
Generator Installed Capacity (Total)	122.4 MW
Type of Turbine	Impulse
Elevation Nozzles	2,536 ft
Elevation Normal Tail Water Surface	2,529 ft
Maximum Static Head	2,096 ft
Minimum Static Head	1,806 ft
Minimum Estimated Hydraulic Capacity	50 cfs
Maximum Estimated Hydraulic Capacity	940 cfs
R.P.M.	400
Middle Fork Interbay	
Dam	
Type	Gravity
Material	Concrete
Height of Dam Crest above Streambed	70.5 ft
Dam Crest Length	233 ft
Elevation of Dam Crest	2,536 ft
Elevation of Streambed	2,465 ft
Volume	14,360 cu yd
Stream Maintenance Pipe Capacity	23 cfs
Low-Level Outlet Capacity at Water Surface 2,530 (full reservoir)	890 cfs
Roadway Width, Curb to Curb	14 ft
Elevation of Roadway	2,538 ft
Spillway	
Type	Gated Ogee Crest
Capacity (Water Surface 2,534)	36,506 cfs
Width of Spillway	80 ft Gated, 60 ft Uncontrolled
Number of Gates	4
Type of Gates	Radial
Size of Gates	20 ft x 20 ft
Elevation of Top of Gates	2,530 ft
Elevation of Sill of Gates	2,510 ft

SMP Table 1. Project Facility Infrastructure Specifications at Locations where Sediment Management Activities are Implemented (continued).

Middle Fork Interbay (continued)	
Reservoir	
Maximum Operating Water Surface	2,529 ft
Minimum Operating Water Surface	2,502 ft
Normal Operating Water Surface	2,527 ft
Gross Storage	175 ac-ft
Dead Storage (as constructed), at Tunnel Intake Lip	2 ac-ft
Active Storage (as constructed)	173 ac-ft
Area at Maximum Operating Water Surface	7 acres
Area at Minimum Operating Water Surface	3 acres
Depth at Minimum Operating Water Surface	37 ft
Middle Fork – Ralston Tunnel	
Nominal Size/Shape	13 ft 5 in/Horseshoe
Length:	
Total	35,397 ft or 6.7 mi
Concrete Lined (Est.)	8,245 ft
Steel Lined (Est.)	245 ft
Maximum Discharge	836 cfs
Invert Gradient	0.0054
Ralston Powerhouse	
Penstock	
Length	1,670 ft
Diameter	8 ft to 9 ft 6 in O.D.
Powerhouse	
Installed Capacity, Generator	79.2 MW
Type of Turbine	Impulse
Elevation Nozzles	1,186 ft
Static Head	1,344 ft
Minimum Estimated Hydraulic Capacity	75 cfs
Maximum Estimated Hydraulic Capacity	924 cfs
R.P.M.	240
Ralston Afterbay	
Dam	
Type	Gravity
Material	Concrete
Height of Dam Crest above Streambed	89 ft
Dam Crest Length	560 ft
Volume	76,300 cu yd
Elevation of Dam Crest	1,189 ft
Elevation of Streambed	1,100 ft
Streamflow Maintenance Pipe Capacity (30-in pipe)	155 cfs
Maximum Low-Level Outlet Capacity at water surface 1,179 (full reservoir) - calculated (72-in pipe)	1,132 cfs

SMP Table 1. Project Facility Infrastructure Specifications at Locations where Sediment Management Activities are Implemented (continued).

Ralston Afterbay (continued)	
Dam (continued)	
Roadway Width, Curb to Curb	12 ft
Elevation of Roadway	1,188.42 ft
Spillway	
Type	Gated Ogee Crest
Capacity at Water Surface 1,186	171,200 cfs
Elevation of Top of Gates	1,179 ft
Elevation of Sill of Gates	1,149 ft
Crest Length	232 ft
Number of Gates	5
Type of Gates	Radial
Size of Gates	30 ft x 40 ft
Reservoir	
Gross Storage	2,782 ac-ft
Active Storage	1,804 ac-ft
Ralston – Oxbow Tunnel	
Nominal Size/Shape	13 ft 3 in/Horseshoe
Length:	
Total	403 ft or 0.08 mi
Concrete Lined	343 ft
Steel Lined	60 ft
Maximum Discharge	1,088 cfs
Invert Gradient	0.12035
Oxbow Powerhouse	
Penstock	
Length	5 ft
Diameter	9 ft I.D.
Powerhouse	
Installed Capacity, Generator	6.1 MW
Type of Turbine	Francis
Elevation Runner	1,098.5 ft
Static Head	90 ft
Normal Tail Water Surface	1,089 ft
Minimum Estimated Hydraulic Capacity	200 cfs
Maximum Estimated Hydraulic Capacity	1,025 cfs
R.P.M.	200

SMP Table 1. Project Facility Infrastructure Specifications at Locations where Sediment Management Activities are Implemented (continued).

Summary	
Power and Energy Production	
Total Installed Capacity (at 0.9 power factor)	223.7 MW
Total Dependable Capacity (at 0.9 power factor)	223.7 MW
Average Annual Energy Production[2]	1,039,078 MWh
Maximum Total Static Head	4,162
Water Supply and Regulation	
Total Gross Storage	345,560 ac-ft
Project Features	
Earth and Rock Fill Dams	11,900,000 cu yd
Concrete Dams and Diversions	94,000 cu yd
Tunnels and Penstocks	23.2 mi
Project Completed – 1967	

[2]Generation from French Meadows, Middle Fork, Ralston, and Oxbow powerhouses is averaged over a 40-year period of record (1967 to 2006). Hell Hole Powerhouse was constructed in 1983; therefore, generation from Hell Hole Powerhouse is averaged over the 24-year period that the facility has been in operation (1983 to 2006). The Average Annual Energy Production represents the sum of the average net generation for the five Project powerhouses based on their respective period of record. Refer to Table 3-16.

Notes:
ac-ft = acre-feet
cfs = cubic feet per second
cu yd = cubic yards
ft = feet
I.D. = inside diameter
in = inch
MW = megawatt
MWh = megawatt hours
mi = miles
O.D. = outside diameter

SMP Table 2. Summary of Historic Sediment Removal Activities at MFP Diversion Pools and Medium Reservoirs (through 2009).[1]

Year	Month[2]	Loose, Uncompacted Volume of Sediment Removed (cubic yds)
Duncan Creek Diversion Pool (period of record 1997-2009)		
1988	-	Sediment removal occurred in this year, however, no information on the volume of sediment removed is available
1998	Aug	4,500
2007	Sept	1,570
Total		**6,070**
Frequency of Sediment Removal Activities: 3 times between 1988-2009 (22 years)		**once every 7.3 years**
Volume Removed per Maintenance Activity[2]		**3,035 cubic yards**
North Fork Long Canyon Diversion Pool (period of record 1980-2009)		
1980	-	Sediment removal occurred in these years, however, no information on the volume of sediment removed is available
1982	-	
1986	-	
1988	-	
1990	-	
1992	-	
1995	-	
1997	-	1,600
2004	Sept	400
2006	Sept	1,370
Total		**3,370**
Frequency of Sediment Removal Activities: 10 times between 1980-2009 (30 years)		**once every 3 years**
Average Volume Removed per Maintenance Activity[2]		**1,123 cubic yards**
South Fork Long Canyon Diversion Pool (period of record 1980-2009)		
1980	-	Sediment removal occurred in these years, however, no information on the volume of sediment removed is available
1982	-	
1986	-	
1988	-	
1995	-	
1997	-	2,500
2006	Sept	2,850
Total		**5,350**
Frequency of Sediment Removal Activities: 7 times between 1980-2009 (30 years)		**once every 4.3 years**
Average Volume Removed per Maintenance Activity[2]		**2,675 cubic yards**
Middle Fork Interbay (period of record 1987-2009)		
1987	Oct	25,000
1988	Oct	35,000
1997	Feb	16,000
2000	Oct	68,000
Total		**144,000**
Frequency of Sediment Removal Activities: 4 times between 1987-2009 (23 years)		**once every 5.8 years**
Average Volume Removed per Maintenance Activity[2]		**36,000 cubic yards**
Ralston Afterbay (period of record 1969-2009)		
1969	-	Sediment removal occurred in this year, however, no information on the volume of sediment removed is available
1981	Oct	10,000
1984	Oct	13,000
1985	Oct	12,000
1986	Mar	45,000
1986	Oct	80,000
1989	Oct	35,000
1994	Sept	77,000
1997	Feb	65,000
2002	Oct	101,000[3]
Total		**438,000**
Frequency of Sediment Removal Activities: 10 times between 1969-2009 (41 years)		**once every 4.6 years**
Average Volume Removed per Maintenance Activity[2]		**48,667 cubic yards**

[1]Source: AQ 9 – Geomorphology Technical Study Report.

[2]Includes only the years with known sediment volumes.

[3]Volume equals 45,000 cubic yards compacted, in-place sediment at Indian Bar; and 29,000 cubic yards compacted, in-place sediment at Ralston Ridge.

SMP Table 3. Sediment Management at Small Diversions.

Interim and Contingency Sediment Management			
Sediment Management Details	**Duncan Creek Diversion Pool**	**North Fork Long Canyon Diversion Pool**	**South Fork Long Canyon Diversion Pool**
Start/End Dates	September through October	September through October	September through October
Duration	Interim Removal - 1.5 weeks Contingency Removal - 1 week	Interim Removal - 1 week Contingency Removal - 0.5 week	Interim Removal - 1 week Contingency Removal - 0.5 week
Work Days	5 to 8 days	3 to 5 days	3 to 5 days
Work Hours	7 am to 6 pm	7 am to 6 pm	7 am to 6 pm
Impact Area			
Site Access/Road Improvements	re-grade two 100-feet-long access ramp to diversion pool	re-grade 100-feet-long access ramp to diversion pool	re-grade 100-feet-long access ramp to diversion pool
Staging Areas (acres)	0.12	0.09	0.11
Materials			
Material Exported (cubic yards)	Interim Removal - 500 Contingency Removal - 100	Interim Removal - 200 Contingency Removal - 50	Interim Removal - 200 Contingency Removal - 50
Disposal			
Disposal Area	Duncan	North Fork Long Canyon Crossing Disposal Site	North Fork Long Canyon Crossing Disposal Site
Available Capacity (cubic yards)	20,000	10,000 to 20,000	10,000 to 20,000
Equipment/Personnel			
Equipment to be Used	1 medium excavator (e.g., JD 690); 1 small bulldozer (e.g.,CAT D4); 1 backoe; 2-3 haul trucks (10-ton); 1 water pumps	1 medium excavator (e.g., JD 690); 1 small bulldozer (e.g.,CAT D4); 1-2 haul trucks (10-ton); 1 water pumps	1 medium excavator (e.g., JD 690); 1 small bulldozer (e.g.,CAT D4); 1-2 haul trucks (10-ton); 1 water pumps
No. of People in Work Crew	8	6	6
No. of Haul Truck Trips	Interim Removal - 50 trips, twice in 5 years Contingency Removal - 10 trips, 5 times over 45 years	Interim Removal - 20 trips, twice in 5 years Contingency Removal - 5 trips, 5 times over 45 years	Interim Removal - 20 trips, twice in 5 years Contingency Removal - 5 trips, 5 times over 45 years
Crew Transportation To/From Site	Carpooling to/from Auburn	Carpooling to/from Auburn	Carpooling to/from Auburn
Crew Housing	Local residences	Local residences	Local residences
Channel Work			
Materials placed in streambed (*fill in cubic feet*)	50-100	50-100	50-100
Temporary Diversion/ Dewatering (*method, materials*)	Install temporary diversion structure at upstream end of reservoir to divert up to 5 cubic feet per second of flow around excavation area; pump water from excavation areas as needed	Install temporary diversion structure at upstream end of reservoir to divert up to 2 cubic feet per second of flow around excavation area; pump water from excavation areas as needed	Install temporary diversion structure at upstream end of reservoir to divert up to 3 cubic feet per second of flow around excavation area; pump water from excavation areas as needed

SMP Table 4. Sediment Management at Medium Diversions.

Routine Sediment Management		
Sediment Management Details	**Middle Fork Interbay**	**Ralston Afterbay**
Start/End Dates	September through October	September through October
Duration	4 to 8 weeks	4 to 8 weeks
Work Days	20 to 40 days	20 to 40 days
Work Hours	7 am to 6 pm	7 am to 6 pm
Impact Area		
Site Access/Road Improvements	Grade existing access ramp into reservoir	Construct haul road within dewatered reservoir
New Staging Areas (acres)	None (temporary staging and parking at existing sites at Middle Fork Gatehouse, and Powerhouse and Switchyards)	0.82
Materials		
Material Exported	36,000 cubic yards every 6 years	49,000 cubic yards every 5 years
Disposal Sites		
Disposal Location/Available Capacity	Middle Fork Interbay Sediment Disposal Area 20,000 cubic yards	Ralston Ridge Sediment Disposal Area 20,000 to 25,000 cubic yards
Augmentation Site/Available Capacity	Middle Fork Interbay Augmentaiton Area 5,000 cubic yards	Indian Bar Sediment Disposal Area 15,000 cubic yards
Equipment/Personnel		
Equipment to be Used	1 medium excavator (JD 690); 1 large loader (e.g., CAT 966); 1 medium bulldozer (CAT D8); 1 small bulldozer (CAT D4); 2-3 haul trucks (25-35 ton)	1 large excavator (e.g., Komatsu 750); 1 large loader (e.g., CAT 980); 1 medium excavator (JD 690); 1 small bulldozer (CAT D4); 2-3 haul trucks (25-35 ton)
No. of People in Work Crew	6 to 10	6 to 10
No. of Truck Trips	1,728 every 6 years	1,728 every 5 years
Crew Transportation To/From Site	carpooling from Auburn	carpooling from Auburn
Crew Housing	local residences	local residences
Channel Work		
Materials to be installed in streambed (*fill in cubic feet*)	500	3,500
Temporary Diversion/ Dewatering (*method, materials*)	~2,000 feet of pipe to bypass site to meet in-stream flow (discharge downstream of dam and augmentation area; small temporary dam across stream in dewatered reservoir to divert excess flow into existing tunnel;	CMP culverts for low flow channel in dewatered reservoir (capacity: 150% of expected flow); discharge downstream into lowered reservoir

SMP Table 5. Avoidance and Protection Measures to be Implemented during Sediment Management.

Avoidance and Protection Measures	Small Diversions		Medium Reservoirs		
			Routine Sediment Management		
	Interim Sediment Management	Contingency Sediment Management	Sediment Removal	Sediment Augmentation	Sediment Disposal
USDA-FS Water Quality Best Management Practices					
Timing of Construction Activities (Practice 2-3). This BMP requires project proponents to minimize erosion by conducting operations during minimal runoff.					
• The Licensee will conduct sediment management activities within the river and reservoir beds during minimal runoff periods (i.e., during the dry season or when rain and runoff are unlikely, typically during the late summer or fall).	x	x	x	x	
• Equipment will not be operated when ground conditions are such that excessive rutting and soil compaction could result.	x	x	x	x	x
• Equipment will be operated only on the dry and exposed reservoir or diversion pool bed, and will not enter wetted areas.	x	x	x	x	
• Construction of drainage facilities or other work to control erosion or sedimentation will be required in conjunction with earthwork.	x	x	x	x	x
Stabilization of Road Slope Surfaces and Spoil Disposal Areas (Practice 2-4): This BMP requires implementation of measures to minimize erosion from exposed slopes and spoil disposal areas.					
• Bioengineering and other techniques will be implemented to prevent or minimize erosion, including vegetative or mechanical measures to improve surface soil stability.	x	x	x	x	x
• Revegetation including seeding of grasses, shrubs, or trees will be used as necessary to prevent or minimize erosion. A combination of woody and fibrous root systems usually produce the best results. All revegetation and seeding will be implemented in accordance with applicable USDA-FS policies (Refer to BMP 5-4).	x	x	x	x	x
• Mechanical measures including, but not limited to, wattles, erosion nets, terraces, mats, riprapping, mulch, soil seals, or coir rolls, may be used as necessary.	x	x	x	x	x

SMP Table 5. Avoidance and Protection Measures to be Implemented during Sediment Management (continued).

Avoidance and Protection Measures	Small Diversions		Medium Reservoirs		
			Routine Sediment Management		
	Interim Sediment Management	Contingency Sediment Management	Sediment Removal	Sediment Augmentation	Sediment Disposal
USDA-FS Water Quality Best Management Practices (continued)					
Stabilization of Road Slope Surfaces and Spoil Disposal Areas (Practice 2-4): This BMP requires implementation of measures to minimize erosion from exposed slopes and spoil disposal areas (continued).					
• Silt fence and/or straw bales will be installed around the sediment storage sites, where turbid runoff could occur during rain storms.					x
• Slopes of the sediment piles at disposal areas will not exceed a 2:1 ratio.					x
Servicing and Refueling of Equipment (Practice 2-12): This BMP requires implementation of measures to prevent pollutants (e.g., fuels, lubricants, or other hazardous materials) from being discharged into river, streams, or impoundments.					
• The Licensee will develop a Spill Prevention, Containment and Counter Measures Plan (SPCC) that describes the emergency response to spills or discovery of hazardous materials (refer also to Practice 7-4, below).	x	x	x	x	x
• A designated fueling site, if necessary, will be established outside of the reservoir or diversion. Absorbent spill clean-up materials and spill kits will be available to absorb small spills. All used absorbent materials will be properly disposed of.	x	x	x	x	
• Temporary fuel tanks will have adequate local containment consisting of berms and plastic sheeting to protect against accidental spills or leaks.	x	x	x	x	x
• A spill response kit will be maintained at each site.	x	x	x	x	x
• If any accidental releases of sediment, fuels, or oil occur, immediate containment and cleanup will be implemented, and the resource agencies notified in accordance with project permits.	x	x	x	x	x
• If fuel spills on the soil of the reservoir bed, the soil will be removed from the reservoir and properly disposed of.	x	x	x	x	

SMP Table 5. Avoidance and Protection Measures to be Implemented during Sediment Management (continued).

Avoidance and Protection Measures	Small Diversions		Medium Reservoirs		
			Routine Sediment Management		
	Interim Sediment Management	Contingency Sediment Management	Sediment Removal	Sediment Augmentation	Sediment Disposal
USDA-FS Water Quality Best Management Practices (continued)					
Servicing and Refueling of Equipment (Practice 2-12): This BMP requires implementation of measures to prevent pollutants (e.g., fuels, lubricants, or other hazardous materials) from being discharged into river, streams, or impoundments (continued).					
• Hazardous waste products such as grease cartridges and oil absorbents will be placed in proper containers and transported from the job site to an authorized Hazardous Waste Collections Site.	x	x	x	x	x
• All equipment will be thoroughly cleaned of dirt, grease, etc., prior to entering the National Forest, and will be inspected to ensure that they are in proper functioning condition. All suspect hoses and hydraulic lines will be replaced prior to entering the National Forest.	x	x	x	x	x
Controlling In-Channel Excavation (Practice 2-14): This BMP requires measures to minimize in-channel disturbances and associated sediment production.					
• The area of disturbance within the river or reservoir bed will be limited to the minimum area necessary to implement sediment management activities.	x	x	x	x	
• After sediment removal, the channel or lake bottom will be restored to its original configuration, as applicable.	x	x	x		
• To protect the roadway and embankment from damage, rubber matting or metal plates will be used at the augmentation site, extending approximately 20 to 30 feet down the slope (applicable to Middle Fork Interbay).				x	
• Disturbance of stream or lake banks will be kept to a minimum. Existing access ramps will be used to access the river or reservoir bed to the extent possible.	x	x	x	x	
• Disturbed banks will be stabilized as necessary.	x	x	x	x	

SMP Table 5. Avoidance and Protection Measures to be Implemented during Sediment Management (continued).

Avoidance and Protection Measures	Small Diversions		Medium Reservoirs		
			Routine Sediment Management		
	Interim Sediment Management	Contingency Sediment Management	Sediment Removal	Sediment Augmentation	Sediment Disposal
USDA-FS Water Quality Best Management Practices (continued)					
Diversion of Flows around Construction Sites (Practice 2-15): This BMP requires that stream diversions are carefully plan to minimize downstream sedimentation, and to restore stream channels to their natural grade, condition, and alignment as soon as possible.					
• Streamflow will be diverted during excavation of sediment.	x	x	x	x	
• Minimum instream flows levels will be maintained.	x	x	x		
• Diverted flows will be returned to their natural streamcourse as soon as possible after construction.	x	x	x	x	
• Disturbed areas will be stabilized as soon as possible.	x	x	x	x	
Revegetation of Surface Disturbed Areas (Practice 5-4): This BMP requires minimization of soil erosion through establishment and vegetation foliage and root networks.					
• Unstable or disturbed soil surfaces (i.e., on river or reservoir banks) will be revegetated as soon as possible.	x	x	x	x	
• The Licensee will implement all revegetation and seeding in conformance with USDA-FS revegetation and seeding policies. Refer to the Vegetation and Integrated Pest Management Plan.	x	x	x	x	
Forest and Hazardous Substance Spill Prevention Control and Counter Measure Plan (Practice 7-4):					
• USDA-FS requires preparation of an SPCC plan if total storage of fuel at the sites exceeds 660 gallons in a single container, or if total storage exceeds 1,320 gallons.	x	x	x	x	x
• SPCC plans must be compatible with appropriate County SPCC Plans and California State guidelines.	x	x	x	x	x

SMP Table 5. Avoidance and Protection Measures to be Implemented during Sediment Management (continued).

Avoidance and Protection Measures	Small Diversions		Medium Reservoirs		
			Routine Sediment Management		
	Interim Sediment Management	Contingency Sediment Management	Sediment Removal	Sediment Augmentation	Sediment Disposal
USDA-FS Water Quality Best Management Practices (continued)					
Fire Prevention and Protection Measures					
The provisions below outline the channels of responsibility for fire prevention and suppression activities, and established procedure in the event of a fire.					
• The contractor, its employees, and subcontractors and their employees, will make all reasonable efforts to prevent and suppress wild fires, and will exercise diligence in protecting from damage the land and property of the United States.	x	x	x	x	x
• No burning of any kind will occur as part of sediment management activities.	x	x	x	x	x
• The following fire equipment will be on site at all times: o One shovel, one axe and one fire extinguisher UL rated at 4 BC or more on each truck, personnel vehicle, tractor, grader, and any other heavy equipment will be used. o One shovel and one back-pack five gallon water filled tank with pump with each welder. o One shovel and one chemical pressurized fire extinguisher (fully charged) located at a point no greater than a distance of 25-feet from the work site, for each gasoline powered tool, including but not limited to chain saws, rock drills, etc.	x	x	x	x	x
Air Quality Measures					
Fugitive Dust Reduction Measures					
• Require contractors to comply with provisions of the Placer County Air Pollution Control District Rule 228 – Fugitive Dust, including Section 300 limits on visible emissions, PM_{10} concentrations, track-out onto paved public roadways, and other applicable requirements.	x	x	x	x	x

SMP Table 5. Avoidance and Protection Measures to be Implemented during Sediment Management (continued).

Avoidance and Protection Measures	Small Diversions		Medium Reservoirs		
			Routine Sediment Management		
	Interim Sediment Management	Contingency Sediment Management	Sediment Removal	Sediment Augmentation	Sediment Disposal
Air Quality Measures (continued)					
Fugitive Dust Reduction Measures (continued)					
• Stabilize unpaved areas subject to vehicle traffic by watering, treating with a non-toxic chemical dust suppressant, or covering.	x	x	x	x	x
• Limit the speed of any vehicles and equipment traveling across unpaved areas no more than 15 miles per hour unless the road surface and surrounding area is sufficiently stabilized.	x	x	x	x	x
• Stabilize storage piles and disturbed areas not subject to vehicular traffic by keeping wet, treating with a non-toxic chemical dust suppressant, or covering when material is not being added to, or removed from the pile.	x	x	x	x	x
• Prior to any ground disturbance, including grading, excavating, and land clearing, apply sufficient water to the area to be disturbed to limit dust and minimize emissions from crossing the boundary line.	x	x	x	x	x
• Clean construction vehicles leaving the site to prevent dust, silt, mud, and dirt, from being released or tracked offsite.	x	x	x	x	x
• Remove significant accumulations of mud or dirt from paved, public streets at the end of each work day using wet sweeping or a HEPA filter equipped vacuum device. Do not use blower devices.	x	x	x	x	x
• Suspend grading and earthmoving operations if wind speeds are high enough to result in dust emissions crossing the boundary line, despite the application of dust mitigation measures.	x	x	x	x	x
• Prevent spillage from materials transported off-site by either covering with tarps, or wetting loads such that the material does not touch the front, back, or sides of the cargo compartment at any point less than six inches from the top and that no point of the load extends above the top of the cargo compartment.	X	x	x	x	x

SMP Table 5. Avoidance and Protection Measures to be Implemented during Sediment Management (continued).

Avoidance and Protection Measures	Small Diversions		Medium Reservoirs		
			Routine Sediment Management		
	Interim Sediment Management	Contingency Sediment Management	Sediment Removal	Sediment Augmentation	Sediment Disposal
Air Quality Measures (continued)					
Fugitive Dust Reduction Measures (continued)					
• If any naturally occurring asbestos, ultramafic rock, or serpentine is disturbed: (1) wash all equipment before moving from the property onto a paved public road, and (2) upon completion of the project, stabilize disturbed surfaces using one or more of the following methods: (a) establishment of a vegetative cover; (b) placement of at least one foot of non-asbestos-containing material, or (c) paving.	x	x	x	x	x
Diesel Emissions Reduction Measures					
• Depending on equipment availability, require that all diesel construction engines with a rating of 50 horsepower or greater meet, at a minimum, the Tier 2 California emission standards for off-road engines (13 CCR 2423 per 40 CFR 89.112).	x	x	x	x	x
• Require contractors to limit idling of construction vehicles and equipment on site to 15 minutes or less, unless idling is necessary for effective work progress or equipment operation.	X	x	x	x	x
• Require contractors to maintain construction equipment in proper working order, and in accordance with manufacturer specifications.	X	x	x	x	X
Fuel Emissions Measures					
• Comply with the use of ultra-low sulfur diesel fuel for all construction equipment, as required by the state of California, to minimize diesel particular matter emissions.	X	x	x	x	x

SMP Table 5. Avoidance and Protection Measures to be Implemented during Sediment Management (continued).

Avoidance and Protection Measures	Small Diversions		Medium Reservoirs		
			Routine Sediment Management		
	Interim Sediment Management	Contingency Sediment Management	Sediment Removal	Sediment Augmentation	Sediment Disposal
Public and Worker Safety Measures					
• Material Safety Data Sheets for all substances used on the job site will be on file at the job headquarters in the Rock Creek Yard at Auburn, as required by the Hazard Communication Law, General Industry Safety Orders, Sec 5194, and will be available as necessary.	x	x	x	x	x
• Normal construction safety procedures, road signage, employee training and tailboards, and good housekeeping will be implemented to assure that no unseen safety hazards exist.	x	x	x	x	x
• Traffic control will consist of temporary construction signs, trucks entering roadway signs, and flaggers as needed.	x	x	x	x	x
• Road closures will be implemented as necessary during sediment removal and hauling.			x	x	x
Biological Resource Measures					
General Biological Resource Measures					
• Sediment management activities will be limited to the minimum area necessary for completion of the work, and will be confined to the diversion or reservoir channels and previously disturbed or developed upland areas.	x	x	x	x	
• All staging areas and access routes will be located on developed roads and previously disturbed areas (with the exception of temporary access to the Junction Bar Sediment Augmentation Area).	x	x	x	x	x
• Road resurfacing or other road maintenance necessary for ingress and egress of construction equipment will be confined to the existing road surfaces (with the exception of temporary access to the Junction Bar Sediment Augmentation Area).	x	x	x	x	x

SMP Table 5. Avoidance and Protection Measures to be Implemented during Sediment Management (continued).

Avoidance and Protection Measures	Small Diversions		Medium Reservoirs		
			Routine Sediment Management		
	Interim Sediment Management	Contingency Sediment Management	Sediment Removal	Sediment Augmentation	Sediment Disposal
Biological Resource Measures (continued)					
Noxious Weed Measures					
• The Licensee will implement measures to prevent the introduction or spread of noxious weeds (as defined in the VIPMP) when conducting sediment management activities.	x	x	x	x	x
Riparian Measures					
• The Licensee will use existing ramps to access the reservoirs and diversion pools whenever possible. When it is not possible to use existing ramps, an access route will be selected in an area that does not support riparian vegetation.	x	x	x	x	
Special-Status Plant Measures					
• If a new special-status plant population (i.e., Stebbins' phacelia or other special-status plant species) that could be affected by sediment management activities is detected during the term of the license, the Licensee will consult with USDA-FS, USFWS, and CDFG, as appropriate, to determine a site-specific protective buffer around the population considering the special-status plant species, location of the population, and topography of the site.	x	x	x	x	x

SMP Table 5. Avoidance and Protection Measures to be Implemented during Sediment Management (continued).

Avoidance and Protection Measures	Small Diversions		Medium Reservoirs		
			Routine Sediment Management		
	Interim Sediment Management	Contingency Sediment Management	Sediment Removal	Sediment Augmentation	Sediment Disposal
Ralston Afterbay Measures					
Reservoir Elevation and Minimum Instream Flow Requirements					
• During sediment removal the Ralston Afterbay water surface elevation will be maintained at an elevation no lower than the bottom of the spill gates (1,149 ft) to provide a refuge pool for fish. Oxbow Powerhouse will be shut down when the reservoir elevation reaches below 1,167 ft elevation. The minimum flow requirement applicable to the peaking reach will flow through Ralston Afterbay and the refuge pool (e.g., over the spill gates) to maintain channel connectivity in Ralston Afterbay and water quality conditions in the refuge pool.			X[1]		
Foothill Yellow-Legged Frog (FYLF) Measures					
• Sediment augmentation will not occur during the FYLF breeding period May 15–June 15. FYLF will be surveyed prior to vegetation removal activities associated with sediment augmentation at Indian Bar and Junction Bar and prior to installation of the temporary bridge across Willow Bar. Any FYLF within 100 m of the sediment augmentation activities will be relocated downstream outside of the disposal areas.				X[2]	

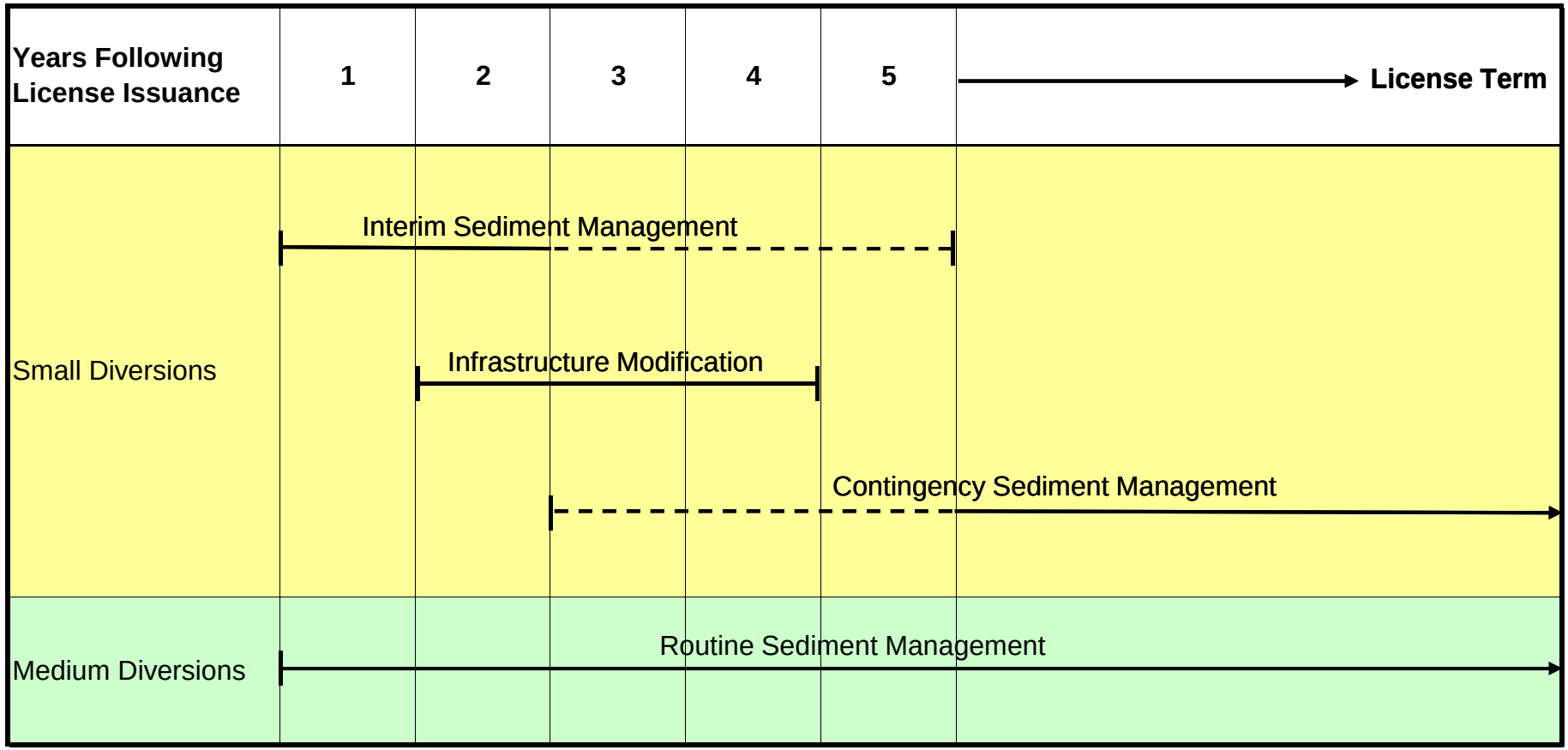
[1] Only at Ralston Afterbay.
[2] Only at Indian Bar and Junction Bar below Ralston Afterbay.

SMP Table 5. Avoidance and Protection Measures to be Implemented during Sediment Management (continued).

Avoidance and Protection Measures	Small Diversions		Medium Reservoirs		
			Routine Sediment Management		
	Interim Sediment Management	Contingency Sediment Management	Sediment Removal	Sediment Augmentation	Sediment Disposal
Aquatic Species Measures					
• Check reservoirs during dewatering and transport stranded species. Prior to diverting or bypassing flows, all fish inhabiting the affected reach shall be captured and rescued to a downstream location.	x	x	x	x	X
• If fish are present within the small diversion pools during dewatering, fish will be rescued and transported downstream of the diversion. A record will be maintained of all fish rescued. This will include survey personnel names, date captured and relocated, and method of capture. The complete record will be provided to resources agencies following completion of sediment management.	x	x	x	x	x
• If fish are present within Middle Fork Interbay during dewatering, fish will be rescued and transported downstream of the sediment augmentation site and associated silt fence. In addition, fish present at the sediment augmentation site will be rescued and transported downstream of the silt fence. A record will be maintained of all fish rescued. This will include survey personnel names, date captured and relocated, and method of capture. The complete record will be provided to the resource agencies following completion of sediment management.	x	x	x	x	x
Raptor Measures					
• Sediment management activities will be conducted after September 15 and before February 15 outside the raptor nesting season	x	x	x	x	X

FIGURES

SMP Figure 1. Sediment Management Timeline.



MAPS

ATTACHMENT A

Sediment Pass through Turbidity Monitoring Protocols (Revised January 2010)

Sediment Pass Through (SPT) will be initiated when PCWA believes that streamflows will exceed 3,500 cfs at Ralston Dam for an extended period of time (one day or more). Turbidity monitoring at five locations is to be initiated immediately prior to the onset of SPT operations at Ralston Dam, if possible. If not possible, monitoring will be initiated immediately following SPT initiation. The following outlines the steps and protocols for initiating SPT and associated turbidity monitoring.

1. PCWA will closely monitor available weather forecasts throughout the winter. If an approaching storm (or series of storms) appears to be of sufficient magnitude, then Steve Jones, Marie Davis, and Ben Ransom will confer.
2. As soon as a decision is made to attempt to implement SPT, Ben Ransom will notify the turbidity monitoring crew (turbidity monitoring crew contact information will be updated annually on the contact list below) via telephone and email. PCWA will attempt to notify the turbidity monitoring crew at least the day before SPT is anticipated.
3. PCWA will continue to monitor the weather forecast and streamflow conditions to determine the appropriate specific time to commence SPT. Steve Jones and the PCWA operators will determine this time, and notify Ben Ransom and Marie Davis via email or phone. Ben or Marie will then notify the turbidity monitoring crew. PCWA will strive to notify the turbidity monitoring crew at least several hours before SPT is planned to begin. PCWA will attempt to initiate SPT prior to 1 pm to allow at least one (preferably two) round of turbidity monitoring to occur during daylight, if feasible.
4. PCWA will ensure that the equipment necessary for turbidity is available for the turbidity monitoring crew to pick up at the Power Systems office in Foresthill.
5. Prior to implementing SPT, effort will be made to conduct at least one round of turbidity monitoring to measure pre-SPT turbidity conditions.
6. PCWA operators will begin SPT at the specified time and when the turbidity monitoring crew is known to have been mobilized to ensure that the turbidity monitoring crew will begin turbidity monitoring within one hour of the initiation of SPT. The monitoring will occur at the following five sites, in order:
    a. Middle Fork American River near gaging station (R11, just upstream of Horseshoe Bar) – (R11);
    b. North Fork of the Middle Fork American River upstream of Circle Bridge – (NFMFAR);
    c. Middle Fork American River between Ralston Dam and the Indian Bar Sediment Disposal area – (INDIAN BAR);
    d. Middle Fork American River adjacent to the picnic area upstream of the bridge (Little Circle Bridge) – (PICNIC);
    e. Rubicon River sufficiently upstream of the Ralston Powerhouse tailrace area of effect – (RUBICON); and
    f. Repeat “c” (INDIAN BAR).

These locations are shown on Map 1.

7. Water samples will be taken within the top 12 inches of the water column in a flowing section of the river.
8. Photographs will be taken of the river at each sample site and recorded on the photo log (attached), if possible.
9. The sample site name, date, and time will be recorded on the data sheet (attached).
10. The sample will be transferred from the sampling bottle to a "milk" bottle; a label that contains "Client," "Sample Site," "Sampled By," "Sample Date," and "Sample Time" will be affixed to the milk bottle.
11. After all five sites are sampled, the water samples will be taken to Ralston Powerhouse, or other pre-arranged facility, to test for turbidity[1].
    a. Thoroughly mix the water sample and transfer a small portion to the turbidimeter sample vial (do not remove the batteries from the turbidimeter or it will default to the factory settings and not the calibrated setting).
    b. Clean and dry the sample vial with a Kim-Wipe.
    c. Place the sample in the turbidimeter and record the turbidity on the data sheet.
    d. Repeat the procedure for the four other water samples.
12. At least once each storm event, or every 20 samples, when 20 samples have been made during a single storm event, a second sample (called a field duplicate sample) must be taken at one of the sites. The field duplicate sample should be taken immediately following the normal water sample and all labeling, recording, and testing procedures followed. The datasheet and label should indicate the duplicate sample.
13. At least once each storm event, or every 20 samples, when 20 samples have been made during a single storm event, a plastic bottle for the lab must be filled with deionized or distilled water, a label filled out and affixed to the bottle (write "distilled water" on the label in the space for "Sample Site"), and the turbidity of the distilled water must be measured and recorded on the data sheet.
14. Following turbidity testing, the water samples should be stored cold in an ice chest.
15. Prior to leaving Ralston Powerhouse, the turbidity monitoring crew will call Ben Ransom and provide the turbidity sampling results.
16. Repeat steps 6 though 13. The turbidity monitoring crew should endeavor to complete a round of sampling every two hours while being mindful of safety.

[1]The turbidity monitoring crew has the option of testing turbidity on each site (e.g., in vehicle), if conditions permit.

17. Within 16-24 hours of collection, the turbidity monitoring crew will provide PCWA – Auburn (Ransom, Fecko, or Bell) the sample “milk” bottles and a chain of custody form (attached). PCWA will provide the samples and chain of custody to Brad Wilkins (PCWA Water Quality) to be sent off to the lab.
18. Continue SPT monitoring until notified by PCWA.

Turbidity Monitoring Contact List

Name	Position	Home	Office	Cell	Email
Power Systems			**530.367.2291**		
Steve Jones	Manager	530.367.3478	530.367.2291	530.401.2293	sjones@pcwa.net
Jon Mattson	Hydro Engineer	530.367.3726	530.367.2291	530.401.3527	jmattson@pcwa.net
Jessica Wyatt	Hydro Clerk	530.367.3871	530.367.2291		jwyatt@pcwa.net
Don Fleming	Senior Operator	530.367.2270	530.367.2287	530.613.1613	ralston@wildblue.net
Dan Hounchell	Roving Operator	530.367.3048	530.367.2287	530.308.3027	ralston@wildblue.net
Kelly Bacal	Roving Operator	530.888.0507	530.367.2287	530.613.8146	ralston@wildblue.net
Marc Wyatt	Maintenance Supervisor	530.367.3871	530.367.2291	530.906.7427	mwyatt@pcwa.net
Mark Marsh	Maintenance	530.889.1335	530.367.2291		
Phil Collins	Maintenance	530.367.3585	530.367.2291	916.539.2897	
Business Office			**530.823.4973**		
Andy Fecko	Resource Administrator	530.308.4507		530.367.5829	afecko@pcwa.net
Ben Ransom	Env. Scientist			530.308.4554	bransom@pcwa.net
Marie Davis	Consultant	530.333.1242		530.906.1984	mdavis@pcwa.net
Beverly Bell	Administrative Aide		530.823.4973		bbell@pcwa.net
Turbidity Monitoring Crew			**916.923.1097**		
Katie Ross-Smith	Cardno ENTRIX			916-386-3820	kross@entrix.com
Peter Graf	Cardno ENTRIX			775-560-1253	pgraf@entrix.com
Jillian Aldrin	Cardno ENTRIX			512-413-8360	jaldrin@entrix.com
Melissa Nugent	Cardno ENTRIX			512-585-3697	mnugent@entrix.com
Eric Lee	Cardno ENTRIX			916-457-2305	elee@entrix.com
Drum Powerhouse	**24-hour**		**530-389-2551**		

PCWA Sediment Pass Through Turbidity Monitoring – Field Datasheet

Date: SPT Duration: SPT Team:

Flow (cfs) at Start SPT: Flow (cfs) at End SPT: Max Flow (cfs): Page: /

Date	Bottle Label	Sample Collection Time	Turbidity (NTU)					
			Horseshoe Bar @ R11	NFMF	MF Rafters Put-In	MF Picnic Area	RR US Ralston PH	DI Water

PCWA Sediment Pass Through Turbidity Monitoring – Field Datasheet

Date: SPT Duration: SPT Team:
Flow (cfs) at Start SPT: Flow (cfs) at End SPT: Max Flow (cfs): Page: /

Date	Bottle Label	Sample Collection Time	Turbidity (NTU)					
			Horseshoe Bar @ R11	NFMF	MF Rafters Put-In	MF Picnic Area	RR US Ralston PH	DI Water
18 SAMPLES COLLECTED - ANALYZE FIELD DUPLICATE AND DI WATER, FILL MILK BOTTLE WITH DI WATER								

NOTES:

PCWA Sediment Pass Through Turbidity Monitoring - Photo Log

pg ____ of _____

Photo No.	Date/Time	Location	Photo Description	Comments

NORTH COAST LABORATORIES LTD.
5680 West End Road • Arcata • CA 95521-9202
707-822-4649 Fax 707-822-6831

P. _____ of _____

Chain of Custody

LABORATORY NUMBER:

Attention: _____
Results & Invoice to: _____
Address: _____
_____
Phone: _____
Copies of Report to: _____
_____
Sampler (Sign & Print): _____

TAT: ☐ STD (2-3 Wk) ☐ Other:
PRIOR AUTHORIZATION IS REQUIRED FOR RUSH SAMPLES.

REPORTING REQUIREMENTS:
☐ State Forms
☐ Geotracker ☐ SWAMP ☐ Other EDD:
☐ Final Report PDF ☐ FAX By:

CONTAINER CODES: 1—½ gal. pl; 2—250 ml pl; 3—500 ml pl; 4—1 L Nalgene; 5—250 ml BG; 6—500 ml BG; 7—1 L BG; 8—40 ml VOA; 9—60 ml VOA; 10—125 ml VOA; 11—4 oz glass jar; 12—8 oz glass jar; 13—brass tube; 14—other
PRESERVATIVE CODES: a—HNO_3; b—HCl; c—H_2SO_4; d—$Na_2S_2O_3$; e—NaOH; f—$C_2H_3O_2Cl$; g—other

PROJECT INFORMATION
Project Number: _____
Project Name: _____
Purchase Order Number: _____

LAB ID	SAMPLE ID	DATE	TIME	MATRIX*	PRESERVATIVE	CONTAINER	ANALYSIS

SAMPLE CONDITION/SPECIAL INSTRUCTIONS

RELINQUISHED BY (Sign & Print)	DATE/TIME	RECEIVED BY (Sign)	DATE/TIME

SAMPLE DISPOSAL
☐ NCL Disposal of Non-Contaminated
☐ Return ☐ Pickup

CHAIN OF CUSTODY SEALS Y/N/NA
SHIPPED VIA: UPS Fed-Ex Hand

***MATRIX:** DW=Drinking Water; Eff=Effluent; Inf=Influent; SW=Surface Water; GW=Ground Water; WW=Waste Water; S=Soil; O=Other.

ALL CONTAMINATED NON-AQUEOUS SAMPLES WILL BE RETURNED TO CLIENT

MAP