Initial Study/Mitigated Negative Declaration

Ralston Afterbay Sediment Management Project

Prepared for:

Placer County Water Agency
Power System
Foresthill, California

Prepared by:

Jones & Stokes

July 2001

Draft
Initial Study/Mitigated Negative Declaration
Ralston Afterbay Sediment Management Project

Prepared for:

Placer County Water Agency
P.O. Box 667
Foresthill, CA 95631
Contact: Stephen J. Jones
530/367-2291

Prepared by:

Jones & Stokes
2600 V Street
Sacramento, CA 95818-1914
Contact: Doug Brewer
916/737-3000

July 2001

Contents

Tables

List of Figures

List of Acronyms

af	acre feet
Afterbay	Ralston Afterbay Reservoir
APCD	Placer County Air Pollution Control District
BMPs	best management practices
DFG	California Department of Fish and Game
DPR	California Department of Parks and Recreation
CESA	California Endangered Species Act
CNPS	California Native Plant Society
Cal/OSHA	California Occupational Safety and Health Administration
CVRWQCB	Central Valley Regional Water Quality Control Board
CWA	Clean Water Act
CEQA	California Environmental Quality Act
cfs	cubic feet per second
dBA	decibels
ESA	Endangered Species Act
EIR	environmental impact report
Farmland	Unique Farmland, or Farmland of Statewide Importance
FERC	Federal Energy Regulatory Commission
ft	feet
IS/MND	initial study and proposed mitigated negative declaration
MFAR	Middle Fork of the American River
MFARP	Middle Fork of the American River Project
MBTA	Migratory Bird Treaty Act
mph	miles per hour
mg/l	milligrams per liter

NHPA	National Historic Preservation Act
NMFAR	North Fork of the Middle Fork of the American River
North Fork	North Fork of the American River
NRHP	National Register of Historic Places
NTU	nephelometric turbidity units
PG&E	Pacific Gas and Electric Co.
PCWA	Placer County Water Agency
proposed project	Ralston Afterbay Sediment Management Project
PCWA	Placer County Water Agency
SPT	sediment pass through
STLC	soluble threshold limit concentration
SHPO	State Historic Preservation Officer
TNF	Tahoe National Forest
TTLC	total threshold limit concentration
TSS	total suspended solids
USGS	U.S. Geological Survey
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WDRs	Waste Discharge Requirements
Basin Plan	Water Quality Control Plan
yds	yards

Chapter 1

Introduction and Summary

Introduction

This document is an initial study and proposed mitigated negative declaration (IS/MND) that addresses the environmental impacts of the Ralston Afterbay Sediment Management Project (the proposed project) located approximately 5 miles east of Foresthill in Placer County, California. Based on agency input received at Placer County Water Agency (PCWA) board meetings, and to ensure full compliance with the California Environmental Quality Act (CEQA) on all environmental issues associated with the proposed project, it was determined that an IS/MND should be prepared.

This IS/MND is a public information document prepared to disclose the proposed project's environmental effects and inform decision makers, in compliance with CEQA and the State CEQA Guidelines.

The IS/MND describes the proposed project, the existing environmental setting, and the environmental impacts of the proposed project. Chapter 3, "Environmental Checklist," contains an IS checklist that identifies the anticipated environmental impacts by topic. The checklist refers to the project description for a discussion of measures incorporated into the design and construction specifications to ensure that potential impacts are mitigated to the extent practicable.

An MND is proposed for this project based on information contained in chapter 3, which shows that, with mitigation, the proposed project will not have a significant effect on the environment.

This draft IS/MND will be circulated for public and agency review as required by CEQA. Because state agencies will act as responsible or trustee agencies, PCWA will circulate the IS/MND to the State Clearinghouse for distribution and a 30-day review. Comments on the IS/MND will be evaluated and responses prepared to address any substantial evidence that the proposed project may have a significant impact on the environment. If the information and analysis presented in the IS/MND or in the comments received do not provide substantial evidence that the proposed project will have a significant effect on the environment, the MND will be approved by the PCWA board of directors.

Overview of the Proposed Project

The sediment management project consists of 2 independent components. PCWA is serving as the lead agency under CEQA. In the first component, PCWA proposes to increase sediment storage capacity to the upstream end of Ralston Afterbay Reservoir (Afterbay). Approximately 75,000 cubic yards (yds) of sediment will be dredged from the reservoir and stored downstream of the dam on a 7-acre portion of Indian Bar.

The second component of the project consists of reoperating Ralston Dam during high-flow events and allowing finer sediment to pass through the dam's low-level outlet gate. The so-called *sediment-pass-through* (SPT) operations would be conducted whenever river flows exceed approximately 3,500 cubic feet per second (cfs).

Purpose and Objectives of the Proposed Project

The primary purpose of the sediment management project is to create sediment storage capacity within Afterbay, maintain operational flexibility of Ralston Dam and Oxbow Powerhouse, and delay the complete sedimentation of Afterbay. A secondary objective is to restore natural migration of coarse and fine sediment in the Middle Fork of the American River (MFAR) downstream of Ralston Dam. The sediment poses a threat to the reliability of power generation at Ralston Powerhouse. The sediment will be permanently placed downstream of the dam on a 7-acre portion of Indian Bar. The spoil pile will be configured to provide a sediment source for the MFAR.

Project Location

The proposed project is located on the border of Placer and El Dorado Counties, in both the Tahoe and El Dorado National Forests. It is about 5 miles east of Foresthill, California, or 11 miles by road.

Background

Afterbay was created when Afterbay Dam was completed in 1966, as part of the Middle Fork of the American River Project (MFARP). After the voters of Placer County approved the issuance of bonds to construct the project, and after Pacific Gas and Electric Co. (PG&E) secured the financing, PCWA constructed the project between 1963 and 1966. The MFARP consists of 2 major water storage reservoirs, French Meadows and Hell Hole, 4 small to medium diversion reservoirs, and 1 regulating reservoir (Afterbay) (figure 1). In addition to the dams forming these reservoirs, the project consists of 5 powerhouses connected to the reservoirs by a system of intakes, tunnels, penstocks, and related facilities.

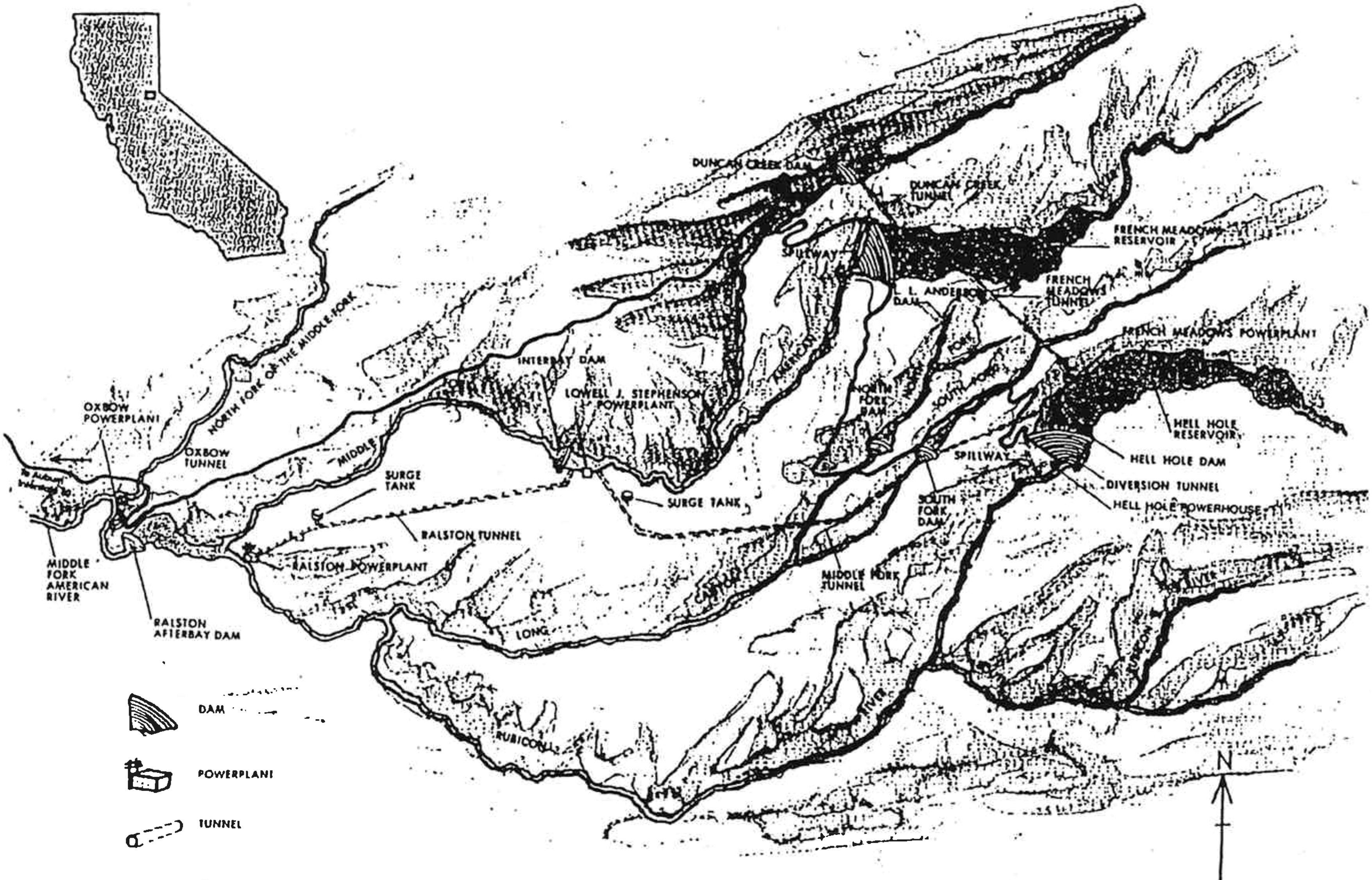
Afterbay serves 3 primary purposes. First, it is used as a regulating reservoir to control the rate of change of stage downstream from Afterbay to protect public safety and fisheries. Second, it is used as a buffer to permit the 2 largest powerhouses of the MFARP, Middle Fork and Ralston Powerhouses, which together constitute 90% of the total generation capacity of the project, to be quickly put on line and ramped up to full generation, to respond to system electrical needs. Third, Afterbay is also used to impound water to generate power at Oxbow Powerhouse. The Rubicon River and the MFAR flow into Afterbay. Flows also enter the reservoir at Ralston Powerhouse on the Rubicon River fork. These flows originate from Interbay diversion reservoir 10 miles upstream from Afterbay on the MFAR.

The accumulation of sediment in Afterbay has been studied by Bechtel Engineering Corporation and EA Engineering, Science, and Technology. These studies have documented the continuing need for sediment removal operations, such as the proposed project. Bechtel's study, *Sediment Study of Ralston Afterbay Reservoir—Final Report* dated May 1997, is available for review at PCWA's Foresthill office. One method of dealing with the reservoir sedimentation issue is called SPT, which is also discussed in the Bechtel report. Simply, SPT is operating the reservoir in such a way that erosion- or landslide-caused sediments transported by the rivers can be passed, to some degree, through the reservoir to the river downstream, rather than being trapped in the reservoir. This would be done, in Afterbay's case, by opening all spillgates, and, when storm flows exceed a particular flow, probably around 3,500 cfs, open the low-level outlet valve fully. The low-level outlet valve would be closed at the point when the storm flows begin to subside.

PCWA has received input from resource and regulatory agencies that placing sediment containing gravel and cobbles in the floodplain in a shape designed to permit the sediments to be recruited to the river downstream when the dam is spilling, may improve the habitat for downstream aquatic species. During storms, including when SPT is implemented, mostly silts and sands are passed by the dam, therefore the need to recruit coarser sands and gravels. Mussetter Engineering of Fort Collins, Colorado, under contract with Jones and Stokes, designed the sediment pile at Indian Bar, which has been designed to erode at a certain rate, thus recruiting the gravels (Mussetter Engineering 2001). In-depth analysis of the river geomorphology was conducted to develop the rate of recruitment in order to enhance the downstream aquatic environment, as further described below. The MEI report is available for review at PCWA's Foresthill office.

On November 19, 1999, PCWA received the results of a study of incising and scour of the MFAR at the site of a U.S. Geological Survey (USGS) gaging station 1.6 miles downstream from Afterbay dam. Streamflow current-meter measurements made from 1980 through 1999 were analyzed to determine the extent of scour. The Consulting Engineer's study concluded that significant scour has occurred in this river segment, an estimated 500 cubic feet per lineal foot of channel. The force of the water has scoured out the available material over the years since the dam was built. The material that has been transported downstream, but not replaced, is the smaller material that is important for suitable habitat for aquatic organisms and fish. PCWA has an opportunity during the upcoming sediment removal project of making similar-sized sediments from the upper portion of the reservoir available for recruitment to the river downstream of the dam, rather than placing these sediments in a dry fill at a location above the reservoir.

The value of making these sediments available for recruitment downstream, when the dam is spilling, is pointed out in the following quotation: "Gravel and cobble-sized sediment has tremendous ecological importance, as habitat for benthic macro invertebrates, and as spawning habitat for salmon and trout" (Kondolf and Wolman 1993). While anadromous fish are not in the rivers above Folsom Reservoir, there are trout and other species of fish that require suitable habitat for spawning. In his report to PCWA, dated August 15, 1996, Dr. Kondolf states, "Below many dams, gravels have been

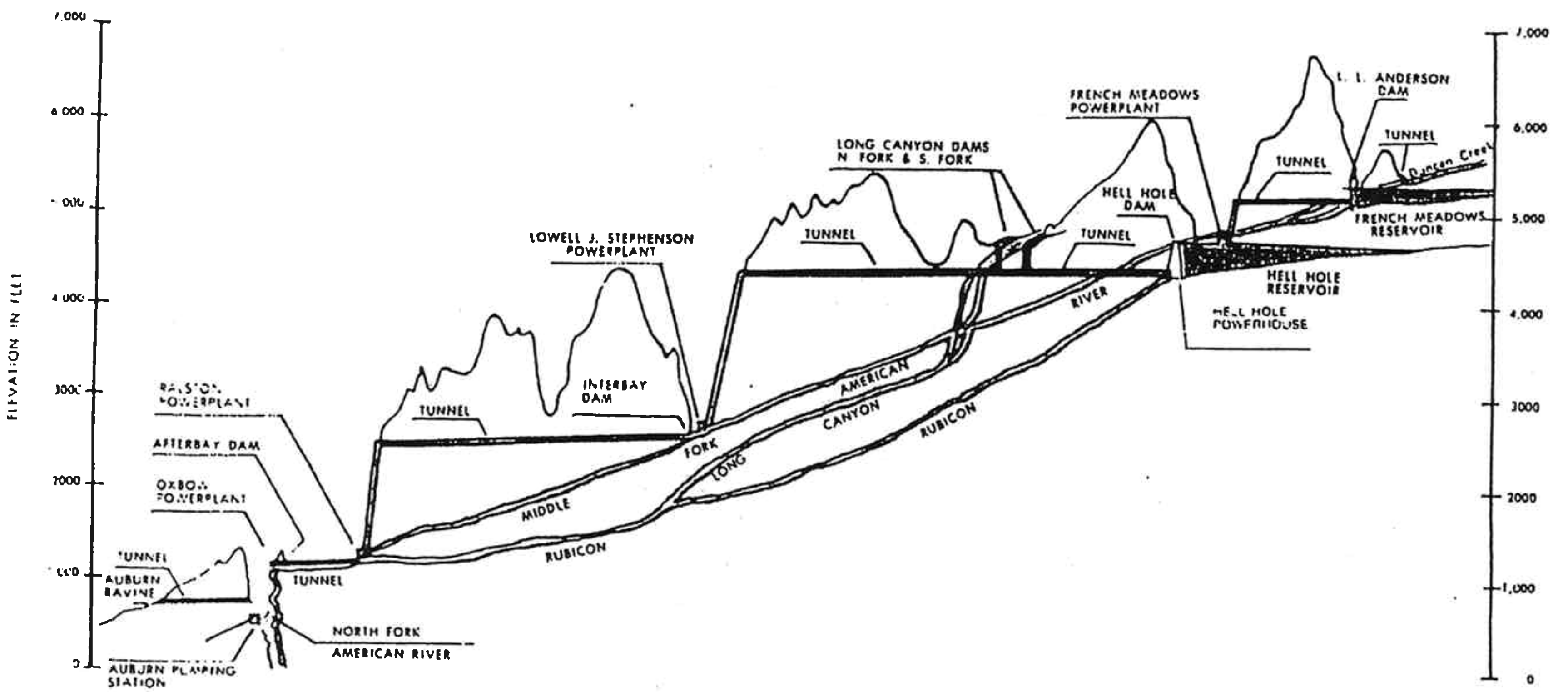


Source: PCWA

00297.00 (5/01)

Jones & Stokes

Figure 1
American River Project
Placer County Water Agency Power System



Source: PCWA

00297.00 (5/01)

Jones & Stokes

Figure 1, continued
Profile of American River Project
Placer County Water Agency Power System

transported downstream without replacement from upstream, resulting in loss of important aquatic habitat" (Parfitt and Buer 1980). Dr. Kondolf goes on to state, "In at least 16 rivers and streams in California, gravels have been artificially added downstream of reservoirs in an attempt to compensate for the loss of gravel and its effects on salmonid spawning habitat (Kondolf and Matthews 1993). These artificial gravel augmentation programs can be expensive, with more than $22 million committed to gravel replenishment on the upper Sacramento River by the year 2000, and the improvement in gravel supply is often only temporary, with the added gravels washed out in the next high flows."

PCWA contracted on July 20, 2000, with Jones & Stokes, a multidisciplinary environmental services firm headquartered in Sacramento, California, to provide the environmental services required to obtain approval of SPT and the placement of suitable sediments below the dam for recruitment to the river. Jones & Stokes subcontracted to Mussetter Engineering, in Fort Collins, Colorado, to perform the analysis and modeling necessary to design the shape of the placement of the sediment below the dam.

Format of the Initial Study

In addition to this introductory chapter, this IS/MND contains the following chapters:

- **Chapter 2, "Project Description,"** contains a detailed description of the location, objectives, characteristics, and construction specifications of the proposed project.
- **Chapter 3, "Environmental Checklist,"** contains an evaluation of the proposed project using the IS checklist format.
- **Chapter 4, "References Cited,"** lists the documents and individuals consulted during preparation of this document.
- **Chapter 5, "List of Preparers,"** identifies individuals who contributed to the preparation of this document.

Terminology Used in This Document

For each impact identified in this IS/MND, a statement of the level of significance of the impact is provided. Impacts are categorized in the following categories:

- A **potentially significant impact** could cause a substantial adverse change in the environment.
- A **less-than-significant-with-mitigation-incorporated impact** could cause a substantial adverse change in the environment, but mitigation has been adopted as part of the project description to reduce this impact to less than significant.
- A **less-than-significant impact** would cause no substantial adverse change in the environment and requires no mitigation measures.
- **No impact** indicates that the proposed project would not have any potential to cause an impact.

Summary

The conclusion of this IS/MND is that, with mitigation measures, no substantial evidence indicates that any aspect of this proposed project, either individually or cumulatively, may cause a significant impact on the environment. Project design features or contract specifications that would maintain impacts at less-than-significant levels are indicated in chapter 2, "Project Description."

Chapter 2
Project Description

History of Past Sediment Removal from the Reservoir

Most of the sediment in Afterbay was deposited during severe flood conditions, particularly during the record storms of 1986 and 1997. In 1997, flows through the Afterbay Dam spillgates reached more than 100,000 cubic feet per second (cfs). All sediment removal efforts to date have been in the upper half of the reservoir and have consisted of removing primarily coarser sediments consisting mostly of gravel, cobbles, and boulders, and including some sand and silt. Planned sediment removal projects have been done in the fall because river flows are low, and summer peak power demands have usually started to decline. Work in the reservoir must be concurrent with the annual powerhouse outages. Emergency projects were done in the winters of 1969, 1986, and 1997 because large inflows of sediment were deposited in the tailrace of Ralston Powerhouse, and these large depositions prevented operation of the powerhouse.

The first sediment removal job occurred in 1969 and was confined to the area of the Ralston Powerhouse tailrace, from which sediments that had been brought in by a large storm were removed. The next sediment removal job occurred in October 1981, at which time approximately 10,000 yards of sediment were removed from the Ralston Powerhouse tailrace, continuing downstream for 800 feet, and placed on a large bench across the river from the powerhouse. In October 1984, approximately 13,000 yards of sediment were removed from the Rubicon River, beginning at the Ralston Powerhouse tailrace and continuing downstream about 1,500 feet. In October 1985, approximately 12,000 yards of sediment were removed from the river in the general area including bars B and C, as shown on figure 2.

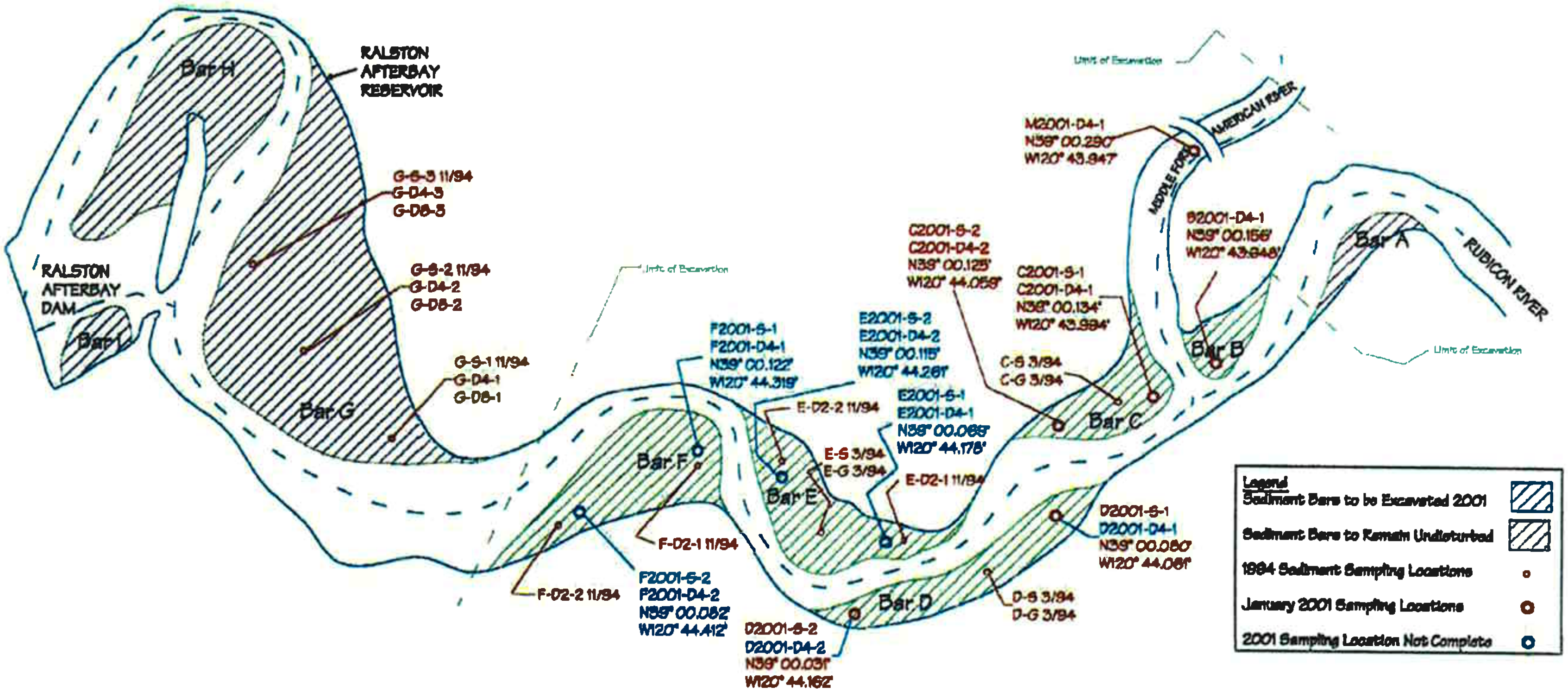
After the flood of February 1986, a large crane with a dragline was brought in to dredge the river for 2 months beginning at the Ralston Powerhouse tailrace and continuing downstream 1,500 feet nearly to the first bend in the river. An extensive sediment removal operation was also done in the fall of 1986, beginning approximately 300 feet upstream from the Ralston Powerhouse tailrace and continuing downstream including bars A, B, C, and D, as shown on figure 2. In all, approximately 125,000 cubic yards of sediment were removed from the reservoir in 1986. In the fall of 1989, about 35,000 cubic yards of sediment were removed from bars D and E.

During September and October 1994, approximately 77,000 cubic yards of sediment were removed from the upper area of the reservoir and placed as an engineered fill at a site (Ralston Ridge) on El Dorado National Forest land 3.2 miles from the reservoir. The sediments were placed in accordance with an engineered fill plan designed by Ebasco. Immediately after the record 1997 New Year's flood, which resulted in 100-year floodflows on the Rubicon River, approximately 65,000 cubic yards of sediment were removed from the reservoir beginning at the tailrace of Ralston Powerhouse and continuing down through bars A and B, and in the upper MFAR channel. This sediment was hauled to Sheridan and Foresthill, California, and put to commercial use.

The Ebasco fill plan developed and approved for the 1994 sediment removal project, was designed as a 2-year project. However, because of funding limitations, the 1995 portion of the project was not constructed. The 2001 sediment removal project will complete the balance of the fill, if all the sediment excavated is hauled to this site. The engineered fill consists of a compacted berm constructed with suitable granular sediments. Once the berm is complete, the basin created by this berm will be filled with unclassified sediments, including sands and silts. PCWA holds a current Special Use Permit with the El Dorado National Forest for the Ralston Ridge site.

Purpose and Objectives of the Proposed Project

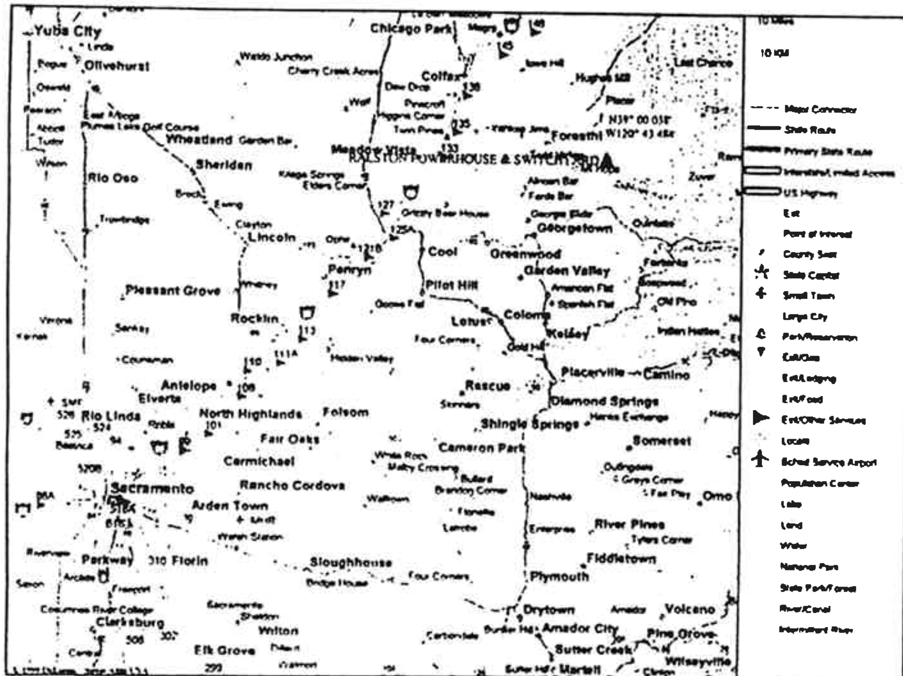
PCWA proposes to remove approximately 75,000 to 100,000 cubic yds of accumulated storm sediment and debris from Afterbay during September and October 2002 and place this sediment in 2 sediment storage locations, at Ralston Ridge and at Indian Bar. Afterbay is located on the MFAR and Rubicon River in Placer and El Dorado Counties (figure 3). All project operations will be conducted on National Forest lands. PCWA also plans to modify wintertime operations at the Afterbay to implement a process called *sediment pass through* (SPT), which is intended to reduce the impacts of

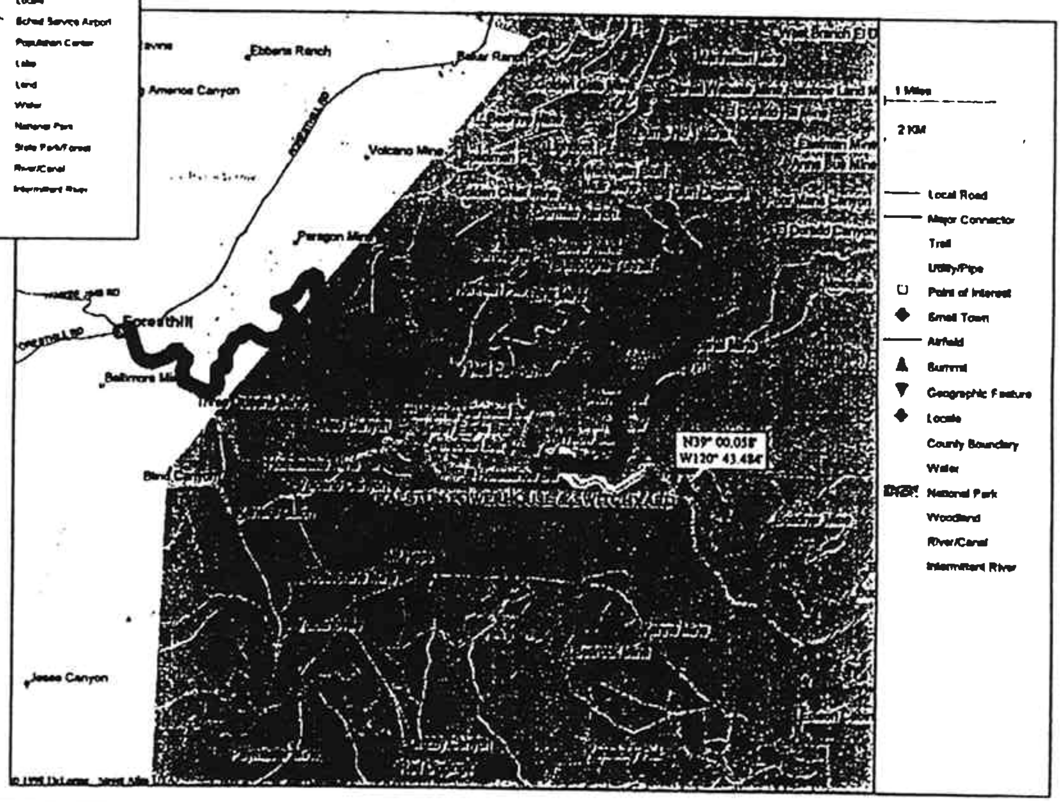


Source: PCWA

Jones & Stokes

Figure 2
Ralston Afterbay Sediment Removal Project–2001: Past and Proposed Sediment Sampling Locations





Source: PCWA

00297.00 (5/01)

Jones & Stokes

Figure 3
Vicinity Map

long-term sedimentation of the reservoir. PCWA is pursuing approval of the SPT mode of reservoir operation during periods of high river flows.

The water storage capacity of Afterbay is declining, as erosion and landslide activity in the reservoir's watershed continue to deposit silt, debris, sands and gravels, cobbles, and boulders, primarily during major storm events. Coarser sediments generally deposit near the upstream end of the reservoir, and the finer silts generally deposit in the wider, downstream end of the reservoir. Several sediment removal projects have been done since Afterbay's completion in 1966, primarily following major storm events. The earliest sediment removal project was in 1969, and the most recent was done under emergency conditions in winter 1997.

Two locations for placement of the sediment are proposed. The Ralston Ridge site, about 3 miles from Afterbay via a steep portion of the Blacksmith Flat Road, is a spoil storage site on U.S. Forest Service land, for which a special use permit was issued by the Forest Service to PCWA. Approximately 77,000 cubic yds of sediment were placed at this site in the fall of 1994 as an engineered fill. The site has room for approximately another 75,000 cubic yds. No approvals are needed for this placement location.

The proposed Indian Bar site is located in and along the river channel immediately downstream of Afterbay Dam. Some or all of the sediment removed from the reservoir may be placed at the Indian Bar site if the required permits and regulatory approvals can be obtained. It is anticipated that primarily coarse excavated sediments will be placed at Indian Bar, which has a planned storage capacity of 75,000 cubic yds. PCWA intends to use the site as a long-term solution to managing Afterbay sediments. The purpose of placing the coarse sediment at Indian Bar is to provide a source for river gravels to be reintroduced into the river during high river flow conditions, because Afterbay Dam acts as a barrier to the natural flow of gravels.

The Ralston Ridge site is not the preferred disposal site because of the high cost of transporting the sediment. Removing the sediment from the river also eliminates any potential secondary benefits associated with improving aquatic habitat through sediment entrainment downstream of Ralston Dam.

The primary purposes of the project are to

- create storage capacity in the upper half of Afterbay to accommodate future sediment influx during storms, thus promoting continued reliable power generation at Ralston Powerhouse;
- restore operating capacity to Afterbay, to provide for more efficient operation of the power generating system and better regulation of downstream river flows;
- restore to some degree the natural migration of coarse and fine sediments in the MFAR downstream of Afterbay Dam, thus improving the health of the aquatic environment and reducing continued buildup of sediment in Afterbay. Afterbay Dam acts as a barrier to coarse and fine sediment transport;
- limit sediment and debris intrusion into Oxbow Powerhouse intake and Ralston Powerhouse tailrace;
- delay the complete sedimentation of Afterbay and the resulting negative environmental effects; and
- increase clearance under the Blacksmith Flat Road bridge at the MFAR to protect the bridge during flood conditions.

Project Construction

The project construction activities will consist of 3 primary operations: excavation, hauling, and placement.

Excavation

Excavation of sediments in Afterbay will be performed in an unwatered condition, with the reservoir water elevation drawn down about 30 feet (ft) to the base of the spillgates at elevation 1149. This will leave several large bar areas exposed, with the river flow following a low water channel between the sediment bars until it enters the reservoir pool at 1149. Excavation will be performed on these bar areas, which will be connected to the Blacksmith Flat haul road via a minimum of 2 river crossings constructed of large steel culverts backfilled with granular river sediments. Diversion channeling will also be necessary to keep the water table low. A large excavator with about a 6-cubic-yard bucket (Komatsu 750 or equal), supported by a large loader with about a 5-cubic-yard bucket (Cat 980 or equal), will remove the sediment and load it into the haul trucks. A medium-sized excavator (JD690 or equal) will be used to install culvert crossings and dig diversion channels. A small bulldozer may be used for access road preparation. This method of excavation was used successfully in the 1994 sediment removal job at Afterbay and had the concurrence of the resource agencies. Preliminary plans for excavation are shown in figures 4 and 5. Excavation of bars B through E and the MFAR channel will be priority. It is unlikely that a substantial amount of sediment will be removed from bar F, due to the quantity of material in the other bars.

Hauling to the Ralston Ridge Site

If the Ralston Ridge site is used, the hauling will be conducted using highway trucks such as belly dumps and end dumps, off-highway trucks such as the articulated Volvo A-35, or a combination of the 2 types. Portions of the Blacksmith Flat haul road are steep and narrow, so traffic control measures will be implemented. It is anticipated that about 12 trucks per shift will be required to maintain an efficient operation. There are no inhabited structures near, or in view of, the haul road.

Hauling to the Indian Bar Site

The haul road to the Indian Bar site is less severe, and a portion can be closed to public access. The hauling will be done by trucks similar to those described above. The haul distance is less than half the distance to the Ralston Ridge site, the road is not as steep, and the total vertical climb is only about 280 ft versus more than 1200 ft to the Ralston Ridge site. Therefore, the hauling costs will be much less per cubic yard, not as many trucks will be required, and only a fraction of the fuel will be consumed compared to the amount of fuel required to haul the same yardage to the Ralston Ridge site. Traffic control measures will be implemented to ensure safety of the public and employees. It is anticipated that about 8 trucks per shift will be required to maintain an efficient operation. There are no inhabited structures near, or in view of, the haul road.

Ralston Ridge Site Sediment Placement

If the Ralston Ridge site is used, the sediments will be placed and compacted at the existing, partially completed engineered fill. The fill was engineered in 1992 by Ebasco, and is about half full from a 1994 sediment removal operation. The remaining capacity of the site is about 75,000 cubic yds. The fill will be placed according to the 1992 Ebasco specifications and drawings, using a bulldozer (D7 or equal), 2 vibratory compactors (IR SD-100 or equal), and a medium-sized excavator (JD690 or equal). The site will be stabilized and revegetated following construction. Complete plans and specifications for the engineered fill are shown in Ebasco's *Engineered Fill Plan for Disposal of Sediments from the Ralston Afterbay Reservoir*, dated August 17, 1992. Stability analysis of the fill was also performed by Ebasco.

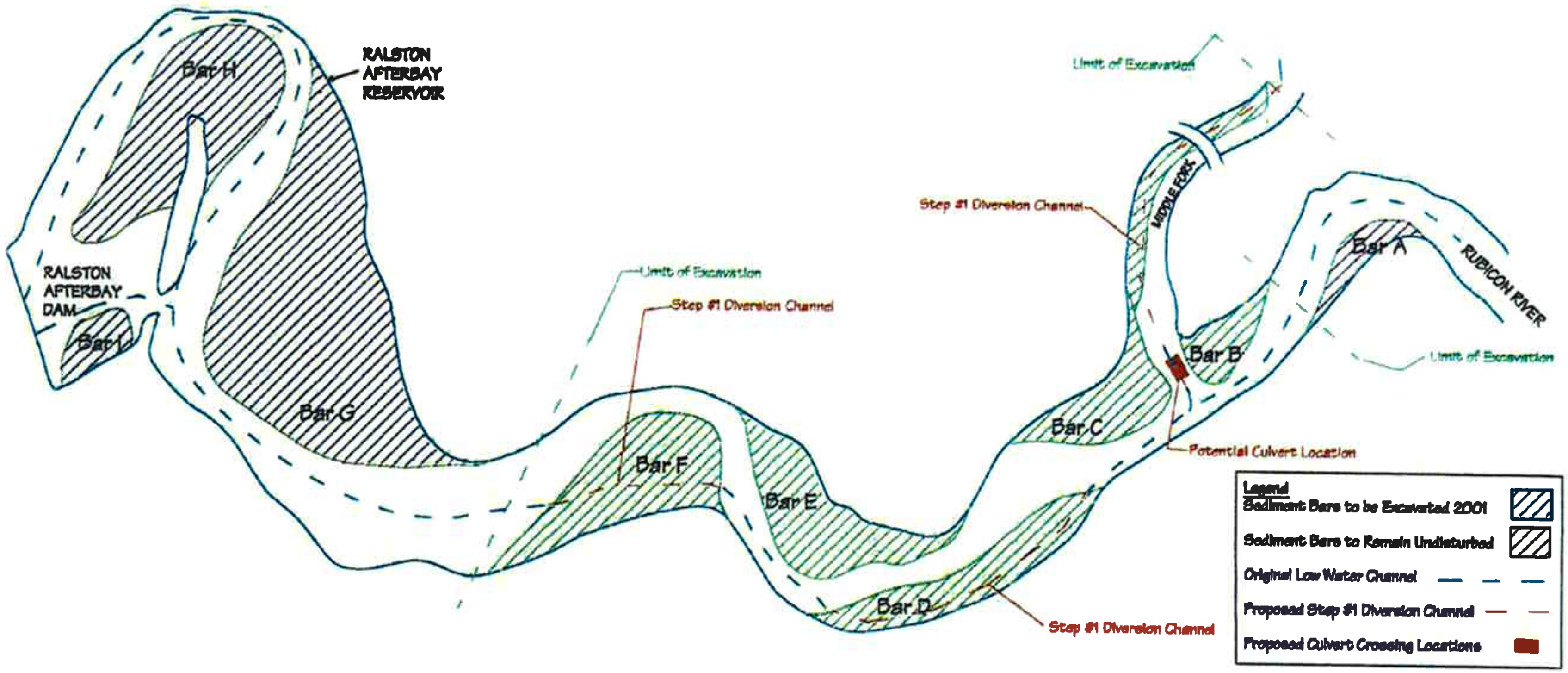
Indian Bar Site Sediment Placement

Figure 6 shows the site location downstream of the dam and estimated boundaries for sediment placement. The yellow line is the project's maximum boundary. The total area begins about 200 feet downstream of Afterbay dam, is about 380 feet wide at its widest point and has a total length of about 1600 feet. The total area is within PCWA's Federal Energy Regulatory Commission (FERC) Project boundaries. The green, red, and blue lines in figure 6 show the new area of the site that would erode with single flow events of 3,500, 5,000 and 8,000 cfs. Figure 7 shows a 3-dimensional rendering of the sediment disposal site under existing conditions, 3,500, 5,000, 8,000, and 105,000 cfs. The highest flow (105,000 cfs) represent the 100-year flow event for the MFAR. The results of the 2-D modeling of Indian Bar site are explained more fully in the Hydrology section of the IS/MND. The modeling report can be reviewed at the PCWA offices in Foresthill.

Because the purpose of the proposed Indian Bar sediment pile is to allow the entrainment of sediments in high-flow events, and because of the coarse nature of the sediments to be placed there, sediment will not be compacted. The pile will be created as a series of lifts to maintain a well-sorted distribution of particle sizes and prevent compacted conditions. The sediment pile will be placed to the designed lines and grades, subject to approval by the various resource agencies. It is planned that a bulldozer similar in size to a Caterpillar D8 will be used to do any required foundation preparation and to spread, track-walk, and grade the sediment being hauled from the reservoir. Final sloping and grading will be done by a medium-sized excavator or a small bulldozer.

Project Schedule

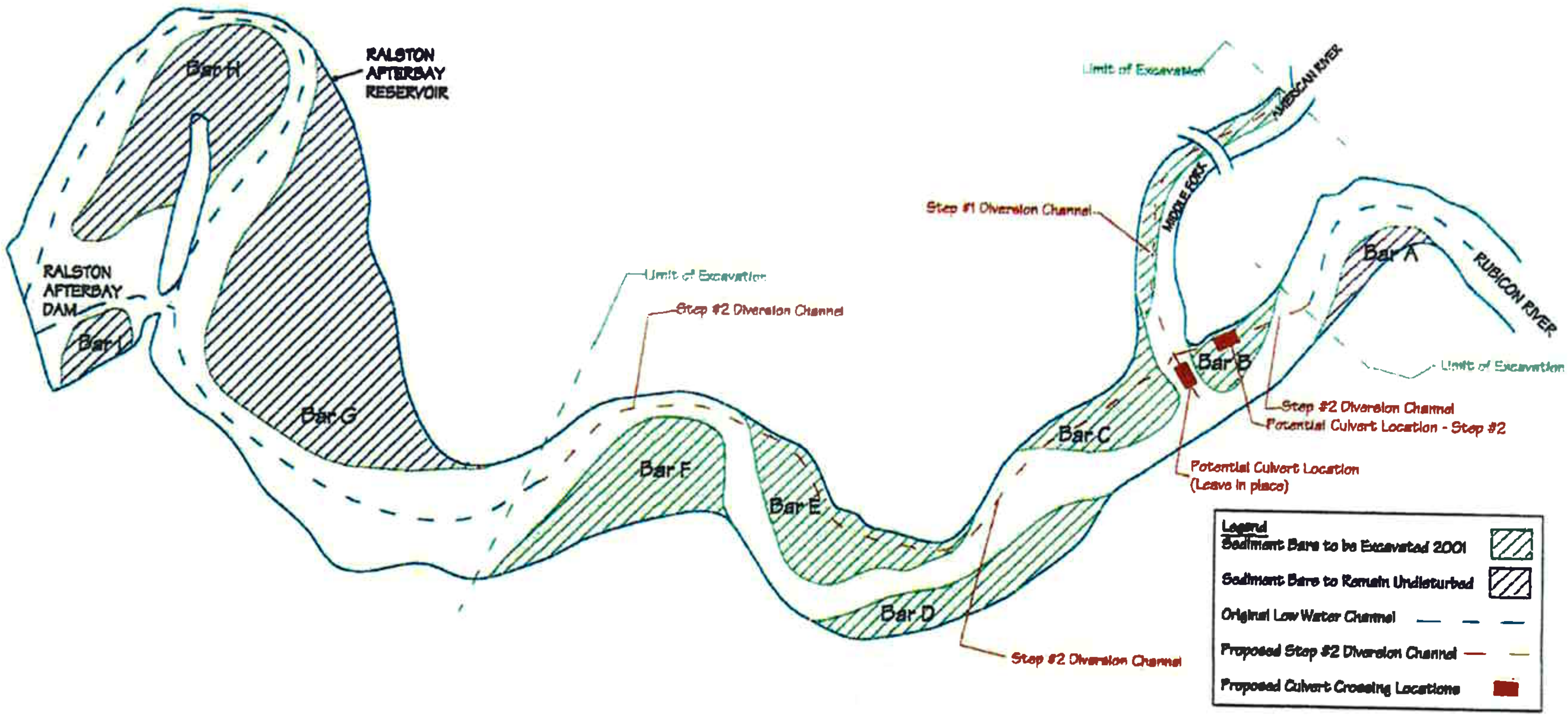
Project excavation activities are scheduled to begin about August 2002. Work in the reservoir should begin about September 15 and should be complete before October 31, 2002. Final demobilization, cleanup, and erosion control should be complete by mid-November 2002. Work during the 3–4 week reservoir outage will be performed up to 7 days per week, 2 shifts per day. SPT will be implemented as storm and river flow conditions allow.



Source: PCWA

Jones & Stokes

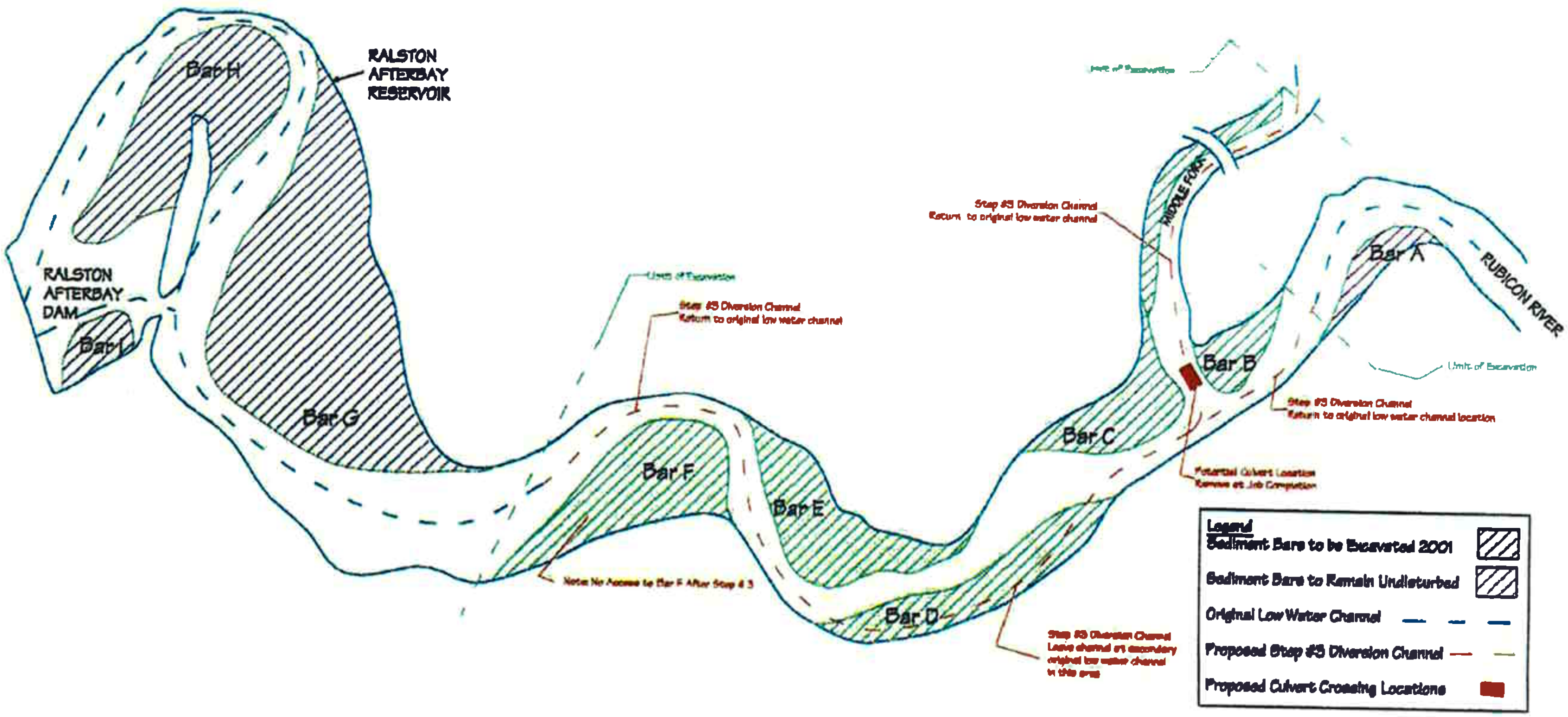
Figure 4
Ralston Afterbay Sediment Removal Project–2001:
Preliminary Plan for Step #1–Initial Access and Diversion Channels



Source: PCWA

Jones & Stokes

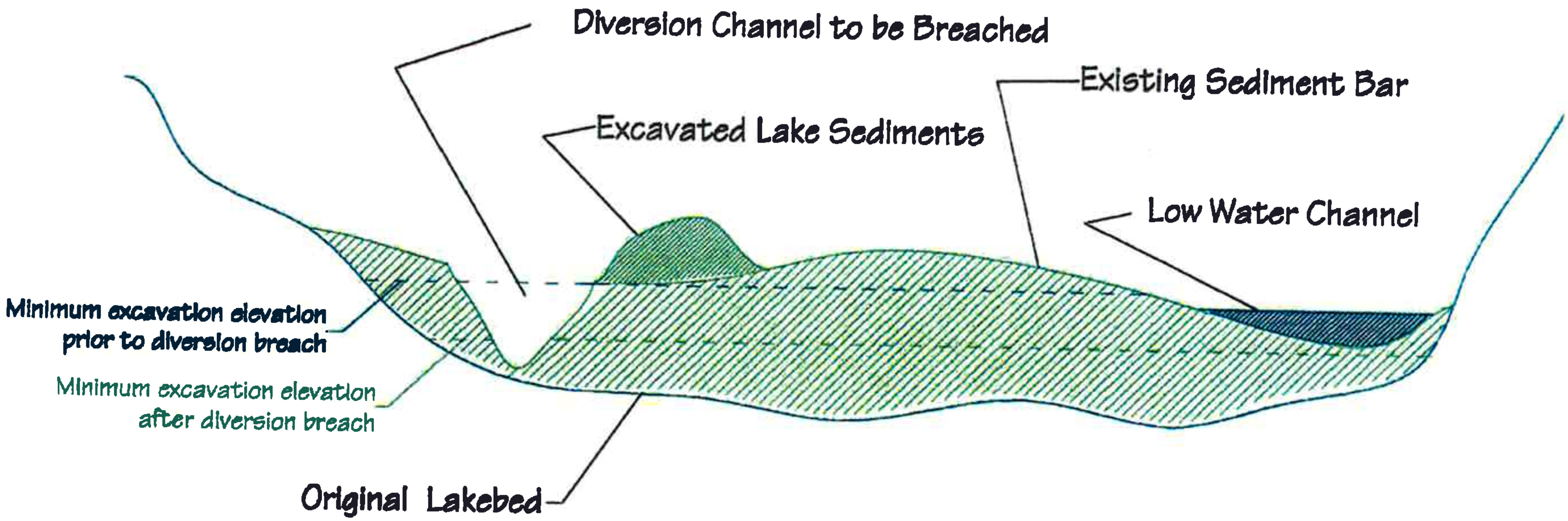
Figure 4, continued
Ralston Afterbay Sediment Removal Project–2001:
Preliminary Plan for Step #2–Move Diversion Channel North



Source: PCWA

Jones & Stokes

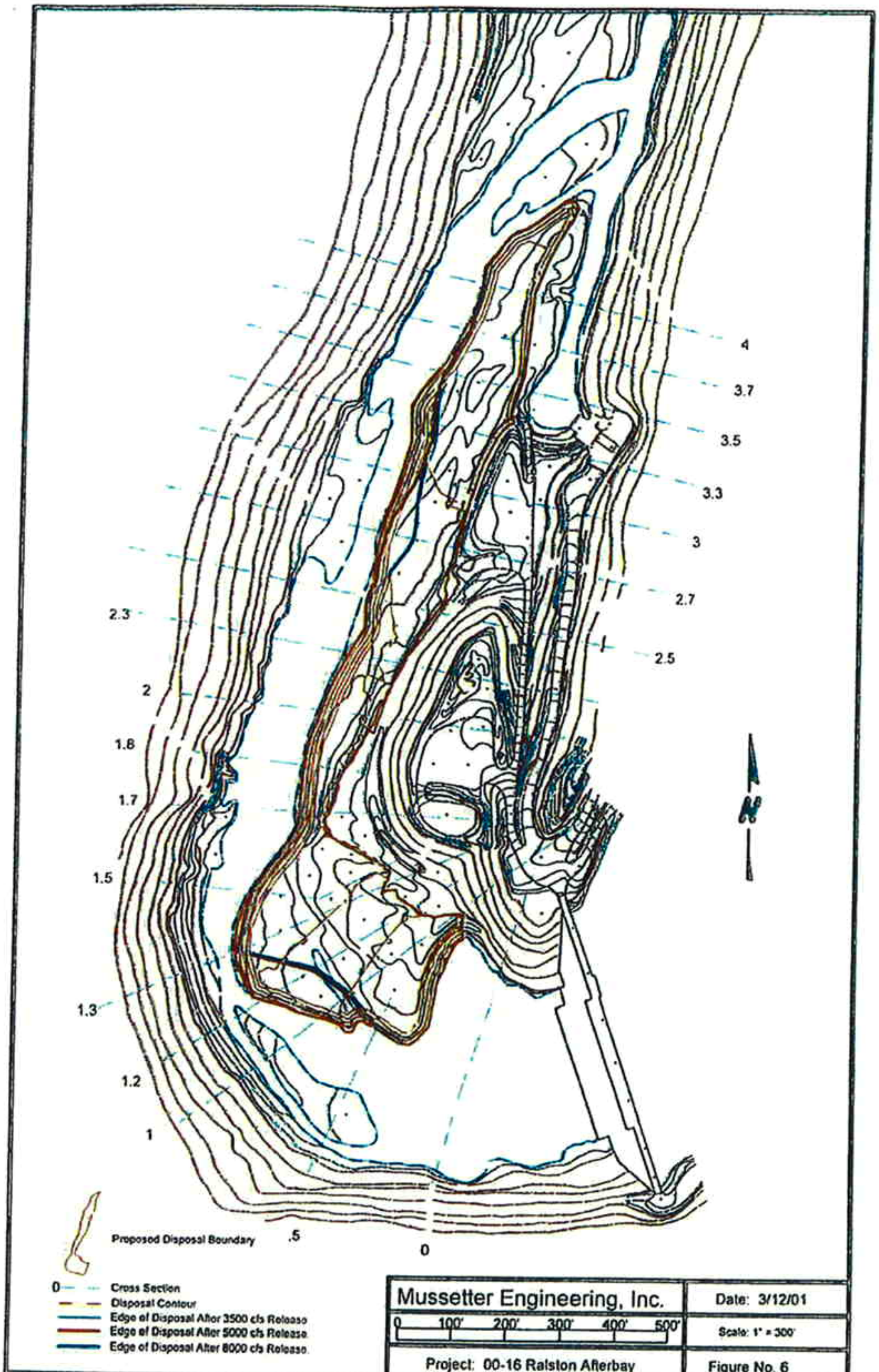
Figure 4, continued
Ralston Afterbay Sediment Removal Project–2001:
Preliminary Plan for Step #3–Final Relocation of Channel



Source: PCWA

Jones & Stokes

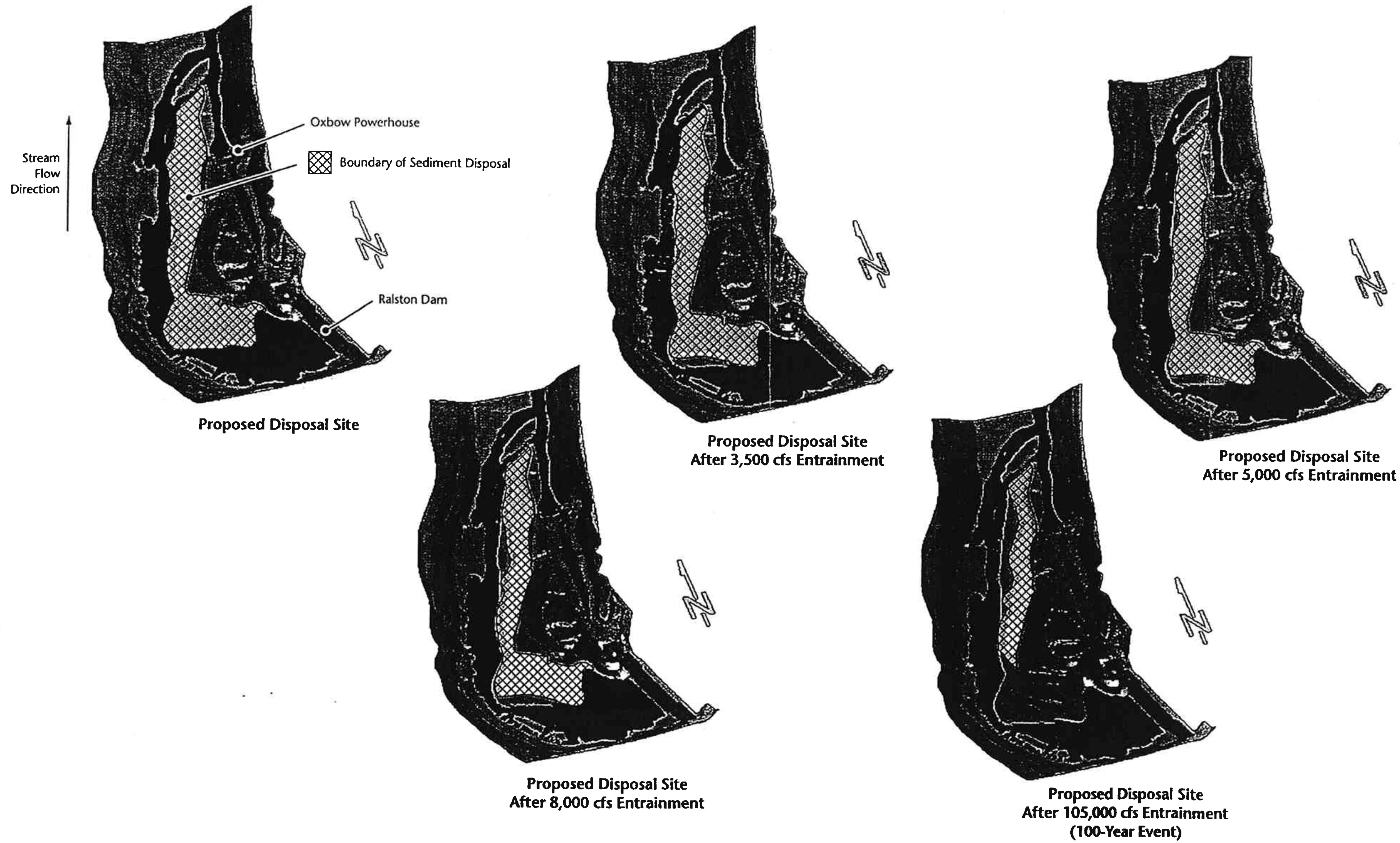
Figure 5
Ralston Afterbay Sediment Removal Project–2001: Typical Reservoir Cross Section



Source: Mussetter Engineering, Inc. 2001

Jones & Stokes

Figure 6
Map of Indian Bar Site Showing the Outline and Elevations of the Proposed Disposal Site and Boundaries of Entrained Material at 3,000, 5,000 and 8,000 cfs.

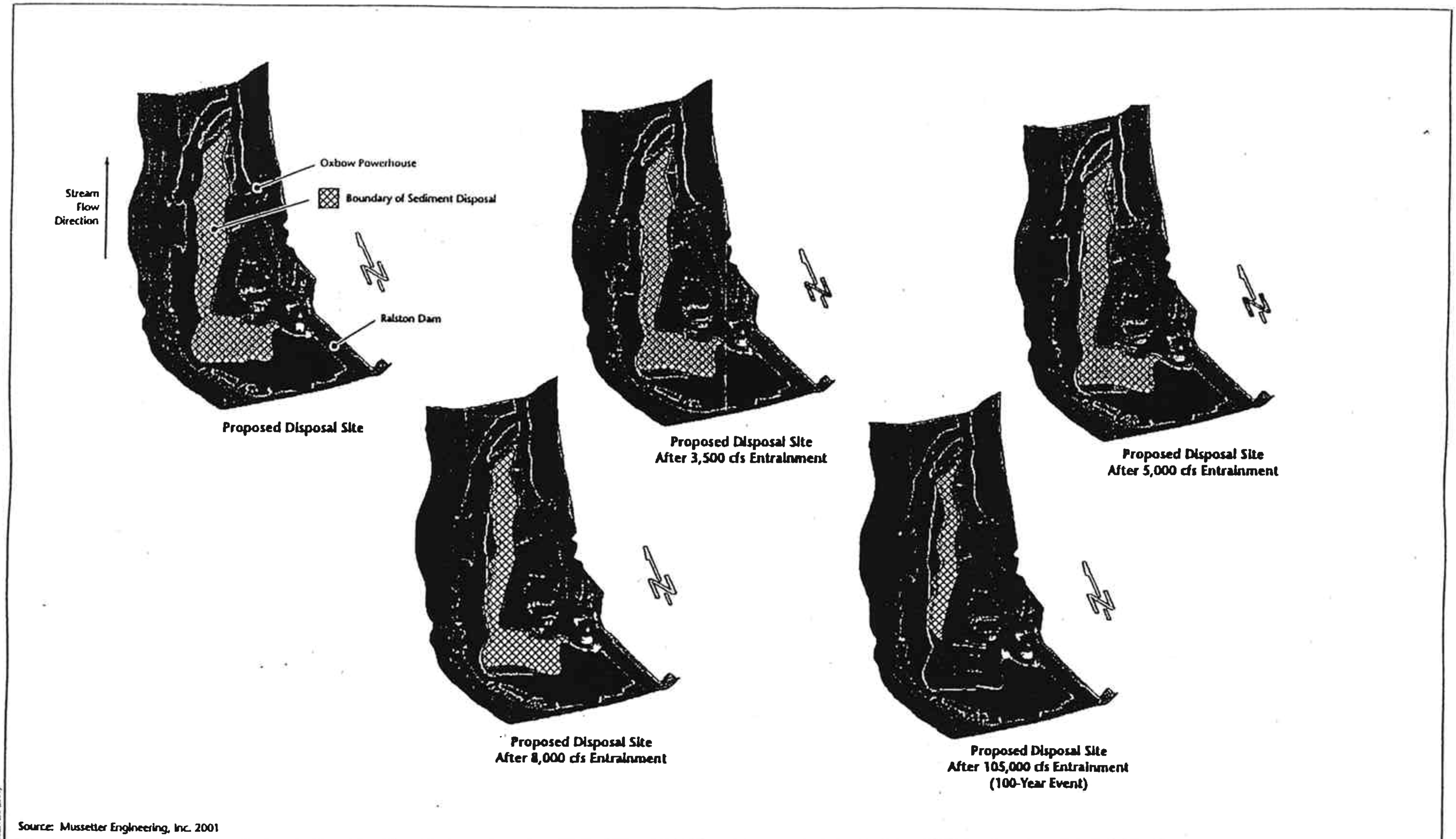


Source: Mussetter Engineering, Inc. 2001

00297.00 (5/01)

Jones & Stokes

Figure 7
Three-Dimensional Rendering of Indian Bar Disposal Site and Boundaries of Sediment Pile



Jones & Stokes

Figure 7
Three-Dimensional Rendering of Indian Bar Disposal Site and Boundaries of Sediment Pile

Testing of Sediments

Sediment samples have been collected twice in the past from Afterbay, in 1994 and 1995. The purpose of the sampling was to test for concentrations of metals that would be injurious to people or aquatic life. The tests were conducted following California Waste Extraction Test (WET) procedures and showed no unacceptable heavy metals concentrations.

Because additional sediments have been deposited in Afterbay since the 1994 sampling, additional sampling was done in January 2001 using the approved 1994 sampling plan as a guideline. Eight samples from 6 locations, as shown in figure 2, were analyzed for total threshold limit concentration (TTLC) for the CAM 17 metals, using EPA 6010, 7471, 7760, 7740, and 7841. Three of these samples were analyzed for Acid Generating Potential, EPA 670. Based on the favorable TTLC results, soluble threshold limit concentration (STLC) testing was not performed on the samples. The sample results showed heavy metal concentrations were well below the California Regulatory Limits. Because of a limited reservoir outage window and high reservoir levels resulting from the severe energy demands of the January 2001 California energy shortage, only 8 of the 14 samples planned were taken, but should provide a reasonably representative sampling. Results of the 1994 and 2001 sampling are shown in figure 2. Locations of the sampling also are shown in figure 2. It is anticipated that additional sediment samples will be collected prior to conducting project dredging operations. Testing will be conducted in accordance with requirements of the Central Valley Regional Water Quality Control Board (RWQCB) using the WET procedures.

Quantities and Gradation of Sediment in the Reservoir

Sediment sampling for material gradation in Afterbay was done in 1988 by Alpha Geotechnical consultants. Though this is before the January 1997 storm, it should still provide an indication of existing sediments. Gradations in the bars to be excavated in 2001 are as follows: bar B—well-graded gravel up to 2 feet across; bar C—poorly graded sand with silt, and poorly graded gravel up to 5 inches across; bar D—well-graded gravel with sand, and sandy gravel, up to 10 inches across, some 3-foot boulders; bar E—well-graded sandy gravel, and gravelly sand, with cobbles up to 1foot across; bar F—well graded gravel at the upstream end of the bar, and poorly graded sand with silt and silty sand downstream, with organics. Material gradation in the upper Middle Fork arm of the reservoir is expected to be similar to the sediment in bars B and C. The sediment descriptions are based on the Unified Soil Classification System, ASTM D2487-85. If necessary, additional samples would be collected to determine sediment gradation prior to conducting the dredging operations.

Monitoring Plan for SPT and Gravel Recruitment

A monitoring plan for SPT and the gravel recruitment at the Indian Bar site, in and along the river immediately downstream of Afterbay Dam as shown in appendix A, was developed by Jones & Stokes. The monitoring program is an integral component of the proposed project and will be implemented by PCWA. The monitoring program is designed to evaluate the proposed sediment management activities and ensure that adverse water-quality and aquatic-habitat effects do not occur downstream of Afterbay in the MFAR. Jones & Stokes biologists collected and reviewed available data and information on water quality, fish, benthic macroinvertebrate populations, and aquatic habitat in the reservoir and river areas. These data and information were used to develop a list of key evaluation parameters.

The monitoring plan includes aquatic habitat and BMI sampling at representative transects upstream of Afterbay (control reaches) and transects below the Indian Bar site (test reaches). The location of transects downstream of the Indian Bar site are based in part on the modeling and sediment transport analyses performed by Mussetter Engineering. Transects will be placed in representative habitats determined to be sensitive to deposition of sediment. Water quality monitoring stations were selected to provide data from upstream control areas and downstream areas that might be affected by the project.

Aquatic habitat parameters that will be monitored at each transect include channel cross sections, substrate size composition, and embeddedness. Macroinvertebrates will be evaluated by abundance and species distribution. Water quality sampling will include automated turbidity probe measurements and manual grab samples for total suspended solids (TSS).

Plans for Protecting the Environment during Project Construction

The preventive measures described below would be incorporated into the construction specifications of the proposed project to address project-related impacts on water quality, air quality, biological resources, and cultural resources.

Erosion Control during and following Construction

Erosion control measures at the Ralston Ridge storage site will be used to help prevent erosion and reduce sedimentation during the establishment of a vegetative cover both during and following the construction period. Mechanical erosion control measures include mulching, hay bale checks, silt fencing, velocity dissipaters, culverts, excelsior blankets, etc. Erosion control of the engineered fill will be in accordance with the Ebasco specification and the El Dorado National Forest special use permit. Following construction, the appropriate mechanical measures will be left in place permanently to promote the establishment of vegetative cover, where necessary. Seeding will be performed according to the special use permit.

With the exception of access roads in the reservoir and at the spoil site, which have rocky surfaces, all project roads have either asphalt concrete, or chip seal pavements, which will minimize erosion potential. Existing drainage measures, such as ditches, culverts, and energy dissipators, will be maintained, and the pavement patched where damaged.

Silt fence and/or straw bales will be installed as necessary around the site, where turbid runoff could occur during rainstorms. Silt fence and/or straw bales will also be installed in ditches or drainage swales, to slow water velocity and provide settlement areas. Final erosion control measures include riprap drainage channels and placement of topsoil, which will be hydroseeded, mulched, fertilized, and covered with excelsior blanket, unless otherwise approved by the U.S. Forest Service.

Erosion control measures at the Indian Bar site will be confined largely to water bars, hay bale checks, ditch maintenance, and energy dissipators, where necessary. The nature of the sediment is coarse, free draining, and resistant to rainfall erosion. If there is any initial turbid runoff, silt fence or erosion control excelsior logs will be used to contain and filter the runoff. No revegetation is planned at the Indian Bar site other than through natural propagation.

Streamflow Maintenance in the Reservoir during Construction

Because of the reservoir size, the large streamflow maintenance requirement of 75 cubic feet per second (cfs) minimum, and construction techniques to minimize impacts to water quality, a pumped bypass of the entire work area is neither practical nor warranted. It is anticipated that about 15–20 cfs will normally flow during September and October in the MFAR upstream of Afterbay; therefore at least 55–60 cfs will be necessary from the Rubicon River. The Rubicon flow can be supplemented by larger releases at Hell Hole Dam or at Ralston Powerhouse, if the plant is operational during the outage period. The 75 cfs either will follow the existing low level channels, which are naturally armored, or will be temporarily diverted into bypass channels around the sediment bars that will serve to lower the water levels around the excavation areas. Where equipment crossings are necessary over the streamflow, large culverts will be installed, then backfilled with granular river sediment. If a large storm occurs that could potentially overwhelm the culverts, equipment will be available to remove the culverts.

Protection of Water Quality during Construction Activities

The intent of the project construction plan is to excavate sediments in the dry, in a manner similar to the way it was done in the successful 1994 sediment removal at Afterbay. Even with lowering the reservoir to the spillgate sill at elevation 1149, only a small portion of the sediment bars is exposed. Thus the creek channel above elevation 1149 will need to be lowered to excavate the bars in the dry. The process will involve 3 steps, as shown in figure 4. To lower the creek channel, a series of diversion channels will be excavated through the sediment bars. The excavation will be performed with the medium-sized excavator moving in the upstream direction. Although the excavator will need to dig well below the water table surface, it will be far enough from the flowing water that the turbidity should be contained in the channel excavation. At the same time, the excavator will be pulling up material into stockpiles for easy loading. Once the new diversion channel is complete, the upstream end will be breached slowly, and the streamflow will be allowed to follow the new course. Because the depth of sediment in the project area averages around 10 ft, and because of the configuration of the reservoir, about 3 series of diversions will be required. Where equipment needs to cross flowing water, large culverts will be installed and backfilled with coarse reservoir sediments. It is anticipated that a minimum of 2 culverted stream crossings will be required. In a few instances, the excavator will make a "wet" crossing of the stream in order to create a diversion channel on 1 of the bars. Because the equipment is required to be steam-cleaned before arriving on-site and will be inspected daily for leaks, this method of crossing is superior to installing a culvert when only 1 or 2 crossings by the excavator are needed to set up a diversion channel.

All excavation work will be below the normal high-water mark of the reservoir. No streambed alteration will be performed in the river channels above the high-water mark. The excavation procedure described above will result in very short periods of turbidity when a channel is breached or a culvert installed. With the exception of bar F, and portions of bars D and E, most sediments in the project area are relatively coarse, and will armor the diversion channels almost immediately. Care will be taken when creating a diversion channel through bars where the sediment is mostly sandy, such as creating extra width to reduce velocities. The gradients through these areas will be minimal.

Immediately downstream of the project area is the lowered reservoir pool, where there is still 100–200 acre feet (af) of water storage capacity that the stream must flow through before being released through the dam or powerhouse. This pool will act as a large settling basin, which is adequate for the 75-cfs streamflows and the limited periods of turbidity caused by rechannelling and installing culverts.

Seventy-five-cfs flow into this pool is equivalent to a change of water about every 24 hours. Also, an oil absorbent boom will be placed across the reservoir pool just downstream of the project area, in a location where the water surface is quiet enough for the boom to function properly.

To minimize turbidity when drawing the lake down to elevation 1149, a maximum rate of 2 ft per hour will be observed. Annual drawdowns of the reservoir are required for normal maintenance and usually result in some level of reduced clarity of the reservoir. If required by the regulatory agencies, daily monitoring downstream of Afterbay Dam and upstream of the project site during excavation will be done for turbidity and settleable solids. If monitoring is required, PCWA proposes that turbidity reaching 10 nephelometric turbidity units (NTU) will result in interruption of project activities in the reservoir until the cause can be determined and corrective measures taken.

During placement of the coarse sediments at the Indian Bar site, some of the side slopes of the "recruitable" sediment may extend into the water in the river channel. Most of the river in this area is ponded because of a sediment obstruction downstream. If necessary, a silt curtain will be placed at the downstream end of this pond to prevent turbidity from migrating downstream. The section of river between Ralston Afterbay Dam and Oxbow Powerhouse sees only minimal flows, if FERC–mandated streamflows are maintained through the powerhouse rather than the dam. Downstream of the ponded area, the channel can be relocated easily to the far side to prevent any fines from the sediment-stockpiling operation from entering the watercourse.

Measures to Protect Air Quality

During project construction, the construction crew will be required to follow a dust control plan to minimize emissions of dust and ozone precursors from construction equipment. Impacts are described in chapter 3, "Environmental Checklist." Before breaking ground on the proposed project, PCWA will prepare a dust control plan and will submit the plan to the Placer County Air Pollution Control District (APCD) for review and approval. The plan will ensure that adequate dust controls are implemented during all phases of project construction; at a minimum, it will include the measures listed below.

- Apply dust suppressants to exposed earth during grading of the road. Dust suppressants should be applied at least twice daily, preferably in the late morning and at the end of the work day, and should cover exposed soil surfaces completely.

- On each day of construction, clean up mud and dirt clinging to truck wheels and undercarriages that otherwise would be carried from the construction site and deposited onto roads.

- To contain the release of dust into the atmosphere, adequately water or completely cover all fill material transported on-site or off-site.

- Minimize the area disturbed by grading.

- Limit off-road vehicle speed to 15 mph, where appropriate.

- Require that construction equipment operating on a project site comply with applicable emission control requirements. All equipment and internal combustion engines shall be properly maintained and well tuned in accordance with the manufacturer's specifications.

PCWA will implement the dust control plan. Compliance with the dust control plan will be monitored by the PCWA construction manager and the Placer County APCD.

Measures to Protect Cultural Resources

Although no evidence indicates that there are any surface cultural resources that would be affected by the proposed project, it is possible that significant buried cultural resources could be exposed during excavation activities. Should such resources be exposed, they could be demolished or substantially damaged. If buried cultural resources are discovered during ground-disturbing activities, PCWA will implement the following measure:

- Stop work if cultural resources are discovered during ground-disturbing activities. Appendix K of the State CEQA Guidelines provides the following direction for archaeological sites accidentally found during construction:

  a) If archaeological remains (chipped or ground stone, glass, bone, ceramic, building remains, or historic debris) are discovered during construction, the contractor will stop all work in the immediate vicinity of the find and a qualified archaeologist will evaluate the find. If the find is determined to be an important cultural resource, contingency funding and a time allotment sufficient to allow recovering an archaeological sample or to employ an avoidance measure will be made available by the contractor. Construction work can continue on other parts of the project while archaeological mitigation takes place.

  b) In the event of discovery or recognition of any human remains in any location other than a dedicated cemetery, there shall be no further excavation or disturbance of the site or any nearby area reasonably suspected to overlie adjacent human remains until:

     1) the coroner of the county has been informed and has determined that no investigation of the cause of death is required, and,

     2) if the remains are of Native American origin,

        - the descendants from the deceased Native Americans have made recommendation to the landowner or the person responsible for the excavation work for means of treating or disposing of, with appropriate dignity, the human remains and any associated grave goods as provided in Public Resources Code, Section 5097.98, or

        - the Native American Heritage Commission was unable to identify a descendant or the descendant failed to make a recommendation within 24 hours after being notified by the commission.

Required Permits and Approvals

Lead Agency Approvals

Before the proposed project can be implemented, PCWA must

- adopt the proposed MND and
- approve the final engineering design of the disposal area.

Approvals by Other Agencies

The agencies listed below are expected to use this CEQA document for approval of the following actions:

- Federal Energy Regulatory Commission—has overall project approval and verification that all regulatory issues have been addressed
- California Department of Fish and Game Section 1601 Streambed Alteration Agreement
- U.S. Army Corps of Engineers Section 404 Permit, including consultation with designated state and federal agencies
- California State Water Resources Control Board Section 401 Certification
- Central Valley Regional Water Quality Control Board Waste Discharge Requirements, or waiver thereof
- U.S. Fish and Wildlife Service—recommendations of environmental measures to minimize erosion and adverse effects to fish and wildlife resources

- U.S. Forest Service—special use permit and recommendations of environmental measures to protect land and water resources

- California State Historic Preservation Officer Consultation

- Compliance with CEQA, including consultations through the California State Clearinghouse

Public Involvement

PCWA has been working with landowners to help address and minimize potential environmental issues that may affect residents along the site of the proposed project. As a result of this effort, PCWA is committed to

- minimizing daily movement of traffic through the local residential areas by storing equipment on-site;

- ensuring that the temporary construction easement area is returned as nearly as practicable to preproject conditions by reseeding and replacing gravel and any broken pipes; and

- scheduling staggered work periods to minimize repair-related effects (e.g., noise) on nearby residents.

This draft IS/MND will be circulated for a 30-day public and agency review, as required by the State CEQA Guidelines. Public and agency comments will be evaluated and responses will be prepared during preparation of the final IS/MND. The PCWA board of directors will hold a public meeting to consider the proposed project, the environmental documentation, and all public and agency comments. The board of directors will adopt findings concerning all environmental issues raised by the public and responsible agencies.

During the review period, written comments may be submitted to the following address:

Placer County Water Agency
P.O. Box 667
Foresthill, CA 95631
Contact: Jon Mattson

Chapter 3

Environmental Checklist

1.	**Project Title:**	Ralston Afterbay Sediment Management Project
2.	**Lead Agency Name and Address:**	Placer County Water Agency (PCWA) P.O. Box 667 Foresthill, CA 95631
3.	**Contact Person and Phone Number:**	Stephen J. Jones or Jon Mattson 530/367-2291
4.	**Project Location:**	Approximately 5 miles east of Foresthill, Placer County, California
5.	**Project Sponsor's Name and Address:**	PCWA P.O. Box 667 Foresthill, CA 95631
6.	**General Plan Designation:**	Open Space
7.	**Zoning:**	Open Space

8. **Description of Project:** The project involves the dredging of approximately 75,000 cubic yds of sediment and disposal on a 7-acre portion of Indian Bar. An access road to Indian Bar will have to be graded and stabilized.

9. **Surrounding Land Uses and Setting:** The Tahoe and El Dorado National Forests surround the project area. Small mining camps are located within 3 miles of the project site.

10. **Other Public Agencies Whose Approval Is Required:** Federal Energy Regulatory Commission, overall project approval, and verification that all regulatory issues have been addressed; California Department of Fish and Game Section 1601 Streambed Alteration Agreement; U.S. Army Corps of Engineers Section 404 Permit, including consultation with designated state and federal agencies; California State Water Resources Control Board Section 401 Certification; Central Valley Regional Water Quality Control Board Waste Discharge Requirements, or waiver thereof; U.S. Fish and Wildlife Service, recommendations of environmental measures to minimize erosion and adverse effects to fish and wildlife resources; U.S. Forest Service, Special Use Permit and recommendations of environmental measures to protect land and water resources; California State Historic Preservation Officer, consultation; compliance with CEQA, including consultations through the California State Clearinghouse.

Environmental Factors Potentially Affected:

The environmental factors checked below could be affected by this project (i.e., the project would involve at least 1 impact that is a "Potentially Significant Impact"), as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Agricultural Resources	☒ Air Quality
☒ Biological Resources	☒ Cultural Resources	☐ Geology/Soils
☐ Hazards and Hazardous	☒ Hydrology/Water Quality	☐ Land Use/Planning
☐ Mineral Resources	☐ Noise	☐ Population/Housing
☐ Public Services	☐ Recreation	☒ Transportation/Traffic
☐ Utilities/Service Systems	☐ Mandatory Findings of Significance	

Determination:

On the basis of this initial evaluation:

☐ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☒ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions to the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have an impact on the environment that is "potentially significant" or "potentially significant unless mitigated" but at least one effect (1) has been adequately analyzed in an earlier document pursuant to applicable legal standards and (2) has been addressed by mitigation measures based on the earlier analysis, as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier ENVIRONMENTAL IMPACT REPORT or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier ENVIRONMENTAL IMPACT REPORT or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the project, nothing further is required.

_______________________________ Signature

_______________ Date

Stephen J. Jones
_______________________________ Printed Name

_______________ For

Evaluation of Environmental Impacts:

1. A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained if it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2. All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

3. Once the lead agency has determined that there may be a particular physical impact, the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are 1 or more "Potentially Significant Impact" entries when the determination is made, an environmental impact report (EIR) is required.

4. "Less than Significant with Mitigation Incorporated" applies when the incorporation of mitigation measures has reduced an effect from a "Potentially Significant Impact" to a "Less-than-Significant Impact." The lead agency must describe the mitigation measures and briefly explain how they reduce the effect to a less-than-significant level. (Mitigation measures from Section XVII, "Earlier Analyses," may be cross-referenced.)

5. Earlier analyses may be used if, pursuant to tiering, a program EIR, or another CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration (State CEQA Guidelines, Section 15063[c][3][D]). In this case, a brief discussion should identify the following:

   (a) *Earlier Analysis Used.* Identify and state where earlier analyses are available for review.

   (b) *Adequacy of Impact Analysis.* Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.

   (c) *Mitigation Measures.* For effects that are "Less than Significant with Mitigation Incorporated," describe the mitigation measures that were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

6. Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). When appropriate, a reference to a previously prepared or outside document should include a reference to the page or pages where the statement is substantiated.

7. Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.

8. This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.

9. The explanation of each issue should identify

   (a) the significance criteria or threshold, if any, used to evaluate each question; and
   (b) the mitigation measure identified, if any, to reduce the impact to a less-than-significant level.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
I.	**AESTHETICS** - Would the project:				
a.	Have a substantial adverse effect on a scenic vista?	☐	☐	■	☐
b.	Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings along a scenic highway?	☐	☐	☐	■
c.	Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	■	☐
d.	Create a new source of substantial light or glare that would adversely affect daytime or nighttime views in the area?	☐	☐	■	☐

Discussion of Impacts

a. The project site is not located on or near a scenic vista or a state scenic highway or other officially designated scenic roadway, and it provides no views of a scenic vista. Because the proposed project is not located in the vicinity of an officially designated scenic resource, and because the project site is shielded to some degree from public vantage points, there will be less-than-significant impacts on scenic resources.

b. There are no substantial rock outcroppings of scenic quality or historic buildings in the immediate project area. Several small trees at the Indian Bar disposal site would be affected. Please refer to the "Biological Resources" section for a discussion of impacts on trees.

c. Project impacts on the existing visual character are considered less than significant because of the short-term nature of the construction activities and the relatively small area that would be affected. The Indian Bar site will blend in with its surroundings.

d. The proposed project will involve the temporary installation of mobile lighting systems for nighttime construction. Project construction will take place 24 hours a day, but because of the remoteness of the area,

there will be less-than-significant impacts associated with additional lighting or glare.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
II.	**AGRICULTURAL RESOURCES** - In determining whether impacts on agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Department of Conservation. Would the project:				
a.	Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	■
b.	Conflict with existing zoning for agricultural use or conflict with a Williamson Act contract?	☐	☐	☐	■
c.	Involve other changes in the existing environment that, due to their location or nature, could result in conversion of Farmland to non-agricultural use?	☐	☐	☐	■

Discussion of Impacts

a. As stated in the "Land Use and Planning" section of this environmental checklist, the project site is not located on any land that is officially designated as agricultural or currently undergoing agricultural operations. Consequently, implementation of the proposed project will not result in any impacts on agricultural lands, zoning designations, or Williamson Act contracts based on review of the Placer County General Plan.

b. Please see the response to "a" above.

c. Please see the response to "a" above.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
III. **AIR QUALITY** - When available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a. Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	■	☐
b. Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	■	☐
c. Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is a nonattainment area for an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors)?	☐	☐	■	☐
d. Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	■	☐
e. Create objectionable odors affecting a substantial number of people?	☐	☐	☐	■

Discussion of Impacts

a. The proposed project will not violate any air quality regulations, plans, or policies, and it will not involve the release of toxic air contaminants or other hazardous materials. It will not affect existing traffic patterns or concentrate vehicles in such a way as to create a nonstationary source "hot spot" or cause a violation of carbon monoxide standards. Where applicable, the proposed project will implement the Placer County Air Pollution Control District (APCD) air quality measures described in chapter 2, "Project Description"; therefore, construction of the proposed project will not violate any applicable air quality standards, contribute to an existing air quality violation, or conflict with any applicable air quality plan. This impact is considered less than significant.

b. Please see the response to "a" above.

c. Please see the response to "a" above.

d. The air pollutants potentially generated by the proposed project during construction-related activities will include dust and particulate matter. Emissions from construction vehicles of ozone precursors and carbon monoxide will be minor because construction-related activities will be temporary and there will be relatively few construction vehicles at the site. Construction workers will be exposed to dust for only very short periods of time. The proposed project will implement the Placer County APCD air quality measures described in Chapter 2, "Project Description"; therefore, this impact is considered less than significant.

e. Implementation of the proposed project would involve excavating reservoir sediments and storing these sediments at Indian Bar. Odors in these materials would be derived primarily from decomposing organic material or oxidation of sulfides. Previous dredging projects at Ralston Afterbay Reservoir (Afterbay) have not resulted in a an odor problem. The reservoir is well oxygenated and production of sulfides is minimal. The area is remote and the local area lacks sensitive receptors; therefore, impacts are considered less than significant.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
IV.	**BIOLOGICAL RESOURCES** - Would the project:				
a.	Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	❑	❑	❑	■
b.	Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	❑	❑	❑	■
c.	Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marshes, vernal pools, coastal wetlands, etc.) through direct removal, filling, hydrological interruption, or other means?	❑	❑	❑	■
d.	Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	❑	❑	❑	■
e.	Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	❑	❑	■	❑

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
f.	Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	■

Common and Sensitive Habitats and Associated Wildlife

This section describes the terrestrial biological resources present at Afterbay, applicable laws and regulations pertaining to terrestrial biological resources in the project area, and permit requirements for the proposed project. Biological resources discussed in this section include vegetation, wetlands, wildlife resources, including special-status species, and fisheries.

Sources of Information and Methodology

Prior to conducting the field survey, the biologists reviewed existing reports and database information to determine the location and types of biological resources that could exist in the survey area. This information included DFG's California Natural Diversity Database (CNDDB) (2001), California Native Plant Society's (CNPS's) Inventory of Rare and Endangered Vascular Plants of California—6th Edition (July 6, 2000 version), and Jones & Stokes' file information.

A Jones & Stokes botanist and wildlife biologist conducted a field survey of the proposed site on January 11, 2001. The site visit was a reconnaissance-level survey only. No protocol-level surveys were conducted at the site. During the field survey, the biologists walked the proposed site and documented the habitats present. The biologists also conducted a habitat assessment for special-status species identified by the pre–field investigation as having the potential to occur in the surrounding area. The biologists also identified sites that could qualify as wetlands and other waters of the United States and would be subject to Corps jurisdiction under Section 404 of the Clean Water Act (CWA) based on observable characteristics. Tables 3-1 and 3-2 list the special-status plant and wildlife species with potential to occur in the project area.

Definitions

Sensitive Natural Communities

For the purpose of this report, sensitive natural communities are those that are especially diverse, regionally uncommon, considered sensitive natural communities (as defined by CNDDB 1999, List of Terrestrial Natural Habitats), or regulated by federal or state agencies. Several state and federal laws regulate the management of these areas, such as Section 404 of the CWA, and California Fish and Game Code Section 1601. Most sensitive natural communities are given special consideration because they provide important ecological functions. Some communities support a unique or diverse assemblage of plant or wildlife species, and therefore are considered sensitive from an ecological standpoint.

Special-Status Species

Special-status species are plants and animals that are legally protected under state and federal ESAs or other regulations and species that are considered sufficiently rare by the scientific community to qualify for such listing. Special-status plants and animals are species in the following categories:

- plants or animals listed or proposed for listing as threatened or endangered under the federal ESA (50 Code of Federal Regulations [CFR] 17.12 [listed plants], 17.11 [listed animals] and various notices in the Federal Register [FR][proposed species]);
- plants or animals that are candidates for possible future listing as threatened or endangered under the federal ESA (64 FR 57534, October 25, 1999);
- plants or animals designated as "special concern" (former C2 candidates) by USFWS;
- plants or animals listed or proposed for listing by the State of California as threatened or endangered under the California ESA (14 California Code of Regulations [CCR] 670.5);
- plants listed as rare or endangered under the California Native Plant Protection Act (California Fish and Game Code, Section 1900 et seq.);
- plants that meet the definitions of rare or endangered under CEQA (State CEQA Guidelines, Section 15380);

Table 3-2 continued

[a] Status explanations

State

E	=	listed as endangered under state Endangered Species Act
T	=	listed as threatened under state Endangered Species Act
SSC	=	species of special concern; species for which existing information indicates it may warrant listing but for which substantial biological information to support a proposed rule is lacking
–	=	no status definition

Federal

T	=	listed as threatened under federal Endangered Species Act
SC	=	species of concern; species for which existing information indicates it may warrant listing but for which substantial biological information to support a proposed rule is lacking
–	=	no status definition
FPD	=	federally proposed for delisting

Table 3-1. Special-Status Plant Species That Have the Potential to Occur at the Ralston Afterbay Project Site

Species	Listing Status * Federal	State	CNPS	Distribution	Habitat Associations	Period of Identification	Suitability of Habitat at Study Area
Nissenan manzanita (*Arctostaphylos nissenana*)	--	--	1B	Known from a few occurrences in El Dorado and Tuolumne Counties	Closed-cone coniferous forest and chaparral, usually on metamorphic soils	Feb–March	None
Pine Hill ceanothus (*Ceonothus roderickii*)	E	R	1B	Known only from El Dorado County	Serpentine or gabbroic soils in openings of chaparral and cismontane woodland	May–June	None
Red Hills soaproot (*Chlorogalum grandiflorum*)	SC	--	1B	Known only from El Dorado County	Serpentine or gabbroic soils in openings of chaparral and cismontane woodland	May–June	None
Brandegee's fairyfan (*Clarkia biloba ssp. brandegeae*)	--	--	1B	Eastern side of Sacramento Valley	Openings in cismontane woodland and chaparral	May–July	None
Butte County fritillary (*Fritillaria eastwoodiae*)	SC	--	3	Known from Butte, Placer, Shasta, Tehama, and Yuba Counties.	Moist openings in chaparral, cismontane woodland, and lower montane conifer forest.	March–May	None
El Dorado bedstraw (*Galium californicum ssp. sierrae*)	E	R	1B	Known from El Dorado, Placer, and Tuolomne Counties	Serpentine or gabbroic soils in openings of chaparral and cismontane woodland	May–June	None
Saw-Toothed lewisia (*Lewisia serrata*)	SC	--	1B	Known only from El Dorado and Placer Counties	Broadleafed upland forest, lower montane coniferous forest, riparian forest	May–June	None
Stebbinsii's Phacelia (*Phacelia Stebbinsii*)	SC	--	1B	Known from El Dorado and Placer Counties	Lower montane coniferous forest, cismontane woodland, meadows and seeps, riparian woodland	May–June	None
Layne's ragwort (*Senecio layneae*)	T	R	1B	Known from El Dorado and Tuolomne Counties	Serpentine or gabbroic soils in chaparral or cismontane woodland	April–July	None
El Dorado County mule's ears (*Wyethia reticulata*)	SC	--	1B	Eastern side of Sacramento Valley, known only from El Dorado County	Clay or gabbroic soils in chaparral, cismontane woodland, or lower montane conifer forests	May–July	None

Table 3-2 continued

Common Name *Scientific Name*	Status[a] State/Federal	California Distribution	Habitats	Occurrence in Project Area
Bald eagle *Haliaeetus leucocephalus*	E/FPD	Nests in Siskiyou, Modoc, Trinity, Shasta, Lassen, Plumas, Butte, Tehama, Lake, and Mendocino Counties and in the Lake Tahoe Basin; reintroduced into central coast; winter range includes the rest of California, except southeastern deserts, very high elevations in Sierra Nevada, and east of Sierra Nevada south of Mono County; range expanding	In western North America, nests and roosts in coniferous forests within 1 mile of lake, reservoir, stream, or ocean	Not known to occur in the project area; moderate quality foraging habitat present at reservoir
Northern goshawk *Accipiter gentilis*	SSC/SC	Permanent resident of Klamath and Cascade Ranges, north Coast Ranges from Del Norte to Mendocino County, and the Sierra Nevada south to Kern County; winters in Modoc, Lassen, Mono, and northern Inyo Counties; rare in southern California	Nests and roosts in older stands of red fir, Jeffrey pine, and lodgepole pine forests; hunts in forests, forest clearings, and meadows	Moderate; suitable foraging habitat present; no suitable nesting habitat due to steep slopes around reservoir
Sharp-shinned hawk *Accipiter striatus*	--/SSC	Permanent resident on the Sierra Nevada, Cascade, Klamath, and north Coast Ranges at midelevations and along the coast in Marin, San Francisco, San Mateo, Santa Cruz, and Monterey Counties; winters over the rest of the state except very high elevations	Dense canopy ponderosa pine or mixed-conifer forest and riparian habitats	Moderate; suitable foraging habitat present; no suitable nesting habitat due to steep slopes around reservoir
Cooper's hawk *Accipiter cooperii*	--/SSC	Throughout California except high altitudes in the Sierra Nevada; winters in the Central Valley, southeastern desert regions, and plains east of the Cascade Range; permanent residents occupy the rest of the state	Nests primarily in riparian forests dominated by deciduous species; also nests in densely canopied forests from digger pine-oak woodland up to ponderosa pine; forages in open woodlands	Moderate; suitable foraging habitat present; no suitable nesting habitat due to steep slopes around reservoir
California spotted owl *Strix occidentalis occidentalis*	--/SC	Sierra Nevada from Lassen County south to northern Kern County; occurs in localized areas of Transverse and Peninsular Ranges of southern California	Mature forests with permanent water and suitable nesting trees and snags; in southern California, nearly always associates with oak and oak-conifer habitats	Moderate; suitable foraging habitat present; no suitable nesting habitat due to steep slopes and lack of canopy closure

Table 3-2 continued

Common Name *Scientific Name*	Status[a] State/Federal	California Distribution	Habitats	Occurrence in Project Area
Harlequin duck *Histrionicus histrionicus*	SC/SSC	May still nest in very small numbers in Calaveras County and eastern Amador and Placer Counties; winters on the coast from Del Norte County to central San Luis Obispo County	Turbulent mountain streams in summer and rough coastal waters in winter; forages by diving along rocky shorelines	Not known to occur; no suitable habitat in reservoir; suitable habitat upstream in American and Rubicon Rivers
Vaux's swift *Chaetura vauxi*	--/SSC	Coastal belt from Del Norte County south to Santa Cruz County; also nests rarely in midelevation forests of the Sierra Nevada	Nests in hollow, burned-out tree trunks in large conifers; most other activities are conducted in the air	Moderate; suitable foraging and nesting habitat present in surrounding forest
Black swift *Cypseloides niger*	–/SSC	Breeds locally in the Sierra Nevada and Cascade Range, the San Gabriel, San Bernardino, and San Jacinto Mountains; and in coastal bluffs from San Mateo County south to near San Luis Obispo County	Nests in moist crevice or cave on sea cliffs above the surf, or on cliffs behind, or adjacent to, waterfalls in deep canyons	Low; no suitable nesting habitat onsite; suitable foraging habitat in and around reservoir
Little willow flycatcher *Empidonax traillii brewsteri*	E/SC	Summer range includes a narrow strip along the eastern Sierra Nevada from Shasta County to Kern County, another strip along the western Sierra Nevada from El Dorado County to Madera County; widespread in migration	Riparian areas and large, wet meadows with abundant willows for breeding; usually found in riparian habitats during migration	No suitable nesting habitat present; moderate potential to occur during migration
California yellow warbler *Dendroica petechia brewsteri*	SSC/--	Nests over all of California except the Central Valley, the Mojave Desert region, and high altitudes in the Sierra Nevada; winters along the Colorado River and in parts of Imperial and Riverside Counties; 2 small permanent populations in San Diego and Santa Barbara Counties	Nests in riparian areas dominated by willows, cottonwoods, sycamores, or alders or in mature chaparral; may also use oaks, conifers, and urban areas near streamcourses	High; suitable nesting and foraging habitat present onsite and in surrounding habitats
Yellow-breasted chat *Icteria virens*	--/SSC	Uncommon migrant in California; nests in a few locations with appropriate habitat, such as Sweetwater and Weber Creeks, El Dorado County; Pit River, Shasta County; Russian River, Sonoma County; Little Lake Valley, Mendocino County; and upper Putah Creek, Yolo County	Nests in dense riparian habitats dominated by willows, alders, Oregon ash, tall weeds, blackberry vines, and grapevines	Low; marginal nesting habitat present downstream of dam in small, isolated, willow and blackberry thickets

Table 3-2 continued

Common Name *Scientific Name*	Status[a] State/Federal	California Distribution	Habitats	Occurrence in Project Area
Bell's sage sparrow *Amphispiza belli belli*	SC/SSC	Western Sierra foothills from El Dorado County south to Mariposa County, inner Coast Ranges from Shasta County southward, extending to vicinity of coast from Marin County to San Diego County; from southern San Benito County to San Bernardino County; absent from innermost Coast Ranges and desert slopes of San Gabriel and San Bernardino Mountains	Prefers chaparral habitats dominated by chamise	No suitable habitat present on project site or surrounding area
American marten *Martes americana*	SSC/--	Northern Sierra Nevada from 3,400 to 10,400 ft; southern Sierra Nevada from 4,000 to 13,100 ft	Dense canopy mixed evergreen forests with many large snags and downed logs, small openings with good ground cover for foraging, riparian corridors	Not known to occur; low quality habitat present in forested areas around reservoir
California wolverine *Gulo gulo luteus*	T/SC	Klamath and Cascade Ranges south through Sierra Nevada to Tulare County	Variety of habitats from 1,600 to 14,200 feet; most common in open terrain above timberline and in subalpine forests	Not known to occur; no suitable habitat present on project site
Pacific fisher *Martes pennanti pacifica*	–/SC	Coastal mountains from Del Norte to Sonoma County, through Cascades to Lassen County; south in Sierra Nevada to Kern County	Mixed conifer habitats with high overstory cover; preference for riparian areas and other ecotonal habitats	Not known to occur; suitable but low-quality habitat present in forested areas surrounding reservoir
Townsend's big-eared bat *Corynorhinus townsendii*	SC/S	Klamath Mountains, Cascades, Sierra Nevada, Central Valley, Transverse and Peninsular Ranges, Great Basin, and Mojave and Sonora Deserts	Mesic habitats; gleans insects from brush or trees and feeds along habitat edges; caves and mines for roosting	Suitable foraging habitat present in project area; no suitable nesting habitat present; species has not been observed in project area

- plants considered under the California Native Plant Society (CNPS) to be "rare, threatened, or endangered in California" (Lists 1B and 2: July 6, 2000, version);
- plants listed by CNPS as plants about which more information is needed to determine their status and plants of limited distribution (Lists 3 and 4: July 6, 2000 version), which may be included as special-status species on the basis of local significance or recent biological information;
- animal species of special concern to DFG (Remsen 1978 [birds], Williams 1986 [mammals], Jennings and Hayes 1994 [reptiles and amphibians], Moyle et al. 1989 [fish]);
- animals fully protected in California (California Fish and Game Code, Sections 3511 [birds], 4700 [mammals], and 5050 [reptiles and amphibians]); and
- animals protected under the Migratory Bird Treaty Act or California Fish and Game Code, Sections 3503.5.

Setting

Montane Riparian Habitat

A perennial drainage, the Middle Fork American River (MFAR) is in the construction area and is considered a water of the United States, subject to jurisdiction under Section 404 of the Clean Water Act (CWA). Montane riparian habitat is found in the study area in a narrow corridor along the bank of the MFAR and the associated floodplain. Riparian habitats often qualify as waters of the United States because they have a prevalence of hydrophytic vegetation and may have wetland hydrology and hydric soils. Species encountered include sandbar willow, Fremont's cottonwood, and other scattered willow species. The understory is sparsely vegetated because of seasonal fluctuations in the water level.

Riparian habitat along the banks of the American River is narrow and does not support the usual diversity of wildlife species because of the lack of understory vegetation. Nevertheless, some wildlife species in the area may make primary use of the riparian habitat. These species include song sparrows and spotted towhees. Mammals found in the riparian portion may include striped skunk, gray fox, and river otter.

Substantial statewide decline of riparian communities in recent years has increased concerns about dependent plant and wildlife species. Riparian vegetation has a variety of functions such as stabilizing banks, controlling erosion, and providing wildlife habitat. California Department of Fish and Game (DFG) has adopted a no-net-loss policy for riparian habitat value. In addition, the U.S. Fish and Wildlife Service (USFWS) mitigation policy identifies California's riparian habitats in Resource Category 2, for which no net loss of existing habitat value is recommended (46 FR 7644, January 23, 1981).

Ponderosa Pine Habitat

In the study area, pine forest is found in the upper portion of the canyon, and scattered pine trees also occur in north- and south-facing oak woodlands and chaparral throughout the area. Species encountered include gray pine, ponderosa pine, and Douglas-fir.

Common mammals in pine forest habitat include western gray squirrel, deer mice, and several other small mammal species. Bird species using the pines for nesting and foraging include yellow-rumped warbler, dark-eyed junco, and hairy woodpecker.

Montane Hardwood Habitat

The American River canyon in the project area is characterized by steep north- and south-facing slopes. Differences in available light and moisture cause species composition to vary on these slopes.

The montane hardwood habitat includes dense areas of mixed hardwoods. Canyon live oak is the dominant tree species in the canopy, with interior live oak, Pacific madrone, and California bay as common associates. In general, the understory is sparsely vegetated, but shrubs are common in openings and in the transition to chaparral habitat. Species present in these areas include toyon, manzanita, ceanothus, and diverse herbaceous plants.

The south-facing slopes are drier than north-facing slopes and tend to be dominated by oaks with a fairly open canopy. This habitat type is highly variable, but includes many of the same species present on north-facing slopes. Canyon and live oaks are the most common species, with grey pine and black oaks occurring on the better-draining soils.

Oak woodland is used by a variety of wildlife species. Lewis's woodpecker, hermit thrush, bushtit, Hutton's vireo, and red-tailed hawks are common bird species, with golden and white-crowned sparrows and dusky-footed woodrats existing where patches of shrubs exist in the understory.

Open Water

Open water habitat exists as the river and Afterbay in the study area. Open water habitats generally lack hydrophytic vegetation but may support scattered aquatic species along their edges. These habitats typically qualify as waters of the United States because they support wetland hydrology and hydric soil conditions, but are not classified as wetlands because they lack a prevalence of hydrophytic vegetation. In addition, DFG regulates activities that would interfere with the natural flow of, or substantially alter the channel, bed, or bank of a lake, river, or stream. These activities are regulated under California Fish and Game Code Section 1601 for public agencies and Section 1603 for private individuals. Requirements to protect the integrity of biological resources and water quality are often conditions of streambed alteration agreements. Conditions that may be required by DFG include avoidance or minimization of vegetation removal, use of standard erosion control measures, limitations on the use of heavy equipment, limitations on work periods to avoid impacts on fisheries and wildlife resources, and requirements to restore degraded sites or compensate for permanent habitat losses.

Many birds use open water to feed and rest. During migration and winter, several waterfowl species rest for brief time periods before continuing their migration. During the summer, resident species may include mallard and common merganser. Other diving waterbirds including pied-billed grebe and red mergansers may also occur on Afterbay briefly.

Ruderal and Disturbed Areas

A small amount of ruderal or disturbed habitat exists in the study area. These areas include existing roads, a parking area for a boat launch, and a sediment disposal area from a previous project. Vegetation in this habitat type varies from native shrubs and forbs to introduced weedy vegetation depending on the level of disturbance.

Ruderal and developed areas are locally and regionally common and typically do not provide important habitat for special-status species.

Special-Status Plants

Special-status plant surveys were not conducted as part of this analysis because the field surveys were initiated outside of the identification periods for special-status plants listed in table 3-1.

Based on a review of the California Natural Diversity Database (CNDDB) records, information gathered during the January 11, 2001, field visit and a review of previous environmental documents, no special-status plants were identified as having potential to occur in the study area. Habitats directly affected by the project are previously disturbed areas in the floodplain of the river. Special-status plants in the vicinity of the project site do not occur in this type of habitat. Based on this information, the study area was determined to have no potential to support special-status plants, and no additional studies are necessary.

Special-Status Wildlife

Several special-status wildlife species are known to occur in the region, but many of these species' distributions do not overlap with the project area, suitable habitat is not present in the project area, or the species occur only during winter or brief periods during migration. Special-status wildlife species known to occur or with the potential to occur in the project area that could potentially be impacted by project activities are listed in table 3-2. Each species' status (i.e., the species' technical designation under federal and state laws), California distribution, habitats, and occurrence in the project area are described. If no suitable habitat is present for the species, and the species has not been recorded in the project area (i.e., in CNDDB records, surveys, or other biological reports), the species is listed as "not known to occur." Special-status wildlife species that are known to occur in the project area or that may occur in the project area based on their mobility or suitability of habitat on or near the project area are summarized below.

Foothill Yellow-Legged Frog

The foothill yellow-legged frog is designated by DFG as a species of special concern and a species of concern by the USFWS. Historically, the species was distributed throughout the foothill portions of most drainages in California from the Oregon border south to the San Gabriel River (Jennings et al. 1994). This species is found locally in the northern and central Coast Ranges and Sierra Nevada foothills. The foothill yellow-legged frog occurs in or near rocky streams in a wide variety of habitats, including valley-foothill hardwood, hardwood-conifer, and riparian; chaparral; coastal scrub; coniferous forest; and meadow (Zeiner et al. 1990). It inhabits streams that are shallow and partly shaded and have a rocky substrate of at least cobble-size material (Hayes and Jennings 1988). The foothill yellow-legged frog is often observed in riffle areas along streams but also has been seen in pools that persist in otherwise dry streams. This species is rarely found far from permanent water (Zeiner et al. 1990).

Foothill yellow-legged frogs lay their eggs from about mid-March to May. The egg clusters are attached to gravel or rocks in moving water near stream margins. Foothill yellow-legged frog larvae require about 3–4 months to complete metamorphosis (Zeiner et al. 1990).

Several foothill yellow-legged frogs were located by biologists during a reconnaissance level survey on October 19, 2000. Several frogs were observed in a riffle area approximately 100 yds upstream of Ralston Power House. Suitable breeding and foraging habitat for foothill yellow-legged frogs is present downstream of Afterbay in the MFAR. Afterbay, however, does not provide suitable breeding habitat, and it provides only low quality foraging habitat for the yellow-legged frog because of the lack of vegetation on the margins of Afterbay, slow moving water, and high degree of siltation or deep water areas.

Little Willow Flycatcher

The little willow flycatcher is listed as endangered under the California Endangered Species Act (CESA), and is a federal species of concern. Historically, it was a common nesting species in the Sierra Nevada, Central Valley, and the central and northern Coast Ranges. Currently, it is found only in isolated populations in the Sierra Nevada and the Cascade Range and occasionally in the northern Coast Ranges (Harris et al. 1988, California Department of Fish and Game 1997).

The little willow flycatcher nests primarily in dense willow thickets in montane meadows and along streams. This species forages in riparian and meadow habitats during the nesting season. It arrives on the breeding grounds in May and June and migrates to southern Mexico and Central America in August (Harris et al. 1988; Zeiner et al. 1990).

No suitable nesting habitat is present in the project area for the willow flycatcher. The riparian scrub immediately downstream of Afterbay is not characteristic of willow flycatcher breeding habitat. There is no meadow system associated with this riparian area, and the understory is composed of sand and rock. This portion of the project area, however, may provide limited foraging habitat for the willow flycatcher during migration.

California Spotted Owl

The California spotted owl is a federal species of concern and has been petitioned to be listed as threatened under the federal Endangered Species Act (ESA). In California, this species is found throughout the Sierra Nevada from Lassen County south to northern Kern County and in localized areas of the Transverse and Peninsula Ranges of southern California.

The California spotted owl nests in mixed conifer, ponderosa pine, red fir, and montane hardwood vegetation types. Stands that are suitable for nesting are characterized by dense canopy closure with medium to large trees and multistoried structure. Foraging habitat includes old- to intermediate-aged stands with a mixture of tree sizes. Breeding activity begins in March and ends in August (Verner et al. 1992).

California spotted owls are not known to nest in project area (California Department of Fish and Game 2001). Spotted owls likely nest in the surrounding region where the topography is less steep. In the project area, potential habitat for the California spotted owl occurs in the pine forests and north-slope woodland, primarily as foraging habitat.

American Peregrine Falcon

The American peregrine falcon is listed as endangered under CESA, and has been delisted from ESA. Historically, it was found throughout the Sierra Nevada and most of California (California Department of Fish and Game 1980, U.S. Fish and Wildlife Service 1982). Now, it is an uncommon breeding resident and uncommon migrant (Zeiner et al. 1990). The American peregrine falcon nests on vertical cliffs with large potholes or ledges that are inaccessible to land predators. Because this species preys primarily on birds, nest sites are usually located near areas that support large populations of birds, such as coastal areas or wetlands (Monk and Walton 1988). Peregrine falcons may travel long distances from their nesting grounds to forage near or in forested habitat (Grinnell and Miller 1944, California Department of Fish and Game 1980). Breeding activity begins as early as March and ends in August (Zeiner et al. 1990).

Peregrine falcons are not known to nest in the project area. Suitable nesting habitat likely occurs in the canyon, but no vertical cliffs with exposed rock are present on or near the project site.

Northern Goshawk

The northern goshawk is designated as a species of special concern by DFG, and considered a species of concern by USFWS. This species breeds in the north Coast Ranges and throughout the Sierra Nevada, Cascade Ranges, and Klamath Mountains.

The northern goshawk nests in mid-to-high-elevation conifer forests. Occupied habitats often include or occur adjacent to deciduous forest and riparian elements, meadows, and grasslands (Shuster 1980; Reynolds et al. 1992; Saunders 1982; Hall 1984). Goshawks forage in wooded areas; they use snags and dead-topped trees for observation and prey-plucking perches. In northern California, breeding activity begins in mid-June and ends in August (Zeiner et al. 1990).

Northern goshawks are not known to nest in the project area (California Department of Fish and Game 2001). Goshawks nests likely occur in the surrounding region at higher elevations where the topography of the land is less steep. In the project area, potential habitat for the northern goshawk occurs in pine forests and north-slope oak woodland, primarily as foraging habitat.

Osprey

The osprey is designated as a species of special concern by DFG. This species breeds throughout northern California from the Cascade Range south to Marin County and throughout the Sierra Nevada (Zeiner et al. 1990). Large breeding populations are known to occur at Lake Almanor, Eagle Lake, and Shasta Lake in northeastern California. In general, the populations at existing sites have increased in recent years, and the species breeding range has expanded substantially (Jones & Stokes file information).

In forested habitats, ospreys nest in the top of tall, broken-top trees or snags in open forest habitat or along the edge of a water body (Airola and Shubert 1981). This species forages exclusively on fish, and therefore is found only near lakes, reservoirs, coastal bays, or large rivers. Breeding activity begins in March and ends in September (Zeiner et al. 1990).

The project area includes suitable foraging and nesting habitat for osprey. However, osprey have not been reported to nest on or near Afterbay (California Department of Fish and Game 2001).

Bald Eagle

The bald eagle is listed as endangered under ESA and CESA, and is federally proposed for delisting under ESA. Historically, the bald eagle bred throughout California; however, its current breeding distribution is restricted primarily to the mountainous habitats in the northern quarter of the state, including the Sierra Nevada, Cascade Range, and northern Coast Ranges (California Department of Fish and Game 1992). The bald eagle nesting population in the state has increased over the last 30 years in response to reduction of DDT–based compounds in the environment and substantial management effort.

Bald eagle nesting territories in California are found primarily in ponderosa pine and mixed conifer forests. Nest sites are always associated with a lake, reservoir, river, or other large water body that supports abundant fish, waterfowl, or other waterbird prey. Nest trees are usually located in mature and old-growth stands within 1 mile of water. Nests are constructed in trees that provide an unobstructed view of the water body; nest trees are typically the dominant or codominant tree in the surrounding stand (Lehman 1979). Breeding activity begins as early as February and ends in July (Zeiner et al. 1990).

The project area includes suitable foraging and nesting habitat for bald eagles. However, no nesting records for the bald eagle have been reported for Afterbay (California Department of Fish and Game 2001).

Vaux's Swift

The Vaux's swift is designated as a species of special concern by DFG. The Vaux's swift is migratory, spending the spring and summer in North America, and migrating to Central and South America during the winter. Vaux's swifts nest in large hollow redwood and Douglas-fir trees or snags during spring and summer (Ehrlich et al. 1988). They forage in a variety of habitats and are often observed foraging with swallow species.

No records of Vaux's swift were reported by the CNDDB search (California Department of Fish and Game 2001). However, suitable nest trees are present in the pine woodland and north-slope oak woodland habitat adjacent to the project area.

Black Swift

The black swift is designated as a species of special concern by DFG. This species is not common inland, and found only in a handful of locations throughout the state because of its nesting behavior. Black swift nests at inland sites are found in crevices and ledges of cliffs behind waterfalls. Like the Vaux's swift, they forage over a wide variety of habitats, often with swallows.

Black swifts do not nest at the project site and are not known to nest in the adjacent habitat (California Department of Fish and Game 2001). This species may nest in the American River canyon where large waterfalls are present.

California Yellow Warbler

The California yellow warbler is designated as a species of special concern by DFG. Its current breeding range in California includes the Great Basin, Sierra Nevada, Cascade Ranges, Klamath Mountains, Coast Ranges, and northern Sacramento Valley (Zeiner et al. 1990). The species has been extirpated from substantial areas of its former range in the Central Valley because of habitat loss and cowbird parasitism (Remsen 1978). The species is still common in many mid-elevation areas of the Sierra Nevada (Gaines 1988)

Yellow warblers typically nest in riparian scrub and riparian forest habitats from lowland riparian areas up to the mixed north-slope forest zone. In the Sierra, however, the species frequently uses stands of brush and small trees on drier hillsides away from water (Gaines 1988). Breeding activity begins in April and ends in August.

Yellow warblers commonly occur in the American River canyon. They typically nest in montane chaparral in this region and a variety of forested habitats including riparian scrub. Because the field survey was conducted in winter when yellow warblers would not be in the area, it is unknown if the species nests on or around the project site. However, because they are common to the area, no additional survey is needed to quantify their presence in the project area.

American Marten

The American marten is designated as a species of special concern by DFG. In California, marten occur throughout the Sierra Nevada at mid-to-high elevations (Freel 1991).

The American marten inhabits multispecies late-seral coniferous forests. Suitable stands are characterized by a dense multistoried canopy, with abundant large snags and downed logs (Freel 1991). These areas are generally near riparian corridors, which are used as movement corridors and are interspersed with small open areas with dense ground cover for foraging. Important habitats include red fir, lodgepole pine, subalpine conifer, mixed conifer, Jeffrey pine, and eastside pine forest types (Schempf and White 1977; Clark et al. 1987). Martens feed primarily on small mammals, lagomorphs, and fruits. They will use snags, downed woody debris, stumps, burrows, and crevices in rocky areas for cover and denning.

Martens are known to occur sporadically in the MFAR but are relatively common in some of the higher elevation areas in the surrounding region. Habitat conditions for the marten in the project area are not ideal because of the steepness of slopes and high oak component in the vegetation community. Martens are not known to occur in the project area (California Department of Fish and Game 2001). Pine forest and oak woodland adjacent to the project area is considered potential habitat for marten, although the quality would be low.

Pacific Fisher

The Pacific fisher is considered a species of concern by USFWS. In California, fishers are found in the Sierra Nevada, Cascade, and Klamath Ranges and less frequently in low elevation coastal forests (Williams 1986). Currently, the fisher appears to be absent from substantial areas of its former range in the Sierra Nevada; the most significant population declines in California have occurred in the Sierra Nevada (Williams 1986).

The Pacific fisher inhabits mid-to-upper elevation mature and old-growth forest habitats. Suitable habitat is characterized by dense canopy cover and abundant snags and down logs (Williams 1986, Buck 1982). Sites used for denning and cover include cavities in large trees, snags, logs, and brush piles. Fishers forage in forest openings and early- to mid-seral stages, and occasionally in riparian habitat (Freel 1991).

Fishers are not known to occur in the project area but have been found on lands adjacent to the project area (California Department of Fish and Game 2001). Pine forest and oak woodland adjacent to the project area is considered potential habitat for fishers.

Other Special-Status Species

Nesting Swallows

Several swallow species may nest and forage in the project area, and nesting swallows are protected under the Migratory Bird Treaty Act (MBTA). The most abundant nesting swallow in the project area is the tree swallow. Tree swallows commonly nest in pine or oak snags near water. Other nesting swallow species in the project area may include the violet-green swallow, barn swallow, cliff swallow, and northern rough-winged swallow.

Fisheries

Existing Conditions

Little information is available on existing fish populations and habitat conditions in the project area based on discussions with various DFG staff (Hiscox, Meinz, Perrault pers. comm.) and from literature reviews. The following description of existing conditions is based on general information presented in the Rubicon River Wild Trout Management Plan (California Department of Fish and Game 1979), fish rescues performed during recent construction and maintenance activities at Ralston and Interbay Reservoirs, and anecdotal information. The life history summaries were primarily based on descriptions by Moyle (1976) and Moyle et al. (1995).

Fish Species

The primary game species in the project area are resident rainbow and brown trout. Rainbow trout are the only resident game species native to the MFAR and its tributaries. Historical records indicate that anadromous spring-run chinook salmon and steelhead rainbow trout used the lower reaches of the Rubicon River (below Pilot Creek) for spawning before access was eliminated by downstream dams. Native nongame fish in the project area include Sacramento sucker, speckled dace, riffle sculpin, Sacramento pikeminnow, and hardhead. The hardhead is recognized as a state species of special concern (Moyle et al. 1995). No federally or state-listed threatened, endangered, or candidate species occur in the project area.

Rainbow Trout

Rainbow trout commonly occur in cool, fast-flowing permanent streams and rivers, but also occur in mountain lakes and the cold, deep waters of reservoirs where they are often planted to support recreational fisheries. Rainbow trout can survive water temperatures of 0–28°C, but optimum temperatures for growth and completion of most life history stages range from 13° to 21°C. Stream-dwelling rainbow trout feed mostly on drift organisms, but they will also feed on benthic invertebrates. Consequently, their diet may include a variety of aquatic and terrestrial insects, amphipods, snails, and occasional small fish. In streams, rainbow trout commonly establish feeding territories that are defended from other trout.

Most resident rainbow trout mature in their second or third year, at sizes of 13 centimeters (cm) and up. Most wild rainbow trout spawn in the spring (February to June), but low water temperatures may delay spawning until July or August. Spawning generally occurs on gravel beds where the female, attended by a male, digs a nest and buries her eggs. Successful reproduction requires relatively clean gravels (i.e., low quantities of fine sediments), suitable water temperatures and dissolved oxygen levels, and sufficient intergravel flow to supply oxygen to the developing embryos. The eggs hatch in 3–4 weeks (at 10–15°C), and the fry emerge from the gravel 2–3 weeks later. The fry initially live in quiet waters close to shore but move to deeper and faster water as they grow.

Brown Trout

Brown trout appear to prefer medium to large, clear streams but occur in a broad range of trout waters from small streams to large lakes. Temperature is an important factor limiting their distribution. They can survive short exposures to temperatures exceeding 27°C but grow best at temperatures between 7° and 19°C. Preferred temperatures appear to be in the upper half of this range. In streams, brown trout are rather sedentary and more cover-oriented than rainbow trout. When brown trout and rainbow trout occur in the same stream, brown trout tend to select slow, deep pools with dense cover, while rainbows select faster water. Brown trout commonly feed on drifting and benthic invertebrates, although trout longer than 25 cm frequently prey on larger organisms, including other fish. Brown trout usually mature in their second or third year. Spawning generally occurs in the fall and winter, commonly in November and December in California. Spawning habitat and behavior are similar to those of rainbow trout. The eggs hatch in 4–21 weeks (typically 7–8 weeks), depending on temperature, and the fry emerge from the gravel 3–6 weeks later. The fry initially live in quiet waters close to shore but move to deeper water as they grow.

Hardhead

Hardhead, a native California minnow, are typically found in undisturbed areas of larger middle- and low-elevation streams. Most streams in which they occur have summer temperatures in excess of 20°C, and preferred temperatures appear to be 24–28°C. Hardhead prefer clear, deep pools with coarse substrates and slow water velocities. In streams, adult hardhead tend to remain in the lower half of the water column while juveniles concentrate in shallow water close to the stream edge. Hardhead are typically found in association with Sacramento pikeminnow and suckers and tend to be absent from streams dominated by introduced species, especially centrarchids (e.g., bass, sunfish, crappie). Hardhead mature following their second year and presumably spawn in spring based on the observed timing of adult upstream migrations. Spawning activity has not been documented but presumably involves mass spawning in upstream gravel riffles.

Trout Populations and Habitat

Available information on trout populations is limited to population estimates and the results of angler surveys conducted by DFG in the Rubicon River in the late 1970s. Angler surveys indicated that the abundance of trout (rainbow and brown trout 6 inches long) is relatively low (100–299 fish per mile) in the lower portion of the wild trout section (Ralston Powerhouse–Buckeye Flat area) and generally increases upstream in relation to remoteness and angler access. The Rubicon River gorge is characterized as a high quality wild trout fishery based on trout size, abundance, and catch rates; trout population densities in remote portions of the Rubicon River gorge may range from 500 to 1,000 fish per mile based on angling success. In more accessible areas upstream of the gorge (Ellicott Bridge and Hales Crossing), trout population estimates based on electrofishing surveys ranged from 200 to 500 fish per mile. Angling and fish population surveys indicate that the growth rate of trout in the Rubicon River is comparable to other streams on the west slope of the Sierra Nevada. No angling or fish population data are available for Afterbay or the MFAR downstream of the dam.

The quality of existing habitat in the Rubicon River is generally good, based on the observed recruitment, growth, and abundance of trout in the 1970s. Controlled releases from Hell Hole Reservoir are relatively stable; minimum flow releases from the reservoir range from 6 to 20 cfs depending on the month and water-year type. Reservoir releases are augmented by tributary inflows downstream of the dam. Releases of cold water from the lower depths of Hell Hole Reservoir generally result in summer water temperatures below 65°F downstream to Ellicott Bridge, but temperatures may reach 80°F in the lower river near Ralston Powerhouse. Spawning gravel is restricted to a few scattered patches, but DFG concluded that spawning gravel is not limiting trout production based on the abundance of yearling trout observed in 1975.

The project area is immediately downstream of the state-designated wild trout section of the Rubicon River, which extends 30 miles from Hell Hole Dam downstream to the confluence of the MFAR. The goals of the wild trout management plan are to protect the aquatic environment of the Rubicon River and its tributaries, perpetuate a naturally sustained population of rainbow trout, and preserve the natural scenic character of the river. As part of this plan, DFG recommended a fisheries monitoring program and coordination with the federal, state, and local management and regulatory agencies to ensure that future land use and other activities in the Rubicon River wild trout area are consistent with the goals of the management plan. General trout regulations currently apply to the Rubicon River and project area downstream of the wild trout section.

DFG identified several environmental problems that could adversely affect the fishery and scenic values of the wild trout section of the Rubicon River, including future water development, sediment inputs from operation and maintenance of existing water development projects, timber management, private land development, mining, recreational development, and road development. Several recommendations were made to address these problems.

No information is available on trout populations in Afterbay and the MFAR downstream of Afterbay and powerhouse, but trout production is probably lower than in the MFAR and Rubicon Rivers upstream of the project area. Afterbay creates an impoundment that may provide habitat for native nongame species (e.g., suckers) and possibly overwintering habitat for trout. Habitat quality in and downstream of the powerhouse tailrace is affected by large daily flow fluctuations associated with hydroelectric peaking operations. Extreme flow fluctuations in regulated streams are known to adversely affect stream production and fish populations. These impacts occur largely because benthic algae, invertebrates, and fish are subject to frequent stranding and/or displacement from preferred habitats. Based on recent observations, spawning gravels appear to be scarce in the river between Ralston Dam and Horseshoe Bar, indicating that most trout in this reach may originate from upstream or downstream spawning areas.

Discussion of Impacts

a. Special-status wildlife species that may be affected by the proposed project include the foothill yellow-legged frog, osprey, bald eagle, and yellow warbler. Potential impacts on each of these species are listed below. Several other special-status wildlife species including the California red-legged frog, northern leopard frog, harlequin duck, Bell's sage sparrow, American marten, and California wolverine will not be affected by project activities because habitat conditions on the project site are not suitable for them. Although the American peregrine falcon, northern goshawk, Cooper's hawk, sharp-shinned hawk, California spotted owl, Vaux's swift, black swift, yellow-breasted chat, Pacific fisher, Townsend's western big-eared bat, and nesting swallows are known to occur in the region and may occur in the project area, they would occur only during migration; if they occurred during the summer, they would not nest on or near the project site, and would occur near the project to forage, and would not be affected by project activities because their habitat will not be affected. These species are also mobile and can avoid project activities outside of their suitable habitat.

Impact: Potential impacts on foothill yellow-legged frog (less than significant). The project could potentially cause the direct mortality of individual foothill yellow-legged frogs and degrade their habitat. These impacts could occur from project activities including dredging and modification of habitat downstream of Afterbay from increased sedimentation. The potential impacts, however, are considered less than significant. Optimal habitat for the species is present in and on the margins of rivers and streams, not Afterbay. Dredging in Afterbay has a low probability of directly impacting frogs because few individuals occur in and on the margins of the reservoir. These margins of Afterbay are forested, generally steep, and/or are devoid of emergent and submergent vegetation and have no cover for hiding.

Potential populations of foothill yellow-legged frogs downstream of Afterbay would be minimally affected by the project. Increased sedimentation would occur primarily in the winter during high flows, not during the late-spring and summer when the frogs are laying eggs and young are developing. This increase in sedimentation during winter would not have an impact on the species and would likely benefit the frog's habitat by replenishing sediment and small gravel in the river. No mitigation is required.

Impact: Potential impact on nesting bald eagles and osprey (less than significant). The project could potentially cause the loss of bald eagle and osprey nest(s) if the species are found nesting near the reservoir. These impacts could occur from disturbance by construction activities between March 1–July 15, which could cause the abandonment of a nest. DFG code 3503.5 prohibits the destruction of raptor nests, and any loss of eggs or individuals would be considered a significant impact. Additionally, impacts on a bald eagle nest would be considered "take" under CESA and ESA. These potential impacts, however, are considered less than significant because no nest sites were observed near the reservoir during field surveys and the proposed reservoir dredging will be conducted after the nesting season during the fall.

Impact: Potential impacts on California yellow warbler (less than significant). The project could potentially cause the direct mortality of individual yellow warbler nests and degrade their habitat. These impacts could occur from project activities such as depositing sediment near the riparian area below the dam or removing riparian vegetation in this area. The potential impacts, however, are considered less than significant. Yellow warblers commonly nest throughout the American River canyon and surrounding montane chaparral habitats. If they were found nesting in the riparian scrub below the dam where sediment will be deposited, impacts on this area will be minimized by removing the least amount of riparian vegetation (see vegetation section impacts and mitigation measures below), and any riparian scrub removed would be small compared to the amount of suitable habitat in the MFAR canyon. Thus, if the species is present, the number of nesting yellow warblers affected would be limited to a few pairs and would not constitute a substantial reduction in the local population. Additionally, the increased sedimentation moving downstream from project activities would likely improve the development of riparian vegetation and create long-term benefits to yellow warblers by potentially increasing the amount of riparian scrub habitat in the MFAR canyon. No mitigation is required.

b. **Impact. Potential loss or disturbance of riparian habitat in the project area (less than significant).** Based on the project design drawings provided by PCWA, the project could potentially cause the temporary loss of a small amount, less than 2.8 acres, of riparian habitat on the riverbank. This amount of estimated acreage of impacts is considered worst-case and would likely be less. These impacts would occur primarily during placement of sediment at the proposed Indian Bar placement site. No impacts on riparian habitat would occur from reservoir dredging. Natural recruitment of riparian habitat on the Indian Bar site is likely if no major flows in the river are experienced for several seasons. Although some temporary disturbance of the riparian corridor would occur, the long-term benefits of increased sediment flows along the river are considered beneficial to riparian recruitment and establishment downstream from the project area. Impacts would be minimized as much as possible by following the guidelines set forth in the required permits for the project. PCWA will work closely with DFG on measures for riparian habitat. USFWS may require mitigation for temporary riparian habitat loss as part of conditions of the CWA Section 404 permit. Based on the small amount of habitat that will be disturbed, the nature of the disturbance, and the potential long-term benefits to riparian habitat associated with the project, impacts on the riparian corridor at the Indian Bar placement site are considered less than significant.

c. Federally protected wetlands are not present in the project area. Therefore, the project will not have an adverse effect on wetlands.

d. The proposed project will not impede the use of native wildlife nursery sites.

Impact: Temporary disturbance of common wildlife species and interference with migratory corridors (less than significant). The proposed project will disturb the movements of native resident wildlife species on the project site. This disturbance will result from construction activities (primarily continuous noise from large equipment). However, the disturbance of resident wildlife species is considered less than significant because the species are locally and regionally common, and the disturbance is temporary and restricted to a small area in the watershed. No mitigation is required.

e. The project would not conflict with any local policies or ordinances such as preservation policies or ordinances protecting biological resources.

f. The proposed project will not conflict the provisions of any habitat conservation plans, natural community conservation plans, or other approved local, regional, or state habitat conservation plans.

Cumulative Effects

The short-term impacts on wildlife and the riparian corridor caused by construction activities are relatively insignificant when compared to the long-term benefits of removing siltation in Afterbay and replenishing sediment downstream that will improve the habitat quality of riverine environments. Increased sediment flows similar to the natural processes present before the addition of hydroelectric development on the river are necessary for riparian establishment along the river corridor. In addition, successful riparian recruitment and establishment are important factors in wildlife habitat value. No adverse cumulative effects are expected to occur.

downstream of Ralston Afterbay Dam. Corrective measures could include modifying or ceasing SPT operations. PCWA will report annually to DFG the results of monitoring and any changes that are necessary to the SPT program.

Impact: Inadvertent discharge of other substances (e.g., fuels and other petroleum products) used in construction activities could be introduced into the river (less than significant): These substances can directly or indirectly cause mortality of fish and other aquatic organisms through lethal or sublethal effects. This impact is considered less than significant because PCWA will require the construction contractor as part of bid specifications to prepare a spill contingency and response plan, similar to the Interbay Reservoir plan, that outlines precautions that will be taken to avoid such accidents and provide a course of action in the event of an accidental spill during the construction window.

Impact: Loss of fish habitat at the Indian Bar site (less than significant): Placement of excavated sediments at Indian Bar would reduce the channel area and alter the physical characteristics of adjacent stream habitat. Potential changes in physical habitat include the loss of shallow, nearshore habitat and cover (e.g., willows), and increases in the average flow depth and velocities adjacent to the disposal area during high flows. These impacts are considered less than significant because of anticipated increases in the quantity and quality of downstream habitat resulting from recruitment and deposition of coarse sediments originating from the disposal site. These impacts will be further reduced by revegetating the existing bar downstream of the disposal site. The incremental benefits of sediment replenishment to downstream areas outweigh the loss of marginal habitat at the Indian Bar site.

Impact: Modification of flow changes as a result of SPT operations (less than significant): Discussions with DFG staff during a February 2001 field trip indicate that they are concerned about potential fish stranding during periodic SPT operations (Hiscox, Meinz. Perrault pers. comm.). The proposed SPT operations would not be initiated until the combined flows through Oxbow Powerhouse and over the dam spillway reach 3,500 cfs. The initial flow from the dam's low level outlet under these conditions would be 1,130 cfs; flow rate would be greater under higher reservoir elevations. The relative effect of SPT will be greatest at the lower flow regimes when compared to major flood events. In any event, PCWA currently operates the dam and powerhouse according to the ramping rates prescribed in their FERC license. Changes in dam operations with SPT would increase the rate of river flow increases and decreases in the MFAR downstream of Ralston Afterbay, potentially increasing the risk of stranding fish on bars or in off-channel areas. The existing FERC flow ramping requirements are 3 ft per hour (about 800 cfs/hr, if starting at 100 cfs). Juvenile fish are most susceptible to stranding because of their limited swimming abilities and preference for shallow, nearshore areas and inactivity during winter. This potential impact is considered less than significant because all operations would be performed to prevent changes in stage from exceeding allowable rates, as measured at the gaging station located 1.6 miles downstream of the dam.

c. The project will have no impact on wetlands.

d. Please see "b" for impacts related to turbidity and suspended sediment.

e. Please see "Water Quality" impact assessment.

f. The proposed project does not conflict with any approved habitat or conservation plan.

- is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
- is associated with the lives of persons important in our past;
- embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or
- has yielded, or may be likely to yield, information important in prehistory or history.

Ethnographic Setting

The project area was ethnographically inhabited by the Northern Hill Nisenan. The Nisenan, or Southern Maidu, occupied the Yuba, Bear, and American Rivers and the lower drainages of the Feather River. The Nisenan and their northern neighbors—the Maidu and the Konkow—form the Maiduan language family of the Penutian linguistic stock (Shipley 1978).

The Nisenan occupied permanent villages that were usually located on low rises along major watercourses. Village size ranged from 3 houses to 40 or 50. Houses were domed structures covered with earth and tule or grass and usually measured 10–15 ft in diameter. Brush shelters were used in the summer and at temporary camps during food-gathering rounds. (Wilson and Towne 1978.)

The Nisenan subsisted primarily on deer, rabbit, and salmon, but many other insect and animal species were taken when available. The acorn crop from the blue oak (*Quercus douglasii*) and black oak (*Q. kelloggii*) was carefully managed as well as stored in preparation for winter; this careful management was equivalent to agriculture.

Historic Context

The project vicinity was visited by Spanish explorers as early as 1807 and used by fur trappers in the 1820s and 1830s. The first intensive use of the area by Euroamericans came with the Gold Rush in 1848.

After gold was discovered in Auburn Ravine in May of 1848, gold seekers arrived in droves via the California Trail and Emigrant Gap (Hart 1978.) The town of Foresthill, 5 miles west of the project area, originated as a mining camp. News of rich diggings uncovered there lured a rush of miners in the 1850s. As a result, the camp soon developed into a town. Many of the bars along the American River served as mining camps. American, Horseshoe Number Two, and Stoney Bars are among several in the immediate vicinity of the project area. (Hoover et al. 1990.)

The area was heavily mined through the rest of the 19th century. Mining ditches were constructed to facilitate the constant supply of water necessary to process large quantities of placer gravels. By the 1870s, water companies were conveying water to mining operations through extensive networks of canals and ditches. Advancements in underground mining technology in the 1890s increased production in the gold mining industry, but this mining boom was short-lived because of national and world declines in the price of gold. Mining activity increased briefly during the Great Depression but never reached the levels it had attained in the 19th century. (Hoover et al. 1990.)

During the Gold Rush, unsuccessful miners turned to other pursuits to supply and service the large mining population. As the gold industry declined, more and more residents turned their attentions to transportation and ranching. The network of mining ditches and canals was reused to provide water for irrigation agriculture.

Discussion of Impacts

Methods and Results

Pre–field research for the project included an overview of historic maps and records for the region, and a cultural resources records search conducted in January 2001 by Nolan Smith, Foresthill District Archaeologist, Tahoe National Forest (TNF). Jones & Stokes received a Special Use Permit from the U.S. Department of Agriculture (USDA) Forest Service to conduct archaeological fieldwork on Forest Service land, and Jones & Stokes archaeologists systematically surveyed the project area February 15, 2001. Consultation letters were sent to interested Native American individuals and groups recommended by Donna Day, Heritage Resources and Tribal Relations Contact for the TNF. To date, no response has been received from any of the individuals or groups contacted.

The records search indicated that a large mining camp and water conveyance features associated with historic gold mining along the American River have been identified and recorded in the vicinity of the project area. The project area was surveyed for cultural resources as early as 1965 in conjunction with the construction of dams and reservoirs along the Rubicon River and MFAR.

During the field survey conducted for this project, 1 isolated archaeological feature was identified and recorded in the project area. This isolate is a single boulder located along the river's edge featuring a ground surface (slick) associated with the food processing activities of regional prehistoric or ethnographic-period populations. The location of the grinding slick on the rock surface indicates that the boulder has been moved by the river and is no longer *in situ*. Beyond identification and recording, isolated archaeological features are not considered historically important for purposes of CEQA, nor are they eligible for listing in the National Register of Historic Places in conjunction with NEPA/Section 106 compliance.

Previous fieldwork, as well as the current investigation, suggests that the project area has been severely disturbed by historic mining activities, river flooding and erosion, the1960s construction of the adjacent powerhouse, and the development of subsequent recreational facilities. Although remains of substantial historic mining activities have been identified and recorded near the project area, none were identified in the area of potential effects for the proposed project. The high level of natural and historic disturbance throughout the project area suggests that the potential for finding intact buried archaeological remains is very low. A survey report was prepared for this project by Jones & Stokes archaeologists. It will be placed on file at the TNF Heritage Resources Office and with the North Central Information Center at California State University, Sacramento.

There will be no impacts to identified historic properties as a result of the proposed project.

d. **Impact: Potential impact to undiscovered buried resources.** There is no evidence that unidentified (buried) cultural resources are located in the project area. However, there is always a possibility that such resources could be exposed during construction associated with the proposed project, resulting in a potential for significant impacts to important archaeological properties. Appendix K of the State CEQA Guidelines provides direction for archaeological materials accidentally found during construction, which PCWA has agreed to implement for this project. PCWA will also include these guidelines in its contractor's specifications for the project. Therefore, this impact is considered less than significant.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
VI.	**GEOLOGY AND SOILS** - Would the project:				
a.	Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
	1. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	■
	2. Strong seismic groundshaking?	☐	☐	☐	■
	3. Seismic-related ground failure, including liquefaction?	☐	☐	☐	■
	4. Landslides?	☐	☐	☐	■
b.	Result in substantial soil erosion or the loss of topsoil?	☐	☐	■	☐
c.	Be located on a geologic unit or soil that is unstable or that would become unstable as a result of the project and potentially result in an onsite or offsite landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	☐	■
d.	Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	■
e.	Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems in areas where sewers are not available for the disposal of wastewater?	☐	☐	☐	■

Discussion of Impacts

a. Placer County is classified as a low-severity earthquake zone, and no active faults are known to exist within the county. The project study area and surrounding lands are not designated as an Alquist-Priolo Special Studies Zone (California Department of Conservation 1999). The site is considered to have low seismic risk with respect to such effects as fault rupture hazard, strong seismic ground shaking, and ground failure (e.g., liquefaction). There is a landslide hazard. However, implementation of the proposed project will not involve developing any structures that will be used by people, and the proposed project has no components or features that will increase the exposure of people to geologic or related hazards compared to current conditions in the project study area. Therefore, implementing the proposed project will not increase the exposure of people or structures to the geological hazards mentioned above.

b. Grading and stabilization of the access road to Indian Bar will result in the temporary disruption of soil. Soils in the project area are somewhat shallow and moderately to highly erodible. As described more fully in chapter 2, "Project Description," PCWA has agreed to implement "best management practices" that will minimize soil erosion. The extent and duration of the disruption will be limited, and as documented in chapter 2, construction specification measures designed to minimize soil erosion have been incorporated into the project; therefore, this impact is considered less than significant.

c. Please see the response to "a" above.

d. Please see the response to "a" above.

e. The proposed project involves dredging of a reservoir; it is not associated with and will not require the use of septic tanks or alternative wastewater disposal systems. Consequently, there will be no impact.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
VII. HAZARDS AND HAZARDOUS MATERIALS - Would the project:				
a. Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	■	☐
b. Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	■	☐
c. Emit hazardous emissions or involve handling hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	■	☐
d. Be located on a site that is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	■	☐
e. Be located within an airport land use plan area or, where such a plan has not been adopted, be within two miles of a public airport or public use airport, and result in a safety hazard for people residing or working in the project area?	☐	☐	☐	■
f. Be located within the vicinity of a private airstrip and result in a safety hazard for people residing or working in the project area?	☐	☐	☐	■

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
g.	Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	■
h.	Expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	■

Discussion of Impacts

a. The proposed project will involve commonly used materials such as fuels and oils. Construction workers may therefore be exposed to dust or emissions containing these materials. This impact is considered temporary and less than significant. Standard construction procedures will be implemented to reduce the emissions of dust or other pollutants during the proposed project. Qualified personnel will evaluate all potentially contaminated areas, if encountered during construction, in the context of applicable local, state, and federal regulations governing hazardous waste. Handling and storage of fuels, flammable materials, and common construction-related hazardous materials are governed by California Occupational Safety and Health Administration (Cal/OSHA) standards for storage and fire prevention.

b. Please see the response to "a" above.

c. Please see the response to "a" above.

d. Please see the response to "a" above.

e. The proposed project is not located within the vicinity of a public airport or private airstrip. Consequently, there will be no impacts related to air safety hazards for people residing or working in the vicinity.

f. Please see the response to "e" above

g. The proposed project would not interfere with or affect existing emergency response or evacuation plans, because there is a large enough area near the project site for emergency vehicles to access local residences and because construction-related activities would be located off the primary road network.

h. Implementation of the proposed project would not increase any fire hazards at the project site because PCWA construction staff will adhere to all rules and regulations regarding the handling and storage of fuels and flammable materials.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
VIII.	**<u>HYDROLOGY AND WATER QUALITY</u>** - Would the project:				
a.	Violate any water quality standards or waste discharge requirements?	☐	■	☐	☐
b.	Substantially deplete groundwater supplies or interfere substantially with groundwater recharge, resulting in a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level that would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	■	☐
c.	Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner that would result in substantial erosion or siltation onsite or offsite?	☐	☐	■	☐
d.	Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner that would result in flooding onsite or offsite?	☐	☐	■	☐
e.	Create or contribute runoff water that would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	■
f.	Otherwise substantially degrade water quality?	☐	☐	■	☐

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
g.	Place housing within a 100-year flood hazard area, as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	❑	❑	❑	■
h.	Place within a 100-year flood hazard area structures that would impede or redirect floodflows?	❑	❑	❑	■
i.	Expose people or structures to a significant risk of loss, injury, or death involving flooding, including flooding as a result of the failure of a levee or dam?	❑	❑	❑	■
j.	Contribute to inundation by seiche, tsunami, or mudflow?	❑	❑	❑	■

Hydrology

The project area is Afterbay, about 1 mile downstream of the confluence of the Rubicon River and the MFAR, which have a combined watershed of 430 square miles. Indian Bar is immediately downstream from Ralston Dam and lies in the MFAR floodplain. Annual average precipitation in the form of rain, or snow at higher elevations, exceeds 60 inches. Approximately 215 square miles of the Rubicon River and MFAR watersheds immediately upstream from Afterbay is unregulated by storage reservoirs. The MFAR watershed upstream of Afterbay is approximately 115 square miles. The nearest U.S. Geological Survey (USGS) flow gage, 10 miles upstream at Interbay Dam, represents flow from 90 square miles of the watershed. Flows in the MFAR are substantially attenuated by upstream reservoir storage, including French Meadows Reservoir. USGS flow records indicate that the average daily flow in the MFAR is about 50 cfs with a peak flow of 9,990 cfs recorded in 1980 (Hydrosphere Data Products Inc. 2000).

The Rubicon River watershed is about 315 square miles and provides the majority of flow to Afterbay with an average daily flow of 332 cfs. The unregulated portion of the Rubicon River watershed extends 32 miles upstream to Hell Hole Reservoir, resulting in large flow variations with a recorded peak flow of approximately 300,000 cfs caused when Hell Hole dam failed in December 1964. The North Fork of the MFAR (NMFAR) has an 89-square-mile watershed and enters immediately downstream of Ralston Dam and Oxbow Powerhouse. The NMFAR is unregulated by reservoirs and contributes a substantial amount of flow to the MFAR with an average daily flow of 285 cfs, a 1% exceedance flow of 2,400 cfs, and a peak flow of 30,100 cfs that was recorded in 1980.

PCWA operates a flow gage on the MFAR immediately downstream of the NMFAR confluence and upstream of Horseshoe Bar. The flow records for this site indicate that the average daily flow is 1,150 cfs and the 1% exceedance flow is 6,900 cfs. The January 1997 storm was considered to generate peak flows in the American River basin and its tributaries that were nearly as large as the projected 100-year flood event; however, peak flows were not recorded for the Rubicon River, NMFAR, or MFAR at the Horseshoe Bar gage. PCWA estimated the peak 1997 flow passing Ralston Dam to be about 100,000 cfs. The highest recorded peak flow at the Horseshoe Bar gage, excluding the peak caused by the December 1964 Hell Hole Dam failure, was 113,000 cfs recorded in 1963.

Geomorphology

The MFAR was extensively mined for gold in the mid- to late 1800s (Farqhuar 1990). During this period, the riverbed and surrounding tributaries were mined and severely damaged. Mining operations dewatered the river, sorted the river sediments, and sent the fine material downstream. Discarded dredging equipment and large piles of dredged cobbles and other rock were left along the edges of the river canyon. The impacts from mining increased the severity and magnitude of natural storm events because of the substantial changes to the riverbed during this time in history. The river and surrounding ecosystem sustained major damage during this period. Sporadic gold mining still occurs today in various spots along the MFAR downstream of Afterbay and major tributaries. Construction of Ralston Dam in 1966 also changed the sediment transport mechanism in the river downstream by trapping some of the sediment that otherwise would have moved downstream. The geomorphology of the MFAR today is a reflection of these 2 human-caused events combined with major storm events in the American River canyon. Since major gold mining activities have ceased, the river's ecosystem is healing the wounds of mining and coming back into a state of equilibrium with regard to sediment transport. It is from this regional context that the general effects of the proposed project are considered.

The geomorphic characteristics that determine channel erosion, sediment transport, and sediment deposition characteristics include complex processes that depend primarily on the geologic, hydrologic, and hydraulic properties during high energy flow events. Fluctuating water levels, high stream velocities, turbulence, sustained high flows, and debris and vegetation in the river that direct flow toward the banks are all potential causes of bank erosion and channel scouring. During high flows, the portion of sediment load that is suspended in the water column is called the *wash load*; larger material that moves along the bottom of the channel is called *bedload*. Particles larger than 1.0 mm typically travel as bedload sediment close to or on the bottom; particles less than 0.1 mm generally travel suspended in the water and are measured as TSS; particles between 0.1 mm and 1.0 mm may travel as either bedload or TSS depending on the water velocity. Deposition typically occurs where transport energy is reduced, such as areas of low velocity and backwater formed upstream of erosion-resistant bedrock formations.

Channel maintenance flows are those flows with a recurrence rate of every 1 to 2 years. Channel forming flows occur much less frequently and generally are associated with large 50- and 100-year storm events. For the MFAR, the 1.5-year flood that is expected to initiate substantial transport of sediment is estimated to be about 4,500 cfs (EA Engineering, Science, and Technology 1990). Sediment transport studies have concluded that the Rubicon River is the major source of sediment to Afterbay because of higher streamflow rates and transport energy, and considerable erosion that occurs on the steep slopes and relatively unstable soils along the river canyon (EA Engineering, Science, and Technology 1990; Ayres Associates 1997; Bechtel 1997).

Sediment deposition in Afterbay follows a typical pattern, with large coarse cobble and gravels settling near the head of the reservoir and finer silts and sands accumulating closer to Ralston Dam. The estimated annual rate of accumulation of sediments in the reservoir from 1966 to 1989 was about 56,500 cubic yds (EA Engineering, Science, and Technology 1990). Ayres Associates (1997) estimated the sediment transport in the MFAR immediately downstream of the tunnel at Horseshoe Bar by several methods. Based on review of Soil Conservation Service sediment yield maps and a standardized rating procedure for evaluating factors affecting sediment yield, the average annual volume of total bedload and wash load sediment yield was estimated to be about 76,000 cubic yds. Based on empirical equations and hydraulic modeling of the river for a 200-year flood event, the annual average volume of bedload was estimated to be about 11,000 cubic yds, with transport during a single 200-year flood of about 412,000 cubic yds. The average annual and single 200-year flood event wash load yield was estimated with a rating curve based on available TSS data for the MFAR as 18,000 cubic yds and 675,000 cubic yds, respectively. The reported upper and lower limits for these sediment yield values are estimated to be about 4 times higher and lower than the average, respectively. Average bedload input estimated in the Ayres Associates report is considerably lower than the actual average deposition calculated from bathymetric surveys and may be a result of overall skewing of the data during the major flow events of 1964, 1980, 1986, and 1997 toward a higher average input than would normally occur. Only about 20% of the fine sands and silts transported as wash load in the MFAR during high flow events are estimated to deposit and be retained in Afterbay (Ayres Associates 1997).

The MFAR from Indian Bar downstream of Ralston Dam to Horseshoe Bar is a high energy reach where the river has sufficient hydraulic capacity to transport the majority of sediment that enters the river. Horseshoe Bar is considered a major hydraulic control for flow in the river because of the sweeping S-shaped bends that effectively restrict the rate of flow. A large tunnel was constructed by miners in the late 19th century to dewater Horseshoe Bar and allow access to the bar for gold mining operations. Consequently, all of the MFAR flow passes through the tunnel under normal conditions; flow around Horshoe Bar occurs only during extremely high flows. Because of the hydraulic backwater conditions created by Horseshoe Bar at high flows, it is believed to effectively prevent the downstream transport of the large-sized bedload material in the river. However, field observations indicate that there is no accumulation of sediment upstream of the tunnel suggesting that the existing sediment load is passed through the tunnel (Mussetter Engineering Inc. 2001).

Water Quality

Water quality is regulated in California primarily by the State Water Resources Control Board (SWRCB) and its affiliated 9 regional water quality control boards under the federal Clean Water Act and Safe Drinking Water Act and the Porter-Cologne Water Quality Control Act. The project area lies within the jurisdiction of the RWQCB, which establishes beneficial uses and water quality objectives for surface water and groundwater in the Water Quality Control Plan (Basin Plan) (Regional Water Quality Control Board 1998). The RWQCB permits discharges that have potential for affecting water quality by issuing Waste Discharge Requirements (WDRs) that stipulate the measures and practices that will be followed to avoid and minimize adverse effects. The MFAR generally has excellent water quality because of its origins as snowmelt in the Sierra Nevada and supports all existing beneficial uses of the Basin Plan including domestic and agricultural water supply, hydropower, recreation, wildlife habitat, and cold and warm freshwater fish habitat. Basin Plan water quality objectives for turbidity, suspended material, pH, and toxicity would be most applicable to the proposed project. The Basin Plan contains narrative water quality objectives only for TSS; numerical turbidity objectives vary in relation to the background levels according to the following scheme:

- where natural turbidity is between 5 and 50 nephelometric turbidity units (NTUs), increases shall not exceed 20%;
- where natural turbidity is between 50 and 100 NTUs, increases shall not exceed 10 NTUs; and
- where natural turbidity is greater than 100 NTUs, increases shall not exceed 10%.

There are very few available data for turbidity in the MFAR; however, the concentrations of turbidity and TSS typically correlate well with each other (Environmental Protection Agency 1991). The concentrations of TSS and turbidity will vary during a storm in relation to rainfall, runoff, and streamflow conditions. As the streamflow increases during a storm, the TSS load and associated turbidity carried in the flow rise and then typically decrease as the storm passes and streamflows start to recede. Figure 8 shows TSS data for 25 samples that were collected on the same day from high flow events on the MFAR at Foresthill and Auburn (47 miles downstream) between 1956 and 1962 (EarthInfo Inc. 1993). The values ranged from low values representative of relatively clear water (i.e., < 5 milligrams per liter [mg/l] TSS) to about 150 mg/l. Very muddy water with little clarity typically has TSS values exceeding 200 mg/l (Kunkle and Comer 1971). Based on limited TSS data for the MFAR, TSS varies considerably during storm events and all 3 ranges of the RWQCB numerical turbidity objectives may apply to the proposed project.

As requested by the RWQCB, PCWA tested sediments for acid-generating potential and trace metals that could be toxic to aquatic life if disturbed (e.g., arsenic, chromium, copper, mercury, lead) using several analytical extraction methods according to California standards in 1988 and 1999 at Interbay Reservoir, which is upstream of Afterbay. No unacceptable levels of metals were found in the sediments. Similar analyses were conducted for Afterbay sediments at several locations in 1994 and 2001. No mercury was detected in any of the Afterbay sediments, and copper and zinc were within acceptable limits.

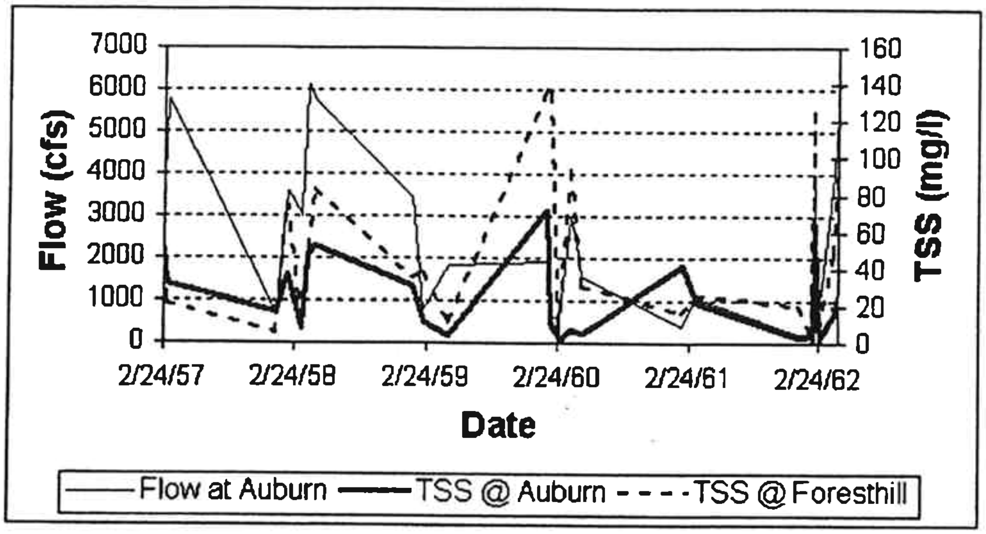
Discussion of Impacts

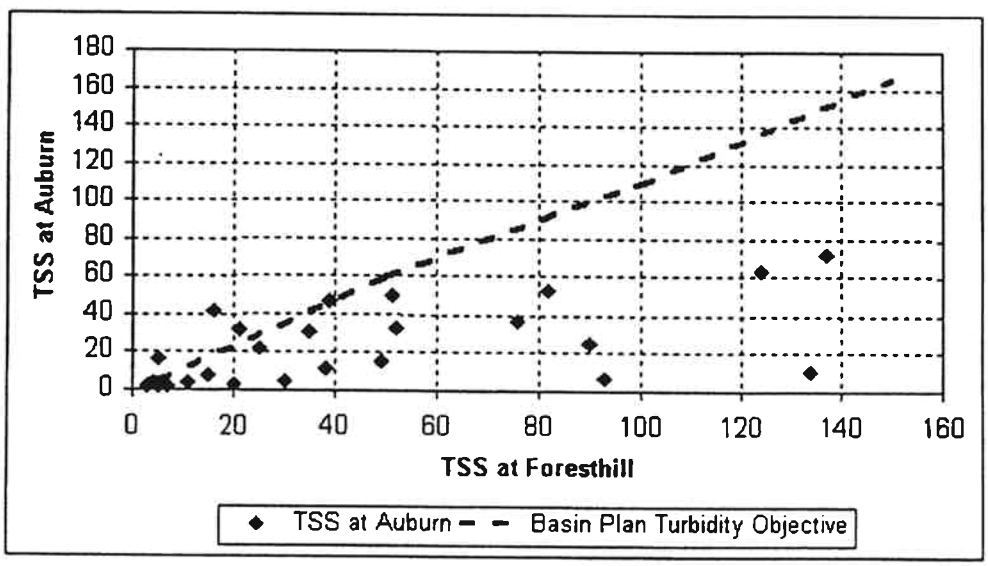
Hydraulic Modeling of Indian Bar Sediment Placement Project

Placement of sediments on Indian Bar will change sediment transport rates and geomorphological characteristics and conditions in the river near the disposal site. Mussetter Engineering Inc. (MEI) (2001) developed a 2-dimensional hydrodynamic model for the site to evaluate alternatives and design the project to result in effective entrainment of sediment materials that will be placed there. Modeling was conducted for streamflows of 3,500, 5,000, 8,000 cfs, and 105,000 cfs, which correspond to flow events with 1.3-, 1.6-, 2.2-, and 100-year return intervals, respectively. Analysis of streamflow records for the MFAR at Horseshoe Bar shows that 52 flow events exceeding 3,500 cfs have occurred between 10/1/65 and 9/30/84. The 2-D model that was developed provides detailed information on the depth and velocity of streamflow at 17 cross-sections along Indian Bar. Entrainment characteristics were evaluated using an assumed footprint for disposal consisting of 75,000 cubic yards of material placed to an average depth of about 15 ft above the existing ground surface.

Sediment material will be entrained when the shear stress, caused primarily by velocity of streamflow in the channel, exceeds the resistance to movement of the average size particles. Based on analysis of material deposited at the upstream end of Afterbay, the median size of sediment material that will be placed at Indian Bar is 80 millimeters (approximately 3¼ inches) (Bechtel 1997). When the shear stress increases with rising streamflow reach a sufficient level to move the average size particles, particles up to 5 times the size of the average particle can also be entrained. This phenomenon results because it takes less erosive energy to move larger particles once an entire mass of various-sized sediment particles begins to move.

MEI modeling results of potential sediment entrainment from Indian Bar are shown in figures 6 and 7 for the flow rates. The data indicate that the majority of entrainment would occur between cross sections 0.5 and 1.5 and between 2.5 and 4. The quantity of material entrained at the 3,500, 5,000, and 8,000 flow events would be 8,530, 12,020, and 16,580 cubic yards, respectively (Mussetter Engineering Inc. 2001). The 100-year flow would generally entrain most of the material at Indian Bar and leave only a thin deposit downstream of cross section 1.7. Raising the elevation of the pile





Source: Earth Info Inc. 1993

00297 00 (5/01)

Jones & Stokes

Figure 8
Flow and TSS in the Middle Fork of the American River

by 1 foot would add about 7% to the total amount of sediment that would be entrainable. Decreasing the size of the particles placed at Indian Bar by 50% would increase the entrainable portion only by 10 to 15% at the range of modeled flows. The material entrained from the site is expected to pass through the tunnel at Horseshoe Bar and into the downstream sections of the MFAR.

Limitations of hydrodynamic modeling make accuracy and reliability of modeling for higher flows less predictable. Therefore, modeling potential entrainment at a higher range of flows was not performed. Only a qualitative assessment of entrainment effects at higher flows is possible. Given the observations of effects at Indian Bar during the 1986 and 1997 flood events, it is reasonable to conclude that substantial quantities of the material placed on Indian Bar would be entrained at the infrequent high-flow-rate flood events. Discharges greater than 8,000 cfs will help to mobilize the edge of the disposed material at the upper end of the pile near Ralston Dam, but cannot be expected to entrain the entire placement (Mussetter Engineering Inc. 2000).

a. The construction components for the project including excavation of sediments from the upstream end of Afterbay and placement on Indian Bar would cause temporary and localized discharges of sediments to the river. This is one of the stated purposes of the project. Turbidity impacts in the reservoir should be relatively minor with the precautions PCWA will undertake. Discharges of eroded sediment and other construction-related substances (e.g., fuels, oils) during the low-flow construction season would be considered a significant impact. Contaminants that enter the water can increase turbidity, stimulate the growth of algae, increase sedimentation of aquatic habitat, and introduce compounds that are toxic to aquatic organisms. The potential for adverse environmental impacts depends on the erodibility of the sediment encountered, type of construction practice, extent and duration of disturbed area, and timing of precipitation, and proximity to the water.

   Long-term operations of sediment pass through (SPT) also have the potential to increase the concentration and duration of turbid water in the river during high flow events. When the low-level outlet gate is opened for SPT operation, a larger proportion of the fine suspended sediments being transported in the river will be transported downstream compared to the existing condition, where some settling and deposition occur in the reservoir. Although these sediments would normally be transported through the project area if the reservoir had not been constructed, exacerbating turbid water and TSS transport from existing conditions in exceedance of state water quality objectives would still be considered a significant impact. Long-term sediment disposal operations on Indian Bar would not significantly impair water quality because the material placed would be coarse cobble and gravel. These large-sized sediments do not contribute to the suspended sediment transport because they are entrained and transported only at high flows as bedload in the river. In order to avoid and minimize impacts from construction- and operations-related water quality impacts, PCWA would implement the following mitigation and monitoring measures:

Mitigation Measure. PCWA will implement standard erosion control and hazardous material spill prevention practices during the excavation and placement of sediments adjacent to the river as follows: Avoiding direct disturbance of standing or flowing water by constructing during the dry period of the year; establishing appropriate dewatering or setback areas; constructing low water crossings to avoid direct contact of equipment with water; and installing erosion control best management practices (BMPs) as required; preventing petroleum products, concrete, truck washing, asphalt or other coating materials, and other hazardous materials from contaminating the soil or entering surface waters. Equipment will be refueled in an area safely away from the water courses, and cleanup equipment will be available in the event of an accidental spill. Sediment would be placed during the summer and fall low-flow periods and above the waterline at the Indian Bar site. Consequently, no sediment placed at Indian Bar would enter the river until high winter flows as discussed in the project description.

PCWA will implement a comprehensive water quality monitoring plan for SPT operations and implement appropriate corrective measures if the monitoring data indicate that SPT causes violations of the state water quality objectives for turbidity. Appendix A describes the water quality monitoring plan. Automated turbidity monitors will be installed upstream and downstream of Afterbay. During SPT operations, the turbidity readings will be evaluated to determine whether there are statistically significant increases in turbidity between the downstream and upstream stations. In addition, baseline data will be collected when SPT is not being conducted to better characterize the background turbidity patterns and increase the ability to detect significant changes in turbidity attributable to water quality when SPT is operating. It is expected that the large variation in natural turbidity levels during storm events will make it difficult to detect small differences between the upstream and downstream monitoring stations. However, monitoring will be able to detect large differences should they happen to occur. If the monitoring data indicate that SPT operations are adversely impacting water quality, PCWA would implement corrective measures that could include reducing flow from the low level outlet, or stopping SPT operations until background water quality conditions are more favorable. It takes approximately 10 minutes to close the low-level outlet gate; therefore, the exposure of aquatic organisms to adverse conditions would be short if monitoring data indicate that water quality is being adversely affected.

b. The proposed project would not involve any change in groundwater recharge or use because it involves reservoir dredging and would not have an impact on a known aquifer.

c. Placement of excavated sediments at Indian Bar would temporarily reduce the existing channel area for conveyance of high flows. The reduced channel area would result in high flows passing the bar to have a higher average velocity than existing conditions and could cause erosion of native bank materials on either the north or south side of the river. However, the impact is considered less than significant because the express purpose of the project is to allow the fill material on the north side of the river to gradually be transported downstream during high flows. The south side of the river is a naturally resistant slab of bedrock. In addition, normal high flow events will gradually erode the placed material, and the channel area will return to pre-project conditions.

d. The project will place material in the MFAR floodplain and may temporarily change the flood conveyance capacity in the area immediately adjacent to the fill. The placement of material would reduce the channel area and thereby may increase the water depth during high flows compared to existing conditions. However, there is no increased risk of exposure to life or property because the area is an existing floodplain. There are several private mining operations downstream; however, they do not operate during high flows. Downstream of the fill, the flows would occupy the existing channel area and there would be no change in flow depth. In addition, the fill is designed to gradually be reduced by erosion and transport downstream; therefore, any changes in flood depth would gradually be reduced over the long-term. The impact is considered less than significant.

e. No impact. The project would not change the amount of runoff.

f. No impact. Potential water quality impacts are described under checklist question "a."

g. No housing would be placed in the floodplain.

h. Refer to checklist question "d."

i. There would be no change in the risk of loss, injury, or life from the proposed project. The Indian Bar site is within PCWA's FERC license boundary.

j. The project is not located in an area subject to tsunamis and would not involve any work that could affect risks from seiche or mudflow.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
IX.	**LAND USE AND PLANNING** - Would the project:				
a.	Physically divide an established community?	☐	☐	☐	■
b.	Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, a general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	■	☐
c.	Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	■	☐

Discussion of Impacts

a. The project site is located on lands designated as open space. Indian Bar area is located within the FERC boundary for the Middle Fork Project and within the TNF boundary. The proposed project will involve reservoir dredging. Implementation of the proposed project will not physically divide an established community and will not require the displacement or the relocation of any housing structures. Reservoir dredging and disposal are a compatible use as approved under a special use permit from the USDA Forest Service. Maintenance will not conflict with any habitat conservation plan.

b. Please see the response to "a" above.

c. Please see the response to "a" above.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
X.	**MINERAL RESOURCES** - Would the project:				
a.	Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	■
b.	Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan?	☐	☐	☐	■

Discussion of Impacts

a. The proposed project is not associated with any action that would result in the loss of availability of a known mineral resource that will be of value to the region and the residents of the state. The property is under a special use permit and PCWA is the sole user of the facility. Placing materials at Indian Bar will allow sediment to move downstream and will help replenish beach sand and support riparian habitat.

b. The proposed project is not associated with any action that would result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land-use plan.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
XI.	**NOISE** - Would the project:				
a.	Expose persons to or generate noise levels in excess of standards established in a local general plan or noise ordinance or applicable standards of other agencies?	❑	❑	■	❑
b.	Expose persons to or generate excessive groundborne vibration or groundborne noise levels?	❑	❑	■	❑
c.	Result in a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	❑	❑	■	❑
d.	Result in a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	❑	❑	■	❑
e.	Be located within an airport land use plan area, or, where such a plan has not been adopted, within two miles of a public airport or public use airport and expose people residing or working in the project area to excessive noise levels?	❑	❑	❑	■
f.	Be located in the vicinity of a private airstrip and expose people residing or working in the project area to excessive noise levels?	❑	❑	❑	■

Discussion of Impacts

a. Project-related activities would result in temporary increases in noise levels associated with the simultaneous operation of multiple pieces of construction equipment. Noise levels of the most noisy construction equipment will be 80–90 decibels (dBA) at a distance of 50 ft, assuming no noise-attenuating features. The nearest sensitive receptors are located at least 3 miles from the project site. Therefore, noise impacts are considered less than significant.

b. Please see the response to "a" above.

c. Please see the response to "a" above.

d. Please see the response to "a" above.

e. The proposed project is not located within the vicinity of a public airport or private airstrip. Consequently, there will be no impacts related to air traffic noise.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
XII.	**POPULATION AND HOUSING** - Would the project:				
a.	Induce substantial population growth in an area, either directly (e.g., by proposing new homes and businesses) or indirectly (e.g., through extension of roads or other infrastructure)?	❑	❑	■	❑
b.	Displace a substantial number of existing housing units, necessitating the construction of replacement housing elsewhere?	❑	❑	❑	■
c.	Displace a substantial number of people, necessitating the construction of replacement housing elsewhere?	❑	❑	❑	■

Discussion of Impacts

a. Project impacts are considered less than significant because the proposed project will not involve any changes to existing PCWA facilities or service capabilities that would induce direct or indirect unplanned growth.

b. The proposed project will not result in the displacement of any housing units or people. Consequently, there will be no population and/or housing impacts associated with the proposed project.

c. Please see the response to "b" above.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
XIII. PUBLIC SERVICES - Would the project:				
a. Result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities or a need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the following public services:				
Fire protection?	☐	☐	☐	■
Police protection?	☐	☐	☐	■
Schools?	☐	☐	☐	■
Parks?	☐	☐	☐	■
Other public facilities?	☐	☐	☐	■

Discussion of Impacts

a. The proposed project would have no effect on existing performance standards for local service providers or result in the need for new public services. However, it will have a potential benefit to the public by improving operations at Oxbow Powerhouse and improving power reliability and service to PCWA customers. Consequently, there will be no impacts on local public service providers.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
XIV. RECREATION - Would the project:				
a. Increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	■	☐
b. Include recreational facilities or require the construction or expansion of recreational facilities that might have an adverse physical effect on the environment?	☐	☐	☐	■

Setting

The MFAR downstream of Afterbay is a Class III and Class IV river. Whitewater rafting is popular on the MFAR from Oxbow Powerhouse down to Foresthill and at various points along the river, primarily during spring when flows are high, but rafting does take place throughout the summer. Revenue generated from whitewater rafting on the MFAR is an important source of income to the local economy in the Foresthill/Auburn region. Rafters and commercial rafting companies use the put-in at the Oxbow Powerhouse. Additional access points to this section of the river are limited to Drivers Flat Road, Mammoth Bar OHV Park, Foresthill Road, and private roads. The California Department of Parks and Recreation (DPR) maintains records of commercial rafting trips on the MFAR in the section from Oxbow Powerhouse to the Ruck-A-Chucky rapids. Private trips, or those trips that take out below Ruck-A-Chucky, are generally not captured in the survey results. In 1996 through 2000, DRP data show that commercial rafting companies took an annual average of 15,000 people on trips on the MFAR (Hamburger pers. comm).

Physical features and rapids of the MFAR that attract whitewater recreation include Tunnel Chute, Santa's Mustache, Big Sandy rapids, Punk Rock rapids, Kanaka Falls, Ruck-A-Chucky rapids, Chunder Falls, and other features downstream. This river section includes the infamous Tunnel Chute about 2.5 miles downstream of Ralston Dam that was created in the 1890s by goldminers who diverted the flow of the entire river, allowing them access to 1 mile of dewatered river bed and bars at Horseshoe Bar. The tunnel was the first bedrock tunnel cut through a river bend for mining purposes in California. As such, the Tunnel Chute is not a natural river feature. Over $2,500,000 worth of gold was mined from Horseshoe Bar.

A general concern was raised that the proposed project may have an effect on the whitewater rafting experience on the MFAR by altering or substantially changing the approaches or entrance to rapids including the popular Tunnel Chute, potentially causing public safety issues or making the approach to the tunnel more hazardous than it is today. Natural storm events in the past in the MFAR canyon have transported large boulders and changed the approach to Tunnel Chute and other rapids on the river, increasing the hazard level to rafters as well as decreasing the hazard in specific areas (Wollan pers. comm). To respond to this concern, individuals experienced in the rafting industry and knowledgeable about the river were contacted including Nate Rangel, Chuck Watson, Bill Center, and Bill Deitchman. Nate Rangel is the President of California Outdoors, headquartered in Coloma, and one of the owners and operators of Adventure Connection, a rafting company. As the long-time President of California Outdoors, he has served as a representative of the rafting industry. Chuck Watson is an experienced local whitewater rafter and river recreation consultant. Although not presently an outfitter on the MFAR, Bill Center used to raft on the MFAR. Bill Deitchman is a California State Park Ranger.

Discussion of Impacts

a. After review of the modeling reports and because of the size of material that will be placed at Indian Bar, and discussions with these individuals, it was determined that it is unlikely that the proposed project would have a significant adverse impact on the MFAR rafting experience for the following reasons: (1) the project is unlikely to substantially change the river's gradient because it is primarily controlled by the geologic and geomorphic characteristics of the bounding canyon, and (2) the size of the material being placed at Indian Bar is small relative to the types of materials that cause major changes in the rapids or entrances to rapids along the MFAR. The put-in near the Oxbow Powerhouse tailrace will not be affected by the proposed project.

River Gradient

The river's gradient over the 12.5 miles from Tunnel Chute to the end of the Ruck-A-Chucky rapids is about 300 ft in vertical elevation, which is equivalent to a drop of 24 ft per mile. The river drops about

28 ft per mile from Indian Bar to Tunnel Chute and about 27 ft per mile from Junction Bar to Tunnel Chute. The drop is only 19 ft per mile from the downstream end of Ruck-A-Chucky rapids to the confluence with the North Fork of the American River (North Fork) at the Highway 49 bridge near Auburn. Considering the fact that the river gradient is substantially higher in the segment above Tunnel Chute, the evidence is strong that the sediment eroded from Indian Bar will over time be carried through Tunnel Chute and on downstream, just as the hydraulic mining debris from the nineteenth century moved through this reach of river. The same movement of sediment in the 10-mile reach of the river between Ruck-A-Chucky and Highway 49 bridge will also occur because the river drops about 190 ft in vertical elevation in this reach.

The time required for the sediment transport to occur will depend on the frequency, length, and severity of high flows. The NMFAR joins the MFAR immediately upstream of Horseshoe Bar and is a substantial source of sediment input to the river. As a result of sediment input, the class designation of the Tunnel Chute rapids can change after high flow events have transported large sediment. For instance, between the flood of February 1986 and the flood of January 1997, the Tunnel Chute was classed as a class V–VI rapids, and the DPR recommended portage around the tunnel. After the Flood of January 1997, the Tunnel Chute rapids was reduced in difficulty to a class IV rapids and portage was no longer recommended. Consequently, with or without the project to place larger sediments on Indian Bar for subsequent entrainment in the river during high flow events, the class of the Tunnel Chute rapids may change. It is possible that between some high flow events and some floods, it may become a higher class rapids and make it prudent for most rafters to portage around the rapid. Subsequent floods could return it to a less difficult rapids not requiring portage.

It is expected that part of the sediment eroded from the Indian Bar site during storm flows will be deposited in those areas downstream of Indian Bar that have experienced some local incision and scour of the river bed, as described on page 1-4. Sediment that has been scoured from the river since the dam was constructed in 1963–1966 has passed through the Tunnel Chute and continued on downstream. No adverse effects on rafting have been reported from the scour and incising of the river downstream of Indian Bar over the last 20 years.

Sediment Size and Transport

One-dimensional hydraulic modeling was conducted for the federal Auburn Dry Dam Project several years ago (Ayres Associates 1997), and 2-dimensional hydraulic modeling and sediment transport analyses were conducted for this project (Mussetter Engineering Inc. 2001). These reports provide key information and insights on the sediment transport dynamics in the MFAR. A paper authored by one of the investigators (Harvey et al. 1995) presents the results of investigation and modeling of the MFAR from Horseshoe Bar to the proposed location of a dry, flood-storage-only dam at the site of the original Auburn Dam. This study was done because of concerns that were raised that the proposed dam would cause significant sediment deposition in the rivers upstream of the dam that would adversely affect environmental resources and recreational uses of both the North Fork and the MFAR. However, the study found that because of the relatively small watershed sediment yield (in comparison to other rivers) and the high transport capacity of the flows, in-channel sedimentation was highly unlikely to occur as a result of construction of a dry dam.

The study points out a major constriction in the MFAR at the present location of the Ruck-A-Chucky rapids resulting from construction activities for the previously proposed Ruck-A-Chucky Debris Dam in 1940. The article states, "In contrast to the North Fork, most of the hydraulic mining debris has been flushed out of the MFAR since the planned Ruck-A-Chucky dam was never completed." The huge rocks and material from the massive slope failure caused "landslide rapids" adjacent to and immediately upstream of the Ruck-A-Chucky rapids and falls. The massive slope failure that occurred during the early, aborted attempt to build this dam also created the pool beginning on the upstream end of the landslide rapids. The modeling and analysis indicated that this pool traps significant quantities of sediment during high flows.

The modeling conducted for this project (Mussetter Engineering Inc. 2001) reported that the field observations indicate that the existing sediment load in the MFAR upstream of the Tunnel Chute is passed through the tunnel. In addition, based on the results of previous studies performed for the U.S. Army Corps of Engineers (Ayres Associates 1997), it is predicted that coarse sediments eroded from Indian Bar will be carried downriver and will temporarily settle in depositional areas identified near Volcano Creek (4.5 miles downstream), Ford's Bar and Otter Creek (11.5 miles downstream), Canyon Creek (14.5 miles downstream), Cherokee Bar (17 miles downstream), Mammoth Bar (23 miles downstream), and Louisiana Bar (25 miles downstream). The sediment deposition in the pools is transient. Accumulation of sediment reduces the energy loss in the pool and thereby increases the local hydraulic gradient that in turn increases the sediment transport capacity of the flows. This negative feedback system ensures that the sediment deposited in the pools will eventually be flushed downstream, thereby preserving sediment continuity in the river.

Therefore, based on these lines of evidence, it is predicted that impacts to rafting on the MFAR would be less than significant.

b. The proposed project will not include the development of any new recreation facilities that will have a beneficial or adverse physical effect on the environment; nor will it cause any direct immigration (population increase) that will increase the use of or demand for existing recreational facilities.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
XV. TRANSPORTATION/TRAFFIC - Would the project:				
a. Cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in the number of vehicle trips, the volume-to-capacity ratio on roads, or congestion at intersections)?	☐	☐	■	☐
b. Cause, either individually or cumulatively, exceedance of a level-of-service standard established by the county congestion management agency for designated roads or highways?	☐	☐	■	☐
c. Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	■	☐
d. Substantially increase hazards because of a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	■	☐
e. Result in inadequate emergency access?	☐	☐	■	☐
f. Result in inadequate parking capacity?	☐	☐	☐	■
g. Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	■

Discussion of Impacts

a. Project-related activities will require only a limited amount of equipment at any 1 time and only at times related to construction. Equipment will be parked off the road at the end of each work day. Project-related traffic is not anticipated to substantially increase traffic volumes. Adequate signage will be placed to warn passing motorists about the construction activities.

b. Please see the response to "a" above.

c. The proposed project is not located within the vicinity of a public airport or private airstrip and will not affect existing air traffic patterns. Consequently, there will be no impacts related to air traffic.

d. Please see the response to "a" above.

e. Please see the response to "a" above.

f. Please see the response to "a" above.

g. Please see the response to "a" above.

		Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
XVI.	**<u>UTILITIES AND SERVICE SYSTEMS</u>** - Would the project:				
a.	Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	■	☐
b.	Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	■
c.	Require or result in the construction of new stormwater drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	■
d.	Have sufficient water supplies available to serve the project from existing entitlements and resources, or would new or expanded entitlements be needed?	☐	☐	☐	■
e.	Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	■
f.	Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	■
g.	Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	■

Discussion of Impacts

a. The proposed project will not involve any attributes or environmental impacts that will result in the need for new infrastructure or require an expansion of existing wastewater facilities.

   Precautions will be taken to reduce the amount of sediment transported downstream into generation facilities and to prevent a disruption in service. Consequently, project impacts on utilities and service systems are considered less than significant.

b. No impact. The project will ensure that the Ralston Powerhouse will operate efficiently and without interruption caused by sedimentation. Please see the response to "a" above.

c. No impact. The project involves placement of culverts in the reservoir to remove sediment. No new stormwater facilities are being proposed. Please see the response to "a" above.

d. No impact. Not relevant to the project. Please see the response to "a" above.

e. No impact. Not relevant to the project. Please see the response to "a" above.

f. No impact. No solid waste would be generated by the project. Please see the response to "a" above.

g. No impact. Please see the response to "f" above.

	Potentially Significant Impact	Less than Significant with Mitigation Incorporated	Less-than-Significant Impact	No Impact
XVII. MANDATORY FINDINGS OF SIGNIFICANCE				
a. Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal, or eliminate important examples of the major periods of California history or prehistory?	☐	☐	■	☐
b. Does the project have impacts that are individually limited but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	☐	☐	■	☐
c. Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	■	☐

Discussion of Impacts

a. Although no evidence indicates the existence of any surface cultural resource that will be affected by the proposed project, it is possible that significant buried cultural resources could be exposed during dredging and disposal. These impacts are considered less than significant because, as documented in chapter 2, "Project Description," construction specifications designed to protect cultural resources have been incorporated into the project.

b. PCWA has implemented several sediment removal projects in the past (1969, 1986, 1987, 1994, and 1995) that have had minimal impacts on the river and reservoir. Future projects include a proposed switchyard protection project. The proposed project will result in short-term impacts that have all been reduced to less-than-significant levels. When combined with the impacts of other PCWA maintenance projects, these impacts may increase the magnitude of the short-term impacts. Cumulative impacts are considered less than significant, however, because of the construction specifications that have been incorporated into the project to minimize environmental impacts, and because the impacts are relatively small compared to their overall regional context (e.g, order of magnitude difference in sediment load).

c. As described throughout the preceding checklist sections, the proposed project will not result in any environmental impacts that would cause substantial adverse effects on human beings, either directly or indirectly.

Chapter 4
References Cited

Printed References

Abrams, L., and R. S. Ferris. 1960. *Illustrated flora of the Pacific states.* Stanford, CA: Stanford University Press.

Airola D. A., and N. Shubert. 1981. Reproductive success, nest site selection and management of ospreys at Lake Almanor, California. *Cal-Neva Wildlife Transactions* 1981:79–85.

Ayres Associates. 1997. *American and Sacramento River, California Project. Geomorphic, Sediment Engineering, and Channel Stability Analyses, Final Report.* Prepared for U.S. Army Corps of Engineers, Sacramento District, DACW05-93-C-0045. Sacramento, CA.

Bechtel Corporation. 1997. Geotechnical and Hydraulic Engineering Services. *Sediment Study of Ralston Afterbay Reservoir.* Final Report. Prepared for Placer County Water Agency. San Francisco, CA..

Buck, S. 1982. Habitat utilization by fisher (*Martes pennanti*) near Big Bar, California. M. S. thesis. Humboldt State University. Arcata, CA.

California Department of Conservation. 1999. Fault-rupture hazard, Alquist-Priolo Earthquake Fault Zoning Act with index to earthquake fault zones maps. Division of Mines and Geology. Sacramento, CA.

California Department of Fish and Game. 1997. Annual report on the status of California state listed threatened and endangered plants and animals. Sacramento, CA.

__________. 1980. At the crossroads: a report on the status of California's endangered and rare fish and wildlife. Sacramento, CA.

__________. 1992. 1991 annual report on the status of California state-listed threatened and endangered animals and plants. Sacramento, CA.

__________. 2000. Natural Diversity Data Base records search for 7.5-minute U.S. Geological Survey quadrangles. Sacramento, CA. Unpublished data.

__________. 2001. Natural Diversity Data Base records search for 7.5-minute U.S. Geological Survey quadrangles. Sacramento, CA. Unpublished data.

California Native Plant Society. 2000. *California Native Plant Society's inventory of rare and endangered vascular plants of California.* 6th edition. Sacramento, CA.

Central Valley Regional Water Quality Control Board. 1998. Water quality control plan (basin plan) for the Central Valley region, Sacramento River and San Joaquin River Basins. Sacramento, CA.

Clark, T. W., E. Anderson, C. Douglas, and M. Strickland. 1987. *Martes americana*, Mammal. Species No. 289. 8pp.

EA Engineering, Science, and Technology. 1990. Preliminary feasibility analysis of alternative sediment management options for Ralston Afterbay Reservoir. Prepared for Placer County Water Agency, Lafayette, CA.

EarthInfo, Inc. 1993. U.S. Geological Survey Quality of Water, West 1 Surface Water. Boulder, CO.

Ehrlich, P. R., D. S. Bobkin, and D. Wheye. 1988. *The birder's handbook: a field guide to the natural history of North American birds.* New York: Simon and Schuster.

Environmental Protection Agency. 1991. Monitoring guidelines to evaluate effects of forestry activities on streams in the Pacific Northwest and Alaska. Water Division, Region 10, EPA/910/9-91-001. Seattle, WA.

J&S 00297

Freel, M. 1991. A literature review for management of fisher and marten in California. U.S. Forest Service, Pacific Southwest Region. Unpublished document. 18pp.

Gaines, D. 1988. *Birds of Yosemite and the east slope.* Lee Vining, CA: Artemisia Press.

Grinnel, J., and A. H. Miller. 1944. *The distribution of the birds of California.* Berkeley, CA: Casper Ornithological Club.

Hall, P. A. 1984. Characterization of nesting habitat of goshawks (*Accipiter gentilis*) in northwestern California. M.S. thesis. Humboldt State University. Arcata, CA.

Harris, J. H., S. D. Sanders, and M. A. Flett. 1988. The status and distribution of the willow flycatcher in California, 1986. (Administrative Report 87-2.) California Department of Fish and Game, Wildlife Management Branch, Sacramento, CA.

Harris, S. W. 1991. *Northwestern California birds.* Arcata, CA: Humboldt State University Press.

Hart, J. D. 1978. *A companion to California.* New York: Oxford University Press.

Harvey, M., B. Mussetter, and E. Sing. 1995. *Assessment of dam impacts on sediment transport in a steep mountain stream.* Proceedings Fifteenth Annual USCOLD Lecture Series, May 15–19, 1995. United States Society on Dams, Committee on Large Dams. Denver, CO.

Hayes, M.P., and M. R. Jennings. 1988. Habitat correlates of distribution of the California red-legged frog (*Rana aurora draytonii*) and the foothill yellow-legged frog (*Rana boylii*): implications for management. Pages 144–158 in R. C. Szaro, K. E. Severson, and D. R. Patton (eds.), Proceedings of the symposium on the management of amphibians, reptiles, and small mammals in North America (General Technical Report RM-166.) U.S. Forest Service, Washington, DC.

Hickman, J. C. (ed.) 1993. The Jepson manual: higher plants of California. Berkeley, CA: University of California Press.

Holland, R. F. 1986. Preliminary description of the terrestrial vegetation of California. California Department of Fish and Game, Sacramento, CA.

Hoover, M. B., H. E. Rensch, E. G. Rensch, and W. N. Abeloe. 1990. Historic spots in California. Revised by D. E. Kyle. Stanford, CA: Stanford University Press.

Hydrosphere Data Products, Inc. 2000. *Hydro data 2000.* Boulder, CO.

Jennings, M. R., and M. P. Hayes. 1994. Amphibian and reptile species of special concern in California. Final report. Prepared for Inland Fisheries Division, California Department of Fish and Game, Rancho Cordova, CA.

Kondolf, G. M., and M.G. Wolman, 1993. The sizes of salmonid spawning gravels. *Water Resources Research,* 29:2275–2285; in "Assessment of Potential for Flushing Sediments Released from South Fork Long Canyon Diversion Dam", report submitted to PCWA August 15, 1996.

Kondolf, G. M., and W.V.G. Matthews, 1993. Management of Coarse Sediment in Regulated Rivers of California. University of California Water Resources Center, Riverside. Report No. 80.

Kroeber, A. L. 1925. *Handbook of the Indians of California*. New York: Dover Publications.

Kunkle, S. H., and G. H. Comer. 1971. Estimating suspended sediment concentration in streams by turbidity measurements. *Journal of Soil and Water Conservation* 26(1):18–20.

Lehman, R. N. 1979. A survey of selected habitat features of 95 bald eagle nest sites in California. (Administrative Report 79-1.) California Department of Fish and Game, Wildlife Management Branch, Sacramento, CA.

Meslow, E. C., and H. M. Wight. 1975. Avifauna and succession in Douglas-fir forests of the Pacific Northwest. Pages 266–271 in D. R. Smith (tech. coord.), Management of forest and range habitats for nongame birds. Proceedings of a symposium May 6–9, 1975, Tucson, AZ. (General Technical Report WO-1.) U.S. Forest Service, Washington, DC.

Mussetter Engineering. 2001. Technical Memorandum, Indian Bar Sediment Disposal Site Study. Prepared for Placer County Water Agency. Fort Collins, CO.

Parfitt, D., and K. Buer, 1980. Upper Sacramento River Spawning Gravel Study. California Department of Water Resources, Northern Division, Red Bluff.

Rackerby, F. E. 1965. The archaeology of the Middle Fork American River project, Placer County, California. Report on a joint archaeological project carried out under terms of a contract between Frederic Burk Foundation for Education and the Placer County Water Agency.

Remsen, J. V. 1978. Bird species of special concern in California. California Department of Fish and Game. Sacramento, CA.

Reynolds, R. T., R. T. Graham, M. H. Reiser, R. L. Bassett, P. L. Kennedy, D. A. Boyce, Jr., G. Goodwin, R. Smith, and E. L. Fisher. 1992. Management recommendations for the northern goshawk in the southwestern United States. (General Technical Report RM-217.) U.S. Forest Service, Rocky Mountain Forest and Range Experiment Station, Ft. Collins, CO.

Saunders, L. B. 1982. Essential nesting habitat of the goshawk (*Accipiter gentilis*) in the Shasta-Trinity National Forest, McCloud District. U.S. Forest Service, Shasta-Trinity National Forest, Redding, CA.

Schempf, P. F., and M. White. 1977. Status of six furbearer populations in the mountains of northern California. U.S. Forest Service, San Francisco, CA. 51pp.

Sawyer, J. O., and T. Keeler-Wolf. 1995. *A manual of California vegetation*. Sacramento, CA: California Native Plant Society.

Shipley, W. F. 1978. Native languages of California. Pages 80–90 in R. F. Heizer (ed.), *Handbook of North American Indians*, Volume 8, California. Washington D.C.: Smithsonian Institution.

Shuster, W. C. 1980. Northern goshawk nest site requirements in the Colorado Rockies. *Western Birds* 11:89–96.

U.S. Forest Service. 1993. California spotted owl Sierran Province interim guidelines environmental assessment. 87 pp.

Verner, J., K. S. McKelvey, B. R. Noon, R. J. Gutierrez, G. I. Gould, Jr., and T. W. Beck. 1992. The California spotted owl: a technical assessment of its current status. (General Technical Report PSW-GTR-133.) U.S. Forest Service, Pacific Southwest Research Station, Albany, CA. 285pp.

Williams, D. F. 1986. Mammalian species of special concern in California. (Administrative Report 86-1.) California Department of Fish and Game, Wildlife Management Branch. Sacramento, CA.

Wilson, N. L., and A. H. Towne. 1978. Nisenan. Pages 387–397 in R. F. Heizer (ed.), *Handbook of North American Indians*, Volume 8, California. Washington DC.: Smithsonian Institution.

Zeiner, D. C., W. F. Laudenslayer, Jr., K. E. Mayer, and M. White. 1990. *California's wildlife*. Vol.I—amphibians and reptiles; Vol. II—birds; Vol. III—mammals. California Department of Fish and Game. Sacramento, CA.

Personal Communications

Smith, Nolan. Archaeologist. Tahoe National Forest, Foresthill District. January 16, 2001—e-mail message to Andrea Gueyger.

Hamburger, Harlan. U.S. Forest Service, Tahoe National Forest. July 10, 2001—telephone conversation with Jeff Lafer. Foresthill, CA.

Hiscox, John, Mike Meinz, and Ron Perrault. Fisheries Biologists. California Department of Fish and Game. February 8, 2001—discussion regarding fisheries issues at field meeting.

Wollan, Otis. Board Member. Placer County Water Agency Board of Directors. June 8, 2001—discussion with Doug Brewer and Steve Jones at PCWA board meeting. Auburn, CA.

Chapter 5
List of Preparers

This draft IS/MND has been prepared for Placer County Water Agency by Jones & Stokes. The individuals who contributed to this document are listed below.

Placer County Water Agency

Stephen J. Jones	Project Manager
Jon Mattson	Hydro Engineer

Jones & Stokes

Douglas Brewer	Principal-in-Charge
Simon Page	Project Manager
Bill Mitchell	Biological Resources
Brad Schafer	Biological Resources
Todd Sloat	Biological Resources
Jeff Lafer	Hydrology and Water Quality
Andrea Gueyger	Cultural Resources
Eric Berntsen	All Other CEQA Issues
Christy Anderson,	
Peter Mundwiller	Graphic Artists
Jennifer Whitton	Publications Specialist

Appendix A

Water Quality and Aquatic Resources Monitoring Plan for the Ralston Afterbay Sediment Pass Through Project

Appendix A

Water Quality and Aquatic Resources Monitoring Plan for the Ralston Afterbay Sediment Pass Through Project

Executive Summary

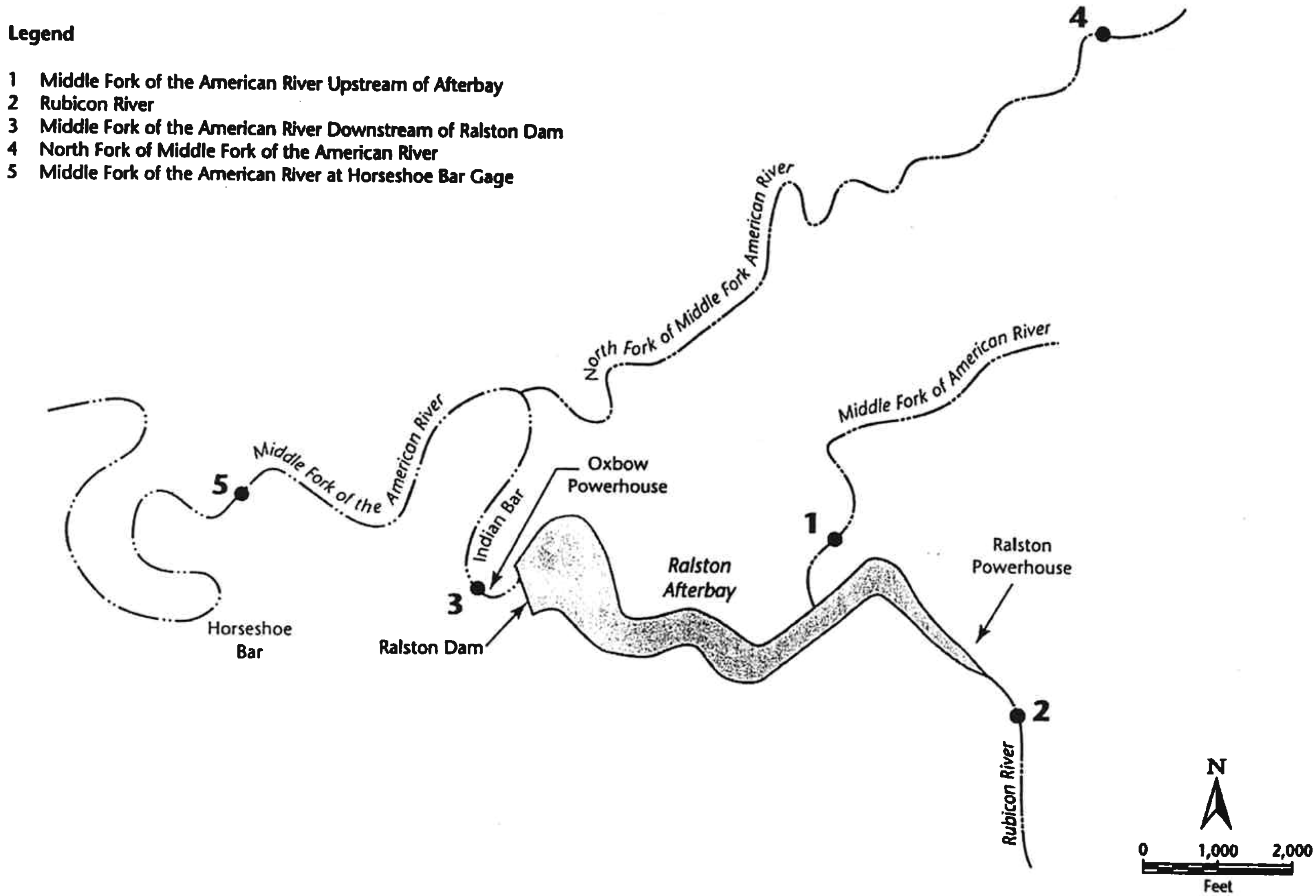
The purpose of this monitoring plan is to evaluate the potential effects of Placer County Water Agency's (PCWA's) proposed sediment pass through (SPT) operations at Ralston Dam and sediment disposal at Indian Bar on water quality and aquatic habitat in the Middle Fork American River (MFAR) downstream of Ralston Dam (figure 1). Water quality may be affected by changes in the concentrations, timing, or patterns of suspended sediment in the MFAR. Potential biological impacts of the project may result from changes in the quantity and quality of aquatic habitat associated with increases in the amount of fine sediment released from the reservoir during SPT operations. PCWA will use the results of the monitoring program to evaluate project performance with respect to established monitoring objectives, and implement appropriate corrective measures if the data indicate that the project is adversely affecting beneficial uses.

The monitoring program consists of 3 major monitoring components: water quality, aquatic habitat, and benthic macroinvertebrate (BMI) monitoring. The monitoring plan includes collection of pre-project (i.e., baseline) and post-project data on several key water quality, aquatic habitat, and biological parameters. Sampling locations will be established in selected stream reaches upstream and downstream of the reservoir (control and treatment reaches, respectively) to facilitate detection of project effects. Potential project-related effects will be evaluated through analysis and comparison of pre- and post-project data from the treatment and control reaches. An

adaptive monitoring strategy is proposed to address significant uncertainty related to large natural variation in sediment dynamics and a general lack of pre-project data on water quality and habitat conditions in the MFAR. Adaptive monitoring will include regular analyses of the data to evaluate the monitoring program and determine whether any changes in the program will improve its overall performance relative to the specific program objectives, subject to time and budget constraints. In addition, the monitoring program will rely on concurrent watershed monitoring programs and assessments to identify and evaluate the potential effects of other sediment sources on water quality and habitat conditions in the affected reaches. Periodic bathymetric surveys of Ralston Afterbay Reservoir (Afterbay) sediments are recommended as an optional task to monitor changes in reservoir sediment storage and provide a measure of the relative contribution of the reservoir to downstream sediment supplies. This information will be particularly valuable in assessing project effects if a large sediment deposition event occurs downstream of Afterbay.

The specific objectives, sampling design, field methods, data analysis, data management, and reporting activities are described in detail in the monitoring plan. Tables 1 and 2 summarize the sampling locations, parameters, and schedules for each component. The proposed timing, duration, and frequency of monitoring activities vary among the 3 major components according to specific data needs. Pre-project water quality, habitat, and BMI data collection should begin this year (2001–2002). A sufficient amount of data are needed to adequately characterize background variability in the monitored parameters and provide a meaningful basis for detecting potential project effects. At least 5–7 storm events, similar in size for operating SPT, are needed to adequately characterize pre-project water quality conditions. It is anticipated that sufficient water quality data could be obtained in 1 year of pre-project monitoring. A minimum of 2–3 years of pre-project aquatic habitat and BMI monitoring is proposed. A longer period of pre-project monitoring is required for aquatic habitat and BMI data collection compared to the water quality component because seasonal variability must be characterized better downstream in the MFAR where potential project-related effects could occur. Ideally, pre-project monitoring should focus on years in which flows reach levels that would trigger SPT operations and/or cause substantial mobilization of fine sediment in the MFAR.

Post-project water quality, aquatic habitat, and BMI monitoring should be conducted for a minimum of 2 years. The number and frequency of pre- and post-project monitoring years will be subject to change depending on the project schedule, the occurrence of SPT–triggering flows, and potential



00297.00 001

Jones & Stokes

Figure 1
Water Quality Monitoring Stations

Table 1. Summary of Water Quality Monitoring Locations, Schedule, and Methods

		Constituents Monitored & Frequency of Activity		
		Total Suspended Solids (Grab Samples Only [1])	Turbidity	
Monitoring Locations	Schedule of Sampling Activities		Grab Samples [1]	Automated [2]
Rubicon River Upstream from Ralston Powerhouse	Year 1 pre-project monitoring	X		X
	Year 2 & 3 monitoring	X		X
	After year 3 follow-on monitoring	X (as needed)		X (as needed)
MFAR Upstream from reservoir at bridge	Year 1 pre-project monitoring	X	X	
	Year 2 & 3 monitoring	X (as needed)	X (as needed)	
MFAR Upstream from Oxbow Powerhouse tailrace	Year 1 pre-project monitoring	X	X	
	Year 2 & 3 monitoring	X (as needed)	X (as needed)	
North Fork of the MFAR at bridge	Year 1 pre-project monitoring	X	X	
	Year 2 & 3 monitoring	X (as needed)	X (as needed)	
MFAR at Downstream gage house	Year 1 pre-project monitoring	X		X
	Year 2 & 3 monitoring	X		X
	After year 3 follow-on monitoring	X (as needed)		X (as needed)

[1] Grab samples for turbidity and total suspended solids (TSS) will be collected at a minimum of 4-hour intervals during storm events when water level is rising and starting when streamflow is 3,000 cfs or greater. Sampling should be targeted to include sufficient storm events that provide data from as wide a range of high streamflows as possible. Sampling in successive years should be targeted at storm events that generate flow conditions similar to those sampled during the pre-project monitoring.

[2] Automated turbidity probe and telemetry system can be adjusted as needed based on available battery power. Data will be monitored during storm events and downloaded by telemetry at a minimum of 4-hour intervals. Turbidity recorders need be used only during storm events and at a frequency sufficient to generate at least 70 samples per year. Sampling should be targeted to include sufficient storm events that provide data from as wide a range of streamflows in excess of 3,000 cfs as possible. Sampling in successive years should be targeted at storm events that generate similar flow conditions similar to those sampled during the pre-project monitoring.

changes in the monitoring program in response to new information. Post-project monitoring will be conducted in each year during (water quality monitoring) and following (aquatic habitat and BMI monitoring) the occurrence of an SPT event. Because SPT operations will probably not occur every year, it may be necessary to wait several years to complete post-project monitoring. Additional monitoring during the intervening years may be warranted. The effects of Indian Bar sediment disposal will be monitored concurrently with SPT monitoring. Because sediment disposal at Indian Bar is designed to increase the amount of coarse sediment in the river, no adverse effects on water quality or aquatic habitat are expected.

Table 2. Summary of Aquatic Habitat and BMI Monitoring Locations, Activities, and Schedules

Monitoring Reach	Purpose	Aerial Survey and Monitoring Reach Selection	Monitoring Site Selection	Field Measurements
Rubicon River upstream of Ralston Powerhouse	Control for SPT operations			
MFAR upstream of Afterbay	Control for SPT operations			
MFAR between Ralston Dam and North Fork of the MFAR	Treatment for SPT operations and Indian Bar sediment disposal	Conduct in first year of pre-project monitoring period and in subsequent years only if warranted	Conduct in first year of pre-project monitoring period and in subsequent years only if warranted	Sample in 2–3 pre-project years and 2–3 post-project years following each occurrence of SPT operations. Schedule subject to change depending on project schedule, the occurrence of SPT–triggering flows, and adaptive monitoring
MFAR between North Fork of the MFAR and Horseshoe Bar	Treatment for SPT operations and Indian Bar sediment disposal			
North Fork of the MFAR	Control for SPT operations and Indian Bar sediment disposal			
MFAR downstream of Horseshoe Bar	Treatment for SPT operations			

Introduction

PCWA proposes to reoperate Ralston Dam at flows exceeding 3,500 cubic feet per second (cfs) to provide for passing sediments through an existing low-level outlet gate. SPT operations are designed to allow primarily the fine sediments that are smaller than sand-sized particles to continue downstream. Currently, during a storm event, the majority of these sediments pass over the dam's spillway, and a smaller portion is deposited in the reservoir. The deposited sediments could eventually fill the reservoir. In addition, PCWA proposes to excavate approximately 75,000 cubic yards (yds) of coarse cobble and sediment that has accumulated at the upstream end of the reservoir and place it at Indian Bar located along the south river bank immediately downstream of Ralston Dam. The project is designed to allow the material placed at Indian Bar to gradually be entrained during high flow events and transported downstream to increase the amount of coarse sediment in the river that is available for aquatic habitat.

Preliminary analyses indicate that the proposed project will not cause significant adverse effects on aquatic resources in the MFAR. SPT operations and sediment disposal at Indian Bar are expected to result in relatively small, temporary increases in turbidity and suspended sediment above ambient levels during high flow events. In addition, past analyses and modeling of the hydraulic and sediment transport characteristics of the MFAR indicate the channel is inherently stable and, therefore, relatively insensitive to changes in discharge and sediment supply (Harvey pers. comm.). The introduction of coarse sediments (gravel and cobble) from the Indian Bar disposal site to the river during high flows is expected to have beneficial effects on aquatic resources.

Uncertainty and Adaptive Monitoring

Significant uncertainty exists as to whether and to what degree the water quality and biological monitoring program will be able to detect environmental changes resulting from the proposed project, particularly if these changes are small relative to natural environmental variability. Factors influencing the ability to detect project effects include large natural variation in suspended and bedload sediment transport in the MFAR, the presence of confounding factors that limit the isolation and identification of cause and effect relationships, and a general lack of pre-project data. Detecting the effect of a given management activity on water quality and habitat parameters requires a demonstration that the change lies outside the normal range of the variable and that the change is attributable to the project in question. Thus, sufficient pre-project data are required to properly characterize pre-project conditions and provide a meaningful basis for detecting project effects. In addition, because habitat monitoring stations will be located downstream of the project area and will be influenced by other sediment sources (North Fork of the MFAR [NMFAR]) and smaller tributaries), establishing a link between observed changes and the project may be difficult. Consequently, an adaptive monitoring strategy will be used to provide flexibility and allow the monitoring program to change in response to new information. Accordingly, monitoring data will be analyzed regularly to evaluate the monitoring program and determine whether any modifications can be made to improve the program's overall effectiveness within time and budget constraints.

For large river basins like the MFAR, the amount of suspended sediment carried in the river will depend on a number of hydrologic and hydraulic characteristics as well as the source of sediment. Particles larger than 1.0 millimeter (mm) typically travel as bedload sediment close to or on the bottom; particles less than 0.1 mm generally travel suspended in the water as total suspended solids (TSS); particles between 0.1 mm and 1.0 mm may travel as either bedload or TSS. Sediment sources include organic litter on the soil surface, soil erosion, landslides and other mass wasting of debris, and scouring of existing channel substrate. Sediment transport will vary during a storm in relation to rainfall, runoff, and streamflow conditions. As streamflow increases during a storm, the TSS load and associated turbidity carried in the flow will rise and then typically decrease as the storm passes and streamflow starts to recede (Environmental Protection Agency 1991). Bedload sediment may be mobilized and transported only during extremely high and infrequent flows. The MFAR has sufficient gradient and hydraulic energy to transport sediment at a faster rate than the natural rate of sediment input from watershed sources (Harvey pers. comm.). Consequently, there is very little deposition of sediment in the high gradient reaches of the river.

Potential sources of sediment transport to Afterbay vary in space and time and include the Rubicon and MFAR upstream of the reservoir. The project area that may be affected by the proposed project also includes the MFAR downstream of Ralston Dam. Additional sources of sediment to the project area include sediments residing in the Afterbay, the NMFAR, smaller tributaries downstream of the NMFAR, and the downstream slopes of the MFAR canyon. Given the large watershed area and variability in flows and erosion rates, background variation in sediment transport is expected to be large. Bathymetric surveys of Afterbay indicate that about 1,205,000 yds of course and fine sediments currently reside in the reservoir (Bechtel Corporation 1997). The estimated annual rate of accumulation since 1966 was estimated at 56,000 yds annually (EA Engineering, Science, and Technology 1990); however, a more recent evaluation indicates that the annual rate between 1987 and 1995 was only 36,250 yds (Bechtel Corporation 1997). It was presumed that the higher rate in previous years was a result of residual contribution of sediments to MFAR from the 1964 failure of Hell Hole Dam, which released large quantities of sediment to the river (Bechtel Corporation 1997). Current estimates of annual sediment transport in the MFAR downstream of Afterbay from natural sources are about 11,000 cubic yds of bedload sediment and 18,000 cubic yds of suspended sediment annually (Ayres Associates 1997). Field observations indicate that there is no accumulation of sediment upstream of the tunnel at Horseshoe Bar, suggesting that the existing sediment load passes through the tunnel (Mussetter Engineering, Inc. 2001).

The quantity of material proposed to be placed at Indian Bar is approximately 75,000 yds. It is unknown how much fine sediment will be transported downstream during SPT operations; however, only about 20% of the total amount of suspended sediment reaching Afterbay is currently estimated to be deposited in the reservoir (Ayres Associates 1997). Consequently, the amount of sediment affected by the proposed project is a relatively small amount of the total amount transported in the river. Additionally, not all of the sediment stored in Afterbay or placed at Indian Bar will be transported in any 1 year, so the potential for project-related effects will most likely be further reduced relative to the existing annual sediment transport rates in the river.

Water quality monitoring is subject to less uncertainty than habitat monitoring because of the presence of pre-project water quality data and because project effects on suspended sediment can be isolated more effectively using appropriate sampling locations. Suspended sediment transport can be evaluated on a single-event basis, and preceding storm events do not necessarily affect results of subsequent sampling events. Channel and substrate conditions, however, exhibit higher spatial and temporal variability that is unrelated to project effects and reflects the effects of past events. Consequently, habitat changes that may occur as a result of the proposed project will be more difficult to distinguish from natural background variation. To improve the ability to detect project effects, habitat monitoring will be conducted using a paired sampling approach whereby selected habitat parameters are measured at treatment sites downstream of the project area and at control sites outside the project's influence (major sediment sources upstream of the treatment sites) before and after project implementation. Additional uncertainty will be addressed by employing adaptive monitoring and using information from other watershed monitoring programs and assessment to evaluate the SPT effects relative to the effects of other potential sediment sources.

Water Quality Monitoring

Objectives

The water quality monitoring program is designed to identify compliance with the water quality objectives established by the Central Valley Regional Water Quality Control Board (RWQCB) in the Water Quality Control Plan (Basin Plan) (Regional Water Quality Control Board 1998). The Basin Plan objectives constitute allowable changes in water quality from project-related disturbances. Therefore, the main objectives of the monitoring program include quantifying water quality differences between sampling stations located upstream and downstream of Afterbay, and ensuring that project-related changes in TSS and turbidity do not exceed the applicable Basin Plan water quality objectives. The water quality monitoring program will be most useful for evaluating project-related effects from SPT operations. SPT operations have a greater likelihood of affecting fine sediment transport that travels as suspended material because coarse material settles out at the upper end of the reservoir. Placement of reservoir sediments at Indian Bar is presumed to have little effect on background concentrations of suspended sediment because excavated reservoir sediments will consist mostly of coarse material that would be transported as bedload. The effects of the project on the coarser material traveling as bedload sediment will be addressed by the habitat monitoring program.

The RWQCB Basin Plan includes numerical water quality objectives for turbidity; however, there are no numerical standards for TSS. The narrative water quality objective for suspended sediment states that the load and discharge rate shall not be altered in such a manner as to cause nuisance or adversely affect beneficial uses. The turbidity water quality objectives vary in relation to the background levels as follows:

- where natural turbidity is between 5 and 50 nephelometric turbidity units (NTUs), increases shall not exceed 20%;
- where natural turbidity is between 50 and 100 NTUs, increases shall not exceed 10 NTUs; and
- where natural turbidity is greater than 100 NTUs, increases shall not exceed 10%.

Based on limited TSS data available for the MFAR, background conditions may vary considerably during storm events and all 3 ranges of the numerical turbidity objectives may apply to the proposed project.

Monitoring Parameters

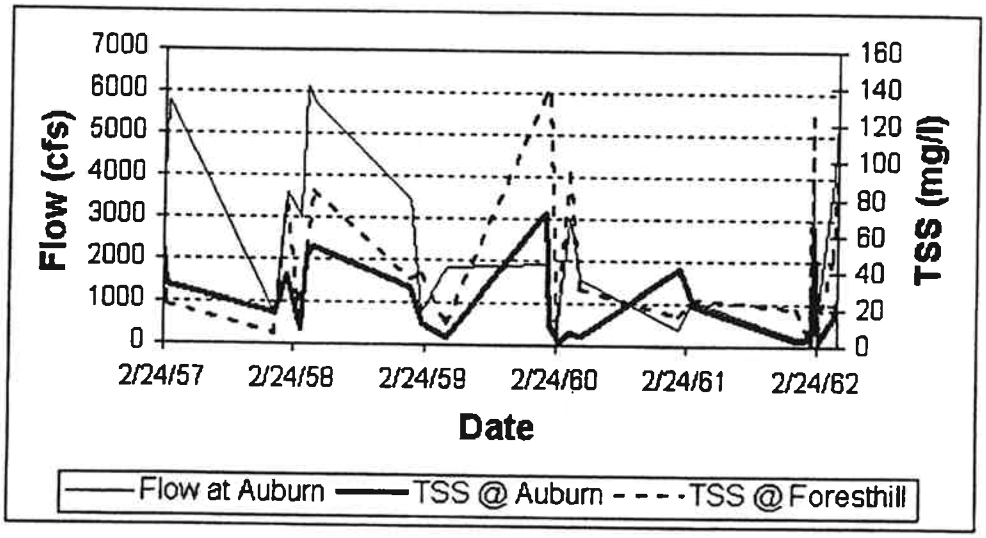
Turbidity levels are generally correlated to the TSS concentrations, typically accounting for roughly 80% of the variability observed in simultaneous TSS measurements (Environmental Protection Agency 1991). The relationship between turbidity and TSS values is not typically linear and must be determined on a site-specific basis because the relationship can vary due to storm size, water color, organic matter, and algae growth. Collecting TSS samples that accurately represent average river conditions depends on hydraulic characteristics such as current patterns, flow velocity, and eddies. A composite sample collected over vertical and lateral intervals in the channel will typically provide a better representation of the average river TSS concentration than a single sample (Environmental Protection Agency 1985). Turbidity measurements are less sensitive to the sampling location because turbidity is primarily a function of finer materials (silt and clay) that are more readily held in suspension and evenly distributed throughout the water. The time required to transport samples to a lab and conduct the analytical procedures for TSS effectively precludes its use as a real-time monitoring tool. Given the practical limitations of TSS sampling methods, need for correlation analysis with turbidity, and lack of regulatory objectives, this monitoring program will be focused on intensive automated turbidity monitoring; TSS data will be collected on a supplemental basis. The site-specific relationship between turbidity and TSS will be determined after sufficient monitoring data have been collected.

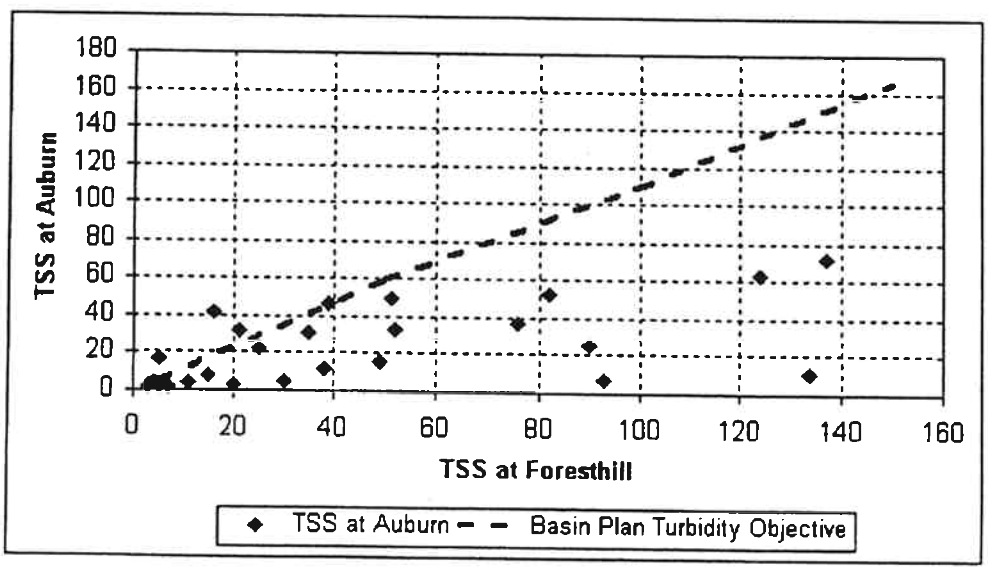
Few water quality data are available for the MFAR downstream of Ralston Dam. Simultaneous grab sample data for TSS are available from the MFAR at Foresthill and Auburn (47 miles downstream) for 25 scattered dates collected during high flow periods between the years 1956 and 1962 (EarthInfo 1993). Other scattered grab samples are available up to 1985. Given that flow and TSS data are available for a variety of years with differing precipitation patterns, the available data may provide a reasonable estimate of the range of conditions that will be observed under current conditions and when the proposed project is implemented. The data represent sediment transport that is affected by several primary watersheds within the project area including the Rubicon River (315 square miles), MFAR above Afterbay (94 square miles), and NMFAR (89 square miles). Streamflow and TSS values at Foresthill and Auburn are reasonably correlated with each other (figure 2). TSS values range up to a maximum of about 120 milligrams per liter (mg/l), and values at Auburn are generally lower than at Foresthill. Table 3 presents descriptive statistics for TSS data from all MFAR sample dates. The maximum value recorded at Foresthill and Auburn of 397 mg/l and 537 mg/l respectively are considerably larger than the paired data in figure 2. The coefficient of variation about the mean (i.e., = standard deviation/mean) is large and indicates that variability in the values is high.

Table 3. Summary Descriptive Statistics for TSS Data in MFAR

Statistic	MFAR at Foresthill (mg/l)	MFAR at Auburn (mg/l)
Mean	54.6	45.6
Median	30.0	12.0
Standard Deviation	71.3	85.5
Minimum	2	1
Maximum	367	537
95% Confidence Interval of Mean	± 25.3	± 19.7
Sample Size	33	75

Real-time automated turbidity monitoring data will serve as the primary tool for evaluating water quality conditions during SPT operations. Appropriate numerical turbidity objectives for long-term evaluation of water quality conditions during SPT were estimated from the variability in existing TSS data for the MFAR. Numerical data quality objectives are generally stated in terms of a specific level of precision and confidence that is desired in the collected data. Based on the Basin Plan objectives for allowable project-related increases in turbidity and lack of existing turbidity values for the MFAR, the monitoring program may need to be able to detect differences between upstream and downstream samples as low as 5 NTUs. Consequently, turbidity monitoring is designed to produce data capable of detecting differences of 5 NTUs with a 95% confidence level. Data will be collected that are sufficient to identify differences in TSS with a precision of 30 mg/l at a 95% confidence interval. Approximately 70 to 100 samples per year for the range of flows shown in table 1 may be needed to detect significant annual differences between upstream and downstream samples at this recommended level of precision.





00297 00 (5/01)

Source: Earth Info Inc. 1993

Jones & Stokes

Figure 2
Flow and TSS in the Middle Fork of the American River

Sampling Design

Table 1 presents sampling locations and protocols for the water quality monitoring program, including collection schedule and sampling methods. Figure 1 shows the location of the water quality monitoring stations. It is hypothesized that during SPT operations, water quality conditions will not differ appreciably between upstream and downstream monitoring stations. Therefore, this monitoring program is designed to evaluate the proposed sediment management activities and ensure that adverse water-quality effects do not occur. An initial 3-year monitoring period is recommended, consisting of 1 year of pre-project monitoring followed by 2 years of monitoring to evaluate the water quality effects of SPT operations. The need for follow-on monitoring after year 3 will be evaluated after the initial data are collected and evaluated. Pre-project monitoring data will be used to develop relationships between turbidity and TSS concentrations at stations upstream and downstream of Afterbay.

To obtain as many data values as possible during storm events and SPT operations, turbidity will be monitored on a real-time basis with automated sensors that can collect data at any desired time interval and relay the data by telemetry to the Ralston Powerhouse and PCWA's Foresthill office. Two sampling locations were selected for installation of automated turbidity monitoring probes to provide the primary compliance monitoring data. The Rubicon River approximately 200 feet upstream from the Ralston Powerhouse (which is generally discharging about 1,000 cfs to the river) will serve as the primary upstream sample site. The Rubicon River has the largest contributing watershed and generates the majority of sediment input to the reservoir (Bechtel Corporation 1997). PCWA's river gaging station immediately upstream from Horseshoe Bar will serve as the principal downstream compliance monitoring location. The Horseshoe Bar gaging station records river stage and has a telemetry unit with radio link to Ralston Powerhouse. The gage can also be monitored from PCWA's Foresthill office.

Supplemental grab samples will be collected for both turbidity and TSS in the MFAR upstream of Afterbay at the bridge crossing, NMFAR bridge crossing, and in the MFAR between Ralston Dam and the Oxbow Powerhouse tailrace. Samples for TSS will be collected manually by field personnel. Grab sample locations will serve as additional indicators of water quality conditions during the initial years of monitoring and allow site-specific correlation between turbidity and TSS values.

If the initial monitoring data indicate that turbidity and TSS data are closely correlated and turbidity measurements are effective for monitoring compliance of SPT operations, compliance monitoring for TSS will be discontinued and the real-time turbidity data will be used as the primary indicator for SPT operations compliance. The TSS data will be used primarily for long-term evaluation of SPT operations and for additional confirmation of real-time water quality conditions as indicated with the automated turbidity sensors.

SPT operations will commence when river flows exceed 3,500 cfs. Therefore, pre-project monitoring of turbidity and TSS will be conducted when storms generate river flow rates that exceed 3,000 cfs. Pre-project data for low flow events will not be conducted because natural variability in TSS and turbidity will be much lower and not representative of conditions during SPT operations. Both automated turbidity and grab sample data will be collected at a minimum of 4-hour intervals during storm events commencing when streamflows begin to rise and ceasing when the hydrograph has begun to recede or SPT operations are discontinued, whichever occurs first. The trigger for commencing sample collection can be water level in the reservoir or flow at the Horseshoe Bar gage. An additional automated water level recorder is recommended for the Rubicon River site to determine when streamflow starts to increase during storm events and provide time to prepare for the necessary manual sampling activities. This gage does not have to be an approved USGS–type stilling well. The system can be a simple enclosure with a pressure transducer for monitoring water level. A flow rating curve does not need to be calculated. For monitored storm flow events, sampling should be targeted to include data from as wide a range of streamflows as possible that exceed 3,000 cfs. Sampling in successive years should be targeted to storm events that generate flow conditions similar to those sampled during the pre-project monitoring.

During SPT operations, PCWA staff will monitor the real-time upstream and downstream turbidity monitoring data to evaluate compliance of operations with Basin Plan water quality objectives. All grab sample data collected at field sites will be recorded on a field data form. TSS and turbidity samples will be collected by hand using an appropriate bottle sampling device (e.g., Van Dorn, Kemmerer). Sample bottles will be specified by the laboratory performing the analyses. Samples will be analyzed to provide the lowest practical detection limit for TSS (less than or equal to 5 mg/l) and turbidity (less than or equal to 1 NTU). Field samples will be refrigerated for sample preservation and shipped to a commercial laboratory after each sampling event. A field blank of de-ionized water and field duplicate samples should be collected once per every 20 samples, with a minimum of 1 replicate per storm event. Automated turbidity probes installed at the Rubicon River and Horseshoe Bar sites will have a minimum detection limit of 1% of full scale reading. The probe should be capable of measuring a range of turbidity measurements up to 500 NTU.

Data Analysis

Standard data control charting methods will be used to identify the rate and direction of change in real-time turbidity concentrations in the river and detect significant excursions from the Basin Plan water quality objectives. Supplemental information regarding TSS concentration conditions will be evaluated from the grab sample data. The long-term performance of SPT operations with respect to water quality objectives will be evaluated with standard statistical testing of the mean differences between pre-project and post-project conditions. Linear regression analysis will also be used for year-to-year evaluations of project-related effects on water quality based on the relationship between values collected at the primary upstream and downstream sample sites. If routine patterns of turbidity and TSS in the tributary streams are constant over the duration of the monitoring program, regression analysis will allow the detection of changes between the Rubicon and the Horseshoe Bar gaging site attributable to the project without explicitly evaluating changes in the tributaries. Consequently, until the initial data collected from the tributaries prove otherwise, it is assumed that the automated turbidity data will be sufficient to establish a statistically significant relationship reflecting differences in water quality conditions between the upstream and downstream sites.

Following collection of the first year of pre-project data, results will be evaluated for statistical variability in turbidity and TSS concentrations. Descriptive and exploratory analysis of the data will be necessary to ensure that the proper statistical tools are applied to the analyses. Issues that may need to be addressed include transformation of data to approximate a normal data distribution and evaluation for autocorrelation among the data points. The estimated number of samples necessary to achieve the desired data quality objectives will be confirmed. Following the second and third years of data collection, means testing and linear regression analysis of turbidity and TSS data will be conducted to identify the differences between pre- and post-project data and the statistical significance of the differences. Adjustments to the data based on related variables such as background TSS and turbidity concentrations or streamflow may be used to improve the sensitivity of the data analyses.

The procedures for determining water quality conditions necessitating corrective actions will be defined in advance in coordination with the RWQCB and California Department of Fish and Game (DFG). When the data indicate that downstream turbidity values exceed the water quality objectives, possible corrective actions may include immediately taking additional samples for both turbidity and TSS to provide additional data on the water quality conditions. If SPT operations are presumed to be causing a water quality compliance problem, other possible corrective actions may include reducing the flow through the gates, increasing flow through the spillway gates, or both. As a final action, the low level outlet gate may be closed to cease SPT until more favorable conditions occur. The procedure for ceasing and restarting SPT operations will also be defined before starting SPT.

Two issues described below merit consideration when interpreting project-related water quality monitoring data for SPT operations and to avoid taking corrective actions when they are not necessarily warranted: (a) evaluating effects of water residence time in the reservoir at varying levels of streamflow; and, (b) evaluating the direction of change in turbidity and TSS concentrations.

- **Hydraulic residence time**: Based on the volume of the reservoir, the residence time of a slug of water passing from the upper end of the reservoir to the downstream end would be short at high flows (approximately 40 minutes at 50,000 cfs) and samples collected simultaneously at upstream and downstream locations will presumably be adequately comparable to each other. When SPT operations first begin at a flow of 3,500 cfs, however, the residence time would be approximately 10 hours. TSS values typically rise and fall in correlation with streamflow. Therefore, it is likely that when upstream turbidity concentrations start to decrease as the stormflows recede, simultaneous measurement made downstream may indicate continued increasing concentrations and regulatory exceedances because of the time delay of previously high turbidity water moving downstream. In order to account for water residence time in the reservoir, data charting procedures should account for the time delay at varying flow rates to establish whether an exceedance in the thresholds is truly occurring. The transport time can be reasonably predicted with empirical calculations from bathymetric profile data of the reservoir. In addition, dye tracer tests can be conducted to more accurately characterize flow through the reservoir. The need for dye tracing will be evaluated after the first year of monitoring to determine whether such precision is necessary for the program.

- **Direction of changes in monitored constituents**: As noted above, TSS will typically rise and fall with the streamflow pattern. Following the passage of peak flows and corresponding TSS and turbidity transport during storm events, high variability in upstream and downstream TSS and turbidity may continue despite an overall decreasing trend in their values. Consequently, the absolute differences between upstream and downstream values during the receding period of a storm event may exceed the numerical water quality objectives. Compliance evaluations should account for whether the concentrations at upstream and downstream locations are rising or falling when interpreting the data with respect to this criteria. If concentrations are decreasing overall, yet downstream values are higher, it would indicate that the flush of sediment resulting from initial mobilization and transport is nearing completion. Concentrations at this point in the storm may be relatively low compared to the higher peak values occurring earlier in the storm and should not constitute a violation of the water quality objectives.

Aquatic Habitat Monitoring

Specific Objectives

The main objective of stream habitat monitoring is to evaluate the proposed sediment management activities at Afterbay and ensure that adverse effects on the quality of aquatic habitat in the MFAR do not occur. SPT operations may affect habitat quality through changes in the supply of fine sediment to the MFAR downstream of Afterbay. Therefore, assessment of project effects will be based on analysis of potential changes in key channel and substrate parameters downstream of Ralston Dam. If the results indicate that SPT operations are causing significant adverse impacts on aquatic habitat, PCWA will implement corrective measures to reverse these impacts and prevent additional impacts from occurring. Under these circumstances, the monitoring program will be continued to evaluate the effectiveness of these corrective measures. Table 2 presents monitoring locations, parameters, and schedules for the aquatic habitat monitoring program.

Monitoring Parameters

Key monitoring parameters for assessing the effects of the project on stream habitat are substrate composition and embeddedness. These parameters were selected because they are sensitive to changes in sediment loads, can be rapidly measured in the field using simple visual techniques, and provide a direct or indirect measure of factors known to limit the survival and production of aquatic organisms. These parameters are particularly relevant to the habitat requirements of salmonids and benthic macroinvertebrates in streams.

Substrate Composition

The size composition of streambed substrates is a major factor determining the amount and suitability of habitat for trout and aquatic invertebrates. Changes in substrate size can affect the quality of stream habitat for aquatic invertebrates and trout spawning, incubation, rearing, and adult life stages. Bed material particle size also provides a relatively sensitive indicator of watershed disturbances that alter surface water runoff and sedimentation rates in streams (Meehan 1991). Bain (1999) describes a rapid field technique for quantifying stream substrate for habitat analysis studies. This technique measures 2 substrate parameters, coarseness and heterogeneity, which have been shown to be important parameters affecting habitat quality and biological production in streams. Quantitative relationships between these substrate parameters and biological parameters (e.g., survival or production) are not available. However, monitoring of these parameters in combination with embeddedness can be used to assess the significance of potential trends in habitat quality. In general, increases in the quantity of fine sediments and associated decreases in substrate heterogeneity correlate to decreases in habitat quality for aquatic invertebrates and trout. Conversely, decreases in fine sediment and increases in substrate heterogeneity generally correlate with increases in habitat quality for these species and life stages.

Embeddedness

Embeddedness is the degree to which coarse sediments (boulders, cobble, gravel) are surrounded or covered by fine sediment. Increases in embeddedness can adversely affect the quality of habitat for aquatic invertebrates and spawning, incubation, and rearing life stages. Embeddedness may also affect the quality of overwintering habitat of juvenile trout. The relationship between embeddedness and the abundance and production of salmonids and aquatic invertebrates in streams has been well documented (e.g., Bjornn and Reiser 1991; Crouse et al. 1981). Based on these relationships and general relationships between percent fines and embryo survival in redds (Waters 1995), change in embeddedness of 20% or more can be used as a criterion for determining whether a significant impact on aquatic resources has occurred.

Sampling Design

As discussed earlier, the results of habitat monitoring will be subject to a significant degree of uncertainty because changes that may occur as a result of the proposed project will likely be difficult to distinguish from natural background variation and other confounding influences. To improve the ability to detect project-related effects, habitat monitoring will be conducted using a paired sampling approach whereby selected habitat parameters are measured at control and treatment sites located upstream and downstream of the affected reach before and after project implementation. This design has an advantage over traditional unpaired designs because it can, with proper pairing of treatment and control sites, provide a basis for statistically separating project effects from the effects of other extraneous factors (Skalski and McKenzie 1982). The effectiveness of this approach, however, depends on whether the control and treatment sites co-vary in a predictable manner from year to year.

A control-treatment paired design will be used as a general framework for the proposed monitoring design. However, given the time frame for the monitoring program and lack of existing pre-project data, it may not be possible to identify suitable control and treatment sites that adequately meet the assumptions of this design or provide sufficient data to detect a project effect. Channel and bed parameters are extremely sensitive to local geology, land form, and hydraulics, and may exhibit considerable variation over relatively short distances and time periods. Therefore, initial pre-project surveys will be used to determine large- and small-scale spatial patterns in substrate conditions in the MFAR and the proposed control streams. Insight into these patterns will help to improve sampling efficiency and select monitoring sites that eliminate, to the extent possible, major sources of variability that would otherwise substantially affect the ability of the monitoring design to detect a project effect. Subsequently, pre-project data collected at control and treatment sites can be used to further evaluate the sensitivity of the monitoring design and determine whether any changes in the design are warranted.

For the purposes of this monitoring program, key criteria for selecting control and treatment reaches and specific sampling locations are that they:

- share similar channel and substrate characteristics;
- are sensitive to changes in sediment loads;

- can be expected to respond similarly to a given change in sediment loads; and
- provide potential trout spawning, rearing, and/or BMI habitat.

Sampling Locations

No pre-project information is available on habitat distribution and quality in the MFAR and its major tributaries upstream and downstream of Afterbay. Based on the hydraulic and sediment transport characteristics of the river, potential sedimentation impacts of the project would occur most likely in localized alluvial portions of the river where the hydraulics and, hence, sediment transport and deposition are controlled by local constrictions that include tributary alluvial fans, landslide debris, and bedrock constrictions (Mussetter Engineering pers comm.). These reaches may also provide important trout and BMI habitat. Mussetter Engineering identified 5 such reaches between Ralston Dam and the North Fork of the American River confluence (Table 4).

Before selecting study sites, a qualified fisheries biologist will conduct an aerial survey of the MFAR by helicopter to examine the 5 reaches identified by Mussetter Engineering and identify other potential monitoring reaches upstream and downstream of Afterbay. This survey should be conducted during the summer and fall at minimum flows. The aerial survey should include the first 5 miles of the MFAR and Rubicon River upstream of Afterbay, the MFAR from Ralston Dam to Louisiana Bar, and the lowermost 5 miles of the NMFAR. The goal of this initial survey is to evaluate the suitability of potential treatment and control reaches based on the criteria presented above. Preference should be given to those reaches that are closest to the project area (to reduce the confounding effects of other sediment sources such as tributaries) and are reasonably accessible by foot. All potential monitoring reaches will be delineated on large-scale topographic maps. Photographs will be taken of representative portions of the potential monitoring reaches.

Table 2 lists the proposed locations of monitoring reaches. Two reaches will be established immediately downstream of Afterbay between the dam and the confluence of the NMFAR and between the confluence at the NMFAR and Horseshoe Bar. These reaches will be used primarily to evaluate changes in substrate composition associated with coarse sediment input from the Indian Bar disposal site. One or more treatment reaches will be established on the MFAR downstream of Horseshoe Bar to evaluate potential changes in fine sediment associated with SPT operations. One or more control areas will be established on the Rubicon River upstream of Afterbay, the MFAR upstream of the reservoir, and on the NMFAR.

Table 4. Locations and Characteristics of Hydraulic Controls for Sediment Transport in the Middle Fork of the American River.

Location	River Mile	Comments
Louisiana Bar	50.4	Pool and riffle upstream of bedrock control. Road accessible.
Mammoth Bar	52.4	Pool and riffle upstream of bedrock constriction at Murderer's Gulch. Road accessible.
Cherokee Bar	59.0	Head of alluvial reach that extends from Greenwood Bridge to Mammoth Bar. Pools and riffles. Road accessible.
Canyon Creek	61.44	Pool formed by alluvial fan constriction and backwater from Ruck-A-Chucky landslide. Not road accessible, but can be reached by track in about 20 minutes.
Other sites: Otter Creek Volcano Creek	64.65 71.4	Pools and riffles upstream of alluvial fan–induced contractions. Neither site is readily accessible, but they are closer to Ralston Dam.

Note: River mile 50.37 is the confluence with the North Fork of the American River

Following selection of monitoring reaches, ground surveys will be conducted to more closely examine the reaches and identify distinct geomorphic units or habitat types (e.g., pools, runs, flat water) based on differences in channel form, dominant substrate types, and other channel features influenced by local sediment transport and deposition processes. Potential monitoring sites (i.e., transect locations) will be selected based on the criteria presented earlier. The location of spawning and rearing habitat will also be noted on the map. The dominant, smallest, and largest substrate type at each site should be noted. Potential monitoring sites may be individual geomorphic units, but smaller-scale patterns in channel and substrate characteristics may warrant further stratification of these units based on the criteria presented earlier. In addition, the monitoring sites must be safe to wade at low flow. Consequently, suitable monitoring sites will likely include the heads of riffles, tails of pools, or both.

Up to ten monitoring sites will be established initially in each reach to monitor substrate composition and embeddedness. Potential monitoring sites should be stratified according to substrate coarseness and heterogeneity (Shirazi and Seim 1981). Stratification improves sampling efficiency by allowing sampling effort to be allocated according to substrate variability (i.e., fewer samples are needed to characterize areas with relatively homogeneous substrate conditions). Transect locations will be selected randomly from among the total number of potential monitoring sites in each substrate category. Alternatively, if the monitoring reaches are long and access is difficult, the first sampling site can be selected randomly and used to select additional sites systematically (e.g., every third site upstream of the first).

Monitoring Schedule

Aerial survey and monitoring site selection will be conducted in the first year of pre-project monitoring. Substrate sampling will be conducted in selected years of the pre- and post-project monitoring periods. All field work should be done in the summer or fall when flows are low enough to permit sampling. Sampling should be conducted at the same time each year to minimize the effects of possible seasonal trends in fine sediments.

Pre-project monitoring should begin as soon as possible and be conducted in selected years during the pre-project monitoring period to evaluate variation in substrate conditions among and within reaches. Ideally, pre-project data should include measurements of streambed conditions following flow events equal in magnitude and duration to those that would trigger SPT operations. A minimum of 2–3 years of pre-project monitoring may be necessary to evaluate the ability of the monitoring design to detect project effects.

Monitoring of project effects should be conducted in the first year after initiation of SPT operations and in subsequent years following the occurrence of each SPT event. A minimum of 2–3 years of post-project monitoring is recommended. Because SPT operations will probably not occur every year, it may be necessary to wait several years to complete the post-project monitoring. Additional monitoring during the intervening years may be warranted to further characterize the relationship between substrate conditions in the treatment and control reaches.

Monitoring of the potential effects of sediment disposal at Indian Bar will be conducted concurrently with SPT monitoring.

Sampling Procedures

Field measurements of substrate composition and embeddedness generally will follow those described by Bain (1999). Before field measurements, 1 to 3 transects will be placed randomly at each monitoring site, depending on substrate variability. The location of each transect should be marked with a metal stake at or above the high-water mark. Cloth or metal measuring tapes should be tightly strung above the wetted channel in line with the stakes. Substrate composition will be measured with a 1-meter (m) lead-core rope, divided into ten 10-centimeter (cm) sections painted contrasting colors. Specific sampling locations along each transect should be selected randomly, or the first location selected randomly and other locations selected systematically (e.g., every second meter across the transect). Three to 5 sampling locations should be established per transect, depending on channel width and substrate variability. At each sampling location, the rope will be lowered across the stream substrate (perpendicular to the current) and the dominant substrate class under each 10-cm segment will be recorded using the modified Wentworth scale (table 5). Coarse sediments (gravel, pebble, cobble, boulder) in midstream or the thalweg location on each transect will be examined, and the modal (most common) embeddedness rating will be recorded (table 6).

Table 5. Modified Wentworth Classification of Substrate Types by Size

Substrate Type	Particle Size Range (millimeters)	Sample Codes
Boulder	>256	5
Cobble	64–256	4
Pebble	16–63	3
Gravel	2–15	2
Sand	0.06–1	1
Silt and Clay	<0.059	0

Source: Cummins 1962

Table 6. Embeddedness Rating for Stream Channel Materials*

Level of Embeddedness	Description
Negligible	Gravel, pebble, cobble, and boulder particles have <5% of their surface covered by sediment.
Low	Gravel, pebble, cobble, and boulder particles have 5–25% of their surface covered by sediment.
Moderate	Gravel, pebble, cobble, and boulder particles have 25–35% of their surface covered by sediment.
High	Gravel, cobble, and boulder particles have 50–75% of their surface covered by sediment.
Very High	Gravel, pebble, cobble, and boulder particles have >75% of their surface covered by sediment.

* Fine sediment includes materials less than 2 millimeter in diameter: sand, silt, and clay.

Source: Platts et al. 1983

Data Analysis

The substrate composition and embeddedness data will be analyzed quantitatively using statistical techniques developed for control-treatment pairing designs (e.g., Skalski and McKenzie 1982). As discussed earlier, the applicability of the proposed design depends on proper pairing of the treatment and control reaches and sufficient pre-project data to characterize the relationship between substrate conditions in these reaches. Alternatively, the data can be analyzed graphically using descriptive statistics (e.g., means, confidence intervals) and/or regression techniques to characterize trends in streambed parameters over time (e.g., Adams and Beschta 1980). This technique will be used after each monitoring period to investigate the properties of the data and determine whether any modifications of the sampling design are warranted. For example, 2 to 3 years of pre-project data will provide an initial measure of substrate variability that can be used to evaluate the ability of the monitoring design, as currently proposed, to detect a change of a given magnitude with a 95% confidence level.

Because the sampling design may not be able to effectively discern project effects from those of other sediment sources in the MFAR watershed, it will be necessary to complement the monitoring program with additional information to assess the relative magnitude of effects related to SPT and other sources. For example, bathymetric surveys of Afterbay before and after SPT operations would provide valuable information on the pre- and post-project quantities of fine sediment in the reservoir. In the event that a large amount of sedimentation is detected downstream of Ralston Dam, bathymetric surveys would provide a measure of net changes in reservoir sediment conditions, which will help assess the extent to which SPT operations contributed to the supply of fine sediment. The data then may help to assess whether any net contribution to fine sediment supply in the river is attributable to the reservoir. Other sources of information include ongoing watershed monitoring programs and assessments being conducted by the U.S. Forest Service, U.S. Geological Survey, and other federal and state agencies responsible for resource and land management in the MFAR, Rubicon, and NMFAR watersheds. Annual reports, maps, and interviews with resource managers will be used to monitor the occurrences of major events (e.g., fires, landslides, intense land use activities) that could influence erosion and sedimentation processes in these watersheds. This information will be used to further evaluate the relative effects of these sediment sources on habitat conditions in the monitoring reaches. The interpretation of monitoring results will also include an analysis of hydrologic parameters that may differentially affect geomorphic conditions in the monitoring reaches from year to year.

Benthic Macroinvertebrate Monitoring

Specific Objectives

The main objective of BMI monitoring is to provide biological indicators of potential project-related effects on the health and functionality of aquatic habitat to be used in concert with the water quality and aquatic habitat monitoring results. Quantitative bioassessment based on BMI was developed by the Environmental Protection Agency as a tool for monitoring and assessing the impacts of watershed management activities on water quality, fish, and stream productivity. Quantitative bioassessment has become the legal standard in most states for mitigation and restoration projects. Justifications for the use of BMI as indicators of water and habitat quality have been described by Hutchinson (1993), Karr and Chu (1999), Resh and Jackson (1993), Rosenburg and Resh (1993), and others. Additional advantages of BMI–based biological assessment include long storage life for preserved samples and the establishment of BMI voucher collections. Voucher collections may be evaluated by other investigators and serve as a source of information for taxonomists and resource managers.

The general sampling locations and schedule for BMI monitoring are the same as those proposed for habitat monitoring. However, BMI will be sampled 3 times per year (late spring, mid-summer, and autumn) to characterize seasonal trends in BMI.

Monitoring Parameters

The following parameters will be used to monitor the overall health and functionality of aquatic habitat in the MFAR downstream and upstream of Afterbay during pre- and post-project periods.

Invertebrate Density

Invertebrate density is the number of individual invertebrates per square meter. This is a measure of overall habitat utilization by BMI, as well as a measure of forage available to fish. Typically, BMI density remains fairly stable. Sudden BMI density fluctuations are indicative of impacts on habitats and water quality. Disturbed systems also may exhibit high BMI densities attributed mainly to opportunistic species. Some opportunistic species include Philippine clam, some crawdad species, chironomid midges (e.g., *Chironomus*), culicids, and some worms.

Taxa Richness

Taxa richness is the total number of individual taxa and is used as a means of determining the overall health of an aquatic habitat (Plafkin et al. 1989). In general, the higher the water quality, habitat suitability, and variety, the higher the taxa richness. Similarly, sudden drops in taxa richness would indicate a negative impact within the system.

BMI Productivity

BMI productivity is defined as the grams of living invertebrates per square meter within the study area. This measurement yields the biomass per unit area that the habitat is able to support. Diverse, highly functional habitats typically produce higher biomass than impaired systems. Alternately, disturbed systems that are overrun by opportunistic species may have abnormally high biomass.

Ephemeroptera, Plecoptera, Trichoptera Ratios

By measuring the abundance of invertebrate families most sensitive to changes in water quality and habitat suitability, the relative habitat health can be examined. The Ephemeroptera, Plecoptera, Trichoptera (EPT) index examines nymphal Ephemeroptera (mayflies), Plecoptera (stoneflies), and Trichoptera (caddisflies), which as a group are generally considered to be pollution sensitive, and their abundance index increases with increasing water quality (Plafkin, et al., 1989).

Jaccard Coefficient of Community Similarity

Jaccard Coefficient of Community Similarity and Community Loss indices (EPA 1989) will be used to determine similarities between the treatment and control reaches and between pre- and post-project years.

$$\text{Jaccard Coefficient of Community Similarity} = \frac{\text{\# of taxa common to both samples}}{\text{\# of taxa in both samples}}$$

The Jaccard Coefficient of Community Similarity estimates the degree of similarity between samples based on presence or absence of taxa. The coefficient values range from 0 to 1.0. The higher the coefficient, the greater the similarity between the samples.

Community Loss Index

The Community Loss index estimates the loss of taxa between comparison samples and reference samples.

$$\text{Community Loss} = \frac{[\text{\# of taxa in reference sample}] - [\text{\# of taxa common to both samples}]}{\text{\# of taxa in comparative sample}}$$

The index identifies the differences in sample composition. The higher the index value, the greater the dissimilarity between the comparison sample and the reference sample.

Sampling Design

BMI populations will be sampled in the control and treatment reaches established for aquatic habitat monitoring before and after the project is implemented. All BMI samples will be collected from representative riffle/run transects selected for aquatic habitat monitoring.

Samples will be collected in the late spring (June), mid-summer (August), and autumn (October). Sampling 3 times per year is a standard protocol to adequately characterize seasonal changes and assess potential seasonal impacts on species and life stage composition of BMI communities. Littoral sampling from Afterbay will not be necessary, because the water in the afterbay fluctuates sufficiently during normal yearly maintenance practices to limit colonization of the littoral zone by BMI.

All BMI samples will be collected using a standard kick seine and preserved immediately in 95% ethanol. All samples will labeled with the following information: collection number, station, date, and collector. After 24 hours the ethanol in each sample will be replaced with fresh 95% ethanol. The samples will then be transported to the Jones & Stokes laboratory and locked in a cabinet.

In the laboratory, chain of custody forms will be used to track the samples. The contents of each sample would be placed into a 300 μm sieve, gently rinsed, and then placed in a Pyrex pan with 30% ethanol. The sample contents would then be examined for BMI by a technician using illuminated magnifying glasses. All BMI would be removed from debris with forceps and placed in containers filled with 70% ethanol. Once a sample presumably had all BMI removed, a second technician would then review the sample to ensure that all BMI were removed. After 2 technicians had searched the sample and found no more BMI, all debris would be discarded. If the second technician found 4 or more BMI remaining in the sample, the original sorter would repeat the search of the entire sample.

Invertebrate biomass would be estimated using volumetric displacement. BMI specimens from all samples would be dried at room temperature for 15 minutes on size 613 qualitative filter paper and then placed in a 25 ml graduated cylinder with 15 ml of 15°C deionized water. The volumetric displacement would then be determined and recorded.

Specimens collected from each sample would be identified by taxonomists to the lowest justifiable taxon using an Olympus SZ-ST40 zoom stereo scope and the appropriate taxonomic references (Arnett 1968; Edmunds, Jensen, and Bemer 1976; Gordon 1977; McAlpine et al. 1981; Merritt and Cummins 1984; Pennak 1978; Usinger 1956; Wiggins 1977) in order to establish diversity, EPT ratios, opportunistic taxa ratios, taxa richness, and abundance, and to develop community indexes.

Data Analysis

All data analyses will be conducted following the protocols for quantitative bioassessment established by EPA and the scientific community (Plafkin et al. 1989; Resh and Rosenberg 1984; Merritt and Cummins 1984; Hutchinson

1993; Karr and Chu 1999; Resh and Jackson 1993; Rosenburg and Resh 1993).

Data Management and Reporting

Successful implementation of the water quality and aquatic resource monitoring program requires proper data reduction and analysis procedures, performing routine quality control checks during sampling and data processing, and annual reporting of results for permit compliance, impact assessment, and performance evaluation. The chain of custody for data handling, storage, and processing should be clearly established. It is best to have a single person responsible for the monitoring program to ensure that all field and laboratory techniques, data entry, quality control and assurance methods, and analytical methods are coordinated and follow established protocols.

Standard field and laboratory data forms will be prepared for each monitoring component. All completed field and laboratory data forms will be kept in a central location or log book. Duplicates will be made and stored in a separate location. The lead technician will proof all data forms at the end of each day of field or laboratory work. All data will be entered into Microsoft Excel spreadsheets (or equivalent) and maintained in a central database. The original spreadsheets will be checked for errors by comparing all entries in the electronic spreadsheets with the raw field and laboratory entries. The central database will be write-protected and maintained on a main computer server. Working copies of the spreadsheets will be used for data reduction, analysis, and reporting.

The results of the pre-project and project operation monitoring will be presented in annual reports prepared at the end of each annual monitoring period (winter). The reports will summarize the methods and results of the current and previous year's monitoring activities. Data and statistical analyses will be presented in summary graphs and tables. The report will present and update conclusions regarding permit compliance, impact assessment, and monitoring performance. The reports will include recommendations for modifications of sampling design and other program elements, if warranted.

References

Printed References

Adams, J. N., and R. L. Beschta. 1980. Gravel bed composition in Oregon coastal streams. *Canadian Journal of Fisheries and Aquatic Sciences* 37:1514-1521.

Arnett, R. H. 1968. *The Beetles of the United States (A Manual for Identification).* The
American Entomological Institute. Ann Arbor, MI . 1112 pp.

Ayres Associates. 1997. *American and Sacramento River, California Project. Geomorphic, Sediment Engineering, and Channel Stability Analyses, Final Report.* Prepared for U.S. Army Corps of Engineers, Sacramento District, DACW05-93-C-0045. Sacramento, CA.

Bain, M. B. 1999. Substrate. Pages 95–103 in Bain, M. B., and N. J. Stevenson, editors. 1999. *Aquatic habitat assessment: common methods.* American Fisheries Society. Bethesda, MD.

Bechtel Corporation. 1997. *Sediment study of Ralston Afterbay Reservoir.* Final Report. Submitted to Placer County Water Agency.

Bjornn, T. C., and D. W. Reiser. Habitat requirements of salmonids in streams. Pages 83–138 in Meehan, W.R., editor. *Influences of forest and rangeland management on salmonid fishes and their habitats.* American Fisheries Society Special Publication 19. Bethesda, MD.

Crouse, M. R., C. A. Callahan, K. W. Malueg, and S. E. Dominguez. 1981. *Effects of fine sediments on growth of juvenile coho salmon in laboratory streams.* Transactions of the American Fisheries Society 110:281–286.

Davis, W. S., B. D. Syder, J. B. Stribling and C. Stoughton. 1996. *Summary of State Biological Assessment Program for Streams and Wadeable Rivers.* EPA 230-R-96-007. U.S. Environmental Protection Agency; Office of Poliсy, Planning and Evaluation. Washington DC.

EA Engineering, Science, and Technology. 1990. *Preliminary feasibility analysis of alternative sediment management options for Ralston Afterbay Reservoir*. Prepared for Placer County Water Agency. Lafayette, CA.

EarthInfo Inc. 1993. USGS Quality of Water, West 1 Surface Water. Boulder, CO.

Edmunds, G. F., Jr., S. L. Jensen and L. Bemer. 1976. *The Mayflies of North and Central America*. University of Mnnesota Press. Minneapolis, MN. 330 pp.

Environmental Protection Agency. 1985. *A Screening Procedure for Toxic and Conventional Pollutants in Surface and Groundwater—Part 1*. EPA/600/6-85/002a, Environmental Research Laboratory. Athens, GA.

Environmental Protection Agency. 1991. *Monitoring Guidelines to Evaluate Effects of Forestry Activities on Streams in the Pacific Northwest and Alaska*. Water Division, Region 10, EPA/910/9-91-001. Seattle, WA.

Hutchinson, G. E. 1993. *A Treatise on Limnology. Vol. IV, The Zoobenthos*. (Ed.) Y. H. Edmondson. John Wiley & Sons, Inc. New York.. 944p.

McAlpine, J. F., (coordinator). 1981. *Manual of Neararctic Diptera*, vol. I–III. Research Branch, Agriculture Canada Monograph 27. 3587 pp. Ottawa.

Meehan, W. R. 1991. Introduction and overview. Pages 1–15 in Meehan, W.R., editor. *Influences of forest and rangeland management on salmonid fishes and their habitats*. American Fisheries Society Special Publication 19. Bethesda, MD.

Menke, A.S., (editor). 1979. *The Semiaquatic and Aquatic Hemiptera of California,(Heteroptera:Hemiptera)*. University of California Press. Berkeley, CA. 166 pp.

Merritt, R. W., and K. W. Cummins (editors). 1996. *An Introduction to the Aquatic Insects of North America*. Second Edition. Dendall/Hunt Publishing Co. Dubuque, IA.

Mussetter Engineering. 2001. Technical Memorandum, Indian Bar Sediment Disposal Site Study. Prepared for Placer County Water Agency. Fort Collins, CO.

Pennak, R.W. 1978. *Fresh-water Invertebrates of the United States.* John Wiley and Sons. New York, NY. 628 pp.

Plafkin, J. L., M. T. Barbour, K. D. Porter, S. K. Gross, and R. M. Hughes. 1989. *Rapid Bioassessment Protocols for use in Streams and Rivers.* U.S. Environmental Protection Agency Publication EPA/440/4-89/001. 189 pp.

Regional Water Quality Control Board. 1998. *Water quality control plan (basin plan) for the Central Valley region, Sacramento River and San Joaquin River Basins.* Sacramento, CA.

Resh, V.H. and J.K. Jackson. 1993. *Rapid Assessment Approaches to Biomonitoring and Benthic Macroinvertebrates.* Chapman and Hall. New York.

Resh, V., and D. Rosenberg. 1984. *The Ecology of Aquatic Insects.* 625 pp. Praeger, NY.

Rosenburg, D. M., and V.H. Resh (eds). 1993. *Freshwater Biomonitoring and Benthic Macroinvertebrates.* Chapman and Hall. New York.

Rosgen, D. L. 1994. A classification of natural rivers. *Catena* 22:169–199

Shirazi, M. A., and W. K. Seim. 1981. Stream system evaluation with emphasis on spawning habitat for salmonids. *Water Resources Research* 17:592–594.

Skalski, J. R., and D. H. McKenzie. 1982. A design for aquatic monitoring programs. *Journal of Environmental Management* 14:237–251.

Stewart, K. W., and B. P. Stark. 1993. *Nymphs of North American Stonefly Genera (Plecoptera).* University of North Texas Press. Denton, TX.

U.S. Geological Survey. 2000a. Suspended sediment database. URL:/webserver.usgs.cr.gov/sediment.

Usinger, R.L. (editor). 1956. *Aquatic Insects of California, With Keys to North American Genera and California Species*. University of California Press. Berkeley, CA. 508 pp.

Waters, T. F. 1995. *Sediment in streams: sources, biological effects, and control*. American Fisheries Society Monograph 7. Bethesda, MD.

Wiggins, G. B. 1977. *Larvae of North American Caddisfly Genera*. University of Toronto Press. Toronto. 401 pp.

Personal Communications

Harvey, M. Hydraulic Engineer. Mussetter Engineering, Inc.—Memorandum. Use of HEC-6 results to identify impact monitoring sites.

Mussetter Engineering, Inc. Use of HEC-6 results to identify SPT impact monitoring sites. March 9, 2001— email to Doug Brewer (Jones & Stokes) from Mike Harvey (Mussetter Engineering).

Placer County Water Agency
Power System
Foresthill, California