
TABLE OF CONTENTS

	Page
8.4 Water Quality Environmental Effects	8.4-1
8.4.1 Project Operations	8.4-1
8.4.1.1 Elevated Levels of Iron and Manganese	8.4-2
8.4.1.2 Methyl Mercury in Fish Tissue	8.4-3
8.4.2 Routine Project Maintenance	8.4-3
8.4.2.1 Vegetation and Noxious Weed Management	8.4-4
8.4.2.2 Sediment Management	8.4-4
8.4.2.3 Road and Trail Maintenance	8.4-5
8.4.3 Non-routine Recreation Facility Activities	8.4-5
8.4.3.1 Removal of Upper Hell Hole Campground	8.4-6
8.4.3.2 Reduction of Select Project Recreation Facilities	8.4-6
8.4.3.3 Conversion of McGuire Picnic Area to a Group Campground	8.4-7
8.4.3.4 McGuire Boat Ramp and Associated Parking Areas	8.4-7
8.4.3.5 Enhancement of Select Recreation Facilities	8.4-8
8.4.3.6 Duncan Creek Diversion Area Primitive Use Site	8.4-9
8.4.3.7 Ralston Afterbay Sediment Removal Access Point Boat Launch	8.4-10
8.4.4 Existing Facility Modification and Construction of New Facilities ...	8.4-10
8.4.5 Conclusions—Water Quality	8.4-11
8.4.6 Unavoidable Adverse Effects	8.4-11

8.4 WATER QUALITY ENVIRONMENTAL EFFECTS

This section describes the potential impacts to water quality in the bypass and peaking reaches and reservoirs under the Proposed Action for the Middle Fork American River Project (MFP or Project). Impacts on water temperature and dissolved oxygen are described in Section 8.5 – Fish and Aquatic Resources Environmental Effects. Section 4.0 – Proposed Action (including Tables 4-4, 4-5, and 4-6) provides a description of routine operation and maintenance activities to be implemented under the Proposed Action compared to the No-Action Alternative. Appendix A – Modified or New Facilities Construction Activities and Concept Designs includes a description of facility modification and construction activities to be implemented under the Proposed Action.

Potential impacts to water quality have been identified based on changes in routine operations and maintenance activities; implementation of non-routine recreation facility activities, and modification of existing or construction of new Project facilities. Specifically, impacts to water quality include the following:

- Potential impacts to water quality as a result of changes in Project operations;
- Elevated levels of iron and manganese;
- Presence of methyl mercury in fish tissue;
- Potential impacts as a result of implementation of routine maintenance;
- Potential impacts as a result of implementation of non-routine recreation facility activities; and
- Potential water quality impacts as a result of existing facility modifications and construction of new facilities.

A description of potential impacts to water quality resulting from implementation of the Proposed Action, considering United States Department of Agriculture-Forest Service (USDA-FS) Water Quality Best Management Practices (BMP's) and Avoidance and Protection (AP) measures is provided below. Impact conclusions and unavoidable adverse effects are summarized at the end of this section.

8.4.1 Project Operations

The Proposed Action includes changes in Project operations that modify flow in the bypass and peaking reaches and modify reservoir storage. These operational changes may potentially impact water quality. However, overall water quality is high in the bypass and peaking reaches and MFP reservoirs under existing conditions and meets all regulatory standards and criteria (Section 7.4 – Water Quality Affected Environment) with two notable exceptions discussed below. The Proposed Action increases flows in the bypass and peaking reaches in most years compared to the No-Action Alternative and, therefore, will maintain the existing high water quality conditions (PCWA 2011a; Supporting Document [SD] A). Reservoir storage (water surface elevations) in the MFP

reservoirs is similar in the Proposed Action and No-Action Alternative (Section 8.3 – Water Use Environmental Effects) and will maintain existing water quality. The following discussion focuses on the effect of the Proposed Action compared to the No-Action Alternative on existing water quality issues in the vicinity of the MFP, and identifies whether these issues are related to MFP operations, and, if so, whether these conditions are controllable.

The two water quality issues observed at or near Project facilities during the course of technical studies conducted for the MFP relicensing include:

- Elevated levels of iron and manganese immediately below the French Meadows Dam; and
- Elevated levels of methyl mercury in fish tissue in MFP reservoirs and in the peaking reach.

Detailed information on these existing water quality issues is provided Section 7.4 – Water Quality Affected Environment. These issues are discussed in the following subsections with respect to Project operations.

8.4.1.1 Elevated Levels of Iron and Manganese

French Meadows Dam is a rock and gravel-filled structure. Water that seeps through the dam (normal condition for this type of dam) is collected in three leakage weirs (channels) and released into the Middle Fork American River directly downstream of the dam. Leakage flows are highest in the spring/early summer (≤ 0.50 cubic feet per second [cfs]) when the reservoir elevation is high and lowest in the fall/winter (≤ 0.25 cfs) when the reservoir elevation is low (PCWA 2011f; SD B; Appendix E).

Water samples collected from three leakage weirs contained elevated concentrations of manganese and iron. The source of the iron and manganese is the rock and gravel dam material (local source material). As water seeps through the dam, iron and manganese become soluble under anoxic conditions. These conditions are Project-related, but not controllable. Specifically:

- Iron concentrations ranged from 16.0–20.4 mg/L, which exceeds the National Toxics Rule (NTR) criteria for protection of aquatic life (1.0 mg/L); and
- Manganese concentrations ranged from 3,610–4,040 $\mu\text{g/L}$, which exceeds the California drinking water secondary Maximum Concentration Levels (MCL) standard of 50 $\mu\text{g/L}$. This drinking water standard is the most stringent water quality standard for manganese and was established primarily to protect the taste, odor, and appearance of drinking water.

Water released directly in the Middle Fork American River from French Meadows Reservoir via the French Meadows low-level outlet pipe contained iron and manganese concentrations (0.035 mg/L and 22 $\mu\text{g/L}$, respectively) that met water quality standards and were protective of aquatic life. Minimum instream flow releases under the No-

Action Alternative range from 4–8 cfs. This water mixes with the leakage weir releases. Under existing conditions, approximately 800 feet downstream of the dam, iron concentrations drop to 0.137 mg/L, well below the NTR standard of 1 mg/L (protective of aquatic life). Manganese concentrations drop to 62.6 µg/L, slightly above the MCL for taste, odor, and appearance of drinking water (50 µg/L). Therefore, these conditions are localized under the No-Action Alternative.

Under the Proposed Action, minimum instream flow releases from French Meadows Dam are increased (ranging from 8–20 cfs), further diluting the water from the leakage weirs compared to the No-Action Alternative. Therefore, the higher flows under the Proposed Action will enhance water quality relative to the No-Action Alternative.

8.4.1.2 Methyl Mercury in Fish Tissue

As part of the MFP relicensing studies, a screening level assessment of methyl mercury concentrations in sport fish muscle tissues was conducted at French Meadows Reservoir, Hell Hole Reservoir, Middle Fork Interbay, Ralston Afterbay, and the Middle Fork American River at Otter Creek in 2007–2009 (AQ 11 – TSR [PCWA 2011f; SD B]). Crayfish were also included in this assessment from Hell Hole and French Meadows reservoirs.

Methyl mercury concentrations in the sampled fish and crayfish were compared to the California's Office of Environmental Health Hazard Assessment (OEHHA) screening guidelines for methyl mercury of 0.08 mg/kg (Cal/EPA 2005; Klasing and Brodberg 2006). Numerous fish tissue and crayfish samples exceeded the OEHHA screening criterion. The Central Valley Regional Water Quality Control Board, Clean Water Act Section 305(b) and 303(d) Integrated Report for the Central Valley Region, includes the North Fork American River, Hell Hole Reservoir, and Oxbow Reservoir (Ralston Afterbay) on the 303(d) list of impaired waters for mercury (RWQCB 2009).

Elevated methyl mercury levels in the Sierra Nevada are often linked to historic mining activities, but may also be attributable to natural causes, including geologic and atmospheric conditions. The source of the mercury in the Middle Fork American River Watershed is unknown, but it is not related to the MFP. Methyl mercury concentrations in sport fish muscle tissues and crayfish are likely to remain elevated in the future. Similar fish tissue results have been reported throughout the Sierra Nevada. Implementation of the Proposed Action will have no effect on methyl mercury levels compared to the No-Action Alternative.

8.4.2 Routine Project Maintenance

The Proposed Action includes changes in Project maintenance activities that could affect water quality including: (1) vegetation management; (2) sediment management; and (3) road and trail maintenance. These activities are discussed below with respect to water quality.

8.4.2.1 Vegetation and Noxious Weed Management

The use of herbicides, surfactants, and fungicides (chemical) as part of routine vegetation and noxious weed management under the Proposed Action could affect water quality. Specifically, the use of these chemicals adjacent to the bypass and peaking reaches and MFP reservoirs and diversion pools could potentially degrade water quality. Vegetation management under the Proposed Action will be conducted in accordance with the Vegetation and Integrated Pest Management Plan (VIPMP) (PCWA 201e; SD A). The VIPMP includes BMPs and AP measures to protect water quality that minimize the risk of potentially toxic chemical introduction into nearby waterbodies. These measures include:

- Restrictions on the use of herbicides, surfactants, and fungicides within protective buffers around bypass and peaking reaches;
- Use of herbicide formulations that are considered by the Environmental Protection Agency (EPA) to be safe for aquatic areas;
- Required supervision of herbicide application by a licensed pest control advisor (PCA) and restrictive application and disposal methods; and
- Implementation of a Water Quality Monitoring Program to evaluate the effectiveness of protective measures included in the VIPMP.

Implementation of these measures under the Proposed Action will protect water quality. Therefore, water quality will be maintained under the Proposed Action.

8.4.2.2 Sediment Management

Under the Proposed Action, sediment removal activities at the small diversion pools are reduced and potentially eliminated (Sediment Management Plan [SMP] [PCWA 2011c; SD A]). Specifically, the small diversion dam will be modified 2–4 years after license issuance allowing the natural transport of sediment downstream during high-flow events. This substantially reduces the need for future sediment removal activities. Interim and contingency sediment management activities may be conducted at the small diversion pools prior to and following completion of the diversion dam modifications. Under the Proposed Action, these modified sediment removal activities at the small diversion pools reduces the potential for future water quality effects compared to the No-Action Alternative.

The Proposed Action also includes new sediment augmentation activities downstream of Middle Fork Interbay (Middle Fork Interbay Sediment Augmentation Area) and Ralston Afterbay (Indian Bar and Junction Bar Sediment Augmentation areas) (PCWA 2011c; SD A). Placement of material at the Junction Bar Augmentation Area includes the installation of a temporary bridge to span the active channel. During sediment removal activities at these two medium reservoirs, a portion of the removed material (preferentially selected within the preferred spawning particle size requirements of

aquatic resources) will be placed in the new sediment augmentation areas. At high flows, the material will be mobilized and transported downstream to enhance aquatic resources. During placement of the material at the sediment augmentation areas, erosion and sedimentation could temporarily increase turbidity levels in the adjacent water bodies. In addition, the accidental release of hazardous materials from heavy equipment used during these activities could degrade water quality.

The SMP includes specific BMPs and AP measures to avoid and protect water quality during sediment management activities (PCWA 2011c; SD A). In addition, the following water quality protection measures are included under the Proposed Action for sediment augmentation below Middle Fork Interbay:

- Prior to placing sediment in the augmentation areas, the instream flow release from Middle Fork Interbay will be temporary diverted into a bypass pipe that extends to a location downstream of the augmentation areas. The intent is to reduce initial mobilization of fine sediment during placement of the material; and
- A silt screen will be placed downstream of the sediment augmentation areas to capture fine sediment. Fish present in the area between the dam and silt screen will be removed and placed downstream prior to implementation of these activities.

Implementation of the SMP BMPs and AP measures, in addition to the measures described above, will protect water quality during sediment augmentation activities. Therefore, water quality will be maintained under the Proposed Action.

8.4.2.3 Road and Trail Maintenance

Maintenance of Project roads and trails, and Project recreation facility access roads is described in the Transportation System Management Plan (TSMP) (PCWA 2011d; SD A). These maintenance activities are the same under the Proposed Action and No-Action Alternative. The TSMP lists BMPs and AP measures that will be implemented during road and trail maintenance to protect water quality (PCWA 2011d; SD A; Table 5). Implementation of these measures will help protect water quality, while maintaining the road and trail surfaces and drainage features (e.g., culverts, water bars, ditches, etc.) in good condition. Maintaining the road and trail surfaces and drainage features will further protect water quality by reducing erosion and sedimentation into nearby water bodies. Therefore, water quality will continue to be protected under the Proposed Action.

8.4.3 Non-routine Recreation Facility Activities

Implementation of the Proposed Action includes non-routine recreation facility activities that could potentially affect water quality. These activities are described in the Recreation Plan (PCWA 2011b; SD A), and include:

- Removal of Upper Hell Hole Campground;

- Reduction of select Project recreation facilities;
- Conversion of McGuire Picnic Area to a Group Campground;
- Consolidation of the parking areas and amenities at the McGuire Boat Ramp Parking Area;
- Enhancements to select Project recreation facilities;
- Development of a primitive use recreation site in the Duncan Creek Diversion area; and
- Formalization of the Ralston Afterbay Sediment Removal Access Point as a public boat launch.

Potential impacts to water quality from these activities will be avoided by implementing the USDA-FS BMPs and AP measures contained in the Recreation Plan (PCWA 2011b; SD A). Overall, the improvements to Project recreation facilities under the Proposed Action will protect, and at some locations, enhance water quality, as discussed in the following.

8.4.3.1 Removal of Upper Hell Hole Campground

Upper Hell Hole Campground is located adjacent to Hell Hole Reservoir, but none of the sites are contiguous to the reservoir. Under the Proposed Action, Upper Hell Hole Campground will be removed. Removing Upper Hell Hole Campground will involve removing all of the site amenities such as picnic tables, fire rings, grills, and food storage lockers. In addition, four pit toilets will be removed. After removal of these amenities, disturbed areas will be allowed to revegetate. To protect water quality during removal of Upper Hell Hole Campground applicable USDA-FS Water Quality BMP's and AP measures will be implemented as identified in the Recreation Plan (PCWA 2011b; SD A).

Removing Upper Hell Hole Campground will help protect water quality. Specifically, removing the antiquated pit toilets will reduce the possibility of contaminating ground water or surface water. In addition, allowing currently disturbed areas to revegetate will reduce the potential for erosion and sedimentation into Hell Hole Reservoir. Therefore, water quality will be maintained under the Proposed Action.

8.4.3.2 Reduction of Select Project Recreation Facilities

Under the Proposed Action, Hell Hole Campground, Poppy Campground, and Ralston Picnic Area will be reduced in size. Hell Hole Campground is not located adjacent to a reservoir or stream. Poppy Campground is situated on the north shore of French Meadows Reservoir and Ralston Picnic Area is located on the Middle Fork American River, at the upper end of Ralston Afterbay. Reducing the size of these facilities will involve removing site amenities such as picnic tables, fire rings, grills, and food storage lockers. Previously disturbed areas will be allowed to revegetate. To protect water

quality during reduction of Hell Hole Campground, Poppy Campground, and Ralston Picnic Area applicable USDA-FS Water Quality BMP's and AP measures will be implemented as identified in the Recreation Plan (PCWA 2011b; SD A).

Reducing the size of these facilities will help protect water quality. Specifically, removing individual sites will reduce the footprint of the recreation facility, and will contain recreation use to a smaller area, which in turn will reduce the potential for erosion and sedimentation into nearby water bodies. Allowing these sites to revegetate will further reduce erosion and sedimentation. Therefore, water quality will be maintained under the Proposed Action.

8.4.3.3 Conversion of McGuire Picnic Area to a Group Campground

McGuire Picnic Area and Beach is located on the north shore of French Meadows Reservoir. Under the Proposed Action, McGuire Picnic Area and Beach will be converted to the McGuire Group Campground. This conversion will involve removing all amenities at the existing picnic sites and reconfiguring the site for group use. Previously disturbed areas that are not occupied by the new group camp sites will be allowed to revegetate.

McGuire Picnic Area currently includes two flush bathroom structures and water faucets. To the extent practicable, the group sites will be configured to utilize the existing bathrooms, water faucets, and associated infrastructure (e.g., water lines, drains, septic systems). However, one bathroom located along the trail to the beach will be removed and replaced with a double unit, accessible pre-fabricated vault toilet building. The existing septic water lines and septic system will be decommissioned. To protect water quality during conversion of McGuire Picnic Area applicable USDA-FS Water Quality BMP's and AP measures will be implemented as identified in the Recreation Plan (PCWA 2011b; SD A).

Converting McGuire Picnic Area to a group campground will help protect water quality. Specifically, allowing currently disturbed areas to revegetate will reduce the potential for erosion and sedimentation into French Meadows Reservoir and upgrading the sanitation facilities will reduce the possibility of contaminating ground water or surface water. Therefore, water quality will be maintained under the Proposed Action.

8.4.3.4 McGuire Boat Ramp and Associated Parking Areas

McGuire Boat Ramp and associated parking areas is located on the north shore of French Meadows Reservoir. Under the Proposed Action, this facility will be consolidated. Among other things, consolidating this area includes: removing the Poppy Campground Trailhead Parking Area and access road; installing barrier rock at the entrance to the Parking Area access road to prohibit future vehicle use; treating the surface of the road and parking area to allow for natural revegetation; and consolidating, relocating, and upgrading the existing bathrooms. To protect water quality during consolidation of McGuire Boat Ramp and Associated Parking Area applicable USDA-FS

Water Quality BMP's and AP measures will be implemented as identified in the Recreation Plan (PCWA 2011b; SD A).

Consolidation of the amenities at McGuire Boat Ramp and Associated Parking Area will help protect water quality. Specifically, removing the Poppy Campground Trailhead Parking Area and access road will limit recreation use and parking to a smaller area, which in turn will reduce the potential for erosion and sedimentation into French Meadows Reservoir. Similarly, allowing the parking area and access road to revegetate will further reduce the potential for erosion and sedimentation. In addition, upgrading the sanitation facilities will reduce the possibility of contaminating ground water or surface water. Therefore, water quality will be maintained under the Proposed Action.

8.4.3.5 Enhancement of Select Recreation Facilities

The Proposed Action includes enhancements to four existing Project recreation facilities: Ahart Campground; Indian Bar Rafter Access; Hell Hole Boat Ramp; and French Meadows Boat Ramp. To protect water quality during enhancement of these recreation facilities applicable USDA-FS Water Quality BMP's and AP measures will be implemented as identified in the Recreation Plan (PCWA 2011b; SD A). These enhancements are discussed by site in the following.

Ahart Campground

Under the Proposed Action, PCWA will install a groundwater well and hand pump in Ahart Campground to provide recreation visitors with a potable water source. All drilling materials (e.g., drilling mud, excess cement, and well development mud/water) will be contained and hauled off-site and disposed of in accordance with California state laws. In addition, all fuel and hydraulic lubricants will be contained in accordance with the BMPs specified in Recreation Plan (PCWA 2011b; SD A). The well and hand pump will be installed to meet California well and pump installation standards, and will include a sanitary seal to ensure that groundwater is not contaminated by surface water runoff.

Under the Proposed Action, PCWA will also pave about 0.6 mile of Forest Route (FR) 96 from the end of the existing pavement to approximately 200 feet past the Ahart Campground entrance and the campground loop road and spurs. The road and campground are located immediately adjacent to the Middle Fork American River. According to the USDA-FS, sediment erodes from the roadways into the Middle Fork American River.

Ahart Campground enhancements will ensure that groundwater and surface water is protected, while providing the public with a potable water source. In addition, these enhancements will reduce erosion and sedimentation into the Middle Fork American River. Therefore, implementation of this element of the Proposed Action will enhance water quality.

Indian Bar Rafter Access

Indian Bar Rafter Access is located on the Middle Fork American River, immediately downstream of Ralston Afterbay. Among other things, this facility will be improved by: (1) installing an additional accessible vault toilet or modifying the existing vault toilet to accommodate peak use; (2) reconstructing the existing boat ramp; and (3) installing a supplemental slide ramp downstream of the existing ramp.

Indian Bar Rafter Access enhancements will help protect water quality. Specifically, upgrading the sanitation facilities will reduce the possibility of contaminating ground water or surface water. In addition, the boat launch improvements will help protect and maintain water quality by reducing the potential for erosion and sedimentation into the Middle Fork American River. Therefore, implementation of this element of the Proposed Action will enhance water quality.

French Meadows and Hell Hole Boat Ramps

Under the Proposed Action, French Meadows and Hell Hole Boat Ramps will be extended. To protect water quality, the ramps will be extended during a critical or extreme critical water year, when reservoir water surface elevations are lower than the areas affected.

French Meadows and Hell Hole Boat ramp enhancements will help protect water quality. Specifically, extending the boat ramps will reduce erosion by providing solid substrates for boat launching at the two reservoirs. Therefore, implementation of this element of the Proposed Action will enhance water quality in French Meadows and Hell Hole reservoirs.

8.4.3.6 Duncan Creek Diversion Area Primitive Use Site

Under the Proposed Action, a primitive use site will be developed in the Duncan Creek Diversion Area to address sanitation issues and to reduce potential resource impacts related to dispersed recreation. Development of the site will include installation of: (1) a single-unit accessible vault toilet; (2) barrier rocks to limit vehicle use and camping to specific areas; and (3) a bear-resistant garbage container. To protect water quality during development of the Duncan Creek Diversion Area Primitive Use Site applicable USDA-FS Water Quality BMP's and AP measures will be implemented as identified in the Recreation Plan (PCWA 2011b; SD A).

Development of the Duncan Creek Diversion Area Primitive Use Site will help protect water quality by limiting vehicle use and camping to a specific area reducing erosion and sedimentation into Duncan Creek. In addition, installation of sanitation facilities will reduce the possibility of contaminating ground water or surface water. Implementation of this element of the Proposed Action will enhance water quality.

8.4.3.7 Ralston Afterbay Sediment Removal Access Point Boat Launch

Under the Proposed Action, Ralston Afterbay Sediment Removal Access Point will be improved to accommodate boat launching by the public. This includes: (1) delineating the boat ramp and parking area with barrier rocks or other barrier devices; (2) grading the ramp to remove large cobbles and rocks; and (3) installing signage and barriers to limit parking and direct visitors to the Ralston Afterbay Picnic Area for additional parking. To protect water quality, the boat ramp will be graded and the barrier rocks will be installed during the fall maintenance outage when Ralston Afterbay is drawn down well below the bottom of the boat ramp. To protect water quality during improvement of Ralston Afterbay Sediment Removal Access Point Boat Launch applicable USDA-FS Water Quality BMP's and AP measures will be implemented as identified in the Recreation Plan (PCWA 2011b; SD A).

Overall, formalizing the Ralston Afterbay Sediment Removal Access Point as a public boat launch will help protect water quality in Ralston Afterbay by providing a better launching surface (reducing potential erosion) and by limiting parking to specific areas that are not contiguous to the water. Therefore, water quality will be maintained under the Proposed Action.

8.4.4 Existing Facility Modification and Construction of New Facilities

Under the Proposed Action, modification or construction projects will be implemented to improve operations and maintenance of the Project, enhance environmental resources, and/or meet the requirements specified in new environmental programs and measures. These projects are described in Section 4.0 – Proposed Action, and include:

- Hell Hole Reservoir Seasonal Storage Increase Improvement;
- Small Diversion Modifications;
- Outlet Works Modifications; and
- Construction of New Stream Gages.

Appendix A – Modified or New Facility Construction Activities and Concept Designs provides a detailed description of modification and construction activities associated with the Proposed Action.

Potential construction-related impacts to water quality will be avoided by implementing the BMPs and AP measures identified in Appendix A. Implementing the USDA-FS Water Quality BMPs will protect water quality during the modification of existing and construction of new facilities. Therefore, water quality will be protected under the Proposed Action.

8.4.5 Conclusions—Water Quality

Overall, implementation of the Proposed Action will protect or enhance water quality compared to the No-Action Alternative, as summarized in the following:

- Increased instream flows will enhance water quality downstream of French Meadows Dam;
- Implementation of BMPs and AP measures included in the VIPMP, SMP, Recreation Plan, and Appendix A will protect water quality during routine Project maintenance activities, non-routine recreation facility activities, and modification of existing and construction of new facilities; and
- Non-routine recreation facility activities (removal, reduction, conversion, enhancement, and improvements) will protect water quality, and at some locations, enhance water quality.

8.4.6 Unavoidable Adverse Effects

There are no unavoidable adverse effects to water quality under the Proposed Action.

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