4.7 No Hatchery Alternative

4.7.1 Introduction

4.7.1.1 Alternative Description

The No Hatchery Alternative is the same as the Proposed Project except that operations at the Iron Gate Hatchery would cease at the time of dam removal and would not continue for eight years following dam removal, and the Fall Creek Hatchery would not reopen with upgraded facilities. Under this alternative, all hatchery production of salmonids would be discontinued after hatchery releases occur in the fall of dam removal year 1 and the production goals for the Proposed Project as identified in Section 2.7.6 *Hatchery Operations* would not occur.

Post-dam removal adult fall-run Chinook salmon could continue to return to the former location of the hatchery through post-dam removal year 2 (age 4 returning adults), and post-dam removal adult coho salmon could continue to return potentially through post-dam removal year 1 (age 3 adults) (Table 4.7-1).

Table 4.7-1. Natural (N) and Hatchery (H) smolts and adult returns in Klamath River under the No Hatchery Alternative.

Species		Dam Removal Year		Post-dam Removal Year			
		1[a]	2[b]	1	2	3	4
Chinook salmon	Produced	N and final H smolts (age 0 in spring and age 1 in fall)	N smolts	N smolts from new habitat	N smolts	N smolts	N smolts
	Returning	N and H adults (age 3–4) downstream of Iron Gate Dam	N and H adults access new habitat	N and H adults	N and last H adults (age 4, progeny of post-dam removal year 1 outmigration)	N adults (age 3) from new habitat	N adults
Coho salmon	Produced	N and final H smolts (age 1)	N smolts	N smolts	N smolts from new habitat	N smolts	N smolts
	Returning	N and H adults (age 3) downstream of Iron Gate Dam	N and H adults access new habitat	N and last H adults (age 3, progeny of post-dam removal year 1 outmigration)	N adults	N adults (age 3) from new habitat	N adults

[a] Final year of hatchery releases occurs in dam removal year 1. Early drawdown of Copco No. 1 begins in dam removal year 1.
[b] Drawdown of all reservoirs occurs and dams are removed in dam removal year 2 (see Table 2.8-1).
H hatchery releases or progeny
N progeny of natural spawning (natural-origin)

Under the No Hatchery Alternative, construction activities would include all those identified under the Proposed Project, except that Iron Gate Hatchery facilities would be completely removed, instead of partially removed and redeveloped as under the Proposed Project (Section 2.7.1.4 *Iron Gate Dam and Powerhouse*). The fish trapping and holding facilities at the toe of Iron Gate Dam and the cold-water supply for the hatchery would be removed, consistent with the Proposed Project, but they would not be relocated. In order to make a conservative assumption about the greatest potential impact, this alternative assumes that all Iron Gate Hatchery facilities would be demolished, rather than re-purposed or decommissioned in place. Additional deconstruction activities at Iron Gate Hatchery under this alternative would therefore include removal of all weirs, traps, additional holding pools, raceways, tanks, buildings, and other infrastructure (see also Figure 2.3-4 and Section 2.7.1.4 *Iron Gate Dam and Powerhouse*). Iron Gate Hatchery facilities would be removed as part of dam deconstruction activities starting January 1 of dam removal year 2. Under the No Hatchery Alternative, water diversion from Bogus Creek to operate the Iron Gate Hatchery would not be needed, so the diversion for the hatchery water supply would not be constructed near the confluence of Bogus Creek and the Klamath River (Section 2.7.6 *Hatchery Operations*).

Under the No Hatchery Alternative, the Fall Creek Hatchery would not reopen with upgraded facilities (e.g., renovated raceways, upgraded plumbing) for raising coho salmon and Chinook salmon. Construction of the settling pond would not be needed on Parcel B lands downstream of the Fall Creek Hatchery. Water diversion from the PacifiCorp Fall Creek powerhouse return canal downstream of the City of Yreka's diversion facility at Fall Creek Dam A would not be needed. As Fall Creek Hatchery is part of PacifiCorp's Klamath Hydroelectric Project No. 2082, the existing Fall Creek Hatchery facilities are subject to the terms of any new FERC action for Project No. 2082. Accordingly, this alternative analysis assumes the status quo, i.e., that the Fall Creek Hatchery facilities would not be demolished or re-purposed.

4.7.1.2 Alternative Analysis Approach

The potential impacts of the No Hatchery Alternative are analyzed in comparison to existing conditions, with reference to impact analyses conducted for the Proposed Project, where appropriate. Unless otherwise indicated, the significance criteria, area of analysis, environmental setting, and impact analysis approach, including consideration of existing local policies, for all environmental resource areas under the No Hatchery Alternative are the same as those described for the Proposed Project (see Section 3.1 *Introduction* and individual resource area subsections in Section 3 *Environmental Setting, Potential Impacts, and Mitigation Measures*). The potential impacts for each environmental resource area are analyzed both in the short term and the long term, and unless otherwise indicated, use the same definitions of short term and long term as described for each resource area analyzed for the Proposed Project.

4.7.2 Water Quality

With the exception of potential water quality effects related to hatchery operations, the No Hatchery Alternative would have the same potential short-term and long-term impacts on water temperature, suspended sediments, nutrients, dissolved oxygen, pH, chlorophyll-*a*, algal toxins, and inorganic and organic contaminants relative to existing conditions as those described for the Proposed Project (Potential Impacts 3.2-1 through

3.2-18). Potential short-term impacts on water quality would be the same as those described for the Proposed Project because full removal of Iron Gate Hatchery under the No Hatchery Alternative would result in a similar degree of construction activities and related short-term impacts to water quality as the Iron Gate Hatchery modifications (i.e., relocation of fish trapping and holding facilities, relocation of the cold-water supply) and Fall Creek Hatchery upgrades that are included under the Proposed Project.

Under this alternative, there would be no discharges from Iron Gate Hatchery to the Middle Klamath River. While these hatchery discharges would be eliminated under this alternative, hatchery discharges under existing conditions have a less than significant impact on water quality, including water temperature, suspended material, nutrients, biochemical oxygen demand, and inorganic and organic contaminants (i.e., water treatment chemicals) based on an evaluation of the water quality impacts of California Department of Fish and Wildlife hatcheries, including Iron Gate Hatchery (ICF 2010) (for more detail see Potential Impact 3.2-17). There would be no changes to water quality in Fall Creek or the Klamath River under this alternative relative to existing conditions since Fall Creek Hatchery production has been zero since 2003 and it would remain zero under this alternative. Potential impacts to water quality in Fall Creek and the Klamath River under the Proposed Project (see Potential Impact 3.2-17) would not occur under this alternative since the Fall Creek Hatchery would not be reopened, fish production and associated water quality changes would not occur, and there would be no upgrades to Fall Creek Hatchery facilities to accommodate the fish production specified under the Proposed Project.

Overall, eliminating the Iron Gate Hatchery effluent discharges would reduce potential less-than-significant variations in water quality due to hatchery discharges compared to existing conditions or the lower fish production conditions under the Proposed Project, thus there would be no significant impact on water quality due to ceasing Iron Gate Hatchery operations under the No Hatchery Alternative. Additionally, there would be no change in water quality under this alternative compared to existing conditions due to Fall Creek Hatchery fish production continuing to be zero and potential impacts to water quality due to increases in fish production at Fall Creek Hatchery under the Proposed Project would be eliminated, thus there would be no significant impact on water quality due to Fall Creek Hatchery remaining closed under the No Hatchery Alternative.

4.7.3 Aquatic Resources

Potential impacts to most aquatic ecological attributes (e.g., suspended sediment, bedload, water quality, algal toxins, aquatic habitat, and instream flows) under the No Hatchery Alternative would be the same as impacts under the Proposed Project, described in Section 3.3.5 *[Aquatic Resources] Potential Impacts and Mitigation,* except that impacts to aquatic ecological attributes related to incidence of fish disease and resource competition would be different under the No Hatchery Alternative, as compared with those of the Proposed Project.

The current infectious nidus (i.e., the river reach exhibiting the highest infectivity) for salmonid smolts for *C. shasta* and *P. minibicornis* appears to be the result of the synergistic effect of high spore input from heavily infected spawned adult salmon that congregate downstream from Iron Gate Dam and Iron Gate Hatchery, and the proximity of congregating salmonids to dense populations of polychaetes (Bartholomew et al. 2007). Juveniles released from Iron Gate Hatchery may also contribute to the infectious

nidus, as hatchery released juvenile fish that become infected and experience mortality further downstream in the Klamath River may become another source of myxospores threatening aquatic resources in the Middle and Lower Klamath River (Som et al. 2016c).

Discontinuing hatchery operations would eliminate the congregation of returning hatchery adults to the reach immediately downstream of Iron Gate Dam beginning in post-dam removal year 3 (Table 4.6-1), because dam removal would increase the likelihood that adults would disperse further upstream beginning in post-dam removal year 1 (note that the effect of dam removal on fish disease and parasites is described in more detail in Section 3.3.5 *[Aquatic Resources] Potential Impacts and Mitigation*).

In addition, beginning in dam removal year 2, hatchery juveniles would no longer be released during the natural smolt outmigration period. The Chinook salmon released to the Klamath River annually also likely result in deleterious effects on natural-origin populations, including competitive pressure between hatchery-derived and natural-origin fish in the limited habitat areas (e.g., thermal refugia) used by rearing juveniles in the Klamath River (NMFS 2010a). Iron Gate Hatchery releases Chinook salmon from the middle of May to the end of June, a period when discharge from Iron Gate Dam is in steep decline and water temperatures are rapidly rising, which may create competition between hatchery and natural-origin fish (Chinook salmon, coho salmon, and steelhead) for food and limited resources, especially limited space and resources in thermal refugia (NMFS 2010a). Negative hatchery effects due to competition, leading to displacement and lower growth, are well documented (Flagg et al. 2000, McMichael et al. 1997). In the Clackamas River, Oregon, hatchery steelhead released in the upper basin resulted in an exceedance of system carrying capacity, resulting in negative outcomes for natural-origin fish (Kostow et al. 2003 and Kostow and Zhou 2006), up to a 50 percent decline in the number of recruits per spawner, and a 22 percent decline in the maximum number of natural-origin recruits. These trends appear to have reversed after releases of hatchery fish were discontinued in 2000. Such density-dependent negative effects of hatchery-released fish can extend even into the marine environment, especially during periods of poor ocean conditions (Beamish et al. 1997a, Sweeting et al. 2003). Therefore, it is anticipated that the No Hatchery Alternative would result in reduced impacts to juvenile salmonids from resource competition.

Reservoir drawdown associated with dam removal under the No Hatchery Alternative could directly impact aquatic species. In addition, the removal of the Lower Klamath Project dams and reservoirs could alter the availability and quality of habitat in the Klamath River, resulting in direct and indirect effects on aquatic species. With a few exceptions, potential impacts under this alternative would be the same as those described for the Proposed Project (Section 3.3.5.9, Potential Impact 3.3-1 through Potential Impact 3.3-24) since discontinuing hatchery operations in dam removal year 2 is the only difference between this alternative and the Proposed Project. While the Proposed Project includes continued operation of Iron Gate Hatchery for eight years using flows diverted from Bogus Creek (Section 3.3.5.9, Potential Impact 3.3-23) and the reopening of Fall Creek Hatchery for eight years using flows diverted from Fall Creek (Section 3.3.5.9, Potential Impact 3.3-24), the No Hatchery Alternative does not include continued hatchery operations, and thus there would be no flow diversions from Bogus Creek or Fall Creek and no change relative to existing conditions.

The No Hatchery Alternative includes aquatic resource measures described for the Proposed Project in Section 3.3.5.9, including AR-1 (Mainstem Spawning), AR-2 (Juvenile Outmigration), AR-6 (Suckers), and AR-7 (Freshwater Mussels). Similarly, mitigation measures AQR-1 (Mainstem Spawning) and AQR-2 (Juvenile Outmigration) (described in Section 3.3.5.9, Potential Impact 3.3-1) are included. However, Aquatic Resource Measure AR-4 (Iron Gate Hatchery Management) and Mitigation Measure AQR-3 (Bogus Creek Flow Diversions) would not be included, since both pertain to the Iron Gate Hatchery, which would not be operational under this alternative. Potential impacts to fish species currently propagated at Iron Gate Hatchery (i.e., fall-run Chinook salmon and coho salmon) that would differ from impacts described under the Proposed Project are discussed below.

Potential Impact 3.3-7 Effects on the fall-run Chinook salmon population due to short-term sediment releases and long-term changes habitat quality, habitat quantity, and hatchery operations due to dam removal.

In the short term, reservoir drawdown under the No Hatchery Alternative would result in elevated suspended sediment concentrations (SSCs) and altered sand and finer bedload sediment transport and deposition and would adversely impact fall-run Chinook salmon primarily in the Middle Klamath River downstream of Iron Gate Dam, as described for the Proposed Project (Section 3.3.5.9 *Aquatic Resource Impacts*). Also consistent with the Proposed Project, the effect of SSCs from the No Hatchery Alternative on the fall-run Chinook salmon population, under all scenarios, would not be expected to substantially reduce the population in the short term.

Under the No Hatchery Alternative, hatchery Chinook salmon smolts (age 0 released in spring) and yearlings (age 1 released in fall) would no longer be released into the Klamath River as occurs under existing conditions. From 1978 through 2016, returns of fall-run Chinook salmon adults to the Iron Gate Hatchery have ranged from 2,558 (in 1980) to 72,474 (in 2001), with an average of 16,559 fish (CDFW 2016b). During the same period, natural-origin returns in the Klamath River (not including Trinity River) ranged from 6,957 to 91,757 fall-run Chinook salmon, with an average of 31,379 fish (CDFW 2016a). While natural-origin returns typically outnumber hatchery returns, the proportion of the Chinook salmon escapement comprised of Iron Gate Hatchery returns has historically been substantial (~35 percent of age 3 adults; KRTT 2011, 2012, 2015). Eliminating the hatchery goal of releasing around 6 million Chinook salmon smolts and yearlings annually would likely result in a reduction in adult hatchery returns to the Klamath River. Most adult returns are age 3 (around 75 percent), with some age 4 (around 23 percent), and a few age 5 (<2 percent) fish (KRTT 2011, 2012, 2015). As a result, progeny of hatchery releases would likely return as adults, continuing mostly through post-dam removal year 1 (i.e., 4-year old returns, see Table 4.7-1). The first adult returns from the progeny of natural-origin fish fall-run Chinook salmon using newly accessible habitat upstream of Iron Gate Dam would be expected during post-dam removal year 3 (i.e., 3-year old returns); it is anticipated that initial returns would be low in abundance as the newly accessible habitat is gradually seeded. Based on historical data (CDFW 2016b), the reduction in returns could average around 16,000 fish beginning in post-dam removal year 3, as the population responds to the benefits of dam removal. Based on the current proportion of hatchery adults in the run, this could represent a short-term reduction in abundance of around 35 percent of age 3 adults on average until production from newly accessible habitat increases adult escapement (anticipated to begin in dam removal year 3, Table 4.6-1). However, depending on the year, the reduction could be as high as 50 percent (the proportion of hatchery return

adult spawners in 1993 for example), or as low as 19 percent (the proportion in 1995) (KRTT 2015). The impact of a reduction in the number of hatchery returning fish is not equivalent to a reduction in the natural-origin population, from a population perspective. These adults are progeny of hatchery releases, and they typically return to the hatchery without contributing to the long-term sustainability of the fall-run Chinook salmon population. As discussed in detail in Section 3.3.2.3 *Habitat Attributed Expected to be Affected by the Proposed Project [Fish Hatcheries]*, hatchery returning adults can have substantial detrimental effects on native populations. As such, a reduction in hatchery returns under this alternative would be a benefit for fall-run Chinook salmon over the long term.

Under the No Hatchery Alternative, dam removal would increase habitat access for fall-run Chinook salmon, as described for the Proposed Project. As described in Section 3.3.5.9 *Aquatic Resource Impacts*, quantitative modeling of fall-run Chinook salmon populations suggests that the Proposed Project has a higher likelihood of resulting in increased Chinook salmon abundance than other management scenarios (e.g., continuation of existing conditions) (Oosterhout 2005, Huntington 2006, Dunsmoor and Huntington 2006, Hendrix 2011, Lindley and Davis 2011). Of the available models, the Hendrix (2011) life-cycle model (Evaluation of Dam Removal and Restoration of Anadromy [EDRRA]) approach is considered the most intensive and robust conducted to date. Since the model predictions are based on increased habitat access, the same gains would be expected for the No Hatchery Alternative as for the Proposed Project.

The rate at which recolonization and full post-dam removal fish production occurs would be partially dependent on the number of fish (natural-origin and hatchery strays) available and their ability to persist and adapt to the new habitat conditions. Although eight years of additional hatchery production under the Proposed Project is anticipated to achieve the production levels predicted by the EDRRA model sooner than without continued hatchery production, immediate closure of Iron Gate Hatchery and no production at Fall Creek Hatchery would eliminate most interbreeding of hatchery and natural-origin salmon by post-dam removal year 3, and would likely increase the rate at which Chinook salmon develop traits adapted to their new habitats upstream of Iron Gate Dam (Goodman et al. 2011). This could increase survival of natural-origin Chinook salmon at a faster rate than with continued hatchery operations under the Proposed Project. Goodman et al. (2011) note that this effect would depend, in part, on the degree to which local Chinook salmon stocks have been integrated into the hatchery brood stock and the degree to which the current mixed hatchery and natural-origin spawning population has maintained genetic potential for life history diversity to adapt to conditions upstream of Iron Gate Dam.

As described above in Section 4.7.3 *Aquatic Resources*, mortality from disease has the potential be reduced under this alternative more quickly than under the Proposed Project, since the release of Chinook and coho salmon would cease in dam removal year 2, rather than after eight additional years of hatchery releases.

The cessation of juvenile fish releases from Iron Gate Hatchery may also significantly decrease the amount of competition for food resources and habitat space between hatchery-reared and natural-origin smolts and yearlings in the Klamath River. This would result in higher growth rates for natural-origin fish (McMichael et al. 1997), and thus larger size at ocean entry beginning in dam removal year 2. Smolt size is correlated with increased marine survival for Chinook salmon (Scheuerell et al. 2009, Feldhaus et al.

2016), which in conjunction with reduced competition with hatchery smolts in the marine environment (Sweeting et al. 2003), would likely result in increased adult returns as soon as post-dam removal year 2 (i.e., 3-year-old adult returns).

Summary
In the short term, elevated SSCs and altered sand and finer bedload sediment transport and deposition and would adversely affect fall-run Chinook salmon primarily in the Middle Klamath River downstream of Iron Gate Dam, as described for the Proposed Project (Potential Impact 3.3-7), but would not be expected to substantially reduce the population. However, the elimination of hatchery produced fall-run Chinook salmon would likely result in a reduction (averaging 35 percent, potentially ranging from 19 to 50 percent based on existing conditions) in adult returns beginning in post-dam removal year 3 and continuing for an indeterminate period of perhaps one to five years (i.e., short-term), before the benefits of dam removal predicted by the EDRRA model for adult fall-run Chinook salmon are realized. In comparison with the Proposed Project, the natural-origin Chinook salmon population may adapt more quickly to restored habitat and benefit sooner from decreased competition and disease interactions, potentially reducing the period of short-term impacts. Overall, based on data from 1985 through 2014 (KRRT 2015), natural-origin returns of adult fall-run Chinook salmon have always outnumbered hatchery adult returns in the Klamath River Basin, and hatchery returns have never been estimated to be greater than 50 percent of the escapement in any year and are typically around 35 percent. Furthermore, hatchery returning adults are considered detrimental to the sustainability of natural spawning populations. Therefore, no substantial (> 50 percent) reduction in fall-run Chinook salmon abundance of a year-class is predicted to occur in the short term and this alternative would result in a less than significant impact.

In the long term, removal of the Lower Klamath Project dams under the No Hatchery Alternative would increase habitat availability, restore a more natural flow regime and seasonal variation in water temperature, improve water quality, and reduce the likelihood of fish disease and algal toxins, all of which would be beneficial for fall-run Chinook salmon. As described for the Proposed Project, if fish passage is not provided a Keno Impoundment/Lake Ewuana, restored habitat access to the Hydroelectric Reach and the multiple benefits of the Proposed Project would be beneficial for fall-run Chinook salmon in the long term. If fish passage were provided (per DOI [2007] fish passage prescriptions), an even greater magnitude of restored habitat access to the Upper Klamath River Basin and the multiple benefits of the No Hatchery Alternative would be beneficial for fall-run Chinook salmon in the long term.

Significance
No significant impact for fall-run Chinook salmon in the short term

Beneficial for fall-run Chinook salmon in the long term

Potential Impact 3.3-8 Effects on the spring-run Chinook salmon population due to short-term sediment releases and long-term changes in habitat quality, habitat quantity, and hatchery operations due to dam removal.
In the short term, reservoir drawdown under the No Hatchery Alternative would increase SSCs and bedload sediment transport and deposition and impact spring-run Chinook salmon, as described for the Proposed Project (Section 3.3.5.9 *Aquatic Resource Impacts*). However, based on the distribution of spring-run Chinook salmon in the lower

Klamath River Basin (e.g., within the Salmon and Trinity rivers), the overall effect of suspended sediment from the Proposed Project on the spring-run Chinook salmon population is not anticipated to differ substantially from existing conditions. Also consistent with the Proposed Project, no reduction in the abundance of a year class is predicted in the short term.

Under the No Hatchery Alternative, coho and fall-run Chinook salmon yearlings and smolts would no longer be released into the Klamath River. There are currently no releases of spring-run Chinook salmon from hatcheries into the Klamath River. Therefore, the closure of the Iron Gate Hatchery is not anticipated to result in a decline in adult returns for spring-run Chinook salmon. However, as described above in Section 4.7.3 *Aquatic Resources*, outmigrant spring-run Chinook smolt mortality due to disease would be reduced under this alternative more quickly than under the Proposed Project, since the release of fall-run Chinook and coho salmon would cease in dam removal year 2, rather than after eight additional years of hatchery releases following dam removal. The cessation of juvenile fish releases from Iron Gate Hatchery in conjunction with dam removal may also significantly decrease the amount of competition for food resources and habitat space between hatchery-reared and natural-origin smolts in the Klamath River. This would result in higher growth rates for natural-origin fish (McMichael et al. 1997) and thus larger size at ocean entry beginning in dam removal year 2. Smolt size is correlated with increased marine survival for Chinook salmon (Scheuerell et al. 2009, Feldhaus et al. 2016), which in conjunction with reduced competition with hatchery smolts in the marine environment (Sweeting et al. 2003) is anticipated to result in increased adult returns as soon as post-dam removal year 2 (i.e., 3-year-old adult returns). Therefore, ending hatchery operations under this alternative may result in a more rapid increase in the spring-run Chinook salmon adult population as a result of dam removal than under the Proposed Project.

Summary

In the short term, elevated SSCs and bedload sediment transport and deposition would adversely impact spring-run Chinook salmon, but based on the distribution of spring-run Chinook salmon in the lower Klamath River Basin (e.g., within the Salmon and Trinity rivers) the overall effect on the population is not anticipated to differ substantially from existing conditions and no reduction in the abundance of a year class is predicted.

Under the No Hatchery Alternative, the elimination of hatchery produced salmonids would not affect spring-run Chinook salmon adult returns in the short term. As described for the Proposed Project, this alternative includes aquatic resource measure AR-2 (Juvenile Outmigration) to reduce the short-term effects of SSCs on spring-run Chinook salmon smolts. In addition, although CEQA Guidelines Section 15126.4(a)(3) states that mitigation measures are not required for effects which are not found to be significant, mitigation measure AQR-2, which would be implemented as a result of significant adverse impacts described for Potential Impact 3.3-1 and Potential Impact 3.3-4 (Section 3.3.5.9 *Aquatic Resource Impacts*), would even further reduce the potential for short-term effects of the No Hatchery Alternative on spring-run Chinook salmon by increasing certainty regarding the effectiveness of the proposed aquatic resource measure. With implementation of resource measures, there would still be short-term impacts on spring-run Chinook salmon, including some potential direct mortality, but there would not be a substantial reduction in the abundance of a year class. The impact of the No Hatchery Alternative would be less than significant for spring-run Chinook salmon in the short term.

In the long term, removal of the Lower Klamath Project dams under the No Hatchery Alternative would improve habitat availability, flow regime, water quality, seasonal water temperature variation, and would reduce or eliminate algal toxins, all of which would benefit spring-run Chinook salmon. Dam removal would restore connectivity to hundreds of miles of historical habitat in the Upper Klamath Basin and would create additional habitat within the Hydroelectric Reach. The No Hatchery Alternative would be beneficial for spring-run Chinook salmon in the long term.

Significance

No significant impact for spring-run Chinook salmon in the short term

Beneficial for spring-run Chinook salmon in the long term

Potential Impact 3.3-9 Effects on coho salmon populations due to short-term sediment releases and long-term changes in habitat quality, habitat quantity, and hatchery operations due to dam removal.

In the short term, reservoir drawdown under the No Hatchery Alternative would increase SSCs and bedload sediment transport and deposition and impact coho salmon, as described for the Proposed Project (Section 3.3.5.9 *Aquatic Resource Impacts; Potential Impact 3.3-9*). In general, the wide distribution and use of tributaries by both juvenile and adult coho salmon would likely protect the population from the worst short-term impacts of this alternative. However, direct mortality is anticipated for redds from the Upper Klamath River Population Unit (at most 13 redds based on historic data, see Appendix E). As described for the Proposed Project (Section 3.3.5.9 *Aquatic Resource Impacts*; Potential Impact 3.3-9), no mortality is anticipated for the other population units.

Under the No Hatchery Alternative, hatchery coho salmon smolts (age 1 released in fall) would no longer be released into the Klamath River. Iron Gate Hatchery has a goal to produce 75,000 coho salmon smolts on an annual basis, although that goal has only been met in three of the last seven years (2011–2017). Overall, coho salmon yearling smolt goals are achieved on average (K. Pomeroy, CDFW, pers. comm., 2018). Based on current production levels, ceasing operations would likely result in a reduction of up to 75,000 coho salmon smolts per year beginning in dam removal year 2 (Table 4.7-1). Based on the current low abundance of coho salmon in the upper Klamath River population unit, a conservation focus for the coho salmon program has been deemed necessary to protect the remaining genetic resources of that population unit (CDFW 2014). Coho salmon adult returns to Iron Gate Hatchery have significantly and steadily declined from a high of 2,466 adults in the 2001/2002 return year to 38 adults in the 2015/2016 return year, with an annual average of 866 (CDFW 2016b). Assuming coho smolts would be released for the last time in dam removal year 1 (Table 4.7-1), adults of hatchery progeny would continue to return through post-dam removal year 1 (as age 3 adults). Based on the average coho salmon smolt-to-adult survival ratio of 0.99 percent estimated for current coho salmon Iron Gate Hatchery operations (CDFW 2014), a reduction in the release of 75,000 coho salmon smolts following closure of Iron Gate Hatchery could result in a decline of around 743 adult returns on average annually starting in post-dam removal year 2 (Table 4.7-1). These adults would return to the Iron Gate Hatchery, but also stray into tributaries (primarily Bogus Creek) and spawn naturally. Between 2004 and 2011 an average of 46 coho salmon hatchery adults per year strayed into Bogus Creek (CDFW 2014).

Under existing conditions, CDFW (2014) estimates that greater than 30 percent on average of the total adult returns to the Upper Klamath River are of hatchery origin, including greater than 70 percent of returns to the hatchery, around 34 percent of returns to Bogus Creek, and around 16 percent of returns to tributaries such as the Shasta and Scott rivers. The natural abundance of coho salmon adults in the Upper Klamath Population Unit is less than 200 fish, and in some years the majority of natural-origin spawning is from adults of hatchery origin (CDFW 2014).

Assuming that hatchery production ceases in dam removal year 1, the total reduction in coho salmon returns in post-dam removal year 2 (i.e., after hatchery returns have ended and prior to realization of dam removal habitat benefits) would vary depending on population unit, and it could be substantial (> 50 percent) in the Upper Klamath River Population Unit depending on strength of the natural-origin returning spawners. Reductions are anticipated to be less than substantial (< 20 percent reduction) for the other population units. While the impact could be substantial for the upper Klamath River coho salmon population unit In the short term, the overall short-term impact on coho salmon populations in the Klamath River Basin would not be substantial. In addition, the impact of a reduction in the number of hatchery returning fish is not equivalent to a reduction in the natural spawning population, from a population perspective. These adults are progeny of hatchery releases, and typically return to the hatchery without contributing to the long-term sustainability of the coho salmon population. As discussed in detail in Section 3.3.2.3 *Habitat Attributed Expected to be Affected by the Proposed Project [Fish Hatcheries]*, hatchery returning adults can have substantial detrimental effects on native populations; as addressed by CDFWs plan to operate the hatchery for coho salmon conservation (CDFW 2014).

In addition, and as described in Section 3.3.2.3 *Habitat Attributes Expected to be Affected by the Proposed Project* and summarized in CDFW (2014), there are adverse hatchery-related effects on the coho salmon population, including straying of Iron Gate Hatchery fish into important tributaries with the potential to reduce the reproductive success of the natural population (Mclean et al. 2003, Chilcote 2003, Araki et al. 2007) and negatively affect the diversity of the interior Klamath populations via outbreeding depression[231] (Reisenbichler and Rubin 1999). As described above in Section 4.7.3 *Aquatic Resources*, outmigrant smolt mortality from disease would be reduced under the No Hatchery Alternative more quickly than under the Proposed Project, since the release of Chinook and coho salmon would cease in dam removal year 2, rather than after eight additional years of hatchery releases. The cessation of juvenile fish releases from Iron Gate Hatchery may also significantly decrease the amount of competition for food resources and habitat space between hatchery-reared and natural-origin spawned smolts in the Klamath River. This would result in higher growth rates for natural-origin spawned fish (McMichael et al. 1997), and thus larger size at ocean entry beginning in dam removal year 2. Smolt size is correlated with increased marine survival for coho salmon (Holtby et al. 1990), which in conjunction with reduced competition with hatchery smolts in the marine environment (Sweeting et al. 2003) would likely result in increased adult returns as soon as post-dam removal year 2 (i.e., 3-year-old adult returns). Therefore, ending hatchery operations as part of dam removal may result in a more rapid increase in the adult coho salmon population as compared with the Proposed Project.

[231] Outbreeding depression is progeny that are less adapted to the environment than parents.

As described for the Proposed Project (Section 3.3.5.9, Potential Impact 3.3-9), under the No Hatchery Alternative, dam removal and the associated habitat improvements would likely result in an increase in coho salmon abundance. The first adults that could potentially access the newly available habitat upstream of Iron Gate Dam would occur in dam removal year 2, and they would produce progeny benefiting from improved river function in post-dam removal year 1. Therefore, the first adult returns that could reflect the improved habitat conditions would occur in post-dam removal year 4 (i.e., as age 3 adults).

Summary
In the short term, reservoir drawdown under the No Hatchery Alternative would increase SSCs and bedload sediment transport and deposition and adversely impact coho salmon, as described for the Proposed Project. In general, the wide distribution and use of tributaries by both juvenile and adult coho salmon would likely protect the population from the worst short-term impacts of this alternative. However, direct mortality is anticipated for redds from the Upper Klamath River Population Unit (at most 13 redds based on historic data, see Appendix E). No mortality is anticipated for the other population units.

The elimination of hatchery produced coho salmon would likely result in a reduction in adult returns for a period of one to five years before the benefits of dam removal are realized. Compared with the Proposed Project, the natural coho salmon population would benefit sooner from decreased competition and disease interactions once hatchery releases are eliminated, which would potentially reduce the period of short-term impacts under the No Hatchery Alternative. However, in post-dam removal years 2 and 3 (at a minimum), there would be a 10 to 30 percent reduction in adult returns (depending on population unit), since this would be after hatchery returns have ended, and prior to the first adults capable of realizing the benefits of dam removal (Table 4.6-1). In addition, closure of the coho salmon hatchery program at Iron Gate Hatchery in dam removal year 1 would result in cessation of the genetic management plan's goal of improving diversity and fitness of Klamath River coho salmon (CDFW 2014). Overall, because there would not be a predicted substantial short-term decrease in coho salmon abundance of a year class, nor would there be a substantial decrease in habitat quality or quantity, there would not be a significant impact to coho salmon under the No Hatchery alternative in the short term.

In addition, and as described for the Proposed Project, although there would be no significant impact on coho salmon In the short term, aquatic resource measures AR-1 (Mainstem Spawning) and AR-2 (Juvenile Outmigration) would occur under the No Hatchery Alternative, which would further reduce the potential for short-term effects of SSCs on salmonid juveniles, smolts, and eggs, including coho salmon. In addition, although CEQA Guidelines Section 15126.4(a)(3) states that mitigation measures are not required for effects which are not found to be significant, mitigation measures AQR-1 and AQR-2, which would be implemented as a result of significant adverse impacts described for Potential Impact 3.3-1 and Potential Impact 3.3-4 (Section 3.3.5.9 *Aquatic Resource Impacts*), would even further reduce the potential for short-term effects of the No Hatchery Alternative on coho salmon by increasing certainty regarding the effectiveness of the proposed aquatic resource measures.

In the long term, removal of the Lower Klamath Project dams under the No Hatchery Alternative would improve habitat availability, flow regime, water quality, seasonal

temperature variation, and reduce fish disease incidence and algal toxins, all of which would benefit coho salmon. Dam removal would restore connectivity to habitat on the mainstem Klamath River up to and including Spencer Creek and would create additional habitat within the Hydroelectric Reach. Dam removal would also cause water temperatures to become warmer earlier in the spring and early summer, cooler earlier in the late summer and fall, and have diurnal variations more in sync with historical migration and spawning periods (Hamilton et al. 2011). These changes would result in water temperatures that are more favorable for salmonids in the mainstem.

In the long term, increased adult returns resulting from newly accessible habitat upstream of Iron Gate Dam would offset reductions in adult returns due to cessation of hatchery operations. It is anticipated that as a result of the No Hatchery Alternative, the coho salmon population would experience an increase in abundance, productivity, population spatial structure, and genetic diversity. In general, free flowing river conditions under the No Hatchery Alternative would likely increase adult migration efficiency, decrease outmigrant delay, and increase adult escapement (Buchanan et al. 2011b). The increases associated with dam removal would result in overall increases in the abundance and viability of the coho salmon from all Klamath River population units in the long term.

Significance

No significant impact for coho salmon populations in the short term

Beneficial for coho salmon from all Klamath River population units in the long term

4.7.4 Phytoplankton and Periphyton

The No Hatchery Alternative would have the same potential short-term and long-term impacts on phytoplankton and periphyton as those described for the Proposed Project (Potential Impacts 3.4-1 through 3.4-5). The primary changes to the existing phytoplankton and periphyton conditions under both the Proposed Project and the No Hatchery Alternative are from dam removal and the shift in dynamics from a reservoir system to a riverine system in the Hydroelectric Reach. The difference between the No Hatchery Alternative and either existing conditions or the Proposed Project results from ending operations at Iron Gate Hatchery and not restarting operations at Fall Creek Hatchery. Under the No Hatchery Alternative, discharges from Iron Gate Hatchery, including nutrient discharges, under existing conditions and the Proposed Project would cease. While Iron Gate Hatchery nutrient releases would decrease under the No Hatchery Alternative, the hatchery nutrient discharges are less-than-significant based on an analysis of the water quality impacts of California Department of Fish and Wildlife hatcheries, including Iron Gate Hatchery (ICF 2010) and decreases in hatchery nutrient releases would not necessarily result in a beneficial effect on phytoplankton or periphyton conditions downstream of the hatchery discharge. Thus, phytoplankton and periphyton conditions under the No Hatchery Alternative with no nutrient releases from Iron Gate Hatchery discharges would be similar to existing conditions or the Proposed Project. Potential impacts to dissolved oxygen and water temperature in Fall Creek under the Proposed Project (see Potential Impact 3.2-17) would be eliminated under this alternative since the fish production at Fall Creek Hatchery would not restart and the hatchery discharges would not occur.

Overall, ceasing production and removing Iron Gate Hatchery and not reopening Fall Creek Hatchery under the No Hatchery Alternative would result in no significant difference in phytoplankton and periphyton growth relative to existing conditions or the Proposed Project, thus there would be no significant impact on phytoplankton and periphyton under the No Hatchery Alternative.

4.7.5 Terrestrial Resources

Full removal of Iron Gate Hatchery under the No Hatchery Alternative would result in a similar degree of construction activities and associated impacts to terrestrial resources as the Iron Gate Hatchery modifications (i.e., relocation of fish trapping and holding facilities, relocation of the cold-water supply) and Fall Creek Hatchery upgrades are included under the Proposed Project. Further, not operating the hatcheries under this alternative would have no bearing on the anticipated long-term changes in terrestrial habitat that would result from removal of the Lower Klamath Project dams, reservoirs, and associated facilities. Therefore, the No Hatchery Alternative would have the same short-term and long-term potential impacts on vegetation communities, culturally significant species, special-status species, wildlife corridors, and habitat connectivity as those described for the Proposed Project (Potential Impacts 3.5-1 through 3.5-24 and 3.5-28 through 3.5-30).

While the Proposed Project includes continued operation of Iron Gate Hatchery for eight years using flows diverted from Bogus Creek (Potential Impact 3.5-26) and the reopening of Fall Creek Hatchery for eight years using flows diverted from Fall Creek (Potential Impact 3.5-27), the No Hatchery Alternative does not include continued hatchery operations, and thus there would be no flow diversions from Bogus Creek or Fall Creek and no impact (no change from existing conditions). Potential impacts on wildlife due to the loss of salmon currently propagated at Iron Gate Hatchery (i.e., fall-run Chinook salmon and coho salmon), which would differ from impacts described under the Proposed Project, is discussed below.

Potential Impact 3.5-25 Effects on wildlife from increased habitat for salmonids and changes in hatchery production.
Full removal of the Iron Gate Hatchery, which currently releases fall-run Chinook and coho salmon smolts and contributes to returning adults, may reduce prey availability for special-status wildlife in the short term. Special-status wildlife such as bald eagle, Barrow's goldeneye, common loon, and western pond turtle may forage on out-migrating natural and hatchery-produced salmonids and/or on returning adult carcasses.

Under the No Hatchery Alternative, there would be a reduction of outmigrating yearlings and smolts compared to existing conditions. No data are available to accurately estimate the number of naturally produced smolts in the watershed in comparison with hatchery production, but based on adult returns (Section 3.3.2 *[Aquatic Resources] Environmental Setting*), hatchery-origin out-migrating yearlings and smolts currently comprise approximately 35 percent of all fall-run Chinook salmon smolts outmigrating in the mainstem Klamath River (Section 4.7.2, Potential Impact 3.3-7), and around 30 percent on average of the total coho salmon smolt production (Section 4.7.2, Potential Impact 3.3-9). Thus, under this alternative, beginning in dam removal year 2 hatchery juveniles would not be released during the natural spring smolt outmigration period and prey availability for raptors and mammals during this period would be reduced by over 30 percent. Yearling and smolt production would begin to increase again following dam

removal (i.e., post-dam removal year 1) since both (previously released) hatchery and natural-origin adults would have access to new habitat for spawning. Production would occur in post-dam removal year 1 (see also Section 3.3.5.6 *Fish Hatcheries*), and on average would be expected to increase the availability of outmigrating salmonids as prey for wildlife each year following dam removal.

With respect to adult returns, the elimination of hatchery produced fall-run Chinook salmon would likely result in a reduction (averaging 35 percent, potentially ranging from 19 to 50 percent based on existing conditions) in adult returns in the fall beginning in post-dam removal year 3 and continuing for an indeterminate period of perhaps one to five years (i.e., short-term), before the benefits of dam removal are realized (see Section 4.7.3 *Aquatic Resources*, Potential Impact 3.3-7). The elimination of hatchery produced coho salmon would likely result in a reduction in adult returns for a period of one to five years before the benefits of dam removal are realized (see Section 4.7.3 *Aquatic Resources*, Potential Impact 3.3-9).

Although a variety of wildlife prey directly forage on outmigrating smolts or adult returns originating from Iron Gate Hatchery, bald eagles would be the most likely state-listed special-status species to do so in the Klamath Basin; other state species of special concern that forage on fish include the western pond turtle, Barrow's goldeneye, and common loon. Bald eagles are opportunistic foragers and hunt mainly for fish and waterfowl, but will also feed on small mammals and other small vertebrates and carrion (see also Potential Impact 3.5-21). Similarly, the diet of other state species of special concern includes prey items other than fish. For example, western pond turtles forage on aquatic plants, benthic macroinvertebrates, frogs, and crayfish(see also Potential Impact 3.5-20); Barrow's goldeneye primarily eat aquatic invertebrates and fish eggs (Cornell Lab of Ornithology 2017a); and the common loon also feeds on crustaceans, snails, and aquatic insect larvae (Cornell Lab of Ornithology 2017b).

While the anticipated peak reduction in availability of hatchery-origin outmigrating smolts would occur during spring of dam removal year 2, there would also be an enhanced opportunity for these species to consume stranded or dead fish during and following reservoir drawdown (winter through spring of dam removal year 2) (Potential Impact 3.5-21). Further, these species would continue to forage on natural-origin outmigrating salmonids elsewhere in the basin (e.g., Scott, Shasta, Salmon, Trinity rivers) and would utilize alternate food sources as described above. Overall, the anticipated peak reduction in outmigrating smolts in dam removal year 2 under this alternative would not significantly affect the ability of these special-status species to perform essential feeding behaviors. Similarly, although adult returns would be reduced on average by 35 percent for fall-run Chinook beginning in post-dam removal year 3 and continuing for one to five years, bald eagles that regularly forage in the Middle and Lower Klamath River, and/or the Klamath River Estuary, would still have access to alternate food sources such as small mammals and birds such that this alternative would not significantly affect the ability of this species to perform essential feeding behaviors three to five years following dam removal. Thus, there would be no significant impact in the short term.

In the long term, dam removal would result in increased adult returns for fall-run Chinook and coho salmon due to restored connectivity to hundreds of miles of potentially usable habitat in the Upper Klamath Basin and creation of additional spawning and rearing habitat within the Hydroelectric Reach, as well as improved habitat quality (i.e., more natural flow regime and seasonal variation in water temperature, improved water quality,

reduced likelihood of fish disease and algal toxins). These long-term effects would be beneficial for fall-run Chinook salmon and would offset short-term reductions in adult returns due to cessation of hatchery operations under this alternative. In the long term, the increased abundance and productivity of these adult, juvenile, and out-migrating salmon species would result in an increased prey base and would be beneficial for bald eagles, Barrow's goldeneye, and western pond turtles. Similar conditions would occur for other fish-eating wildlife, including a variety of birds (osprey, merganser, cormorant, egret, heron) and mammals (otters, bears), such that overall there would be no short-term or long-term significant impacts on wildlife due to the loss of hatchery production under this alternative.

Significance

No significant impact in the short term or long term

4.7.6 Flood Hydrology

Removing Iron Gate Hatchery and not reopening Fall Creek Hatchery under the No Hatchery Alternative would not affect river flood stages or flood flow conditions relative to the Proposed Project. Therefore, the flood hydrology impacts of the No Hatchery Alternative would be the same as those described for the Proposed Project (Section 3.6.5 *[Flood Hydrology] Potential Impacts and Mitigation*) and there would be no significant impacts relative to existing conditions for Potential Impacts 3.6-1, 3.6-2, and 3.6-4 through 3.6-6. For reasons described in the Proposed Project, there would be significant and unavoidable impacts relative to existing conditions from exposing structures to a substantial risk of damage due to flooding in the reach between Iron Gate Dam (RM 193) and Humbug Creek (RM 174) (Potential Impact 3.6-3).

4.7.7 Groundwater

Removing Iron Gate Hatchery and not reopening Fall Creek Hatchery under the No Hatchery Alternative would not affect groundwater levels or wells immediately adjacent (potentially extending up to a mile from the reservoirs under certain conditions) to Copco No. 1 and Iron Gate reservoirs relative to the Proposed Project. Therefore, the groundwater impacts of the No Hatchery Alternative would be the same as those described for the Proposed Project (Potential Impacts 3.7-1 and 3.7-2) and there would be no significant impacts relative to existing conditions.

4.7.8 Water Supply/Water Rights

Under the No Hatchery Alternative, the Bogus Creek water diversion of up to 8.75 cfs to operate Iron Gate Hatchery, and the Fall Creek water diversion of up to 9.24 cfs to reopen and operate Fall Creek Hatchery (Section 2.7.6 *Hatchery Operations*), would not occur. However, since water proposed to be diverted for the Iron Gate and Fall Creek Hatcheries under the Proposed Project would be for non-consumptive uses, and therefore would not change the amount of water available for diversion downstream, the lack of these diversions under the No Hatchery Alternative would result in no difference relative to either the Proposed Project or existing conditions. Removing Iron Gate Hatchery and not reopening Fall Creek Hatchery under the No Hatchery Alternative would not otherwise affect the amount of surface water flow available for diversion compared to the Proposed Project; therefore, the effects of the No Hatchery Alternative on the amount of water available for diversion in the Klamath River would be the same

as those described for the Proposed Project (Potential Impacts 3.8-1, 3.8-2, and 3.8-5) and there would be no significant impacts.

Under the No Hatchery Alternative, mobilization of reservoir sediment deposits during reservoir drawdown would occur as described for the Proposed Project, such that release of stored sediment could impact water intake pumps downstream from Iron Gate Dam (Potential Impact 3.8-3) and there would be a significant impact. Implementation of Mitigation Measure WSWR-1 would result in no significant impact.

The City of Yreka's municipal water supply pipeline would still need to be relocated following drawdown of Iron Gate Reservoir under the No Hatchery Alternative, and as described for the Proposed Project there would be potential for disruption to the City's water supply, which would be a significant impact. Implementation of Mitigation Measure WSWR-2 would result in no significant impact.

4.7.9 Air Quality

Full removal of Iron Gate Hatchery under the No Hatchery Alternative would result in a similar degree of construction activities and associated impacts related to air pollutants as the Iron Gate Hatchery modifications (i.e., relocation of fish trapping and holding facilities, relocation of the cold-water supply) and Fall Creek Hatchery upgrades are included under the Proposed Project. Therefore, the No Hatchery Alternative would have the same short-term construction-related emissions of air pollutants (i.e., VOCs, CO, NOx, SOs, PM_{10}, $PM_{2.5}$) as those described for the Proposed Project (Potential Impacts 3.9-1 through 3.9-5). Like the Proposed Project, construction activities occurring under the No Hatchery Alternative would exceed the Siskiyou County Air Pollution Control District emissions thresholds and would result in a significant and unavoidable impact.

Note that analysis of the Proposed Project considers only construction-related air quality impacts because no changes in operational sources are part of the Proposed Project (Section 3.9.4 *[Air Quality] Impact Analysis Approach*). Under the Proposed Project, operational emissions for the reduced operation of Iron Gate Hatchery combined with the re-instated operation of Fall Creek Hatchery are assumed to be the same as existing operation conditions at Iron Gate Hatchery for eight years following dam removal, since the existing functions at the Iron Gate Hatchery that would be eliminated as part of dam removal activities, would be replaced by the reopening and operation of the Fall Creek Hatchery and by making improvements to the Iron Gate Hatchery (Section 2.7.6 *Hatchery Operations*). Thus, as a matter of general comparison, under the No Hatchery Alternative, operational emissions from the hatcheries would be lower (zero) than those under existing conditions. Since the existing operational emissions from Iron Gate Hatchery are not quantified, a beneficial significance determination may not be supported and the alteration in emissions under the No Hatchery Alternative would result in no significant impact.

4.7.10 Greenhouse Gas Emissions

Full removal of Iron Gate Hatchery under the No Hatchery Alternative would result in a similar degree of construction activities and associated impacts related to greenhouse gas emissions as the Iron Gate Hatchery modifications (i.e., relocation of fish trapping and holding facilities, relocation of the cold-water supply) and Fall Creek Hatchery

upgrades are included under the Proposed Project. Therefore, the No Hatchery Alternative would have the same short-term construction-related potential impacts on greenhouse gas emissions as those described for the Proposed Project (Potential Impacts 3.10-1 and 3.10-2) and would result in no significant impact on greenhouse gas levels relative to existing conditions.

Note that analysis of the Proposed Project assumes that energy use associated with the reduced operation of Iron Gate Hatchery combined with the re-instated operation of Fall Creek Hatchery would be the same as existing conditions operations at Iron Gate Hatchery for the eight years following dam removal, since the existing functions at the Iron Gate Hatchery that would be eliminated as part of dam removal activities would be replaced by the reopening and operation of the Fall Creek Hatchery and by making improvements to the Iron Gate Hatchery (Section 2.7.6 *Hatchery Operations*). Thus, as a matter of general comparison, under the No Hatchery Alternative, operational emissions from the hatcheries would be lower (zero) than those under existing conditions. Since the existing operational emissions from Iron Gate Hatchery are not quantified, a beneficial significance determination may not be supported and the alteration in emissions under the No Hatchery Alternative would result in no significant impact.

4.7.11 Geology, Soils, and Mineral Resources

Removing Iron Gate Hatchery and not reopening Fall Creek Hatchery under the No Hatchery Alternative would not affect geologic hazards, short-term soil disturbance, earthen dam embankment instability, or mineral resource availability relative to the Proposed Project. Therefore, the effects of the No Hatchery Alternative on geology and soils would be the same as those described for the Proposed Project (Potential Impacts 3.11-1, 3.11-2, and 3.11-4 through 3.11-8) and there would be no significant impacts relative to existing conditions. For reasons described in Section 3.11.5 *[Geology, Soils, and Mineral Resources] Potential Impacts and Mitigation*, Implementation of Recommended Measure GEO-1 would be necessary to reduce the potential impacts resulting from slope failure in reservoir rim areas at Copco No. 1 Reservoir (see Potential Impact 3.11-3). With implementation of Mitigation Measure GEO-1, there would be no significant impacts due to the potential for hillslope instability at Copco No. 1 Reservoir during drawdown and the year following drawdown.

4.7.12 Historical Resources and Tribal Cultural Resources

Since the Lower Klamath Project dams and associated facilities would be removed in the same manner under the No Hatchery Alternative as the Proposed Project, potential impacts and associated mitigation measures under the No Hatchery Alternative would be the same as those described for the Proposed Project, Section 3.12.5 *[Historical Resources and Tribal Cultural Resources] Potential Impacts and Mitigation*, except for the differences discussed below.

Since the Iron Gate Hatchery would not be operated for eight years following dam removal, the portion of the Limits of Work containing the Iron Gate Hatchery footprint (Figure 2.7-4) would be returned to more natural conditions In the short term, which would be beneficial relative to existing conditions and the Proposed Project. Further, since construction/upgrading activities would not occur at Fall Creek Hatchery, there would be no pre-dam removal construction activities (Potential Impact 3.12-1) at the Fall

Creek site and thus no significant impacts to known or as yet unknown tribal cultural resources (Potential Impact 3.12-1) or historic-period archaeological resources (Potential Impact 3.12-12) relative to existing conditions, and fewer impacts relative to the Proposed Project.

Full removal of the Iron Gate Hatchery, which currently releases salmonid smolts and contributes to returning adults, and not reopening Fall Creek Hatchery, would reduce the amount of Fall-run Chinook and coho salmon present for California Native American tribes that currently use salmon in their diet and consider salmon to be an important part of their culture (Potential Impact 3.12-10). The elimination of hatchery produced fall-run Chinook salmon under this alternative would likely result in a reduction (averaging 35 percent, potentially ranging from 19 to 50 percent based on existing conditions) in adult returns in the fall beginning in post-dam removal year 3 and continuing for an indeterminate period of perhaps one to five years (i.e., short-term), before the benefits of dam removal are realized (see Section 4.7.3 *Aquatic Resources*, Potential Impact 3.3-7). The elimination of hatchery produced coho salmon would likely result in a reduction in adult returns for a period of one to five years before the benefits of dam removal are realized (see Section 4.7.3 *Aquatic Resources*, Potential Impact 3.3-9). This potential impact to the fishery would be greater than under the Proposed Project, because under the Proposed Project the hatcheries would continue to supplement natural adult returns (albeit at a reduced rate of production) until after seven generations or cohorts of fish have been hatched with the benefit from expanded habitat and improved water quality conditions. However, the short term reduction in the fishery due to elimination of hatchery-produced fall-run Chinook and coho salmon under the No Hatchery Alternative would represent a material impairment of the Klamath Riverscape as a resource and a substantial restriction of tribal access to the fishery relative to existing conditions.

In the long term, increased adult returns for fall-run Chinook and coho salmon resulting from restored connectivity to hundreds of miles of potentially usable habitat in the Upper Klamath Basin and creation of additional spawning and rearing habitat within the Hydroelectric Reach, as well as improved habitat quality (more natural flow regime and seasonal variation in water temperature, improved water quality, reduced likelihood of fish disease and algal toxins), would be beneficial for fall-run Chinook salmon and coho salmon and would offset reductions in adult returns due to cessation of hatchery operations under this alternative (Section 4.7.3 *Aquatic Resources*, Potential Impacts 3.3-7 and 3.3-9). Additionally, the populations of other salmonids are expected to benefit from expanded habitat, improved water quality, reduced disease factors and decreased competition from hatchery fish. The increased abundance and productivity of these salmon species would result in an increase in availability of salmon for California Native American tribes and would be beneficial in the long term.

4.7.13 Paleontologic Resources

Removing Iron Gate Hatchery and not reopening Fall Creek Hatchery under the No Hatchery Alternative would not affect downcutting or erosion of the Hornbrook Formation located downstream of Iron Gate Dam relative to the Proposed Project. Therefore, the effects of the No Hatchery Alternative on paleontologic resources would be the same as those described for the Proposed Project (Potential Impact 3.13-1) and there would be no significant impacts relative to existing conditions.

4.7.14 Land Use and Planning

Overall, under the No Hatchery Alternative, potential impacts on connectivity between areas of a community in California would be the same as those described for the Proposed Project in Section 3.14.5 *[Land use and Planning] Potential Impacts and Mitigation*. The California dam removal actions and California land transfer and management for public interest purposes would occur in the same manner under both the No Hatchery Alternative and under the Proposed Project.

4.7.15 Agriculture and Forestry Resources

Fully removing Iron Gate Hatchery and not reopening Fall Creek Hatchery under the No Hatchery Alternative would not affect agriculture and forestry management relative to the Proposed Project or to the existing condition. Therefore, effects of the No Hatchery Alternative on agriculture and forestry resources would be the same as those described for the Proposed Project (Potential Impact 3.15-1 through 3.15-3), and there would be no significant impacts relative to existing conditions.

4.7.16 Population and Housing

Full removal of Iron Gate Hatchery under the No Hatchery Alternative would result in a similar degree of construction activities and associated impacts related to population and housing as the Iron Gate Hatchery modifications (i.e., relocation of fish trapping and holding facilities, relocation of the cold-water supply) and Fall Creek Hatchery upgrades are included under the Proposed Project. Construction activities are the only part of the Proposed Project and this alternative that merit analysis for potential impacts on population and housing. The number of construction workers in California would be the same as those described for the Proposed Project and would not result in a substantial influx of population (Potential Impact 3.16-1), nor would there be a need to displace existing residents or build replacement housing elsewhere (Potential Impact 3.16-2), and there would be no significant impacts relative to existing conditions.

4.7.17 Public Services

Overall, under the No Hatchery Alternative, potential impacts on public services in California would be the same as those described for the Proposed Project. The California dam removal actions and California land transfer and management for public interest purposes would occur in the same manner under both the No Hatchery Alternative and under the Proposed Project. Thus, for reasons described in Section 3.17.5 *[Public Services] Potential Impacts and Mitigation*, impacts and associated mitigation measures from increased public service response times for emergency fire, police, and medical services due to construction and demolition activities, elimination of a long-term water source for wildfire services substantially increasing the response time for suppressing wildfires, and potential effects on schools services and facilities would be the same under the No Hatchery Alternative as those described for the Proposed Project (Potential Impacts 3.5-1 through 3.5-3).

4.7.18 Utilities and Service Systems

Full removal of the Iron Gate Hatchery under the No Hatchery Alternative would result in a similar degree of construction activities and associated impacts related to utilities and

services systems as the Iron Gate Hatchery modifications (i.e., relocation of fish trapping and holding facilities, relocation of the cold-water supply) and Fall Creek Hatchery upgrades are included under the Proposed Project. Construction activities are the only part of the Proposed Project and this alternative that merit analysis for potential impacts on utilities and service systems. For reasons described in Section 3.18.5 *[Utilities and Service Systems] Potential Impacts and Mitigation Measures*, there would be no significant impacts on utilities and service systems related to this degree of construction under the Proposed Project or this alternative. Construction-related activity in California would still require the need for onsite wastewater treatment, stormwater drainage, and/or solid waste disposal facilities at the same level as the Proposed Project (Potential Impacts 3.18-1 through 3.18-4) and would result in no significant impacts relative to existing conditions.

4.7.19 Aesthetics

Full removal of Iron Gate Hatchery under the No Hatchery Alternative would result in a similar degree of construction activities and associated impacts related to aesthetics as the Iron Gate Hatchery modifications (i.e., relocation of fish trapping and holding facilities, relocation of the cold-water supply) and Fall Creek Hatchery upgrades are included under the Proposed Project. Short-term and long-term impacts on aesthetic resources, including a loss of open water and lake vistas in favor of more natural river, canyon, and valley vistas (Potential Impact 3.19-1) and changes in river flows, channel morphology, and visual water quality (Potential Impact 3.19-2 and 3.19-3) would be the same as described for the Proposed Project. Short-term visual changes resulting from reservoir drawdown would be the same as described for the Project (Potential Impact 3.19-4).

Under the No Hatchery Alternative, visual changes resulting from the removal of the Lower Klamath Project dams and associated facilities would be the same as the Proposed Project (Potential Impact 3.19-5) with the exception of the portions of the Limits of Work that contain the Iron Gate Hatchery and Fall Creek Hatchery footprints. Since Iron Gate Hatchery would not be operated for eight years following dam removal, the portion of the Limits of Work containing the Iron Gate Hatchery footprint (Figure 2.7-13) would be returned to more natural conditions in the short term. This would be beneficial relative to existing conditions and the Proposed Project. Since construction/upgrading activities would not occur at the Fall Creek Hatchery, there would be no impact (no change from existing conditions) and a small reduction in short-term impacts on aesthetic resources for the portion of the Limits of Work containing the Fall Creek Hatchery footprint (Figure 2.7-15) relative to the Proposed Project.

Other short-term visual impacts of construction activities (Potential Impact 3.19-6) and nighttime views during short-term construction activities (Potential Impact 3.19-7) would be the same as those described for the Proposed Project.

4.7.20 Recreation

Full removal of Iron Gate Hatchery under the No Hatchery Alternative would result in a similar degree of construction activities and associated impacts related to recreation as the Iron Gate Hatchery modifications (i.e., relocation of fish trapping and holding facilities, relocation of the cold-water supply) and Fall Creek Hatchery upgrades are included under the Proposed Project. Thus, potential impacts would be the same as

those described for the Proposed Project (Potential Impacts 3.20-1 through 3.20-3, 3.20-5) and there would be no significant impact. Loss of hatchery operations would not affect flows in the Hydroelectric Reach, such that the loss of whitewater boating opportunities in the Hell's Corner Reach (within the upper portion of the Hydroelectric Reach) would be the same as the Proposed Project (Proposed Impact 3.20-5) and would be significant and unavoidable. There would be no significant impact in the Middle and Lower Klamath River.

Full removal of the Iron Gate Hatchery, which currently releases salmonid smolts and contributes to returning adults, and not reopening Fall Creek Hatchery, would reduce the amount of salmon present for river-based recreational fishing in the short term (Potential Impact 3.20-6). The elimination of hatchery produced fall-run Chinook salmon under this alternative would likely result in a reduction (averaging 35 percent, potentially ranging from 19 to 50 percent based on existing conditions) in adult returns in the fall beginning in post-dam removal year 3 and continuing for an indeterminate period of perhaps one to five years (i.e., short-term), before the benefits of dam removal are realized (see Section 4.7.3 *Aquatic Resources*, Potential Impact 3.3-7). Most of the recreational river fishing access sites along the Middle Klamath River are rated as light usage (see Section 3.20.2.2 *Klamath River-based Recreation – Middle and Lower Klamath River – Fishing Opportunities*) and species caught by recreational fishers in the Middle and Lower Klamath River include steelhead and trout, in addition to Chinook salmon. Further, adult Chinook salmon returning to Klamath River tributaries (Table 3.20-2) (i.e., natural origin salmon) would still be available as a recreational fishing opportunity. Overall, the 35 percent reduction (on average) in available fall-run Chinook salmon beginning in post-dam removal year 3 and continuing for one to five years under this alternative would not result in changes to or loss of rare or unique recreational facilities affecting a large area or substantial number of people; therefore, the short-term impacts would be less than significant.

In the long term, increased adult returns for fall-run Chinook salmon resulting from restored connectivity to hundreds of miles of potentially usable habitat in the Upper Klamath Basin and creation of additional spawning and rearing habitat within the Hydroelectric Reach, as well as improved habitat quality (more natural flow regime and seasonal variation in water temperature, improved water quality, reduced likelihood of fish disease and algal toxins), would be beneficial for fall-run Chinook salmon and would offset reductions in adult returns due to cessation of hatchery operations under this alternative (Section 4.7.3 *Aquatic Resources*, Potential Impacts 3.3-7 and 3.3-9). The increased abundance and productivity of these salmon species would result in an increase in availability of salmon for river-based recreational fishing opportunities and would be beneficial. Since recreational fisheries would not be adversely impacted under this alternative, and for the reasons described for the Proposed Project, there would be long-term beneficial effects on the scenic quality, recreation, fisheries and wildlife of the California Klamath River wild and scenic river segment and to the resource values of the eligible and suitable wild and scenic river segment under the No Hatchery Alternative (Potential Impact 3.20-7).

4.7.21 Hazards and Hazardous Materials

Full removal of Iron Gate Hatchery under the No Hatchery Alternative would result in a similar degree of construction activities and associated impacts related to hazards and hazardous materials as the Iron Gate Hatchery modifications (i.e., relocation of fish

trapping and holding facilities, relocation of the cold-water supply) and Fall Creek Hatchery upgrades are included under the Proposed Project. Thus, impacts and mitigation measures related to hazards and hazardous materials under the No Hatchery Alternative would be the same as those described in Section 3.21.5 *[Hazards and Hazardous Materials] Potential Impacts and Mitigation*, Potential Impacts 3.21-1 through 3.21-8.

4.7.22 Transportation and Traffic

Full removal of Iron Gate Hatchery under the No Hatchery Alternative would result in a similar degree of construction activities and associated impacts related to transportation and traffic as the Iron Gate Hatchery modifications (i.e., relocation of fish trapping and holding facilities, relocation of the cold-water supply) and Fall Creek Hatchery upgrades are included under the Proposed Project. However, since there would be no modifications to the Fall Creek Hatchery and no operations for managing the hatcheries, there would be slightly reduced traffic compared with that identified for the Proposed Project. The small degree of difference between the Proposed Project and this alternative would not be sufficient to change the assessment of potential transportation and traffic related impacts, and thus for the reasons described under the Proposed Project, Potential Impacts 3.22-1 through 3.22-5 would continue to be significant and unavoidable and Potential Impact 3.22-6 would be less than significant.

4.7.23 Noise

Full removal of Iron Gate Hatchery under the No Hatchery Alternative would result in a similar degree of construction activities and associated impacts related to noise as the Iron Gate Hatchery modifications (i.e., relocation of fish trapping and holding facilities, relocation of the cold-water supply) and Fall Creek Hatchery upgrades are included under the Proposed Project. However, since there would be no modifications to the Fall Creek Hatchery and no operations for managing the hatcheries, there would be slightly reduced noise compared with that identified under the Proposed Project. The small degree of difference between the Proposed Project and this alternative would not be sufficient to change the assessment of potential noise-related impacts. For the reasons described under the Proposed Project, short-term vibration from blasting at Copco No. 1, Copco No. 2, and Iron Gate dams, and noise from deconstruction activities at Copco No. 1 and Iron Gate dams and restoration activities in the reservoir footprints, would result in significant and unavoidable impacts (Potential Impact 3.23-1 through 3.23-2 and 3.23-4 through 3.23-6). Noise-related impacts at Copco No 2. Dam due to construction-related activities (Potential Impact 3.23-3), traffic noise along haul routes (Potential Impact 3.23-7), moving or elevating structures with flood risk and modification of downstream water intakes (as needed) (Potential Impact 3.23-8), construction associated with modifying water intakes (Potential Impact 3.23-9), and construction activities related to deepening or replacement of existing groundwater wells (Potential Impact 3.23-10) would result in no significant impacts relative to existing conditions, as described for the Proposed Project.

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