San Luis Low Point Improvement Project Environmental Impact Statement / Environmental Impact Report

Appendix L2: Operational Impacts on Aquatic Resources

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Appendix L2
Operational Impacts on Aquatic Resources

This section analyzes the impacts to special-status aquatic resources due to changes in hydrologic operations associated with each alternative.

L2.1 Methods

Operational impacts to special-status fishes in the Delta were evaluated for Alternatives 2 through 5. In addition to impacts to Delta fishes, operational impacts to South-Central California Coast Steelhead in Pacheco Creek were also evaluated for Alternative 5.

L2.1.1 Operational Impacts to Delta Fishes

Extensive modeling of hydrologic conditions was performed using CalSim II to provide a quantitative basis from which to assess potential operational effects of the project alternatives on fisheries resources and aquatic habitats in the Delta. Hydrologic indicators (or parameters) for habitat quality in the Delta that were used in this analysis include Sacramento River flow, Delta outflow, Delta inflow, low salinity zone location (X2), Old and Middle River flows, and Delta exports.

Operational impacts would be triggered by changes in hydrology associated with changes in operations. Extensive modeling of hydrologic conditions was performed using CalSim II to provide a quantitative basis from which to assess potential operational effects of the project alternatives on fisheries resources and aquatic habitats in the Delta. CalSim II is a water resources simulation model that simulates the Central Valley Project (CVP) and State Water Project (SWP) operations, as well as other major water supply operations in the Central Valley through optimization. It provides a systemwide hydrologic and operational approach for planning and impact analyses for the Sacramento River, San Joaquin River, and the Delta. CalSim II is widely used to determine the reliability of CVP and SWP water deliveries, as well as to support water resources studies, such as water-right applications for the State Water Resources Control Board (SWRCB), California Environmental Quality Act (CEQA) compliance, and National Environmental Policy Act (NEPA) compliance, to estimate potential changes in surface water resources.

Because the San Luis Reservoir is part of the CVP/SWP, protection would be provided in all action alternatives through operations consistent with applicable laws, regulations, biological opinions (BOs), and court orders in place at the time the intake would become operational and long-term operations of equipment would remain subject to applicable permitting processes.

Hydrologic indicators (or parameters) for habitat quality that were used in this analysis include Sacramento River flow, Delta outflow, Delta inflow, X2, Old and Middle River flows, and Delta exports.

L2.1.1.1 Sacramento River Flow

Flow within the Sacramento River has been identified as an important factor affecting the survival of emigrating juvenile Chinook salmon, important to the downstream transport of planktonic fish eggs and larvae, such as delta smelt and longfin smelt, striped bass, and shad, and important for seasonal floodplain inundation that has been identified as important habitat for successful spawning and larval rearing by species, such as splittail, and as seasonal foraging habitat for juvenile Chinook salmon and steelhead. Sacramento River flows are also important in the transport of organic material and nutrients from the upper regions of the watershed downstream into the Delta. A reduction in Sacramento River flow as a result of water operations, depending on the season and magnitude of change, could adversely affect habitat conditions for both resident and migratory fish species.

The potential effect of flow changes in the Sacramento River at Hood on fish habitat within the Bay-Delta as a result of the proposed project were evaluated. It was assumed that model-predicted changes in the average monthly flows less than 5 percent (plus or minus) relative to the basis-of-comparison would not be expected to result in a significant effect on habitat quality or availability, or the transport mechanisms provided by Sacramento River flow, on resident or migratory fish or the zooplankton and phytoplankton that they rely on for a food resource. A change of 5 percent was used because it is corresponds to a small magnitude of change and also accounts for model error (or noise).

L2.1.1.2 Delta Outflow

Water development has changed the volume and timing of freshwater flows through the Bay-Delta. Over the past several decades, the volume of the Bay-Delta's freshwater supply has been reduced by upstream diversions, in-Delta use, and Delta exports. As a result, the proportion of Delta outflow depleted by upstream and Delta diversions has grown substantially. In wet years, diversions reduce outflow by 10 percent to 30 percent. In dry years, diversions may reduce outflow by more than 50 percent.

Water development has also altered the seasonal timing of flows passing into and through the Bay-Delta. Flows have decreased in April, May, and June and have increased slightly during the summer and fall (San Francisco Estuary Partnership 2015). Seasonal flows influence the transport of eggs and young organisms (e.g., zooplankton, fish eggs, larvae) through the Delta and into San Francisco Bay. Flows during the months of April, May, and June play an especially important role in determining the reproductive success and survival of many estuarine species, including salmon, striped bass, American shad, delta smelt, longfin smelt, splittail, and others (Stevens et al. 1985, Meng and Moyle 1995).

It was assumed that model-predicted changes in the average monthly flows that were less than 5 percent (plus or minus) relative to the basis-of-comparison would not be expected to result in a significant effect on habitat quality or availability. It would also not be expected to result in a significant effect on the transport mechanisms provided by Delta outflow, on resident or migratory fish or the zooplankton and phytoplankton on which they rely for a food resource.

L2.1.1.3 Low Salinity Zone and X2

The transition area between saline waters and fresh water, frequently referred to as the low salinity zone (LSZ), is located within Suisun Bay and the western Delta. The LSZ has also been associated with the entrapment zone, a region of the Bay-Delta characterized by higher levels of particulates, higher abundances of several types of organisms, and a turbidity maximum. It is commonly associated with the position of X2, but actually occurs over a broader range of salinities (Kimmerer 2002). Originally, the primary mechanism responsible for this region was thought to be gravitational circulation, a circulation pattern formed when freshwater flows seaward over a more dense, landward-flowing marine tidal current. However, studies have shown that gravitational circulation does not occur in the entrapment zone in all years, nor is it always associated with X2 (Burau et al. 1998).

Delta outflow establishes the location of the LSZ in the Delta, an area that historically has had high prey densities and other favorable habitat conditions for rearing juvenile delta smelt, striped bass, and other fish species (Kimmerer 2004). The LSZ is often referenced by X2, which is the distance upstream, in kilometers, from the Golden Gate Bridge where tidally averaged salinity is equal to 2 ppt. X2 is largely determined by Delta outflow (Kimmerer 2004). The best combination of habitat factors are believed to occur when X2 is located downstream from the confluence of the Sacramento and San Joaquin rivers. When Delta outflow is low, X2 moves eastward and is located in the relatively narrow channel of these rivers, and at higher outflows, it moves downstream (westward) into more open waters with larger area.

X2 is an index representing the center of the LSZ and has been commonly used to develop relationships with fish and aquatic species abundances by X2 position. Historically, X2 has varied between San Pablo Bay (River kilometer (km) 50) during high Delta outflow and Rio Vista (River km 100) during low Delta outflow. In recent years, it has typically been located between approximately Honker Bay and Sherman Island (River km 70 to 85). X2 is controlled directly by the volume of Delta outflow, although changes in X2 lag behind changes in outflow. Minor modifications in outflow do not greatly alter X2.

Jassby et al. (1995) showed that when X2 is in the vicinity of Suisun Bay, several estuarine organisms tend to show increased abundance. However, it is by no means certain that X2 has a direct effect on any of the species. The observed correlations may result from a close relationship between X2 and other factors that affect these species.

Operations of upstream storage reservoirs have the potential to affect the location of X2 as a result of changes in freshwater flows from the upstream tributaries through the Delta. To evaluate changes in habitat quantity and quality for estuarine species, a significance criterion of a model-predicted upstream change in X2 location within 1 km of the basis-of-comparison condition was considered to be less than significant. The criterion was applied to a comparison of hydrologic model results for basis-of-comparison conditions and project alternative, by month and water year, for the months from February through May and September through November. As specified in the United States Fish and Wildlife Service (USFWS) BO, spring months are important to longfin smelt and striped bass population dynamics, and there is evidence that X2 in the fall may influence delta smelt population dynamics (USFWS 2008).

L2.1.1.4 Old and Middle River Flows

Reverse flows in the central and south Delta occur when Delta exports and agricultural demands exceed San Joaquin River inflow plus Sacramento River inflow through the Delta-Mendota Canal (DMC), Georgiana Slough, and Threemile Slough. The reverse flow condition occurs within Old and Middle rivers as the rate of water diverted at the CVP and SWP export facilities exceeds tidal and downstream flows within the central region of the Delta.

Reverse flows in Old and Middle rivers, resulting from low San Joaquin River inflows and increased exports to the CVP and SWP, have been identified as a potential cause of increased delta smelt mortality at the CVP and SWP fish facilities within recent years (Simi and Ruhl 2005, Ruhl et al. 2006). Results of analyses of the relationship between the magnitude of reverse flows in Old and Middle rivers and salvage of adult delta smelt in the late winter shows a substantial increase in salvage as reverse flows exceed approximately -5,000 cubic feet per second (cfs). Concerns regarding reverse flows in Old and Middle rivers have also focused on planktonic egg and larval stages of striped bass, splittail, and on Chinook salmon smolts, in addition to delta smelt, and while these species do not spawn to a significant extent in the south Delta, eggs and larvae may be transported into the area by reverse flows in Old and Middle rivers. As discussed previously, these early life stages are more vulnerable to entrainment, because they are too small and have poor swimming capabilities to be effectively screened from export waters.

For most fish species, habitat quality in the south Delta is believed to be poor (Feyrer 2004, Feyrer and Healey 2003, Feyrer et al. 2007, Monsen et al. 2007). Nobriga et al. (2008) showed that very low summer abundances of delta smelt in the south Delta are related to significantly higher water temperatures and water clarity in the south Delta than other areas of the Delta. Increased water clarity may increase predation risks and reduce feeding success of planktivorous fish such as delta smelt. Entrainment risk is also much higher in the south Delta because of the large volumes of water exported by the Jones and Banks pumping plants (Kimmerer 2004). In experimental releases, survival of fall-run Chinook salmon smolts migrating from the San Joaquin River was lower for smolts moving through the Delta via the channels south of the San Joaquin River than for those remaining in the river channel (Brandes and McLain 2001). However, the consistent trend is that when the fish have an increased travel time, they have a lower probability of reaching Chipps Island (San Joaquin River Group Authority 2010).

Old and Middle river reverse flows were calculated for project action alternatives. The most biologically sensate period when the potential effects of reverse flows could affect delta smelt, Chinook salmon, and many other species extends from the late winter through early summer. It was assumed that model-predicted changes in the average monthly Old and Middle river reverse flows that were less than 5 percent (plus or minus) relative to the basis-of-comparison would not be expected to result in a significant effect on entrainment vulnerabilities on resident or migratory fish or the zooplankton and phytoplankton on which they rely for a food resource.

L2.1.1.5 Delta Exports

Increased exports could increase the risk of entrainment (fish lost from diversions or exports) and salvage (fish collected at the pumping facilities for release back into the Delta) of resident and migratory fish present in the south Delta, which may include adult delta smelt, juvenile Chinook salmon, steelhead, striped bass, and other species of fish as well as macroinvertebrates and nutrients. Increased exports during drier water years in the summer could result in an increased risk of entrainment and salvage for juvenile delta smelt and salmon (June) and resident warm-water fish such as striped bass, threadfin shad, catfish, and others during the warmer summer months (July through August). Increased exports could also increase the entrainment and removal of phytoplankton, zooplankton, macroinvertebrates, organic material, and nutrients from the Delta.

Changes in the volume of water exported at the CVP and SWP facilities are assumed to result in a direct proportional increase or decrease in the risk of fish being entrained and salvaged at the facilities. It was assumed that model-predicted changes in the average monthly Delta exports that were less than 5 percent (plus or minus) relative to the basis-of-comparison would not be expected to result in a significant (detectable increase in take) effect on entrainment on resident or migratory fish or the zooplankton and phytoplankton on which they rely for a food resource.

L2.1.2 Operational Impacts to Pacheco Creek Steelhead

Habitat suitability modeling was performed by Santa Clara Valley Water District (SCVWD) to evaluate the impact of the New Pacheco Reservoir operations on South-Central California Coast Steelhead critical habitat located in Pacheco Creek (SCVWD 2018). Suitability modeling evaluated the impact of New Pacheco Dam flow releases on steelhead habitat quality for all life stages (adult migration to juvenile outmigration) present in Pacheco Creek. The model considered a range of environmental factors important for steelhead, including flow, temperature, and macro-habitat features.

Changes to suitable habitat for South-Central California Coast Steelhead in Pacheco Creek were directly evaluated through the use of the Pacheco Creek Steelhead Habitat Suitability Model. The model was used to simulate with- and without-Project conditions. Pacheco Reservoir storage levels, and releases to Pacheco Creek from the SCVWD's Water Evaluation and Planning (WEAP) model, were used as inputs into the Pacheco Creek Steelhead Habitat Suitability Model.

An output of the Pacheco Creek Steelhead Habitat Suitability Model is a Steelhead Cohort Score. This Score provides an index of Pacheco Creek's ability to support steelhead through all life stages, based on the 14-month period in which a cohort is expected to remain in the creek (i.e., from adult migration through juvenile outmigration), and considers a range of environmental factors that improve or degrade habitats including water operations, water flow and temperature, surface and groundwater interaction, and ratings of pools, runs, and riffles from field surveys. The Steelhead Cohort Score reflects habitat suitability in Pacheco Creek over the entire cohort lifecycle. For example, if habitat conditions for early life stages during winter/spring months are good, but Pacheco Creek has no flow during summer months, the resultant Steelhead Cohort Score for that cohort would be poor.

L2.1.3 Other Hydrologic Considerations

Operational influences of the project alternatives were also considered for upstream reservoir operations (i.e., Folsom, Shasta, Oroville, and Trinity), American River flows, Feather River flows, and San Joaquin River flows. Hydrologic modeling results predict that the project action alternatives would not result in any appreciable effects for these hydrologic indicators. As a result, they are not discussed further in this section. See Chapter 4, Water Quality, Chapter 5, Surface Water Supply, and Appendix B for additional details on this modeling and the modeling assumptions used in the analysis, and the detailed results of the modeling analyses.

L2.2 Results

L2.2.1 Operational Impacts to Delta Fishes

L2.2.1.1 Alternative 2

Operations of the reservoir would be generally the same as under the No Project. CalSim II modeling results indicate that, on average, there are very slight changes (<1%) to Delta hydrology, hydrodynamics, and water quality resulting from changes in Delta operations of the CVP and SWP compared to the No Action Alternative, which could impact delta fisheries and habitats.

L2.2.1.2 Alternative 3

Operation of the Treatment Alternative would be similar to the Lower San Felipe Intake Alternative. CalSim II modeling results indicate that, on average, there are very slight changes (<1%) to Delta hydrology, hydrodynamics, and water quality resulting from changes in Delta operations of the CVP and SWP compared to the No Action/No Project Alternative, which could impact delta fisheries and habitats.

L2.2.1.3 Alternative 4

L2.2.1.3.1 Sacramento River Flow

As described above, flow within the Sacramento River has been identified as an important factor affecting the survival of emigrating juvenile Chinook salmon, important to the downstream transport of planktonic fish eggs and larvae, such as delta smelt and longfin smelt, striped bass, and shad, and important for seasonal floodplain inundation that has been identified as important habitat for successful spawning and larval rearing by species, such as splittail, and as seasonal foraging habitat for juvenile Chinook salmon and steelhead. Sacramento River flows are also important in the transport of organic material and nutrients from the upper regions of the watershed downstream into the Delta.

Simulated Sacramento River flow at Hood would decrease by less than one percent on average in all months of all water-year types (Table L2-1) for Alternative 4 compared to the No Action/No Project Alternative. During most years Sacramento River flows would be unchanged.

Table L2-1. Modeled Difference in Sacramento River Flow between the No Action/No Project Conditions and San Luis Reservoir Expansion Alternative (% change)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	0.1%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.1%
AN	0.8%	-0.5%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.2%
BN	0.1%	-0.3%	0.2%	0.1%	-0.2%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.2%
D	0.8%	-0.3%	-0.1%	0.0%	0.0%	0.1%	0.0%	0.0%	-0.2%	-0.2%	0.2%	-0.2%
C	0.0%	0.0%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	0.0%	0.0%

- Notes: Data results from CalSim modeling presented in Appendix B
- Key: AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

L2.2.1.3.2 Low Salinity Zone Location (X2)

As discussed above, the linkage between river inflow and the LSZ is referred to as X2, the distance along the main channel (usually in km) from the Golden Gate Bridge to the point where the salinity on the bottom is 2 ppt (Nobriga et al. 2008). Delta outflow largely determines the location of X2 and the LSZ, an area that historically had high prey densities and other favorable habitat conditions for rearing delta smelt (Kimmerer 2004). The LSZ is believed to provide the best combination of habitat conditions when X2 is located downstream from the confluence of the Sacramento and San Joaquin rivers (Kimmerer 2004). Delta outflow and the position of the X2, among other factors, is believed to influence the availability and quality of habitat for several Delta fish species (Feyrer et al. 2007; Feyrer et al. 2011), even though the exact mechanisms for these relationships are not clearly understood. When Delta outflow is low for sustained periods of time, the position of X2 has the potential to move eastward to areas where there is reduced habitat volume (e.g., areas with relatively narrow channels), whereas under periods of sustained higher outflows, it moves downstream into more open waters and associated increased habitat volume (Kimmerer 2004).

Modeling simulations predict that operation of the proposed project would result in small changes to the X2 position (Table L2-2). X2 would not change by more than 0.02 km during February through May or September through November, periods when special-status fish species utilize the LSZ for rearing. During most months of most years, the position of the LSZ would be unchanged.

Table L2-2. Modeled Difference in Position of LSZ (X2) between the No Action/No Project Conditions and San Luis Reservoir Expansion Alternative (km change)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	0.01	0.00	0.00	0.00	0.00	0.00	0.04	0.01	0.00	0.00	0.00	0.00
AN	0.00	0.00	0.03	-0.02	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
BN	0.00	0.00	0.01	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	0.00	0.00
D	0.00	0.00	-0.02	0.00	0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.01
C	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

- Notes: Data results from CalSim modeling presented in Appendix B.
- Key: AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

L2.2.1.3.3 Delta Outflow

Seasonal flows represented by Delta outflow influence the transport of eggs and young organisms (e.g., zooplankton, fish eggs, larvae) through the Delta and into San Francisco Bay. Flows during the months of April, May, and June play an especially important role in determining the reproductive success and survival of many estuarine species, including several special-status species (Stevens et al. 1985, Meng and Moyle 1995).

Simulated Delta outflow would decrease by less than one percent in all months of all water-year types (Table L2-3). During most months of most years Delta outflows would be unchanged.

Table L2-3. Modeled Difference in Delta Outflow between the No Action/No Project Conditions and San Luis Reservoir Expansion Alternative (% change)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	0.0%	0.0%	0.0%	0.0%	-0.1%	-0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
AN	0.0%	-0.6%	0.1%	-0.3%	-0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
BN	0.0%	-0.1%	0.4%	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.1%
D	0.0%	0.3%	-0.2%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	-0.1%	-0.1%
C	0.0%	0.0%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%

- Notes: Data results from CalSim modeling presented in Appendix B.
- Key: AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

L2.2.1.3.4 Old and Middle River Flows

As discussed above, reverse flows in Old and Middle rivers, resulting from low San Joaquin River inflows and increased exports to the CVP and SWP, have been identified as a potential cause of increased delta smelt mortality at the CVP and SWP fish facilities within recent years (Simi and Ruhl 2005, Ruhl et al. 2006). Results of analyses of the relationship between the magnitude of reverse flows in Old and Middle rivers and salvage of adult delta smelt in the late winter shows a substantial increase in salvage as reverse flows exceed approximately -5,000 cfs. Concerns regarding reverse flows in Old and Middle rivers have also focused on planktonic egg and larval stages of striped bass, splittail, and on Chinook salmon and steelhead smolts, in addition to delta smelt, and while these species do not spawn to a large extent in the south Delta, eggs and larvae may be transported into the area by reverse flows in Old and Middle rivers. As discussed previously, these early life stages are generally entrained, because they are too small to be effectively screened from export waters.

Modeling simulations predict that operation of the San Luis Reservoir Expansion Alternative would result in small changes to Old and Middle rivers reverse flows for most months of most year types (Table L2-4). The greatest changes occur in Wet (February and March) and Above Normal (January and February) water year types. All changes in other years were less than 2 percent. As discussed above, results of analyses of the relationship between the magnitude of reverse flows in Old and Middle rivers and salvage of adult delta smelt in the late winter shows a substantial increase in salvage as reverse flows exceed approximately -5,000 cfs. Reverse flows during months and years with the greatest changes were well below the -5,000 cfs threshold for Alternative 4 (Table L2-5) and the No Action/No Project Alternative (Table L2-6).

Table L2-4. Modeled Difference in Old and Middle River Flows between the No Action/No Project Conditions and San Luis Reservoir Expansion Alternative (% change)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	0.2%	-0.2%	0.0%	1.8%	3.3%	9.5%	-0.5%	0.0%	0.0%	0.0%	0.0%	-0.2%
AN	1.3%	0.0%	0.0%	2.7%	5.3%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.4%
BN	0.1%	-0.5%	0.3%	0.0%	-1.3%	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.3%
D	1.2%	-0.9%	0.0%	-0.1%	0.0%	0.0%	0.0%	0.0%	-0.6%	-0.3%	0.4%	-0.2%
C	0.0%	0.0%	-0.1%	0.0%	0.2%	0.0%	0.0%	0.0%	0.0%	1.2%	-0.1%	0.0%

- Notes: Data results from CalSim modeling presented in Appendix B.
- Key: AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

Table L2-5. Modeled Old and Middle River Flows under the San Luis Reservoir Expansion Alternative (cfs)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	-6520	-7397	-5734	-2210	-2993	-2285	2925	1718	-4434	-8962	-10425	-9398
AN	-6046	-6361	-7043	-3639	-3256	-4187	1325	402	-4837	-9806	-10755	-9869
BN	-6343	-7039	-7168	-4240	-3759	-4073	813	25	-4238	-10664	-10699	-9665
D	-5818	-6130	-7267	-4779	-4152	-3179	-425	-748	-3154	-8275	-6589	-6314
C	-5279	-4805	-5055	-4333	-3682	-2322	-1058	-1135	-1426	-3666	-2440	-3823

- Notes: Data results from CalSim modeling presented in Appendix B.
- Key: AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

Table L2-6. Modeled Old and Middle River Flows under the No Action/No Project Alternative (cfs)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	-6,509	-7,413	-5,734	-2,170	-2,897	-2,086	2,941	1,718	-4,434	-8,961	-10,421	-9,416
AN	-5,967	-6,363	-7,046	-3,544	-3,091	-4,177	1,325	402	-4,837	-9,809	-10,755	-9,905
BN	-6,335	-7,072	-7,149	-4,240	-3,808	-4,070	813	25	-4,238	-10,663	-10,699	-9,638
D	-5,747	-6,189	-7,270	-4,784	-4,152	-3,179	-425	-748	-3,173	-8,300	-6,562	-6,328
C	-5,276	-4,806	-5,059	-4,333	-3,675	-2,322	-1,058	-1,135	-1,426	-3,624	-2,441	-3,822

- Notes: Data results from CalSim modeling presented in Appendix B.
- Key: AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

L2.2.1.3.5 Delta Exports

Operation of the San Luis Reservoir Expansion Alternative could result in an increase in CVP and SWP exports during certain periods; this increase is assumed to result in a direct proportional increase in the risk of fish being entrained and salvaged at the Delta facilities.

Except for two model periods, simulated Delta exports would increase by less than two percent in all months of all water-year types (Table L2-7). In March of Wet water years and of February of Above Normal water years, there would be a 2.2 and 2.6 percent increase in Delta exports, respectively. During most years, Delta exports would be unchanged.

Table L2-7. Modeled Difference in Delta Exports between the No Action/No Project Conditions and San Luis Reservoir Expansion Alternative (% change)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	0.2%	-0.2%	0.0%	0.5%	1.1%	2.2%	0.5%	0.0%	0.0%	0.0%	0.0%	-0.2%
AN	1.3%	0.0%	0.0%	1.6%	2.6%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.4%
BN	0.1%	-0.5%	0.2%	0.0%	-0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%
D	1.2%	-0.9%	0.0%	-0.1%	0.0%	0.0%	0.0%	0.0%	-0.7%	-0.3%	0.4%	-0.2%
C	0.0%	0.0%	-0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	1.6%	-0.1%	0.0%

- Notes: Data results from CalSim modeling presented in Appendix B.
- Key: AN – Above Normal; BN – Below Normal; C – Critical; D – Dry; Sac Yr Type – Sacramento River Water Year Type; W – Wet

L2.2.1.4 Alternative 5

Operations of the reservoir would be generally the same for Alternative 5 as under the No Project. CalSim II modeling results indicate that, on average, there are very slight changes (<1%) to Delta hydrology, hydrodynamics, and water quality resulting from changes in Delta operations of the CVP and SWP compared to the No Action Alternative, which could impact delta fisheries and habitats.

L2.3 Operational Impacts to Pacheco Creek Steelhead

L2.3.1 Alternative 5

Table L2-8 presents Alternative 5 versus No Action Alternative average steelhead cohort scores summarized by water year type. The Pacheco Creek Habitat Suitability Model predicted improved viability of steelhead populations through improved habitat conditions in Pacheco Creek in all water year types for Alternative 5 versus the No Action Alternative. The model predicted the most significant improvement in steelhead cohort scores in critical years, where steelhead cohort scores increased from 0.8 to 20.6, a 2,728% increase.

Table L2-8. Average Pacheco Creek Steelhead Cohort Scores for Alternative 5 and the No Action Alternative for all water year types for 1922 to 2003 Simulation Period.

Water Year Type	No Action	Alternative 5	% Difference
W	13.2	28.9	219%
AN	8.2	22.9	281%
BN	13.1	25.6	195%
D	7.5	24.6	327%
C	0.8	20.6	2728%

Table L2-9 presents Alternative 5 versus No Action Alternative annual steelhead cohort scores for the full model record. Table L2-10 presents the monthly modeled river flows in Pacheco Creek for the No Action/ No Project Alternative 1 mile downstream of the Expanded Pacheco Reservoir utilized in the Pacheco Creek Habitat Suitability Model, Table L2-11 presents flows for Alternative 5 at this location, and Table L2-12 presents the change between the alternatives in river flow for each month of the model period.

Table L2-9. Pacheco Creek Steelhead Cohort Scores for Alternative 5 and the No Action Alternative for all water year types for 1922 to 2003 Simulation Period.

Outmigration Year	Water Year Type	Cohort Score		Difference
		No Action/No Project	Alternative 5	
1923	BN	17.1	25.4	8.3
1924	C	0.0	27.6	27.6
1925	D	0.0	19.4	19.4
1926	D	0.5	23.9	23.4
1927	W	4.0	28.2	24.2
1928	AN	7.4	24.4	17.0
1929	C	0.0	24.3	24.3
1930	D	0.0	23.4	23.4
1931	C	0.0	18.5	18.5
1932	D	0.0	18.2	18.2
1933	C	0.0	28.2	28.2
1934	C	0.0	23.5	23.5
1935	BN	0.0	15.4	15.4
1936	BN	1.5	21.8	20.3
1937	BN	17.6	33.2	15.6
1938	W	4.7	31.5	26.8
1939	D	2.2	29.7	27.5
1940	AN	0.0	18.4	18.4
1941	W	0.0	23.7	23.7
1942	W	0.2	27.9	27.7
1943	W	12.6	35.9	23.3
1944	D	15.2	29.3	14.1
1945	BN	8.1	34.4	26.3
1946	BN	10.6	28.3	17.7
1947	D	6.4	31.4	25.0
1948	BN	1.3	19.5	18.2
1949	D	10.2	19.0	8.8
1950	BN	4.5	28.0	23.4
1951	AN	0.4	34.7	34.3
1952	W	11.5	36.1	24.7
1953	W	0.0	29.6	29.6
1954	AN	0.8	32.4	31.6
1955	D	0.0	27.6	27.6
1956	W	1.1	29.9	28.9
1957	AN	2.7	28.7	26.0
1958	W	5.0	23.9	19.0
1959	BN	0.0	28.0	28.0

Outmigration Year	Water Year Type	Cohort Score		Difference
		No Action/No Project	Alternative 5	
1960	D	0.0	25.5	25.5
1961	D	0.0	23.7	23.7
1962	BN	0.0	18.7	18.7
1963	W	0.7	26.1	25.4
1964	D	0.0	30.6	30.6
1965	W	0.2	24.4	24.2
1966	BN	0.0	30.4	30.4
1967	W	0.0	19.4	19.4
1968	BN	0.0	29.1	29.1
1969	W	0.0	21.9	21.9
1970	W	14.0	28.0	14.0
1971	W	9.3	35.4	26.1
1972	BN	0.0	23.7	23.7
1973	AN	0.0	22.9	22.9
1974	W	11.2	35.2	24.0
1975	W	8.9	28.0	19.0
1976	C	0.0	23.0	23.0
1977	C	0.0	18.2	18.2
1978	AN	0.0	18.2	18.2
1979	BN	6.2	28.0	21.8
1980	AN	1.2	27.9	26.7
1981	D	7.2	28.0	20.7
1982	W	0.9	34.2	33.3
1983	W	30.5	35.8	5.3
1984	W	2.9	30.3	27.4
1985	D	0.0	34.4	34.4
1986	W	0.0	29.7	29.7
1987	D	5.1	29.1	24.1
1988	C	0.0	19.4	19.4
1989	D	0.0	18.4	18.4
1990	C	0.0	18.6	18.6
1991	C	0.0	18.5	18.5
1992	C	0.6	18.7	18.1
1993	AN	1.0	25.8	24.8
1994	C	0.0	29.2	29.2
1995	W	0.0	25.3	25.3
1996	W	12.4	30.0	17.6
1997	W	28.1	35.8	7.7
1998	W	1.8	29.0	27.2

Outmigration Year	Water Year Type	Cohort Score		Difference
		No Action/No Project	Alternative 5	
1999	W	14.9	30.9	16.0
2000	AN	12.2	35.8	23.5
2001	D	8.4	25.6	17.1
2002	D	0.6	25.0	24.4
2003	AN	1.3	34.7	33.4

Table L2-10. Pacheco Creek Simulated Average Monthly Flow (cfs) under the No Action Alternative for the 1922 to 2015 Simulation Period 1 Mile Downstream of Pacheco Dam.

Calendar Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1922	9.6	328.6	72.1	33.5	8.5	15.9	13.2	12.6	12.5	12.5	7.6	43.8
1923	146.2	64.4	15.8	51.3	7.1	14.8	13.1	12.7	12.6	12.5	7.3	2.3
1924	2.3	2.5	1.9	1.3	0.1	0.4	0.3	0.2	0.3	0.3	0.3	0.3
1925	0.9	23.8	3.7	8.5	1.9	6.3	5.6	5.4	5.3	5.4	3.1	1.0
1926	1.0	147.6	8.2	84.5	5.8	13.2	12.6	12.5	12.5	12.5	9.3	3.0
1927	5.2	251.4	46.8	54.4	7.2	14.5	13.0	12.6	12.5	12.5	7.4	5.6
1928	4.0	11.1	47.2	18.9	2.3	11.9	11.4	11.2	11.2	11.3	6.6	2.4
1929	2.9	8.1	7.0	4.6	1.1	2.5	2.2	2.0	2.0	2.0	1.2	0.4
1930	2.9	4.8	55.7	2.3	1.0	10.7	10.4	10.3	10.3	10.4	6.0	3.3
1931	2.2	2.6	1.7	1.1	0.1	0.3	0.2	0.2	0.2	0.2	0.0	134.1
1932	105.0	253.6	17.5	7.0	3.5	13.4	12.7	12.5	12.4	12.4	7.3	4.5
1933	12.2	7.1	4.6	3.8	0.7	2.4	2.2	2.1	2.0	2.0	1.2	2.2
1934	8.5	14.8	4.8	1.4	0.4	4.4	4.2	4.2	4.2	4.3	2.4	1.1
1935	1.2	2.3	29.9	32.0	1.5	11.5	11.4	12.8	12.0	13.7	7.8	11.6
1936	29.3	107.2	20.6	29.7	11.9	15.0	14.2	14.2	14.4	14.3	8.2	37.7
1937	27.6	127.6	147.9	9.2	2.5	15.0	14.1	14.2	14.3	14.6	16.8	67.3
1938	81.1	291.3	107.2	36.8	4.1	15.0	14.2	14.2	14.5	17.0	14.6	14.5
1939	2.2	8.0	25.0	2.1	0.0	8.7	9.0	9.1	9.1	9.2	5.3	2.1
1940	4.3	263.5	204.5	62.2	0.0	11.9	12.2	12.2	12.3	12.4	7.2	24.8
1941	79.4	420.9	252.6	236.1	0.2	12.1	12.4	12.4	12.5	12.6	7.3	20.8
1942	105.7	207.5	83.8	154.0	28.7	19.6	13.0	12.6	12.5	12.7	10.1	5.1
1943	259.9	90.9	224.2	31.6	13.4	17.0	13.1	12.4	12.4	12.4	7.5	6.1
1944	10.3	187.4	172.9	12.8	4.2	13.6	12.9	12.2	12.3	12.7	11.1	6.6
1945	6.5	316.0	119.0	22.1	5.2	16.2	14.7	12.2	12.3	12.8	8.3	74.2
1946	64.6	25.3	27.3	31.1	12.3	19.1	18.9	19.0	18.1	13.6	11.9	8.4
1947	14.2	16.0	36.6	4.0	1.0	12.1	11.9	11.9	11.9	12.4	7.2	4.3
1948	3.7	12.2	31.2	78.5	14.9	17.8	12.9	12.5	12.4	12.5	7.4	6.1
1949	9.9	39.5	89.0	11.9	3.4	13.4	12.8	12.7	12.4	12.4	7.2	4.4
1950	17.5	27.5	4.8	18.8	0.6	9.3	9.3	8.8	8.8	8.9	130.4	199.9

Calendar Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1951	61.8	37.7	55.9	9.5	4.8	13.3	15.8	12.3	12.3	12.8	9.6	41.2
1952	428.7	52.9	166.7	22.2	10.8	16.4	15.7	12.5	12.5	12.5	7.5	22.6
1953	32.8	6.2	7.5	5.6	1.2	12.4	12.2	12.1	12.0	12.1	7.9	5.5
1954	4.4	9.7	14.3	7.5	1.1	3.8	3.5	3.4	3.3	3.2	2.6	2.1
1955	24.0	7.6	7.6	3.7	1.2	7.3	6.9	6.8	6.8	6.6	4.1	313.9
1956	280.4	87.7	28.2	16.9	6.6	14.7	13.3	12.6	12.6	12.5	7.3	2.3
1957	3.2	32.0	16.1	5.8	3.5	7.6	7.0	6.9	6.8	6.8	3.9	2.9
1958	33.7	287.1	260.1	490.8	19.0	19.1	13.7	12.7	12.7	12.8	7.5	3.6
1959	4.7	136.2	10.1	4.8	0.6	11.9	11.8	11.8	15.7	12.3	7.3	2.4
1960	3.7	69.0	2.4	4.6	0.5	10.7	10.7	10.6	10.7	10.8	6.3	3.0
1961	2.0	1.9	1.5	1.0	0.2	0.8	0.5	0.3	0.3	0.2	0.2	0.1
1962	0.6	134.4	105.1	5.2	0.6	12.4	12.2	12.4	12.3	14.4	7.6	2.8
1963	10.2	292.3	69.5	195.0	26.8	17.1	13.5	13.2	12.9	13.3	8.6	2.5
1964	28.5	5.4	4.9	4.3	0.4	5.2	5.9	5.7	5.5	5.4	3.1	3.5
1965	167.7	21.6	8.4	104.9	3.3	13.3	13.1	12.5	12.4	13.5	10.6	30.0
1966	12.0	12.0	5.0	3.6	1.1	9.5	9.5	9.4	9.4	9.6	5.7	36.1
1967	251.5	41.1	193.3	227.8	31.0	20.8	13.0	12.8	12.9	12.7	7.5	4.8
1968	5.9	8.1	10.0	3.7	0.3	1.8	1.7	1.7	1.7	1.7	1.9	2.4
1969	483.4	557.4	156.3	30.8	7.6	14.5	12.6	12.3	12.3	12.4	7.2	5.7
1970	192.0	59.2	162.7	12.1	4.2	12.9	12.4	12.2	12.3	12.4	9.7	56.4
1971	74.3	12.1	35.4	15.5	5.5	13.4	12.5	12.2	12.3	12.4	7.2	4.1
1972	3.7	5.1	2.3	1.8	0.2	0.4	0.4	0.3	0.3	0.3	18.3	3.0
1973	139.0	428.4	119.2	25.4	4.8	12.9	12.2	12.2	12.3	12.4	11.9	43.6
1974	129.4	15.5	229.6	104.5	9.2	14.4	12.7	12.3	12.4	12.5	7.3	5.0
1975	4.1	91.3	216.2	50.3	9.5	13.4	12.6	12.4	12.4	12.4	7.2	4.9
1976	2.6	1.6	1.2	0.7	0.0	0.1	0.1	0.1	0.1	0.0	0.0	0.0
1977	0.2	0.2	0.2	0.1	0.1	0.4	0.1	0.1	0.1	0.1	0.0	0.8
1978	161.7	244.0	242.3	51.4	12.3	16.7	12.5	12.3	12.3	12.4	7.2	4.1
1979	8.3	11.5	14.8	7.5	1.4	4.2	4.1	4.0	4.0	4.1	2.3	6.2
1980	182.6	573.2	108.0	25.5	5.7	16.0	13.0	12.4	12.4	12.4	7.2	4.5
1981	36.6	9.9	30.4	6.6	0.8	11.6	11.5	11.5	11.5	11.6	13.7	2.9
1982	173.6	205.4	175.4	340.4	23.8	19.1	13.2	12.7	12.7	12.7	20.1	58.0
1983	288.9	328.1	379.8	93.0	43.4	12.7	12.2	12.3	12.4	12.9	8.3	4.5
1984	12.0	17.9	18.1	2.3	0.1	5.0	5.2	5.2	5.3	5.3	5.9	4.1
1985	1.9	17.7	15.8	1.0	0.0	4.7	5.0	5.0	5.0	5.1	6.9	3.5
1986	8.4	641.4	271.4	24.3	8.1	13.2	12.9	12.4	12.4	12.5	7.4	4.6
1987	3.7	12.1	12.1	4.4	0.4	2.6	2.7	2.7	2.8	2.8	1.7	1.3
1988	1.9	1.4	0.8	2.4	0.6	1.0	0.8	0.7	0.6	0.4	0.3	0.2
1989	0.9	1.3	2.7	1.0	0.7	2.2	2.1	2.0	1.4	1.2	0.8	0.2
1990	0.3	3.9	0.7	0.2	0.0	1.1	1.0	1.1	1.1	1.2	0.5	0.4

Calendar Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1991	0.3	0.3	78.8	10.7	0.9	12.4	12.2	12.2	12.3	12.5	7.3	4.1
1992	2.6	57.3	18.9	3.1	0.9	11.5	11.0	10.7	10.7	11.0	6.7	10.3
1993	338.5	346.6	103.2	32.5	8.7	16.1	12.4	12.5	12.3	12.5	7.4	4.5
1994	2.9	10.0	2.5	2.5	0.7	1.1	1.0	1.1	1.1	1.1	0.9	0.5
1995	217.7	50.3	487.4	40.0	5.2	12.2	13.5	12.5	12.3	12.4	7.6	6.5
1996	51.1	439.7	146.6	12.1	12.8	15.3	12.6	12.5	12.5	12.4	9.4	165.1
1997	871.3	73.1	21.8	12.4	1.3	12.5	12.2	12.3	11.9	12.0	7.2	10.6
1998	146.4	1018.5	120.7	114.6	24.6	16.7	13.8	12.3	12.4	12.5	7.8	6.0
1999	49.9	438.3	146.6	12.1	12.8	15.3	12.6	12.5	12.5	12.4	9.4	5.0
2000	15.0	190.8	107.2	22.6	17.7	13.1	12.4	12.3	12.3	12.6	8.6	4.9
2001	4.7	36.7	15.2	5.0	0.7	8.1	8.5	8.5	8.4	8.4	5.1	17.2
2002	20.0	7.2	14.7	4.6	1.1	8.8	8.2	8.3	8.4	8.5	7.6	61.3
2003	36.8	13.3	16.7	14.6	17.4	13.4	12.2	12.2	12.3	12.4	7.2	7.8
2004	16.7	61.7	9.5	4.6	0.0	11.5	11.8	11.8	11.9	12.0	7.3	26.6
2005	143.8	271.3	212.7	46.9	13.1	14.1	12.7	12.2	12.3	12.8	8.2	36.2
2006	82.9	21.0	189.0	300.5	23.5	17.1	12.6	12.5	12.5	12.6	7.4	3.5
2007	2.4	10.7	5.3	3.1	0.2	1.5	1.5	1.5	1.5	1.5	0.9	0.3
2008	46.7	90.3	16.3	3.4	0.2	12.0	12.1	12.1	12.2	12.3	7.2	3.3
2009	2.1	23.3	36.9	4.7	0.3	8.7	8.8	8.8	8.9	11.9	5.3	5.4
2010	122.6	91.9	74.9	74.6	9.0	14.6	12.5	12.3	12.3	12.4	7.3	29.9
2011	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4	24.4
2012	24.4	189.2	189.2	189.2	189.2	189.2	189.2	189.2	189.2	2.6	1.7	54.1
2013	6.1	2.4	1.7	1.0	0.2	9.1	9.3	9.4	9.4	9.5	5.5	2.3
2014	1.3	3.2	3.3	2.2	0.1	0.8	0.8	0.8	0.8	0.8	0.3	29.5
2015	1.6	22.9	2.0	1.3	0.5	8.3	8.4	8.2	8.3	8.3	8.3	8.3

Table L2-11. Pacheco Creek Simulated Average Monthly Flow (cfs) under Alternative 5 for the 1922 to 2015 Simulation Period 1 Mile Downstream of Pacheco Dam.

Calendar Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1922	9.8	198.3	34.4	35.9	16.1	15.6	14.1	13.5	13.5	13.4	9.7	44.7
1923	83.1	30.4	27.4	24.7	15.4	15.1	14.1	13.6	13.5	13.4	9.5	9.6
1924	9.6	9.5	19.5	19.6	11.4	13.3	13.1	13.1	13.3	13.4	9.7	9.7
1925	10.6	24.9	23.7	28.7	13.6	14.2	13.5	13.3	13.3	13.3	9.4	9.5
1926	9.6	115.3	24.1	40.7	14.6	14.1	13.5	13.3	13.3	13.4	11.5	10.4
1927	12.6	160.3	23.1	26.1	15.5	14.9	13.9	13.5	13.4	13.4	9.5	10.6
1928	10.6	18.5	45.4	39.3	14.1	14.0	13.5	13.3	13.3	13.3	9.5	10.0
1929	10.5	15.6	24.7	22.2	12.6	13.8	13.4	13.2	13.2	13.3	9.4	9.5
1930	12.6	14.4	56.7	22.2	12.5	13.8	13.4	13.3	13.3	13.3	9.4	9.5
1931	9.8	10.8	20.0	19.6	11.3	13.2	13.1	13.1	13.2	13.3	9.4	107.8

Calendar Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1932	50.2	121.6	27.6	23.3	13.7	14.3	13.7	13.4	13.4	13.4	9.5	9.6
1933	19.4	14.6	22.0	21.1	12.2	13.7	13.3	13.2	13.3	13.3	9.4	11.8
1934	15.7	14.6	19.4	15.7	8.8	10.0	9.7	9.6	9.7	9.8	6.9	7.0
1935	10.2	11.5	29.7	32.6	13.2	15.2	15.1	16.5	15.7	17.4	11.6	9.8
1936	29.9	62.9	29.6	34.2	17.8	15.2	15.1	15.2	15.3	15.2	10.4	35.7
1937	28.1	61.5	70.8	24.0	13.2	15.2	15.1	15.2	15.3	15.6	9.2	60.6
1938	38.8	139.9	50.7	37.4	14.0	15.2	15.1	15.2	15.5	18.0	16.9	12.2
1939	9.4	15.5	25.5	19.2	11.2	13.1	13.1	13.1	13.2	13.3	9.4	9.4
1940	12.9	170.3	98.5	29.3	11.2	13.1	13.1	13.1	13.2	13.3	9.4	21.5
1941	66.8	202.4	131.8	230.2	11.2	13.1	13.1	13.1	13.2	13.3	9.4	17.6
1942	81.6	178.7	78.2	148.1	18.8	17.3	13.9	13.4	13.3	13.5	12.3	12.5
1943	227.2	87.2	221.1	34.6	18.5	16.1	14.0	13.4	13.3	13.3	9.6	11.0
1944	16.7	130.5	151.7	25.7	14.1	14.5	13.8	13.2	13.2	13.6	13.3	14.1
1945	14.0	288.6	113.3	30.3	14.6	15.8	15.7	13.1	13.2	13.7	10.5	71.1
1946	30.9	11.8	33.0	34.9	18.0	17.1	19.9	20.0	19.1	14.5	14.2	15.9
1947	11.9	13.6	29.2	20.5	12.6	13.5	13.2	13.2	13.2	13.7	9.7	9.9
1948	10.9	9.9	31.8	57.6	19.0	16.5	13.8	13.3	13.3	13.4	9.5	11.3
1949	16.4	36.1	63.7	25.4	13.7	14.4	13.7	13.6	13.4	13.3	9.4	9.4
1950	14.9	25.4	22.2	39.2	12.0	13.9	13.7	13.2	13.3	13.3	100.1	95.9
1951	29.0	17.8	26.7	23.5	15.3	14.5	17.1	13.5	13.5	14.1	12.0	42.0
1952	216.8	23.9	83.9	30.2	17.3	15.8	16.7	13.4	13.4	13.4	9.7	20.4
1953	33.4	16.4	27.7	21.8	12.8	13.8	13.5	13.4	13.3	13.4	10.3	10.5
1954	10.9	16.8	31.8	25.1	12.6	14.0	13.5	13.4	13.4	13.4	10.3	11.3
1955	23.7	17.0	27.0	23.0	12.8	14.0	13.6	13.6	13.6	13.4	9.8	190.0
1956	134.1	41.2	33.3	28.1	15.3	15.1	14.2	13.5	13.5	13.5	9.5	9.6
1957	10.6	29.6	33.8	23.2	15.5	14.2	13.5	13.5	13.4	13.4	9.4	11.4
1958	32.8	161.2	124.4	391.9	19.9	16.9	14.2	13.2	13.2	13.3	9.4	9.4
1959	12.3	108.1	25.7	20.9	12.0	13.4	13.1	13.1	17.1	13.6	9.7	9.7
1960	11.2	67.4	22.3	22.1	11.9	13.3	13.2	13.1	13.2	13.3	9.4	9.5
1961	9.8	10.3	20.1	19.6	11.5	14.0	13.5	13.4	13.4	13.4	9.5	9.5
1962	10.2	111.3	50.2	22.1	12.1	13.5	13.2	13.3	13.2	15.4	9.8	10.1
1963	17.8	178.8	32.6	93.7	12.5	16.1	14.3	14.0	13.7	14.1	10.7	9.8
1964	26.4	12.8	22.3	21.7	11.8	13.5	14.0	13.8	13.6	13.5	9.5	12.4
1965	119.7	9.8	23.3	51.1	13.3	14.2	13.9	13.4	13.2	14.4	12.8	27.9
1966	12.3	12.3	22.4	20.9	12.8	13.3	13.2	13.2	13.2	13.4	9.6	33.2
1967	143.7	18.9	92.9	109.2	14.4	17.8	13.7	13.6	13.7	13.5	9.6	9.9
1968	12.9	14.8	27.1	21.0	11.6	13.4	13.2	13.1	13.2	13.3	10.5	11.9
1969	273.4	455.6	149.6	34.4	15.7	14.9	13.5	13.2	13.2	13.3	9.4	11.0
1970	129.5	54.7	159.0	25.4	14.1	13.9	13.3	13.2	13.2	13.4	11.9	57.4
1971	41.6	15.5	36.9	27.4	14.7	14.4	13.5	13.2	13.2	13.3	9.4	9.4

Calendar Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1972	10.9	12.7	19.9	19.6	11.4	13.2	13.1	13.1	13.2	13.3	19.3	12.9
1973	97.9	205.8	56.1	31.9	14.3	13.8	13.2	13.1	13.2	13.3	14.1	44.4
1974	74.0	16.9	203.7	96.9	16.3	14.9	13.6	13.2	13.2	13.3	9.4	10.4
1975	10.9	86.6	154.3	42.1	16.6	14.3	13.5	13.3	13.3	13.3	9.4	10.3
1976	9.4	9.4	19.9	19.3	11.2	13.1	13.1	13.1	13.2	13.3	9.4	9.5
1977	9.8	9.6	19.6	19.4	11.4	13.5	13.1	13.1	13.2	13.3	9.4	10.5
1978	120.4	117.0	116.0	24.0	17.9	16.0	13.4	13.2	13.2	13.3	9.4	9.4
1979	15.7	18.6	32.5	25.0	13.1	13.4	13.2	13.2	13.2	13.3	9.4	14.5
1980	126.8	275.4	50.4	32.0	14.8	15.7	13.9	13.3	13.3	13.3	9.4	9.5
1981	34.2	17.5	31.0	24.1	12.3	13.4	13.2	13.1	13.2	13.3	16.4	10.5
1982	118.9	98.3	88.9	336.3	22.6	17.0	13.9	13.3	13.3	13.3	12.4	58.9
1983	264.2	327.1	377.5	84.3	34.0	13.6	13.1	13.1	13.2	13.8	10.4	9.8
1984	19.2	15.6	35.8	19.5	11.4	13.1	13.1	13.1	13.2	13.3	12.4	13.0
1985	10.6	16.9	34.9	19.4	11.2	13.1	13.1	13.1	13.2	13.3	13.5	12.4
1986	17.4	347.4	184.6	30.9	16.0	14.1	13.8	13.3	13.3	13.4	9.6	9.7
1987	10.7	9.8	29.7	21.8	11.8	13.2	13.2	13.2	13.4	13.4	9.6	10.2
1988	11.0	10.2	19.6	21.5	12.0	14.0	13.7	13.6	13.5	13.4	9.4	9.6
1989	10.5	11.0	22.8	20.6	12.2	14.6	14.3	14.2	13.7	13.5	9.5	9.4
1990	9.6	14.1	20.1	19.2	11.2	13.1	13.1	13.1	13.2	13.5	9.5	9.6
1991	9.6	9.6	80.6	25.0	12.3	13.4	13.1	13.2	13.3	13.5	9.5	9.8
1992	9.9	56.3	39.3	20.4	12.4	14.1	13.5	13.2	13.2	13.5	9.8	16.1
1993	199.2	165.8	48.7	35.4	16.2	15.7	13.3	13.4	13.2	13.4	9.6	9.7
1994	9.9	18.1	20.5	20.3	12.2	13.1	13.1	13.1	13.2	13.3	9.7	9.8
1995	147.1	23.5	234.5	37.8	14.5	13.1	14.4	13.4	13.2	13.3	9.8	11.8
1996	48.1	227.8	69.4	25.4	18.3	15.3	13.6	13.4	13.4	13.3	11.6	115.3
1997	501.3	64.6	30.2	24.6	13.0	13.8	13.5	13.7	13.3	13.3	9.6	15.8
1998	106.5	970.0	110.9	107.9	15.0	15.9	14.6	13.1	13.2	13.3	10.0	10.8
1999	47.1	405.5	140.6	25.4	18.3	15.3	13.6	13.4	13.4	13.3	11.6	12.4
2000	12.7	124.9	88.8	30.6	20.7	14.1	13.3	13.2	13.3	13.5	10.8	9.7
2001	11.6	34.2	35.6	25.1	12.1	13.2	13.5	13.4	13.3	13.3	9.6	14.4
2002	18.5	15.6	35.0	22.8	12.7	13.7	13.1	13.1	13.2	13.3	12.2	62.4
2003	22.4	16.2	27.9	27.0	20.5	14.3	13.1	13.1	13.2	13.3	9.4	13.4
2004	12.5	62.9	27.2	20.9	11.2	13.2	13.1	13.1	13.2	13.3	9.7	23.4
2005	96.9	130.2	101.6	22.0	18.3	14.7	13.6	13.1	13.2	13.7	10.4	34.2
2006	59.5	9.8	90.9	253.0	22.6	16.0	13.3	13.1	13.2	13.3	9.4	9.4
2007	9.9	19.1	23.8	20.3	11.4	13.2	13.1	13.1	13.2	13.3	9.4	9.4
2008	47.7	62.6	27.5	21.3	11.5	13.3	13.1	13.1	13.2	13.3	9.4	9.5
2009	9.7	22.1	37.7	22.1	11.6	13.3	13.1	13.1	13.2	16.2	9.5	13.6
2010	95.9	43.8	35.7	35.7	16.3	14.9	13.4	13.2	13.2	13.3	9.4	25.8
2011	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9	24.9

Calendar Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2012	24.9	104.8	104.8	104.8	104.8	104.8	104.8	104.8	104.8	13.3	9.7	54.2
2013	16.2	11.7	20.9	19.9	11.4	13.2	13.1	13.1	13.2	13.3	9.4	9.4
2014	9.4	12.2	22.3	21.0	11.3	13.2	13.1	13.1	13.3	13.3	9.4	30.5
2015	11.3	23.4	21.6	20.7	11.9	13.4	13.3	13.1	13.2	13.2	13.2	13.2

Table L2-12. Difference in Pacheco Creek Simulated Average Monthly Flow (cfs) between the No Action/No Project and Alternative 5 for the 1922 to 2015 Simulation Period 1 Mile Downstream of Pacheco Dam.

Calendar Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1922	0.2	-130.3	-37.7	2.4	7.7	-0.3	0.9	0.9	0.9	0.9	2.2	0.8
1923	-63.1	-34.0	11.5	-26.6	8.3	0.3	0.9	0.9	0.9	0.9	2.2	7.3
1924	7.3	7.0	17.6	18.3	11.3	12.9	12.9	12.9	13.0	13.1	9.3	9.5
1925	9.7	1.1	20.0	20.2	11.7	8.0	7.9	7.9	7.9	8.0	6.3	8.5
1926	8.5	-32.4	15.9	-43.8	8.9	0.9	0.9	0.9	0.9	0.9	2.2	7.4
1927	7.5	-91.1	-23.7	-28.3	8.2	0.4	0.9	0.9	0.9	0.9	2.2	5.0
1928	6.5	7.4	-1.7	20.4	11.8	2.1	2.1	2.1	2.1	2.1	2.9	7.6
1929	7.6	7.5	17.7	17.6	11.6	11.3	11.2	11.2	11.3	11.4	8.2	9.1
1930	9.7	9.6	1.0	19.9	11.6	3.1	3.0	3.0	3.0	3.0	3.4	6.1
1931	7.6	8.2	18.4	18.5	11.2	12.9	12.9	12.9	13.0	13.1	9.4	-26.3
1932	-54.8	-131.9	10.2	16.3	10.3	1.0	1.0	0.9	1.0	0.9	2.2	5.1
1933	7.2	7.5	17.4	17.3	11.5	11.3	11.2	11.2	11.2	11.3	8.2	9.5
1934	7.2	-0.2	14.6	14.2	8.4	5.6	5.5	5.5	5.5	5.6	4.5	5.9
1935	9.0	9.1	-0.2	0.6	11.7	3.7	3.7	3.7	3.7	3.7	3.8	-1.8
1936	0.6	-44.3	9.0	4.6	5.9	0.2	0.9	0.9	1.0	0.9	2.2	-2.0
1937	0.6	-66.0	-77.1	14.8	10.7	0.2	1.0	1.0	1.0	1.0	-7.7	-6.7
1938	-42.2	-151.4	-56.4	0.6	9.8	0.2	0.9	0.9	0.9	1.0	2.3	-2.4
1939	7.3	7.5	0.5	17.1	11.2	4.4	4.1	4.1	4.1	4.1	4.0	7.4
1940	8.6	-93.2	-106.0	-32.8	11.2	1.2	0.9	0.9	0.9	0.9	2.2	-3.2
1941	-12.6	-218.5	-120.8	-6.0	10.9	1.0	0.7	0.7	0.7	0.7	2.1	-3.2
1942	-24.0	-28.7	-5.6	-5.9	-9.9	-2.3	0.8	0.8	0.8	0.8	2.2	7.4
1943	-32.6	-3.7	-3.1	2.9	5.1	-0.9	0.9	0.9	0.9	0.9	2.2	5.0
1944	6.5	-56.9	-21.1	12.8	9.8	0.9	0.9	0.9	0.9	0.9	2.3	7.5
1945	7.5	-27.4	-5.7	8.2	9.4	-0.4	1.0	0.9	0.9	0.9	2.2	-3.1
1946	-33.7	-13.5	5.7	3.8	5.7	-2.0	1.0	1.0	1.0	0.9	2.3	7.5
1947	-2.4	-2.3	-7.4	16.5	11.6	1.4	1.3	1.3	1.3	1.3	2.4	5.6
1948	7.2	-2.3	0.6	-21.0	4.1	-1.3	0.9	0.8	0.9	0.9	2.1	5.2
1949	6.5	-3.4	-25.2	13.6	10.3	1.0	0.9	0.9	0.9	0.9	2.2	5.0
1950	-2.7	-2.1	17.4	20.4	11.4	4.6	4.4	4.4	4.4	4.4	-30.3	-104.0
1951	-32.8	-19.9	-29.2	14.0	10.5	1.2	1.3	1.2	1.2	1.2	2.4	0.8

Calendar Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1952	-212.0	-28.9	-82.9	8.0	6.5	-0.5	1.0	0.9	0.9	0.9	2.2	-2.2
1953	0.6	10.2	20.2	16.1	11.6	1.4	1.3	1.3	1.3	1.3	2.4	5.0
1954	6.6	7.2	17.6	17.6	11.6	10.2	10.1	10.1	10.1	10.2	7.7	9.2
1955	-0.3	9.4	19.4	19.2	11.6	6.8	6.7	6.7	6.7	6.8	5.7	-123.8
1956	-146.3	-46.5	5.0	11.2	8.6	0.3	1.0	0.9	0.9	0.9	2.2	7.3
1957	7.4	-2.3	17.7	17.4	11.9	6.6	6.5	6.5	6.5	6.6	5.5	8.5
1958	-0.9	-125.9	-135.6	-98.9	0.9	-2.2	0.5	0.5	0.5	0.5	1.9	5.9
1959	7.6	-28.2	15.5	16.1	11.4	1.5	1.3	1.3	1.4	1.3	2.4	7.4
1960	7.5	-1.6	19.9	17.5	11.4	2.7	2.5	2.5	2.5	2.5	3.1	6.5
1961	7.8	8.3	18.7	18.6	11.3	13.2	13.0	13.0	13.1	13.1	9.3	9.4
1962	9.6	-23.1	-54.9	17.0	11.4	1.1	0.9	0.9	0.9	1.0	2.2	7.3
1963	7.6	-113.5	-36.8	-101.3	-14.3	-1.1	0.8	0.8	0.8	0.8	2.1	7.3
1964	-2.1	7.4	17.4	17.3	11.4	8.2	8.0	8.0	8.1	8.1	6.4	8.9
1965	-48.0	-11.8	14.9	-53.8	10.1	0.9	0.9	0.8	0.9	0.9	2.2	-2.1
1966	0.3	0.3	17.4	17.3	11.6	3.8	3.8	3.8	3.8	3.8	3.9	-2.9
1967	-107.8	-22.2	-100.4	-118.7	-16.6	-3.0	0.7	0.7	0.8	0.7	2.1	5.2
1968	7.0	6.7	17.1	17.3	11.3	11.5	11.5	11.5	11.5	11.6	8.6	9.5
1969	-210.0	-101.7	-6.7	3.6	8.1	0.4	0.9	0.9	0.9	0.9	2.2	5.3
1970	-62.6	-4.5	-3.7	13.2	9.9	0.9	0.9	0.9	0.9	0.9	2.2	1.0
1971	-32.7	3.4	1.5	11.8	9.2	0.9	0.9	0.9	0.9	0.9	2.2	5.4
1972	7.3	7.5	17.6	17.8	11.3	12.8	12.8	12.8	12.9	13.0	1.0	9.9
1973	-41.2	-222.5	-63.0	6.5	9.5	0.9	0.9	0.9	0.9	0.9	2.3	0.8
1974	-55.4	1.4	-25.9	-7.6	7.1	0.5	0.9	0.9	0.9	0.9	2.1	5.4
1975	6.9	-4.6	-61.9	-8.2	7.1	0.9	0.9	0.9	0.9	0.9	2.2	5.4
1976	6.8	7.8	18.6	18.6	11.2	13.0	13.0	13.0	13.1	13.3	9.4	9.4
1977	9.6	9.4	19.4	19.3	11.3	13.2	13.0	13.1	13.1	13.2	9.4	9.7
1978	-41.2	-127.0	-126.4	-27.4	5.6	-0.7	0.9	0.9	0.9	0.9	2.2	5.4
1979	7.4	7.2	17.7	17.5	11.7	9.2	9.2	9.2	9.2	9.3	7.1	8.3
1980	-55.8	-297.7	-57.7	6.4	9.1	-0.3	0.9	0.9	0.9	0.9	2.2	5.0
1981	-2.4	7.6	0.6	17.5	11.5	1.8	1.7	1.7	1.7	1.7	2.8	7.5
1982	-54.8	-107.1	-86.5	-4.1	-1.2	-2.1	0.6	0.6	0.6	0.6	-7.8	0.9
1983	-24.7	-1.0	-2.4	-8.7	-9.3	0.9	0.9	0.9	0.9	0.9	2.2	5.3
1984	7.3	-2.3	17.7	17.2	11.3	8.1	7.9	7.9	8.0	8.0	6.5	8.9
1985	8.7	-0.8	19.1	18.4	11.2	8.4	8.1	8.1	8.2	8.2	6.6	8.9
1986	9.0	-294.1	-86.9	6.6	7.9	0.9	0.9	0.9	0.9	0.9	2.2	5.1
1987	7.0	-2.4	17.6	17.4	11.4	10.6	10.5	10.5	10.6	10.6	7.9	8.9
1988	9.0	8.8	18.7	19.0	11.4	13.0	12.9	12.9	12.9	12.9	9.2	9.4
1989	9.6	9.7	20.1	19.5	11.5	12.4	12.3	12.3	12.3	12.3	8.8	9.2
1990	9.3	10.2	19.3	19.0	11.2	12.0	12.0	12.1	12.2	12.3	9.1	9.2
1991	9.3	9.3	1.9	14.3	11.4	1.0	0.9	0.9	0.9	0.9	2.2	5.8

Calendar Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1992	7.3	-0.9	20.4	17.3	11.5	2.7	2.5	2.5	2.5	2.5	3.1	5.8
1993	-139.2	-180.8	-54.5	2.8	7.6	-0.4	0.9	0.9	0.9	0.9	2.2	5.2
1994	7.0	8.0	17.9	17.8	11.5	12.0	12.0	12.1	12.2	12.3	8.8	9.3
1995	-70.6	-26.8	-252.8	-2.2	9.3	0.9	0.9	0.9	0.9	0.9	2.2	5.3
1996	-3.0	-211.9	-77.3	13.3	5.5	0.0	0.9	0.9	0.9	0.9	2.2	-49.8
1997	-370.1	-8.5	8.4	12.3	11.7	1.3	1.3	1.3	1.3	1.3	2.4	5.2
1998	-39.9	-48.5	-9.8	-6.7	-9.7	-0.8	0.9	0.8	0.8	0.8	2.1	4.8
1999	-2.9	-32.7	-6.0	13.3	5.5	0.0	0.9	0.9	0.9	0.9	2.2	7.5
2000	-2.3	-65.9	-18.5	7.9	2.9	0.9	0.9	0.9	0.9	0.9	2.2	4.8
2001	6.9	-2.5	20.3	20.1	11.4	5.1	5.0	5.0	5.0	5.0	4.6	-2.7
2002	-1.4	8.3	20.3	18.2	11.6	4.9	4.9	4.9	4.9	4.9	4.6	1.1
2003	-14.5	2.8	11.2	12.4	3.1	1.0	0.9	0.9	0.9	0.9	2.2	5.6
2004	-4.1	1.1	17.7	16.3	11.2	1.6	1.3	1.3	1.3	1.3	2.4	-3.2
2005	-46.9	-141.2	-111.1	-25.0	5.3	0.6	0.9	0.9	0.9	0.9	2.2	-2.0
2006	-23.5	-11.2	-98.1	-47.5	-0.9	-1.1	0.7	0.7	0.7	0.7	2.0	5.9
2007	7.5	8.4	18.4	17.2	11.3	11.7	11.6	11.7	11.7	11.8	8.5	9.2
2008	1.1	-27.7	11.3	17.9	11.3	1.2	1.0	1.0	1.0	1.0	2.2	6.2
2009	7.6	-1.2	0.7	17.4	11.3	4.5	4.3	4.3	4.3	4.4	4.2	8.2
2010	-26.7	-48.1	-39.2	-38.9	7.3	0.4	0.9	0.9	0.9	0.9	2.1	-4.1
2011	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
2012	0.5	-84.4	-84.4	-84.4	-84.4	-84.4	-84.4	-84.4	-84.4	10.7	8.0	0.1
2013	10.2	9.3	19.2	19.0	11.3	4.1	3.8	3.8	3.8	3.8	3.9	7.2
2014	8.2	9.0	19.0	18.8	11.2	12.3	12.3	12.3	12.4	12.5	9.1	0.9
2015	9.7	0.5	19.7	19.5	11.4	5.1	4.9	4.9	4.9	4.9	4.9	4.9

Table L2-13 presents the monthly modeled river flows in Pacheco Creek for the No Action/ No Project Alternative 1 mile downstream of the Expanded Pacheco Reservoir utilized in the Pacheco Creek Habitat Suitability Model, Table L2-14 presents flows for Alternative 5 at this location, and Table L2-15 presents the change between the alternatives in river flow for each month of the model period.

Table L2-13. Pacheco Creek Simulated Average Monthly Flow (cfs) under the No Action Alternative for the 1922 to 2015 Simulation Period 5 Mile Downstream of Pacheco Dam.

Calendar Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1922	7.6	326.4	70.1	31.4	6.5	13.8	11.2	10.6	10.5	10.5	5.5	41.8
1923	144.3	62.2	13.8	49.2	5.1	12.8	11.2	10.7	10.5	10.4	5.2	0.6
1924	0.7	0.7	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1925	0.0	19.0	1.8	6.4	0.4	4.2	3.6	3.3	3.1	3.2	1.2	0.0
1926	0.0	144.8	6.2	82.4	3.8	11.2	10.6	10.4	10.3	10.4	7.2	1.2
1927	3.2	249.2	44.8	52.3	5.2	12.5	11.0	10.6	10.4	10.4	5.2	3.6
1928	2.0	8.9	45.2	16.8	0.7	9.9	9.4	9.2	9.0	9.1	4.5	0.8
1929	1.1	5.8	5.0	2.5	0.0	0.6	0.6	0.4	0.3	0.3	0.0	0.0
1930	0.4	2.5	53.7	0.7	0.0	8.3	8.4	8.2	8.2	8.2	3.8	1.4
1931	0.6	0.8	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	129.0
1932	103.0	251.4	15.5	5.0	1.6	11.3	10.7	10.5	10.3	10.3	5.1	2.4
1933	10.2	4.8	2.6	1.8	0.0	0.4	0.6	0.4	0.4	0.4	0.0	0.4
1934	6.5	12.6	2.8	0.0	0.0	1.7	2.1	2.0	2.0	2.1	0.7	0.0
1935	0.0	0.3	27.9	29.9	0.1	9.4	9.4	10.8	9.9	11.7	5.7	9.7
1936	27.3	105.0	18.6	27.6	9.9	13.0	12.2	12.2	12.3	12.3	6.1	35.7
1937	25.6	125.3	145.9	7.1	0.9	12.9	12.2	12.2	12.3	12.6	14.8	65.3
1938	79.1	289.1	105.2	34.8	2.1	12.9	12.2	12.2	12.5	15.0	12.5	12.5
1939	0.5	5.8	23.0	0.4	0.0	5.4	6.9	6.9	6.9	7.1	3.1	0.4
1940	2.3	261.3	202.5	60.1	0.0	8.5	10.1	10.1	10.1	10.3	5.0	22.8
1941	77.4	418.7	250.6	234.0	0.0	8.9	10.2	10.3	10.3	10.4	5.1	18.8
1942	103.7	205.2	81.8	151.9	26.7	17.6	11.0	10.6	10.4	10.6	8.1	3.1
1943	257.9	88.7	222.2	29.6	11.4	14.9	11.1	10.5	10.2	10.3	5.4	4.1
1944	8.3	185.2	170.9	10.8	2.3	11.5	10.9	10.1	10.1	10.7	9.0	4.6
1945	4.5	313.8	117.0	20.0	3.2	14.2	12.7	10.1	10.1	10.8	6.2	72.2
1946	62.6	23.1	25.4	29.0	10.3	17.0	16.9	17.0	16.1	11.6	9.9	6.4
1947	12.2	13.7	34.6	1.9	0.0	9.7	9.8	9.8	9.7	10.4	5.2	2.3
1948	1.8	10.0	29.2	76.5	12.9	15.8	10.9	10.5	10.3	10.5	5.3	4.1
1949	7.9	37.3	87.0	9.8	1.5	11.3	10.8	10.7	10.3	10.2	5.0	2.3
1950	15.5	25.3	2.8	16.7	0.0	6.7	7.3	6.7	6.7	6.8	128.3	197.9
1951	59.8	35.5	53.9	7.4	2.8	11.2	13.9	10.3	10.2	10.8	7.6	39.2
1952	426.8	50.6	164.7	20.1	8.8	14.3	13.7	10.5	10.5	10.4	5.4	20.6
1953	30.8	4.0	5.5	3.6	0.0	10.2	10.2	10.1	9.8	9.9	5.8	3.5
1954	2.4	7.4	12.3	5.4	0.0	1.6	1.6	1.5	1.4	1.3	0.9	0.5
1955	22.0	5.4	5.6	1.7	0.0	5.0	4.9	4.8	4.7	4.6	2.0	311.9
1956	278.4	85.5	26.2	14.9	4.7	12.7	11.3	10.6	10.5	10.5	5.2	0.6
1957	1.4	29.8	14.1	3.7	1.6	5.6	5.0	4.9	4.7	4.7	1.8	1.1
1958	31.7	284.9	258.1	488.8	17.0	17.1	11.7	10.7	10.5	10.7	5.3	1.6
1959	2.7	134.0	8.1	2.7	0.0	9.2	9.6	9.7	13.6	10.3	5.2	0.7

Calendar Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1960	1.7	66.8	0.8	2.6	0.0	7.9	8.6	8.5	8.5	8.7	4.1	1.2
1961	0.4	0.3	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1962	0.0	129.2	103.2	3.1	0.0	9.8	10.2	10.3	10.1	12.4	5.6	1.1
1963	8.3	290.1	67.5	192.9	24.8	15.1	11.5	11.2	10.8	11.3	6.5	0.9
1964	26.5	3.2	3.0	2.3	0.0	2.5	3.9	3.7	3.4	3.3	1.2	1.6
1965	165.7	19.3	6.4	102.8	1.4	11.3	11.1	10.5	10.2	11.5	8.6	28.0
1966	10.0	9.8	3.0	1.7	0.0	7.3	7.4	7.3	7.2	7.5	3.7	34.1
1967	249.5	38.9	191.3	225.8	29.0	18.7	11.0	10.8	10.8	10.7	5.4	2.8
1968	3.9	5.9	8.0	1.7	0.0	0.0	0.0	0.0	0.1	0.1	0.4	0.8
1969	481.4	555.1	154.3	28.7	5.6	12.4	10.6	10.3	10.1	10.3	5.0	3.7
1970	190.0	57.0	160.7	10.1	2.2	10.9	10.4	10.1	10.1	10.3	7.6	54.4
1971	72.3	9.9	33.4	13.5	3.5	11.4	10.5	10.1	10.1	10.2	5.0	1.9
1972	1.7	2.9	0.7	0.3	0.0	0.0	0.0	0.0	0.0	0.0	13.5	1.2
1973	137.1	426.1	117.2	23.3	2.8	10.8	10.2	10.1	10.1	10.3	9.8	41.6
1974	127.4	13.3	227.6	102.5	7.2	12.3	10.8	10.2	10.2	10.3	5.1	3.0
1975	2.1	89.0	214.2	48.3	7.5	11.3	10.6	10.3	10.2	10.3	5.0	2.9
1976	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1978	156.7	241.8	240.3	49.3	10.3	14.7	10.5	10.2	10.1	10.3	5.0	1.9
1979	6.4	9.3	12.8	5.5	0.0	2.2	2.0	1.9	1.8	1.9	0.6	4.2
1980	180.6	570.9	106.0	23.5	3.7	13.9	11.0	10.4	10.3	10.3	5.0	2.4
1981	34.6	7.7	28.4	4.5	0.0	9.1	9.4	9.3	9.3	9.5	11.6	1.2
1982	171.7	203.2	173.4	338.3	21.8	17.0	11.2	10.7	10.6	10.5	18.1	56.0
1983	286.9	325.9	377.8	90.9	41.4	10.7	10.1	10.1	10.1	10.9	6.2	2.5
1984	10.0	15.6	16.1	0.7	0.0	1.9	3.1	3.1	3.1	3.2	3.8	2.1
1985	0.4	15.5	13.8	0.0	0.0	1.3	2.8	2.9	2.8	3.0	4.8	1.6
1986	6.4	639.2	269.4	22.2	6.1	11.1	10.9	10.3	10.3	10.5	5.3	2.6
1987	1.8	9.9	10.1	2.4	0.0	0.3	0.9	0.9	1.0	1.0	0.2	0.0
1988	0.4	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.4	0.0	0.0	0.0	0.0
1990	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	0.0	0.0	74.4	8.6	0.0	9.9	10.1	10.1	10.1	10.5	5.2	2.1
1992	0.9	55.0	16.9	1.3	0.0	9.0	9.0	8.6	8.5	9.0	4.6	8.3
1993	336.5	344.4	101.2	30.5	6.7	14.0	10.4	10.5	10.1	10.4	5.3	2.5
1994	1.2	7.8	0.9	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1995	214.2	48.1	485.4	37.9	3.2	10.0	11.5	10.5	10.1	10.3	5.5	4.5
1996	49.1	437.5	144.6	10.1	10.8	13.3	10.6	10.5	10.4	10.2	7.3	163.1
1997	869.4	70.9	19.8	10.3	0.0	10.4	10.2	10.3	9.7	9.9	5.1	8.6
1998	144.4	1016.3	118.7	112.5	22.6	14.7	11.8	10.2	10.2	10.3	5.8	4.0
1999	47.9	436.0	144.6	10.1	10.8	13.3	10.6	10.5	10.4	10.2	7.3	3.0

Calendar Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2000	13.0	188.6	105.2	20.6	15.7	11.1	10.4	10.2	10.2	10.5	6.6	2.9
2001	2.7	34.5	13.2	2.9	0.0	5.4	6.5	6.5	6.2	6.2	3.0	15.2
2002	18.0	5.0	12.7	2.6	0.0	6.5	6.1	6.1	6.1	6.3	5.5	59.3
2003	34.9	11.1	14.7	12.6	15.4	11.3	10.0	10.1	10.1	10.2	5.0	5.8
2004	14.7	59.5	7.5	2.5	0.0	8.2	9.6	9.7	9.7	9.9	5.2	24.6
2005	141.9	269.1	210.7	44.9	11.1	12.1	10.7	10.1	10.1	10.8	6.1	34.2
2006	80.9	18.8	187.0	298.4	21.5	15.0	10.6	10.3	10.3	10.5	5.2	1.5
2007	0.8	8.4	3.3	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2008	43.3	88.1	14.3	1.5	0.0	9.1	10.0	10.0	10.0	10.2	5.0	1.4
2009	0.5	21.1	35.0	2.6	0.0	5.8	6.7	6.7	6.7	9.9	3.1	3.4
2010	120.6	89.7	72.9	72.6	7.0	12.5	10.5	10.3	10.1	10.3	5.0	28.0
2011	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4	22.4
2012	22.4	187.0	187.0	187.0	187.0	187.0	187.0	187.0	187.0	0.8	0.2	52.1
2013	4.1	0.7	0.2	0.0	0.0	5.8	7.2	7.2	7.2	7.4	3.3	0.6
2014	0.0	1.1	1.4	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.5
2015	0.2	20.7	0.4	0.0	0.0	5.5	6.4	6.1	6.1	6.1	6.1	6.1

Table L2-14. Pacheco Creek Simulated Average Monthly Flow (cfs) under Alternative 5 for the 1922 to 2015 Simulation Period 5 Mile Downstream of Pacheco Dam.

Calendar Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1922	7.8	196.0	32.3	33.8	14.1	13.5	12.0	11.5	11.3	11.3	7.6	42.6
1923	81.0	28.1	25.3	22.5	13.3	13.0	12.0	11.5	11.4	11.3	7.3	7.4
1924	7.5	7.2	17.4	17.4	9.3	11.2	11.0	10.9	11.0	11.2	7.5	7.7
1925	8.5	22.6	21.6	26.5	11.6	12.1	11.5	11.2	11.0	11.1	7.2	7.3
1926	7.4	113.0	22.0	38.6	12.6	12.0	11.4	11.2	11.1	11.2	9.4	8.3
1927	10.6	158.0	21.0	23.9	13.4	12.8	11.8	11.5	11.2	11.2	7.3	8.5
1928	8.5	16.2	43.3	37.2	12.0	11.9	11.4	11.2	11.0	11.1	7.3	7.9
1929	8.4	13.3	22.6	20.0	10.6	11.7	11.3	11.1	11.0	11.1	7.1	7.3
1930	10.5	12.1	54.7	20.0	10.5	11.6	11.3	11.1	11.0	11.1	7.1	7.3
1931	7.7	8.5	18.0	17.4	9.2	11.0	10.9	10.9	10.9	11.1	7.1	105.7
1932	48.1	119.3	25.6	21.2	11.7	12.2	11.6	11.4	11.2	11.2	7.2	7.4
1933	17.3	12.3	19.9	19.0	10.1	11.6	11.3	11.0	11.0	11.1	7.1	9.7
1934	13.6	12.3	17.3	13.5	6.8	7.8	7.5	7.4	7.4	7.6	4.6	4.9
1935	8.1	9.2	27.6	30.5	11.2	13.0	13.0	14.5	13.5	15.3	9.5	7.7
1936	27.8	60.6	27.5	32.1	15.8	13.0	13.0	13.1	13.2	13.2	8.2	33.7
1937	26.1	59.2	68.7	21.9	11.1	13.0	13.0	13.1	13.2	13.5	7.0	58.5
1938	36.8	137.6	48.7	35.3	11.9	13.0	13.0	13.1	13.3	15.9	14.8	10.1
1939	7.2	13.2	23.4	17.0	9.0	10.8	10.9	10.9	10.9	11.1	7.1	7.2
1940	10.8	168.0	96.4	27.2	9.0	10.8	10.9	10.9	10.9	11.1	7.1	19.5

Calendar Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1941	64.8	200.1	129.7	228.0	9.0	10.8	10.9	10.9	10.9	11.1	7.1	15.5
1942	79.6	176.4	76.1	145.9	16.7	15.1	11.8	11.3	11.1	11.3	10.2	10.5
1943	225.2	84.9	219.0	32.4	16.5	14.0	11.9	11.3	11.0	11.1	7.5	8.9
1944	14.6	128.2	149.7	23.5	12.0	12.4	11.8	11.0	11.0	11.6	11.2	12.0
1945	12.0	286.3	111.2	28.2	12.5	13.7	13.6	10.9	10.9	11.6	8.3	69.0
1946	28.8	9.5	30.9	32.7	15.9	15.0	17.9	17.9	17.0	12.5	12.1	13.9
1947	9.8	11.3	27.1	18.4	10.5	11.3	11.0	11.0	11.0	11.7	7.5	7.8
1948	8.9	7.6	29.7	55.4	17.0	14.4	11.7	11.3	11.0	11.3	7.3	9.2
1949	14.3	33.8	61.7	23.3	11.6	12.2	11.7	11.5	11.2	11.1	7.1	7.2
1950	12.8	23.1	20.2	37.0	10.0	11.8	11.6	11.0	11.0	11.1	97.9	93.9
1951	27.0	15.5	24.6	21.4	13.2	12.3	15.1	11.4	11.4	12.0	9.9	39.9
1952	214.7	21.6	81.8	28.1	15.2	13.7	14.7	11.4	11.3	11.3	7.5	18.3
1953	31.3	14.1	25.6	19.6	10.7	11.7	11.4	11.3	11.1	11.2	8.2	8.5
1954	8.9	14.5	29.7	22.9	10.6	11.9	11.5	11.4	11.3	11.3	8.2	9.2
1955	21.6	14.7	24.9	20.8	10.7	11.9	11.6	11.5	11.4	11.3	7.6	187.9
1956	132.0	38.9	31.2	25.9	13.2	12.9	12.2	11.5	11.4	11.3	7.3	7.4
1957	8.5	27.3	31.7	21.1	13.4	12.1	11.5	11.4	11.2	11.2	7.2	9.3
1958	30.7	158.9	122.4	389.8	17.8	14.8	12.1	11.1	10.9	11.1	7.1	7.2
1959	10.2	105.8	23.6	18.8	10.0	11.2	10.9	10.9	15.0	11.6	7.6	7.7
1960	9.1	65.1	20.2	19.9	9.8	11.2	11.0	10.9	10.9	11.1	7.1	7.4
1961	7.7	7.9	18.1	17.5	9.4	11.8	11.5	11.3	11.3	11.2	7.3	7.3
1962	8.1	108.9	48.2	20.0	10.0	11.4	11.0	11.2	10.9	13.3	7.7	8.1
1963	15.8	176.5	30.6	91.6	10.4	13.9	12.3	11.9	11.5	12.0	8.5	7.8
1964	24.3	10.5	20.3	19.5	9.7	11.3	11.9	11.7	11.4	11.3	7.3	10.3
1965	117.6	7.5	21.3	48.9	11.3	12.1	11.9	11.3	10.9	12.3	10.7	25.8
1966	10.2	10.0	20.3	18.8	10.7	11.2	11.1	11.0	10.9	11.3	7.5	31.1
1967	141.7	16.6	90.9	107.0	12.4	15.7	11.6	11.5	11.5	11.4	7.4	7.8
1968	10.9	12.5	25.0	18.9	9.5	11.2	11.0	10.9	10.9	11.1	8.4	9.9
1969	271.3	453.3	147.5	32.2	13.7	12.8	11.4	11.1	11.0	11.1	7.1	8.9
1970	127.4	52.4	156.9	23.2	12.0	11.7	11.3	11.0	10.9	11.2	9.8	55.3
1971	39.5	13.2	34.9	25.3	12.6	12.3	11.4	11.0	10.9	11.1	7.1	7.2
1972	8.9	10.4	17.8	17.4	9.4	10.9	10.9	10.9	10.9	11.1	17.1	10.8
1973	95.8	203.5	54.1	29.7	12.3	11.7	11.0	10.9	10.9	11.1	12.0	42.3
1974	71.9	14.6	201.6	94.8	14.2	12.7	11.5	11.0	10.9	11.1	7.1	8.3
1975	8.9	84.3	152.3	40.0	14.5	12.1	11.4	11.2	11.0	11.1	7.1	8.2
1976	7.2	7.0	17.8	17.1	9.0	10.8	10.9	10.9	10.9	11.1	7.1	7.3
1977	7.7	7.3	17.5	17.2	9.3	11.4	10.9	10.9	10.9	11.1	7.1	8.4
1978	118.4	114.7	113.9	21.9	15.9	13.9	11.4	11.0	10.9	11.1	7.1	7.2
1979	13.7	16.3	30.4	22.9	11.0	11.3	11.1	11.0	10.9	11.1	7.1	12.4
1980	124.8	273.1	48.3	29.8	12.7	13.5	11.8	11.2	11.1	11.1	7.1	7.3

Calendar Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1981	32.1	15.2	28.9	21.9	10.2	11.3	11.1	10.9	10.9	11.1	14.3	8.4
1982	116.8	96.0	86.8	334.2	20.6	14.8	11.8	11.2	11.1	11.1	10.2	56.8
1983	262.1	324.8	375.4	82.1	32.0	11.5	10.9	10.9	10.9	11.7	8.3	7.7
1984	17.2	13.3	33.7	17.4	9.3	10.8	10.9	10.9	10.9	11.1	10.2	11.0
1985	8.6	14.6	32.8	17.2	9.0	10.8	10.9	10.9	10.9	11.1	11.4	10.4
1986	15.3	345.1	182.5	28.7	13.9	12.0	11.8	11.2	11.1	11.3	7.4	7.6
1987	8.7	7.5	27.6	19.7	9.8	11.0	11.0	11.1	11.2	11.3	7.5	8.1
1988	8.9	7.9	17.5	19.3	9.9	11.9	11.6	11.5	11.4	11.2	7.1	7.4
1989	8.5	8.7	20.7	18.4	10.1	12.5	12.3	12.2	11.6	11.3	7.3	7.2
1990	7.5	11.8	18.0	17.0	9.0	10.8	10.9	10.9	10.9	11.4	7.3	7.5
1991	7.5	7.3	78.6	22.8	10.2	11.3	10.9	10.9	11.0	11.4	7.3	7.8
1992	7.8	54.0	37.3	18.2	10.3	12.0	11.4	11.0	10.9	11.5	7.7	14.1
1993	197.2	163.5	46.6	33.2	14.2	13.6	11.3	11.3	10.9	11.2	7.4	7.7
1994	7.9	15.8	18.4	18.1	10.2	10.8	10.9	10.9	10.9	11.1	7.6	7.7
1995	145.0	21.2	232.5	35.6	12.4	10.8	12.3	11.3	10.9	11.1	7.6	9.7
1996	46.0	225.5	67.3	23.3	16.2	13.2	11.5	11.3	11.3	11.1	9.5	113.2
1997	499.2	62.3	28.1	22.5	10.9	11.7	11.5	11.6	11.0	11.1	7.4	13.7
1998	104.4	967.7	108.8	105.7	12.9	13.8	12.5	10.9	10.9	11.1	7.8	8.7
1999	45.0	403.2	138.5	23.3	16.2	13.2	11.5	11.3	11.3	11.1	9.5	10.4
2000	10.6	122.6	86.7	28.5	18.6	11.9	11.3	11.1	11.0	11.4	8.7	7.7
2001	9.5	31.9	33.5	22.9	10.1	10.9	11.5	11.4	11.1	11.1	7.5	12.4
2002	16.5	13.3	33.0	20.7	10.6	11.6	10.9	10.9	10.9	11.1	10.0	60.4
2003	20.3	13.9	25.8	24.9	18.5	12.2	10.9	10.9	10.9	11.1	7.1	11.3
2004	10.4	60.6	25.2	18.7	9.0	10.9	10.9	10.9	10.9	11.1	7.5	21.4
2005	94.9	127.9	99.6	19.8	16.3	12.6	11.6	10.9	10.9	11.6	8.2	32.1
2006	57.4	7.5	88.8	250.9	20.6	13.9	11.2	10.9	10.9	11.1	7.1	7.2
2007	7.9	16.8	21.7	18.1	9.4	11.0	10.9	10.9	10.9	11.1	7.1	7.2
2008	45.7	60.3	25.5	19.2	9.5	11.1	10.9	10.9	10.9	11.1	7.1	7.3
2009	7.6	19.8	35.6	20.0	9.6	11.1	10.9	10.9	10.9	14.1	7.3	11.5
2010	93.8	41.5	33.7	33.6	14.2	12.8	11.4	11.1	10.9	11.1	7.1	23.8
2011	22.8	22.8	22.8	22.8	22.8	22.8	22.8	22.8	22.8	22.8	22.8	22.8
2012	22.8	102.5	102.5	102.5	102.5	102.5	102.5	102.5	102.5	11.1	7.5	52.1
2013	14.2	9.4	18.9	17.8	9.4	11.0	10.9	10.9	10.9	11.1	7.1	7.2
2014	7.2	9.9	20.3	18.8	9.2	10.9	10.9	10.9	11.0	11.1	7.2	28.4
2015	9.3	21.1	19.6	18.6	9.8	11.3	11.3	10.9	10.9	10.9	10.9	10.9

Table L2-15. Difference in Pacheco Creek Simulated Average Monthly Flow (cfs) between the No Action/No Project and Alternative 5 for the 1922 to 2015 Simulation Period 5 Mile Downstream of Pacheco Dam.

Calendar Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1922	0.2	-130.4	-37.8	2.4	7.6	-0.4	0.9	0.8	0.8	0.8	2.1	0.7
1923	-63.2	-34.0	11.5	-26.7	8.3	0.2	0.8	0.8	0.8	0.8	2.1	6.8
1924	6.8	6.5	17.1	17.4	9.3	11.2	11.0	10.9	11.0	11.2	7.5	7.7
1925	8.5	3.6	19.9	20.1	11.2	7.9	7.8	7.8	7.9	7.9	6.0	7.3
1926	7.4	-31.8	15.8	-43.9	8.8	0.8	0.8	0.8	0.8	0.8	2.1	7.1
1927	7.4	-91.1	-23.8	-28.4	8.2	0.3	0.8	0.8	0.8	0.8	2.1	4.9
1928	6.5	7.3	-1.8	20.3	11.3	2.0	2.0	2.0	2.0	2.0	2.8	7.1
1929	7.3	7.4	17.7	17.5	10.6	11.1	10.7	10.7	10.7	10.8	7.1	7.3
1930	10.2	9.5	0.9	19.4	10.5	3.3	2.9	2.9	2.9	2.9	3.3	5.9
1931	7.1	7.7	17.8	17.4	9.2	11.0	10.9	10.9	10.9	11.1	7.1	-23.2
1932	-54.9	-132.0	10.1	16.2	10.1	0.9	0.9	0.9	0.9	0.9	2.1	5.0
1933	7.2	7.4	17.4	17.2	10.1	11.2	10.7	10.6	10.6	10.7	7.1	9.3
1934	7.1	-0.3	14.5	13.5	6.8	6.2	5.4	5.4	5.4	5.5	4.0	4.9
1935	8.1	8.9	-0.3	0.6	11.1	3.6	3.6	3.6	3.6	3.6	3.8	-1.9
1936	0.5	-44.4	8.9	4.5	5.8	0.1	0.9	0.9	0.9	0.9	2.1	-2.0
1937	0.5	-66.1	-77.2	14.7	10.3	0.2	0.9	0.9	0.9	0.9	-7.7	-6.8
1938	-42.3	-151.5	-56.5	0.5	9.8	0.1	0.9	0.9	0.9	0.9	2.2	-2.4
1939	6.8	7.5	0.4	16.6	9.0	5.4	4.0	4.0	4.0	4.0	4.0	6.8
1940	8.5	-93.3	-106.1	-32.9	9.0	2.3	0.8	0.8	0.8	0.8	2.1	-3.3
1941	-12.6	-218.6	-120.9	-6.0	9.0	1.9	0.7	0.7	0.7	0.7	2.0	-3.3
1942	-24.1	-28.8	-5.7	-6.0	-9.9	-2.4	0.7	0.7	0.7	0.7	2.1	7.4
1943	-32.7	-3.8	-3.2	2.9	5.0	-0.9	0.9	0.8	0.8	0.9	2.1	4.9
1944	6.4	-57.0	-21.2	12.8	9.8	0.9	0.9	0.9	0.9	0.9	2.2	7.4
1945	7.4	-27.5	-5.7	8.1	9.3	-0.5	0.9	0.8	0.8	0.9	2.1	-3.2
1946	-33.8	-13.6	5.6	3.8	5.6	-2.0	1.0	1.0	0.9	0.9	2.2	7.5
1947	-2.4	-2.4	-7.4	16.4	10.5	1.6	1.2	1.3	1.2	1.3	2.3	5.5
1948	7.1	-2.4	0.5	-21.0	4.1	-1.4	0.8	0.8	0.8	0.8	2.1	5.1
1949	6.4	-3.5	-25.3	13.5	10.1	0.9	0.9	0.9	0.9	0.9	2.1	4.9
1950	-2.7	-2.2	17.3	20.3	10.0	5.1	4.4	4.4	4.4	4.4	-30.4	-104.1
1951	-32.8	-20.0	-29.2	13.9	10.4	1.1	1.2	1.1	1.1	1.1	2.3	0.7
1952	-212.0	-29.0	-82.9	7.9	6.4	-0.6	0.9	0.9	0.8	0.9	2.1	-2.3
1953	0.6	10.1	20.1	16.0	10.7	1.5	1.2	1.2	1.2	1.2	2.3	4.9
1954	6.5	7.1	17.5	17.5	10.6	10.2	9.9	9.9	9.9	9.9	7.3	8.7
1955	-0.4	9.3	19.3	19.1	10.7	6.9	6.7	6.7	6.7	6.7	5.6	-123.9
1956	-146.3	-46.6	5.0	11.1	8.6	0.3	0.9	0.9	0.9	0.9	2.1	6.8
1957	7.1	-2.4	17.6	17.4	11.8	6.5	6.5	6.5	6.5	6.5	5.4	8.2
1958	-0.9	-126.0	-135.7	-99.0	0.8	-2.3	0.4	0.4	0.4	0.4	1.8	5.7

Calendar Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1959	7.5	-28.2	15.5	16.1	10.0	2.0	1.3	1.3	1.3	1.3	2.3	6.9
1960	7.4	-1.7	19.5	17.4	9.8	3.3	2.4	2.4	2.4	2.4	3.0	6.2
1961	7.3	7.7	18.0	17.5	9.4	11.8	11.5	11.3	11.3	11.2	7.3	7.3
1962	8.1	-20.3	-55.0	16.9	10.0	1.6	0.9	0.9	0.9	0.9	2.1	7.0
1963	7.5	-113.6	-36.9	-101.3	-14.4	-1.1	0.7	0.7	0.7	0.7	2.0	6.9
1964	-2.2	7.4	17.3	17.3	9.7	8.8	8.0	8.0	8.0	8.0	6.1	8.7
1965	-48.1	-11.8	14.8	-53.8	9.8	0.8	0.8	0.8	0.8	0.8	2.1	-2.2
1966	0.2	0.2	17.3	17.1	10.7	3.9	3.7	3.7	3.7	3.7	3.8	-3.0
1967	-107.9	-22.3	-100.5	-118.8	-16.7	-3.0	0.7	0.7	0.7	0.7	2.0	5.1
1968	6.9	6.6	17.0	17.1	9.5	11.2	11.0	10.9	10.9	11.0	8.0	9.1
1969	-210.1	-101.8	-6.8	3.5	8.1	0.4	0.8	0.8	0.8	0.8	2.1	5.3
1970	-62.7	-4.6	-3.8	13.2	9.8	0.9	0.9	0.9	0.9	0.9	2.2	1.0
1971	-32.8	3.3	1.4	11.8	9.1	0.9	0.9	0.9	0.9	0.9	2.1	5.3
1972	7.1	7.5	17.1	17.2	9.4	10.9	10.9	10.9	10.9	11.1	3.6	9.6
1973	-41.3	-222.6	-63.1	6.4	9.5	0.9	0.8	0.8	0.8	0.8	2.2	0.7
1974	-55.5	1.4	-26.0	-7.7	7.0	0.4	0.8	0.8	0.8	0.8	2.0	5.4
1975	6.8	-4.7	-61.9	-8.3	7.0	0.8	0.8	0.8	0.8	0.8	2.1	5.3
1976	6.4	7.0	17.8	17.1	9.0	10.8	10.9	10.9	10.9	11.1	7.1	7.3
1977	7.7	7.3	17.5	17.2	9.3	11.4	10.9	10.9	10.9	11.1	7.1	8.4
1978	-38.3	-127.1	-126.5	-27.5	5.6	-0.8	0.8	0.8	0.8	0.8	2.1	5.3
1979	7.3	7.1	17.6	17.4	11.0	9.1	9.1	9.1	9.1	9.2	6.5	8.3
1980	-55.9	-297.8	-57.7	6.4	9.0	-0.4	0.9	0.9	0.8	0.8	2.1	5.0
1981	-2.4	7.5	0.5	17.4	10.2	2.2	1.6	1.6	1.6	1.6	2.7	7.2
1982	-54.8	-107.2	-86.6	-4.1	-1.2	-2.2	0.6	0.6	0.6	0.6	-7.8	0.9
1983	-24.8	-1.1	-2.5	-8.8	-9.4	0.8	0.8	0.8	0.8	0.8	2.1	5.2
1984	7.2	-2.4	17.6	16.7	9.3	9.0	7.8	7.8	7.9	7.9	6.4	8.8
1985	8.2	-0.9	19.0	17.2	9.0	9.5	8.0	8.1	8.1	8.1	6.6	8.7
1986	9.0	-294.1	-87.0	6.5	7.8	0.9	0.9	0.9	0.8	0.9	2.1	5.0
1987	6.9	-2.4	17.5	17.3	9.8	10.7	10.1	10.1	10.2	10.3	7.3	8.1
1988	8.6	7.9	17.5	18.9	9.9	11.9	11.6	11.5	11.4	11.2	7.1	7.4
1989	8.5	8.7	20.7	18.4	10.1	12.5	11.9	11.7	11.6	11.3	7.3	7.2
1990	7.5	11.5	18.0	17.0	9.0	10.8	10.9	10.9	10.9	11.4	7.3	7.5
1991	7.5	7.3	4.1	14.2	10.2	1.3	0.9	0.9	0.9	0.9	2.1	5.7
1992	6.9	-1.0	20.3	17.0	10.3	3.0	2.5	2.4	2.5	2.5	3.1	5.7
1993	-139.3	-180.9	-54.6	2.8	7.5	-0.5	0.8	0.8	0.8	0.8	2.1	5.1
1994	6.7	8.0	17.5	17.3	10.2	10.8	10.9	10.9	10.9	11.1	7.6	7.7
1995	-69.2	-26.9	-252.9	-2.3	9.2	0.8	0.9	0.8	0.8	0.8	2.1	5.3
1996	-3.1	-212.0	-77.3	13.2	5.4	-0.1	0.9	0.9	0.9	0.9	2.1	-49.8
1997	-370.1	-8.6	8.3	12.2	10.9	1.3	1.2	1.2	1.2	1.2	2.3	5.1
1998	-40.0	-48.6	-9.9	-6.8	-9.8	-0.9	0.8	0.8	0.8	0.8	2.1	4.8

Calendar Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1999	-2.9	-32.8	-6.1	13.2	5.4	-0.1	0.9	0.9	0.9	0.9	2.1	7.4
2000	-2.4	-65.9	-18.5	7.9	2.8	0.9	0.8	0.8	0.9	0.8	2.1	4.8
2001	6.8	-2.6	20.3	20.0	10.1	5.6	4.9	4.9	4.9	4.9	4.5	-2.8
2002	-1.5	8.3	20.3	18.1	10.6	5.1	4.8	4.8	4.8	4.8	4.5	1.0
2003	-14.6	2.8	11.2	12.3	3.0	0.9	0.9	0.9	0.9	0.9	2.1	5.5
2004	-4.2	1.0	17.6	16.2	9.0	2.7	1.2	1.2	1.2	1.2	2.3	-3.2
2005	-47.0	-141.2	-111.2	-25.0	5.2	0.5	0.8	0.8	0.8	0.8	2.1	-2.1
2006	-23.5	-11.3	-98.2	-47.5	-1.0	-1.1	0.6	0.6	0.6	0.6	1.9	5.7
2007	7.1	8.3	18.4	16.9	9.4	11.0	10.9	10.9	10.9	11.1	7.1	7.2
2008	2.4	-27.8	11.2	17.7	9.5	2.0	0.9	0.9	0.9	0.9	2.1	6.0
2009	7.1	-1.2	0.6	17.3	9.6	5.2	4.2	4.2	4.2	4.3	4.1	8.1
2010	-26.8	-48.1	-39.2	-39.0	7.2	0.3	0.8	0.8	0.8	0.8	2.1	-4.2
2011	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4
2012	0.4	-84.5	-84.5	-84.5	-84.5	-84.5	-84.5	-84.5	-84.5	10.3	7.3	0.0
2013	10.1	8.8	18.6	17.8	9.4	5.2	3.7	3.7	3.7	3.7	3.8	6.7
2014	7.2	8.8	18.8	18.3	9.2	10.9	10.9	10.9	11.0	11.1	7.2	2.9
2015	9.1	0.4	19.1	18.6	9.8	5.8	4.8	4.8	4.8	4.8	4.8	4.8

L2.3 References

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