14. Master Responses

14.1 Master Response on WSIP Purpose and Need

14.1.1 Introduction

Overview

This master response addresses the issues commenters raised on the need for and objectives of the WSIP. Commenters were concerned with the overall combination of goals and objectives of the WSIP as well as with the level of detail provided in the Draft PEIR on these issues. Many commenters expressed an opinion that the Draft PEIR did not adequately describe the needs and deficiencies of the regional water system and the importance for improving the seismic and delivery reliability of the system.

The Draft PEIR provides background information on the purpose and need for the WSIP but does not discuss these issues in great depth; however, these issues do factor into the decision-making process (i.e., project approval), the WSIP bond measure, and the selection of the CEQA alternatives. This master response emphasizes and expands on the benefits of the proposed program but does not address comments related to the program's environmental effects; those comments are bracketed and responded to separately in Chapter 15 and/or in other master responses as appropriate.

This master response is organized by the following subtopics:

14.1.2 Purpose of the WSIP
14.1.3 Need for Seismic Reliability
14.1.4 Need for Water Supply and Drought Reliability
14.1.5 Seismic Improvements and Water Supply
14.1.6 Economic Evaluation of the Need for the WSIP

Commenters

Commenters that addressed this topic include:

Federal Agencies

- None

State Agencies

- California State Assembly – S_CSA

Local and Regional Agencies

- Bay Area Water Supply and Conservation Agency – L_BAWSCA1, L_BAWSCA2, L_BAWSCA3, L_BAWSCA4, L_BAWSCA5, L_BAWSCA6
- City of Hayward – L_Hayward
- City of Menlo Park – L_Menlo1
- City of Millbrae – L_Millbr
- City of Milpitas – L_Milpts

- City of Mountain View – L_MtnVw
- City of Palo Alto – L_PaloAlto
- City of Redwood City – L_RdwdCty
- City of San Jose – L_SanJose
- City of Santa Clara – L_SClara
- Los Altos Hills County Fire District – L_LAHCFD
- Purissima Hills Water District – L_PHWD1, L_PHWD2
- Stanford University (BAWSCA member) – L_Stanford
- Town of Hillsborough – L_Hillsb
- Town of Los Altos Hills – L_LosAltosH

Groups

- Acterra, Action for a Sustainable Earth – SI_ACT
- Environmental Defense – SI_EnvDef
- San Francisco Planning and Urban Research Association – SI_SPUR
- Tuolumne River Trust – SI_TRT3, SI_TRT6, SI_TRT9

Citizens

- Adams, Amy – C_Adams
- Allen, Casey – C_AllenC
- Bramlette, Darryl – C_BramlD
- Brand, Jobst – C_Brand
- Chiapella, Lynn – C_Chiap
- Elliott, Claire – C_EllioC
- Elliott, Patricia – C_EllioP
- Keebra, Suzanne – C_Keebr
- Kim, Michelle – C_Kim
- Kramer, John – C_Krame
- Martin, Michael – C_MartiM
- Neal, Paul – C_Neal
- Parkes, Doug – C_Parke
- Poulton, J – C_Poult
- Raffaeli, Paul – C_Raffa
- Ross, Jim – C_Ross
- Steinhart, Peter – C_Stein
- Symons, Barbara – C_Symon
- Walker, Patricia – C_Walke

PEIR Section Reference

The Draft PEIR addresses this topic area in the following locations: Vol. 1, Summary, Section S.2, pp. S-2 to S-6; Vol. 1, Chapter 2, Section 2.1, p. 2-1, and Section 2.3, pp. 2-16 to 2-31; Vol. 1, Chapter 3, Sections 3.3, 3.4, and 3.5, pp. 3-5 to 3-32; and Vol. 2, Chapter 4, Section 4.4.1, pp. 4.4-4 to 4.4-13.

14.1.2 Purpose of the WSIP

Comment Summary

This section of this master response responds to all or part of the following comments:

S_CSA-01	L_BAWSCA2-02	L_Millbr-02
S_CSA-05	L_BAWSCA3-01	L_Milpts-02
L_BAWSCA1-02	L_BAWSCA4-01	L_MtnVw-01
L_BAWSCA1-04	L_BAWSCA5-01	L_RdwdCty-02
L_BAWSCA1-54	L_BAWSCA6-01	L_SanJose-07
L_BAWSCA1-63	L_PaloAlto-04	L_Stanford-02

L_BAWSCA1-82	L_PaloAlto-05	SI_SPUR-02
L_BAWSCA1-84	L_PHWD2-02	C_Chiap-01
L_BAWSCA1-112	L_PHWD1-04	
L_BAWSCA2-01	L_Menlo1-01	

Summary of Issues Raised by Commenters

- Requests for a more detailed discussion of the overall need for the WSIP and of the potential consequences of not implementing the proposed program.
- Requests for a more detailed discussion of the importance of the WSIP to public health and safety.
- Requests for an expanded description of the needs and deficiencies of the existing regional water system.

Response

As described in the Draft PEIR (Vol. 1, Chapter 2, p. 2-1), the SFPUC developed and designed the WSIP to increase the overall reliability of the regional water system which services 2.4 million people in San Francisco, San Mateo, Santa Clara, Alameda, and Tuolumne Counties. The reliability of the water infrastructure system is of vital importance to the public health, safety, and drinking water needs of the Bay Area, including the welfare of residents, universities, state institutions, health care facilities, businesses, commercial and industrial complexes, and research and development facilities. The San Francisco Bay Area employs millions of Californians and generates billions of dollars in exports and tax revenues to the state. Catastrophic failure of the regional water system would be disastrous for public health and safety, and for the regional and state economies. Failure of the regional water system would present serious implications for Bay Area communities, including for the most vulnerable segments of the population—homebound elderly, children, hospital and nursing home patients, and families that could be displaced from their homes—particularly if failure of the regional system were to happen concurrent with earthquakes and fire. In addition, damage to water supply infrastructure in the event of an earthquake could result in uncontrolled releases of water from pipelines, tunnels, and reservoirs and create severe flood damage and environmental harm to fish and wildlife habitat in the communities in which water facilities are located, which stretch 160 miles from Yosemite National Park to San Francisco.

Existing Needs and Deficiencies

Maintenance Needs

Regular maintenance of regional facilities is needed to maintain the seismic and delivery reliability of the overall system. As described in the Draft PEIR (Vol. 1, Chapter 2, p. 2-1), the regional water system is comprised of over 280 miles of pipeline, over 60 miles of tunnels, 11 reservoirs, 5 pump stations, and 2 water treatment plants. Many of these components were built in the 1800s and early 1900s using now-outdated construction materials and/or methods, and were not designed to meet modern seismic engineering standards. Pipelines, tunnels, treatment and pumping facilities, and other related facilities all require maintenance (see Draft PEIR, Vol. 1, Chapter 2, Section 2.3.6). Maintenance of these facilities, which includes inspections and minor repairs/upkeep as well as major repairs, replacement, and/or rehabilitation, is a fundamental part of regional system operations and often requires that these facilities be completely shut down for up to 45 days or more. The most important facilities to maintain are also the most critical for system operations, making it inherently difficult to take them out of service for extended periods of time for inspection or repair. As a result, several key components of the system, including tunnels, dams, and other critical regional water system facilities, have been poorly maintained or have not been not maintained at all for decades.

Deferred Maintenance Has Reduced Overall System Reliability

As described in the Draft PEIR (Vol. 1, Chapter 2, pp. 2-27 and 2-28), unplanned outages have occurred periodically throughout the regional system for various reasons, including aging and deteriorating infrastructure. Specific examples of facility outages that have recently occurred include:

- In August 1996, a rupture in San Joaquin Pipeline No. 3 due to failure of the pipeline material resulted in a reduction of water delivered from the Hetch Hetchy system to the Bay Area, from 230 million gallons per day (mgd) to 150 mgd for a period of three weeks. The pipeline failure caused an unplanned discharge of over 10 million gallons of water at a rate of 200 to 400 cubic feet per second, flooded the surrounding cattle range land, and created a 1,000-foot-long erosion gully. In November 2002, there was another similar rupture in a different location on the same pipeline.

- In 1990, the 60-inch-diameter San Andreas No. 3 prestressed-concrete pipeline ruptured violently in an urban area of South San Francisco, sending waves of water across a schoolyard and turning cars over.

- During the 1996/1997 rainy season, a landslide originating on the hillside above the Crystal Springs Bypass Pipeline buried a 350-foot segment of the roadway in which the pipeline is aligned. The pipeline was taken out of service for several months to prevent a potentially disastrous discharge if the pipeline were to break. This incident revealed the vulnerability of the Crystal Springs Bypass Pipeline to seismically induced landslides.

Because funding has not been provided to replace facilities at the end of their service life, a tremendous amount of resources go into repairing broken equipment, which in turn causes facility outages, delays in operational schedules, and a shift of resources away from scheduled maintenance programs. Aging pump stations, such as the Baden, Crystal Springs, and San Antonio Pump Stations, are particularly susceptible to equipment failures and could result in outages or decreased operating capacity. Deteriorating valves that operators use to control pipe flow are critical links that affect the SFPUC's ability to isolate facilities for maintenance; some valves were historically installed without a redundant line or isolation valves, making them difficult or impossible to exercise and maintain without shutting down the system.

Pipelines are particularly susceptible to leakage or failure along segments where there is prestressed-concrete cylinder piping; leakage or failure has occurred in recent years on parts of the San Joaquin No. 3, San Antonio, Bay Division No. 4, Crystal Springs No. 2, and San Andreas No. 3 Pipelines, the repair of which has taken from several days to several months. Seismic safety and flooding issues at Calaveras Dam and Lower Crystal Springs Dam (described below under the heading Reduced Storage Capacity) have restricted the normal operating capacity of the system. The deferred maintenance and inspections of key infrastructure, such as the Irvington, Pulgas, and Crystal Springs Bypass Tunnels, have increased the susceptibility of the system to failure and unplanned outages. The frequency and magnitude of unplanned outages would be substantially reduced with increased replacement at the end of service life, increased operating flexibility, and regular maintenance and inspection, thereby substantially improving overall system reliability.

Seismic Vulnerability

Many of the key components of the regional water system are located in a seismically active region. The Draft PEIR (Vol. 2, Chapter 4, pp. 4.4-4 to 4.4-13) describes the regional faulting and seismic hazards along the SFPUC regional water system. The major faults in the vicinity of the regional water system are shown in Figure 4.4-1 (pp. 4.4-7 and 4.4-8). As shown in Figure 4.4-1, several key storage, transmission, and treatment facilities are traversed by, or located very near to, one or more active faults. All four of the major transmission pipelines that carry water from the East Bay to the South Bay, Peninsula, and San Francisco communities are intersected by one or more active faults. Calaveras Reservoir (in Alameda County), and San Andreas and Crystal Springs Reservoirs (in San Mateo County) are traversed by the Calaveras and San Andreas faults, respectively. Further, as described in the Draft PEIR, the U.S. Geological Survey Working Group on California Earthquake Probabilities concluded that there is a 62 percent probability of a magnitude 6.7 or greater earthquake, capable of causing widespread damage, occurring in the San Francisco Bay region in the 30-year period between 2003 and 2032 (Vol. 2, Chapter 4, p. 4.4-5). Although the San Joaquin region is relatively seismically inactive compared to the Bay Area, earthquakes on any of the active faults in the greater Bay Area could also produce groundshaking and associated seismic hazards in this region. The combination of outdated building methods, aging infrastructure, lack of deferred maintenance, and regional seismicity place several of the key facilities at a high risk of catastrophic failure in the event of a major earthquake. As discussed in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-27 and 3-28), the results of seismic reliability studies conducted by the SFPUC indicate that a major earthquake on the San Andreas, Hayward, or Calaveras fault under existing conditions could result in unplanned outages and a drastic disruption of service to all SFPUC customers for more than 14 days and possibly more than 30 days. Refer to Section 14.1.3 below for additional information regarding the vulnerability of the regional water system to seismic hazards.

Need for Drought Planning and Preparedness

Past experience with droughts has reinforced the critical importance of planning for future drought events. The term “drought event” refers to all years or sequences of years when hydrological/meteorological conditions indicate that water supplies may not be adequate to fully meet customer demands and the SFPUC needs to modify its operating procedures and implement drought response actions (Draft PEIR, Vol. 1, Chapter 3, Section 3.5.4). As described in the Draft PEIR (Vol. 1, Chapter 2, Section 2.3.5), the regional water system has experienced drought periods in the last 30 years, most notably the droughts from 1976 to 1977, and from 1987 to 1992. As the 1987–1992 drought progressed, the SFPUC was forced to adopt a mandatory rationing program to impose rationing on customers that resulted in a near 25 percent annual systemwide reduction in water deliveries. Due to the wide variation in types of water users in the regional service area, the program resulted in a wide variation in cutbacks experienced by different customers, ranging from about 20 percent in areas with cooler climates to 40 percent in areas with warmer climates. In the later stages of the six-year drought, the SFPUC initiated programs to achieve a 45 percent reduction in systemwide deliveries, but these programs were averted when a series of storms in March 1991 provided relief.

The potential impacts of a severe drought are based on the frequency, duration, severity, and spatial extent of the drought, and the degree to which a population, water user, or sector of the economy is vulnerable to the effects of a drought (e.g., rainfall/runoff, amount of water in storage, availability of supplemental dry-year supplies). As discussed below, a reduction in the overall storage capacity due to reservoir restrictions imposed by the Division of Safety of Dams (DSOD) has reduced the system firm yield of the regional water system and further impaired the ability of the system to meet water deliveries to current customers during a prolonged drought. Major droughts (such as the 1987–1992 drought) can have substantial direct and indirect impacts on the state and regional economy, environment, and society as a whole. Direct impacts of drought are characteristically biophysical and include reduced water levels, increased fire hazards, a reduction in agricultural production and forest productivity, and adverse impacts on wildlife and fisheries, among others. Indirect impacts are consequential and can include impacts on public health and safety, increased food prices, reduced quality of life, reduced income for water-intensive industries, and increased unemployment. Studies indicate a 30 percent chance that the regional water system will experience a drought in the next 75 years that is equal to or more severe than the 1987–1992 drought, the most extreme recorded drought to affect the regional system (see Draft PEIR, Vol. 1, Chapter 3, p. 3-14). As described below, the future storage capacity and system firm yield of the regional water system are two factors affecting the vulnerability of the system to future drought impacts.

Reduced Storage Capacity

The regional water system is highly dependent on storage to be able to serve water under a variety of meterological/hydrological and operating conditions. While the Hetch Hetchy system provides the majority of water to the regional system, local Bay Area reservoirs are operated to maximize the yield for water deliveries and carryover storage and to provide critical backup or redundancy in the event of water quality problems, transmission disruptions in the Hetch Hetchy system, emergencies, critical maintenance, and droughts. In 1983, the DSOD placed operating restrictions on Lower Crystal Springs Dam due to concerns regarding the ability of the dam to retain water during major flood events, reducing the historical water storage capacity of Crystal Springs Reservoir by approximately 10,900 acre-feet, or about 15 percent (see Draft PEIR, Vol. 1, Chapter 2, Table 2.2, p. 2-6). In terms of operating storage capacity, the DSOD restrictions on Crystal Springs Reservoir are equivalent to 1 mgd of water (annual average over 8.5-year design drought) (Vol. 1, Chapter 3, p. 3-36).

In 2001, the DSOD also placed interim operating restrictions on Calaveras Dam due to the dam's inability to meet current seismic stability criteria at normal operating levels. The restrictions on

Calaveras Dam reduced the total storage capacity of the reservoir by 60 percent and the total, combined working storage capacity of the SFPUC's local reservoirs by over 30 percent. From the perspective of emergency preparedness, the DSOD restriction on Calaveras Dam has reduced the SFPUC's total reservoir storage, including its emergency storage capacity, by over 58,000 acre-feet (see Vol. 1, Chapter 2, pp. 2-10 and 2-11). The loss of operating storage capacity at Calaveras Reservoir resulting from the DSOD restrictions represents an equivalent of 7 mgd of water (annual average over 8.5-year design drought) (Vol. 1, Chapter 3, p. 3-36). Thus, the DSOD restrictions and related decreases in reservoir storage capacities currently impair the ability of the regional system to adequately serve customer water demands in the event of water quality problems, transmission disruptions in the Hetch Hetchy system, emergencies, critical maintenance, and droughts.

Reduced System Firm Yield

"System firm yield" refers to the average annual water delivery that can be sustained throughout an extended drought. As described above, DSOD operating restrictions on Lower Crystal Springs and Calaveras Dams have reduced system firm yield, impairing the SFPUC's ability to serve water deliveries to current customers during an extended drought (Vol. 1, Chapter 2, p. 2-25). In normal and wet years, when there is a system upset such as unusual water quality conditions in any of the SFPUC reservoirs, the regional system includes a number of operational bypasses and backup facilities that allow the SFPUC to modify normal operations in order to serve existing water demand and continue to meet water quality standards. The DSOD operating restrictions placed on Lower Crystal Springs and Calaveras Dams have reduced the system firm yield such that, under the existing condition, the regional water system is even more constrained in its ability to meet existing water demand during a prolonged drought. Without supplemental dry-year water supplies and the restoration of historical water storage capacity in Bay Area reservoirs, the SFPUC cannot meet current demand at its desired goal of no greater than 20 percent rationing in any single year of a drought. These conditions would be further exacerbated by future increases in water demand, resulting in potentially disastrous effects on the communities, businesses, and economy of the Bay Area.

Background and Development of the WSIP

The overall need for and objectives of the WSIP are described in the Draft PEIR (Vol. 1, Chapter 3, p. 3-5). The need for a comprehensive, systemwide program to address the existing needs and deficiencies described above, as well as to plan for future needs, is predicated on the basic mission of the SFPUC, which is in part:

> To serve San Francisco and its Bay Area customers with reliable, high-quality and affordable water, while maximizing benefits from power operations and responsibly managing the resources entrusted to its care.

The WSIP would address the existing needs and deficiencies of the regional water system; that is, decreased seismic and delivery reliability and increased risk of failure due to aging and deteriorating infrastructure; increased vulnerability to seismic hazards due to proximity to active earthquake faults and because certain facilities were historically constructed with building materials that do not meet current seismic standards; the need for system upgrades to improve the

SFPUC's ability to maintain compliance with current water quality standards and to meet anticipated future water quality standards under a range of operating conditions without reducing system reliability; the lack of adequate infrastructure redundancy, which would remove constraints to maintenance and improve delivery reliability in the event of an emergency or system failure; and insufficient water supplies to satisfy current water demand in drought years. In addition, implementation of the WSIP would address the ability of the regional water system to serve projected 2030 demand (purchase requests) in all hydrologic year types and improve overall system reliability.

Reliability, Hydraulic, and Hydrologic Models

The SFPUC began planning for major system improvements over a decade ago and has conducted numerous planning and engineering studies of the regional water system with respect to its vulnerability, reliability, performance, operations, water supply, watershed management, and water quality. As described in the Draft PEIR (Vol. 1, Chapter 3, Section 3.4), the SFPUC primarily used three models—reliability, hydraulic, and hydrologic models—to determine the appropriate performance objectives and level of service goals and to develop the scope of the WSIP facility improvement projects.

- *Reliability Model*. This statistical model was used to evaluate the ability of the system to meet identified targets when subjected to earthquakes on the San Andreas, Hayward, and Calaveras faults, as well as to quantify the risk of system components to failure when subjected to earthquake hazards under both existing and improved conditions.

- *Hydraulic Model*. The hydraulic model was used to determine transmission pipeline and tunnel capacities, which were then used as input to the hydrologic model (see below) to analyze system operations under existing and potential alternative future conditions. This model was used to analyze the hydraulic characteristics of the existing water system and to assist in determining facility sizing for WSIP facility improvement projects.

- *Hydrologic Model*. This model, referred to as the Hetch Hetchy/Local Simulation Model (HH/LSM), was used to simulate the monthly operation of all major water transmission and storage facilities in the regional water system under existing conditions, and to predict system operation under various alternative future conditions using historical hydrology for the 82-year period from July 1920 to September 2002. For additional information on the HH/LSM, see Draft PEIR Section 5.1 (Vol. 3, Chapter 5) and Appendix H (Vol. 5) as well as **Section 14.5, Master Response on Water Resources Modeling** (Vol. 7, Chapter 14).

Water Supply Studies

To provide guidance on addressing the needs of the regional water system through 2030, the SFPUC prepared several studies that evaluated various water supply options based on facilities requirements, costs, environmental effects, water quality impacts, and institutional and regulatory issues (described in Draft PEIR Vol. 1, Chapter 3, Section 3.4.1). The water supply studies provided guidance on demand management strategies and needed improvements related to system infrastructure. The studies also examined drought-related strategies for meeting customer demand during extended periods of drought. The water supply options analyses resulted in the proposed water supply strategy described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-33 to 3-39).

System Performance Studies

To evaluate the vulnerability and reliability of the regional water system, the SFPUC conducted extensive engineering analyses and studies as described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-15 and 3-16). The studies used a statistical, risk-based approach to examine hazards and deficiencies at existing facilities, assessed their reliability, and determined the risk to the overall system presented by hazards such as earthquakes, landslides, flood, fire, and general wear and tear under a range of conditions. The SFPUC conducted system assessment and performance analyses of the WSIP with respect to seismic and delivery reliability over the identified range of conditions, and developed level of service objectives for seismic and delivery reliability. The results of the engineering studies indicated that the existing system would fail to meet the WSIP seismic and delivery level of service objectives under most operating conditions, and that the performance of the system would continue to decline in the future if no improvements were made. These results were used to develop the numerous facility improvement projects that address the identified system deficiencies, particularly with respect to aging infrastructure and seismic hazards. Refer to the discussion under the heading Need for Seismic Reliability, below, for more detailed information regarding the seismic analyses conducted by SFPUC and the level of service objectives used to develop WSIP facility improvement projects.

Water Demand Studies

To assess future water needs in the SFPUC service area through 2030, the SFPUC, in collaboration with its wholesale customers and the Bay Area Water Supply and Conservation Agency (BAWSCA), conducted comprehensive planning studies to assess future water demands as well as the potential for water conservation programs and the use of recycled water to offset demand for potable water supplies in retail and wholesale customer areas (Vol. 1, Chapter 3, Section 3.4.4). Upon completion of the demand, conservation, and recycled water studies, the wholesale customers and the SFPUC (for the retail service area) submitted their best estimates of purchases from the SFPUC regional system in 2030. A high-range estimate of 300 mgd was used for planning purposes to establish the delivery reliability and water supply objectives for the proposed program. This 300 mgd accounts for a level of customer-committed conservation/recycled water programs and use of other supplies, as summarized in the SFPUC planning studies in Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18) and Table 7.2 (Vol. 4, Chapter 7, p. 7-15). Refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14) for a detailed description of customer demand projections as well as the conservation programs and recycling projects proposed by the SFPUC in San Francisco and by the SFPUC's wholesale customers in their respective service areas.

WSIP Goals and Objectives

The goals and objectives of the WSIP are founded on two fundamental principles pertaining to the existing regional water system: (1) maintaining a clean, unfiltered, water source from the Hetch Hetchy system, and (2) maintaining a gravity-driven system. The WSIP goals and objectives are presented in Table 3.2 of the Draft PEIR (Vol. 1, Chapter 3, p. 3-9). In summary, the overall goals of the WSIP for the regional water system are to:

- Maintain high-quality water and a gravity-driven system
- Reduce vulnerability to earthquakes
- Increase delivery reliability and improve maintenance of facilities
- Meet customer water supply needs in nondrought and drought conditions
- Enhance sustainability
- Achieve a cost-effective, fully operational system

Proposed WSIP Levels of Service

To achieve the these goals and system performance objectives, the WSIP also identifies level of service goals that describe and, in many cases, more specifically quantify what the regional water system proposes to achieve under the WSIP, and that thereby guide the water supply actions, facility improvements, operations, and maintenance requirements included in the proposed program. The proposed changes in levels of service with implementation of the WSIP as compared to existing conditions are shown in Table 3.5 of the Draft PEIR (Vol. 1, Chapter 3, p. 3-26). The WSIP level of service goals can be summarized as follows:

- *Water Quality Level of Service*. Ensure compliance with all existing and anticipated federal, state, and local drinking water requirements under a range of operating conditions, including catastrophic events such as a major earthquake.
- *Seismic Reliability Level of Service*. Reduce the regional system's vulnerability to earthquakes; provide basic service to at least 70 percent of customer turnouts in each region within 24 hours after a major earthquake; and restore facilities to meet average-day demand within 30 days after a major earthquake.
- *Water Delivery Reliability Level of Service*. Address the overall operations of the regional system with respect to its ability to deliver water to customers under a variety of conditions, such as reservoir replenishments during planned maintenance, unplanned outages, and loss of any one water source.
- *Water Supply Level of Service*. Assure an adequate supply of water to deliver to customers through the 2030 planning horizon during both nondrought and drought periods, and provide drought-year delivery with a maximum systemwide rationing of 20 percent.

In addition to program goals and objectives in the areas of water quality, seismic reliability, delivery reliability, and water supply, the WSIP includes program goals and objectives in the areas of sustainability and cost-effectiveness.

WSIP Facility Improvement Projects

The WSIP facility improvement projects and proposed water supply option and associated modifications in system operations have been designed to meet the level of service objectives and to ensure the water delivery needs are served in the SFPUC service area through 2030 while reducing impacts on the environment and on existing resources. Table 3.10 of the Draft PEIR (Vol. 1, Chapter 3, pp. 3-49 to 3-56) describes the WSIP facility improvement projects that are necessary to improve the regional water system to meet the goals and objectives of the WSIP with respect to seismic reliability, water quality, delivery reliability, and water supply. The table also shows the objectives to which each individual facility project contributes.

Proposed Water Supply Option

As described in the Draft PEIR (Vol. 1, Chapter 3, Section 3.6), under the WSIP the SFPUC would serve its customers in nondrought years through increased diversions of Tuolumne River and local watershed sources to supplement current Tuolumne River diversions and local watershed supplies in combination with 10 mgd of groundwater/recycled water/conservation projects in San Francisco. During drought periods, the SFPUC would augment the nondrought water supplies with implementation of a groundwater conjunctive-use program in the Westside Groundwater Basin, water transfers with the Turlock and Modesto Irrigation Districts, and restoration of the capacities of Calaveras and Crystal Springs Reservoirs; dry-year delivery assumes a maximum 20 percent systemwide rationing in any one year of a drought.

Management and Asset Management Strategy

As described in the Draft PEIR (Vol. 1, Chapter 3, Section 3.7.4), as part of the proposed changes in system operations, the WSIP includes implementation of a Management and Asset Management Strategy that includes provisions for regular maintenance, repair and replacement, and renewal. The plan uses a 20-year timeline and focuses initially on the major transmission pipelines and tunnels of the regional water system under the WSIP, but can be expanded to a more comprehensive maintenance program to cover the maintenance needs for other facilities in the regional system, including dams, powerhouses, chemical stations, pump stations, treatment plants, balancing reservoirs, valve lots, and other pipelines. The improvements to the transmission system under the WSIP would allow the SFPUC to meet its maintenance goals. System operations under the WSIP would allow planned facility inspection, repair, and maintenance without interrupting customer service, and the SFPUC could schedule planned facility shutdowns to accommodate ongoing system demand. Overall, the proposed program would enable the SFPUC to conduct previously deferred maintenance and repair work throughout the regional system, thereby extending the useful life of facilities and improving overall system reliability.

14.1.3 Need for Seismic Reliability

Comment Summary

This section of this master response responds to all or part of the following comments:

S_CSA-01	L_BAWSCA1-112	L_BAWSCA4-01	L_Hillsb-02
S_CSA-05	L_BAWSCA2-01	L_BAWSCA5-01	L_PHWD1-03
L_BAWSCA1-03	L_BAWSCA2-02	L_BAWSCA6-01	L_Menlo1-01
L_BAWSCA1-04	L_BAWSCA3-01	L_Hayward-01	L_Stanford-03

Summary of Issues Raised by Commenters

- The Draft PEIR does not adequately describe the urgent need for seismic repairs and catastrophic consequences of system failure in the event of an earthquake.

Response

The Draft PEIR clearly identifies seismic hazards as one of the fundamental driving forces in the development of the WSIP. The Draft PEIR (Vol. 2, Chapter 4, pp. 4.4-4 to 4.4-13) describes the regional faulting and seismic hazards along the SFPUC regional water system. Figure 4.4-1 (pp. 4.4-7 and 4.4-8) shows the major active and potentially active faults in the vicinity of the system. One of the WSIP's overall goals for the regional water system is to reduce vulnerability to earthquakes, and the system performance objectives for seismic reliability indicate that the WSIP facility improvement projects would be designed to meet current seismic standards, to deliver basic service to the service area within 24 hours after a major earthquake, and to restore facilities within 30 days after a major earthquake (Vol. 1, Chapter 3, pp. 3-8 and 3-9). These goals and objectives recognize the need to improve the system's ability to prepare for and withstand an earthquake as well as to restore services following an earthquake.

WSIP System Assessment for Level of Service Objectives

As described in the Draft PEIR (Vol. 1, Chapter 3, Section 3.4.2), the SFPUC conducted an extensive series of seismic reliability analyses to evaluate the delivery reliability of existing facilities and the performance of the overall system following a major earthquake event on the San Andreas fault (magnitude 7.9), Hayward fault (magnitude 7.3), and Calaveras fault (magnitude 6.9). The seismic analyses accounted for all of the hazards associated with these earthquakes, including groundshaking, surface fault rupture, liquefaction, and landslides. The results of the analyses were used to estimate the underlying questions posed by each of the level of service objectives:

- **Delivery After a Major Earthquake** – How much water would be delivered by the regional water system after a major earthquake?
- **Percentage of Turnouts that Receive Water** – What percentage of the turnouts in each customer group would receive water after an earthquake?
- **Post-Earthquake Recovery** – How would the regional system recover after an earthquake? After 30 days, how much would the system be able to deliver?

The seismic reliability analysis identified the ability of the existing system to meet quantitative level of service objectives, identified and described the deficiencies in the existing system, and identified the WSIP projects that are needed to meet the level of service objectives. Delivery reliability following a major earthquake was evaluated on a customer group basis, and delivery to individual turnouts within a customer group could vary. The three customer groups in the service area consisted of the South Bay (Alameda/Santa Clara/southern San Mateo County), Peninsula (northern San Mateo County), and San Francisco. Because seismic hazards and damage to facilities following an earthquake cannot be predicted in an exact manner, the uncertainty inherent in the analysis is estimated at 10 percent, meaning that there is a 10 percent or less chance that the actual delivery or percentage of turnouts that receive water would be less than shown.

The post-earthquake delivery analysis estimated how much water the regional system could deliver after a major earthquake to each customer group, and the percentage of turnouts within each customer group that would receive water. **Table 14.1-1** shows the estimated volume of water the

TABLE 14.1-1
DELIVERY WITHIIN 24 HOURS AFTER A MAJOR EARTHQUAKE

Customer Group	Level of Service Objective (mgd)	San Andreas Fault		Hayward Fault		Calaveras Fault	
		Existing System (mgd)	With WSIP (mgd)	Existing System (mgd)	With WSIP (mgd)	Existing System (mgd)	With WSIP (mgd)
South Bay	104	27	122	10	131	0	145
Peninsula	44	3	54	3	61	3	64
City of San Francisco	81	0	83	0	83	0	87
Total System	229	30	267	24	278	3	297

SOURCE: SFPUC, 2006.

system could deliver, expressed in million gallons per day (mgd), following a major earthquake. The results of the analysis indicate that the existing system falls drastically short of meeting the level of service objective of delivering a systemwide total of 229 mgd and providing basic service to at least 70 percent of the turnouts within each customer group within 24 hours after a major earthquake on any of the three major regional faults. For example, the studies estimated that after a major earthquake on the Calaveras fault, the existing system would only deliver a total of 3 mgd to all customer groups, which falls 226 mgd short of the systemwide WSIP level of service objective, and would not be capable of delivering any water to the South Bay and San Francisco customer groups. In fact, the analysis estimated that under any of the three earthquake scenarios, no water would be delivered to San Francisco. After completion of the WSIP, the analysis indicated that the regional system would be capable of meeting the delivery level of service objective systemwide and individually for each customer group (SFPUC, 2006).

Table 14.1-2 shows the estimated percentage of turnouts within each customer group that would receive water within 24 hours following a major earthquake. The results of the analysis indicate that the regional water system without implementation of the WSIP would deliver basic service to an estimated 0 to 14 percent of the turnouts in each customer groups, compared to the 70 percent WSIP level of service objective. After full implementation of the WSIP, the percentage of turnouts under each customer group that would receive water would exceed the level of service objective (SFPUC, 2006).

The post-earthquake recovery analysis determined the percentage of water the regional water system would be capable of delivering 30 days after a major earthquake. This analysis included a facility outage scenario that assumed that facilities with a probability of failure greater than 25 percent would be out of service after the occurrence of a major earthquake, and used estimated repair times as a basis for determining how many of the damaged facilities would be brought back to service after 30 days. The delivery capability of the system was then estimated based on the facilities that could be returned to service in 30 days. As shown in **Table 14.1-3**, 30 days after a major earthquake on the San Andreas fault, the regional system would only be capable of delivering 8 mgd to San Francisco; 31 mgd would be delivered to San Francisco following a major earthquake

TABLE 14.1-2
PERCENTAGE OF TURNOUTS THAT WOULD RECEIVE WATER WITHIN 24 HOURS AFTER A MAJOR EARTHQUAKE

Customer Group	Level of Service Objective	San Andreas Fault		Hayward Fault		Calaveras Fault	
		Existing System	With WSIP	Existing System	With WSIP	Existing System	With WSIP
South Bay	70%	14%	72%	0%	85%	0%	93%
Peninsula	70%	2%	79%	2%	98%	2%	100%
City of San Francisco	70%	0%	80%	0%	100%	0%	100%
Total System	70%	8%	79%	1%	92%	1%	96%

SOURCE: SFPUC, 2006.

TABLE 14.1-3
POST-EARTHQUAKE RECOVERY: DELIVERY 30 DAYS FOLLOWING A MAJOR EARTHQUAKE

Customer Group	Level of Service Objective (mgd)	San Andreas Fault		Hayward Fault		Calaveras Fault	
		Existing System (mgd)	With WSIP (mgd)	Existing System (mgd)	With WSIP (mgd)	Existing System (mgd)	With WSIP (mgd)
South Bay	150	191	257	57	257	197	257
Peninsula	64	56	102	32	102	90	102
City of San Francisco	86	8	104	31	104	91	104
Total System	300	255	463	120	463	378	463

SOURCE: SFPUC, 2006.

on the Hayward fault, compared to the 86 mgd level of service objective for San Francisco. The critical outages under the San Andreas earthquake scenario include the Harry Tracy Water Treatment Plant (WTP), Bay Division Pipelines Nos. 1 and 2, and Sunset and University Mound Reservoirs. For the Hayward earthquake, the critical outages include the Irvington Tunnel, Bay Division Pipelines Nos. 1 and 2, Bay Division Pipelines Nos. 3 and 4, and Harry Tracy WTP (SFPUC, 2006).

Table 14.1-4 shows the most critical WSIP projects that help address the seismic reliability deficiencies and contribute to meeting the seismic reliability objectives. The table also indicates the seismic event for which the project is critical and the seismic benefits provided. As indicated in Tables 14.1-1 through 14.1-3, following completion of all WSIP facility improvement projects, the reliability of deliveries that would be achieved immediately after a major earthquake, the percentage of turnouts that would receive basic water service immediately after an earthquake, and the level of delivery that could be restored after 30 days would meet or exceed the WSIP level of service objectives.

TABLE 14.1-4
KEY WSIP PROJECTS FOR SEISMIC RELIABILITY

	WSIP Facility Improvement Project	Earthquake Scenario			Seismic Reliability Benefits and Deficiencies Addressed
		San Andreas Fault	Hayward Fault	Calaveras Fault	
SV-2	Calaveras Dam	X	X	X	• Addresses potential for failure of Calaveras Dam • Improves delivery reliability of facilities that supply water to Sunol Valley WTP
SV-4	New Irvington Tunnel		X	X	• Provides redundancy for outage of Irvington Tunnel • Improves delivery reliability to all customer groups
BD-1	Bay Division Pipeline (BDPL) Reliability Upgrade	X	X	X	• Increases hydraulic capacity of BDPLs • Provides redundancy for outages along BDPL Nos. 1 and 2 • Improves delivery reliability to all customer groups
BD-2	BDPL 3 and 4 Crossovers	X	X		• Reduces impacts of BDPL outages • Improves delivery reliability to South Bay customers
BD-3	BDPL 3 and 4 Seismic Upgrade at Hayward Fault		X		• Improves delivery reliability to South Bay customers
PN-1	Baden and San Pedro Valve Lots	X			• Improves seismic reliability of Baden and San Pedro Valve Lots • Improves delivery reliability to Peninsula and San Francisco customers
PN-2	CS/SA Transmission	X			• Improves seismic reliability of facilities that supply water to Harry Tracy WTP • Improves delivery reliability to all customer groups
PN-3	HTWTP Long-Term	X	X	X	• Improves seismic reliability of Harry Tracy WTP • Increases sustained capacity of Harry Tracy WTP to 140 mgd • Improves delivery reliability to all customer groups
SF-1	SAPL 3 Installation	X			• Provides redundancy for deliveries to Peninsula high-pressure zone and city of San Francisco customers

SOURCE: SFPUC, 2006.

14.1.4 Need for Water Supply and Drought Reliability

Comment Summary

This section of this master response responds to all or part of the following comments:

S_CSA-01	L_BAWSCA1-11	L_LosAltosH-01	L_Milpts-01
L_BAWSCA1-03	L_BAWSCA1-112	L_PHWD1-01	L_MtnVw-01
L_BAWSCA1-04	L_LAHCFD-01	L_PHWD2-02	L_SClara2-01

Summary of Issues Raised by Commenters

- The Draft PEIR does not adequately describe the impacts on public health and safety that would result from disruption of water service following an earthquake.
- Requests for additional discussion of the importance of drought reliability.

Response

Importance of Water Supplies Following an Earthquake

The SFPUC recognizes that the dependability of public utilities and infrastructure following an earthquake is a major concern with respect to public health and safety. Strong groundshaking produced by a major earthquake on the San Andreas, Hayward, or Calaveras fault could cause serious damage to water transmission and distribution facilities and rupture gas mains and fuel lines. Interruption of water supplies resulting from damage to distribution or transmission infrastructure could disrupt the delivery of vital emergency and government services, threatening public health and safety as well as the environment. The ability of the regional system to deliver water immediately after an earthquake would be especially important for firefighting if ruptured gas mains and fuel lines were to start fires, as occurred following the San Francisco earthquake of April 18, 1906, which toppled buildings and caused gas and water mains to twist and break, crippling the city's water supply. The loss of water in the San Francisco distribution and transmission system following the earthquake caused 4.5 square miles of San Francisco to burn to the ground, left over 200,000 people homeless, and caused hundreds of deaths (USGS, 2008).

As stated in the Draft PEIR (Vol. 1, Chapter 3, p. 3-28), the results of the SFPUC's seismic reliability studies indicated that, under existing conditions, a major earthquake on the San Andreas, Hayward, or Calaveras fault would result in unplanned outages and a drastic disruption of service to all SFPUC customers for more than 14 days and possibly more than 30 days. During the first days following an earthquake, most people in areas with water outages could likely obtain drinking and cooking water from bottled water suppliers. Within a day or two, water for sanitation, personal hygiene, and food cleaning and preparation could become scarce, resulting in an increased risk of infection and gastroenteritis. Disruptions in the delivery of potable water through the municipal distribution system could impair the ability of hospitals and health care institutions to provide services, and these facilities could be overwhelmed by the need for additional services.

As described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-27 and 3-28), implementation of the WSIP would greatly reduce the regional system's vulnerability to earthquakes and would enable the SFPUC to ensure water service to customers within a defined period following a major earthquake. Critical facilities would be upgraded to meet current seismic standards to improve the system's ability to withstand seismic damage, and construction of redundant facilities and backup/standby power would improve the SFPUC's ability to restore service following a major earthquake.

Impacts of Drought

As evidenced by the 1987–1992 drought, reductions in water supplies during a prolonged drought event can result in impacts on residential users, businesses, industry, and government. Severe and prolonged rationing can limit the use of water supplies to serve basic human needs and can increase fire risk. As described above in Section 14.1.2, the regional system is currently operating at a reduced system firm yield due to DSOD restrictions on local dams and reservoirs, and, in the event of an extended drought, the SFPUC would have to impose systemwide rationing similar to that imposed during the historical droughts, possibly up to 25 percent.

As described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-31 and 3-32), implementation of the WSIP would greatly reduce the regional system's vulnerability to droughts and would enable the SFPUC to reduce both the frequency and magnitude of systemwide rationing. The system firm yield would be increased to 256 mgd, and there would be supplemental dry-year water supplies, which would increase overall system reliability and reduce the potential hardship on customers during droughts. Although a maximum systemwide rationing of 20 percent could still be imposed, the frequency of this level of rationing would be greatly reduced, estimated to occur approximately once every 41 years over the 82-year hydrologic record (Vol. 4, Chapter 9, Table 9.5, p. 9-13).

14.1.5 Seismic Improvements and Water Supply

Comment Summary

This section of this master response responds to all or part of the following comments:

L_Hayward-02	SI_TRT6-01	C_EllioC-01	C_Raffa-09
SI_ACT-02	SI_TRT9-06	C_Keebr-01	C_Ross-07
SI_ACT-06	C_AdamsA-01	C_Krame1-02	C_Symon-01
SI_EnvDef-02	C_BramlD2-01	C_Neal-01	C_Walke-01
SI_TRT3-01	C_Brand-01	C_Parke-01	

Summary of Issues Raised by Commenters

- The San Francisco Planning Department, as lead agency, should use a two-tiered approach for CEQA review that separates the seismic improvements from the WSIP water supply and additional Tuolumne River diversions.

Response

California case law, statutory requirements by the state and federal governments, and the SFPUC's contractual obligations to its wholesale customers require that the SFPUC develop a comprehensive plan that ensures the provision of water supplies in a manner that addresses demand and water supply availability under various hydrological/meteorological scenarios as well as in the event of natural disasters and catastrophes. These regulatory provisions and contractual obligations require the SFPUC to secure a reliable water supply capable of serving demand, implement the necessary facility upgrades, construct new facilities to meet future conditions, and design such facilities with sufficient capacities to meet future conveyance needs. Particularly with a complex system such as the SFPUC regional water system, these components must be developed through an integrated planning process in order to effectively achieve level of service goals and objectives and to avoid wasteful expenditures through improper design. Because full implementation of these components is necessary to achieve the level of service goals and objectives, a programmatic approach to CEQA compliance is needed to capture the full spectrum of environmental impacts and to ensure that appropriate CEQA alternatives are developed based on the same level of service goals and objectives.

As a public water utility, the SFPUC is vested with a public interest to provide services considered vital for public health and welfare. The SFPUC is granted special rights (e.g., the right to pursue eminent domain and acquisition of water rights under state law, rights-of-way under the Raker Act) by the government and is heavily regulated to ensure public safety. Under the common law doctrine,[1] the SFPUC, like other public water utilities, holds several obligations to the public, including a "duty to serve" and continuity of service. The "duty to serve" principle requires that the SFPUC adequately and efficiently serve all members of the public located within its service area in a reasonable, non-discriminatory manner. Beyond this obligation, the SFPUC must ensure continuity of service in a safe and reliable manner, which requires that the SFPUC maintain excess capacity to ensure spikes and seasonal peaks in demand can be accommodated and do not drain existing supplies (Monte de Ramos, 2004).

The SFPUC, like all major urban water suppliers, must look ahead many years in order to secure new water supplies to meet growing demands and undertake the capital programs required to meet that demand. The California Urban Water Management Planning Act (California Water Code, Division 6, Part 2.6, Sections 10610 through 10656), as amended in 2001, was passed in response to the California legislature's concern that the state's water supply agencies might not be engaged in adequate long-term planning. The act requires water suppliers generally, and the SFPUC and its wholesale customers, to prepare and update urban water management plans at five-year intervals that describe and quantify, to the extent practicable, future water demand, water supplies, and water reliability in five-year increments, to a minimum of 20 years or as far as data are available. The projected 20-year water supply must account for three scenarios: a normal or average water year; a single dry water year; and multiple dry water years.

1 Common law refers to the body of laws not currently expressed in statutes or previously codified; these types of laws are created by precedent and are upheld by past precedential decisions in relevant courts.

In predicting 20-year water demands, urban water agencies must rely on “data from the state, regional, or local service agency population projections.” Thus, for example, to the extent that any of the wholesale customers with land use planning authority served by the SFPUC (chiefly cities) anticipate large population increases in their adopted general plans, those customers are required to identify how existing and planned water sources meet planned development. General plans (prepared by the local land use agency) and the urban water management plan (prepared by the urban water supplier) design a blueprint of the municipality’s growth over the next 20 years and ensure the water supplies are sufficient to serve the zoning actions of the local land use agency. Within the regional water system, in some cases the local land use agency and the urban water supplier are the same entity, and in many cases they are not. Under California Water Code Sections 10910 through 10912, as amended in 2001 (also known as Senate Bill [SB] 610), an urban water supplier must consult with the cities and counties in its service area when those entities propose development projects of a certain magnitude (e.g., residential projects with more than 500 dwelling units or a retail or business establishment employing more than 1,000 persons or having more than 250,000 square feet). The water supplier must accommodate future development projects either by identifying the water sources available to serve such development or by identifying the plans it would follow to obtain new water supplies for such development, unless the water supplier “finds and determines that the ordinary demands and requirements of water customers cannot be satisfied without depleting the water supply of the distributor to the extent that there would be insufficient water for human consumption, sanitation, and fire protection” (also see California Water Code Section 350).

Urban water suppliers are also subject to 2001 state legislation commonly known as the “Kuehl Bill” (SB 221), after its author State Senator Sheila Kuehl (see Government Code Section 66473.7). SB 221 requires any city or county considering the approval of a proposed subdivision map for more than 500 units to consult with the relevant water supply agency to determine whether adequate water is available for the proposed subdivision, as well as for “existing and planned future uses” (including agriculture) over the next 20 years, under “normal, single-dry, and multiple-dry year” scenarios. If water supplies are inadequate, SB 221 expressly allows a developer to work with the urban water supplier to pursue new supplies. This legislation prohibits local land use agencies from approving a project if supplies are insufficient and, like the Urban Water Management Planning Act, requires urban water suppliers to constantly consider and take the necessary steps to address the growth planned for the next 20 years by the cities and counties within the supplier’s service area.

Existing contractual agreements between the SFPUC and its wholesale customers, which are represented by BAWSCA, obligate the SFPUC to supply an annual average of 184 mgd to its wholesale customers, subject to reductions in the event of a drought, water shortage, earthquake, or other natural disaster, or rehabilitation or maintenance of the system. The 184 mgd is referred to as “the supply assurance” and remains effective following termination of the 1984 Settlement Agreement and Master Sales Water Contract (Master Water Sales Agreement) held between the SFPUC and each of its wholesale customers. In addition to the Master Water Sales Agreement, the SFPUC holds individual wholesale water contracts that specify the SFPUC’s obligations to each customer (see Draft PEIR Vol. 1, Chapter 2, Section 2.5.5).

In addition to the SFPUC's obligations to provide water to its retail and wholesale customers in consideration of future growth within its service area, the state legislature has mandated that the SFPUC rebuild and seismically retrofit the regional water system. California Assembly Bill (AB) 1823, known as the Wholesale Regional Water System Security and Reliability Act, imposes various requirements on wholesale regional water systems and applies directly to the City and County of San Francisco (CCSF) and the SPFUC regional water system. Designed to protect the health, safety, and economic well-being of the 2.4 million people that depend on the regional water system, AB 1823 provides a process to ensure that the system is rebuilt and retrofitted as soon as possible. AB 1823 includes the requirement that the regional water system be retrofitted so as to distribute water on an equitable basis during an interruption of supply after an earthquake or other catastrophe (California Water Code, Division 20.5, Section 73500).

For the reasons described above, the SFPUC addressed future growth and water demand and could not disregard supply augmentation issues during the formulation of the WSIP. Further, facility improvements designed in accordance with future capacity requirements avoid wasteful expenditures and improper design. As described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-1 to 3-9), the WSIP establishes program goals for improvements to the regional system and level of service objectives for system performance in the areas of water quality, seismic reliability, delivery reliability, and water supply. The proposed facility improvement projects and water supply and system operations under the WSIP are an integrated whole designed to meet the program objectives and enable the SFPUC to continue to fulfill its basic mission of providing reliable, high-quality water to its customers. Thus, the SFPUC developed the WSIP as a comprehensive program to improve the regional system, and the San Francisco Planning Department determined that the collection of WSIP facility improvement projects combined with the water supply and system operations modifications should be treated as a single, integrated program during CEQA analysis. Only this programmatic approach was capable of capturing the full spectrum of environmental impacts and ensuring that appropriate CEQA alternatives were developed based on the same level of service goals and objectives.

The PEIR has been prepared as a program EIR in compliance with CEQA Guidelines Section 15168(a), which specifies that a program EIR may be used to evaluate a plan or program that has multiple components (projects and actions) or to address a series of projects or actions that cover a broad geographic scale. The PEIR addresses the environmental effects of the WSIP as a *whole program*, the purpose of which is to improve the ability of the regional water system to deliver water to the SFPUC service area through the year 2030 and to increase the overall reliability of the system.[2] To accomplish this goal, the Draft PEIR includes a combination of program-level and project-level analyses. The PEIR provides a program-level analysis of the major environmental effects of implementing the WSIP facility improvement projects, including those related to seismic improvements, and identifies programmatic mitigation measures to

[2] Although implementation of all of the WSIP projects is required to fully meet the program objectives, the San Francisco Planning Department has determined that several of the WSIP projects have independent utility for CEQA purposes and can undergo environmental review independent of the PEIR. The independent utility projects would not: increase SFPUC water supplies, increase the normal operating capacity of the regional water system, change the manner in which water is dispersed, increase the storage capacity of the system, or increase or alter the nature of the treatment capacity of the system.

reduce the impacts of these projects. The program-level analysis in the Draft PEIR frames the nature and magnitude of these effects and assumes that more detailed, project-level review of the individual projects will be conducted separately as provided for under CEQA. In addition to the program-level analysis of the proposed improvements, the Draft PEIR also evaluates the overall effects associated with implementing the WSIP as a whole. This evaluation includes an analysis of the combined impacts resulting from construction of all of the WSIP facility improvement projects (Vol. 2, Chapter 4, Section 4.16) as well as a project-level impact analysis of implementing the proposed water supply option through 2030 (Vol. 3, Chapter 5). By evaluating the environmental effects of both the facility improvement projects and the proposed water supply option, the PEIR provides a more comprehensive analysis of environmental effects and alternatives than would be practical on a project-by-project basis and allows for the consideration of broad-policy alternatives and program-wide mitigation measures early in the process. In addition, preparation of a program EIR has ensured the consideration of cumulative impacts that might not have been evident in the separate, project-level analyses.

The SFPUC takes seriously its duties to provide sufficient water supplies to its customers when such supplies are needed to serve planned growth and to meet its contractual obligations. As a prudent water system manager, the SFPUC chose to consider future demand at the same time it identified necessary seismic upgrades. From an engineering and design standpoint, it would have been imprudent, impractical, and inefficient for the SFPUC to conduct an overall assessment of how to make the system stronger and more reliable without also considering future demand during the 20-year planning period imposed by law.

Finally, CEQA does not preclude the CCSF from considering supply augmentation components together with seismic retrofit and upgrade components. No provision of CEQA prevents an agency from combining various elements together as one project. In fact, agencies have broad discretion to define projects as they see fit, and thus have substantial leeway in selecting the components of a project analyzed in a single EIR. Therefore, it is entirely within the CCSF's discretion to combine components related to seismic safety and reliability as well as water supply augmentation into a single, long-term project (i.e., the WSIP).

As described in Section 13.4 (Vol. 7, Chapter 13), subsequent to the publication of the Draft PEIR, the SFPUC requested that the PEIR include environmental review of a variation of the WSIP referred to as the Phased WSIP Variant. This variant, developed in response to comments received on the Draft PEIR, would consist of full implementation of the proposed WSIP facility improvement projects together with phased implementation of the water delivery component. This variant would achieve the WSIP goals and level of service objectives for water quality and seismic and delivery reliability, but it would defer a decision regarding long-term water supply until after 2018. Nonetheless, as discussed in Section 13.4, the PEIR analyzes the potential environmental effects of the Phased WSIP Variant as an integrated program and describes the range of potential effects that could occur by 2030 under this variant. Consistent with CEQA guidelines for a program EIR, this PEIR addresses the Phased WSIP Variant as a whole program and determined that the environmental effects fall within the range of alternatives already evaluated in the Draft PEIR. Please refer to Section 13.4, Phased WSIP Variant (Vol. 7, Chapter 13), for further discussion.

14.1.6 Economic Evaluation of the Need for the WSIP

Comment Summary

This section of this master response responds to all or part of the following comments:

L_BAWSCA1-05	L_Tuol1-05	C_Krame2-01
L_BAWSCA1-115	C_AllenC-03	C_MartiM-03
L_Hillsb-02	C_EllioP-01	C_Poult-01
L_Millbr-05	C_Kim-01	C_Stein-01

Summary of Issues Raised by Commenters

- The economic impacts of mandatory rationing should be addressed in the PEIR.
- An economic analysis of the environmental effects on Tuolumne County residents, businesses, and tourism should be conducted prior to approving additional diversions from the Tuolumne River.

Response

Under CEQA, the economic impacts of a proposed project are not treated as significant impacts on the environment (CEQA Guidelines Section 15131[a]). While economic evaluations are beyond the scope of this PEIR, CEQA Guidelines Section 15131(b) states that the "economic or social effects of a project may be used to determine the significance of physical changes caused by the project."

CEQA requirements aside, with respect to the economic impacts of mandatory rationing on wholesale customers, it is not clear that the WSIP level of service objective of a maximum 20 percent systemwide rationing would result in physical changes sufficient enough to warrant an analysis of its economic effects. With implementation of the WSIP, the regional system firm yield would increase to 256 mgd, and the overall system reliability with respect to delivery to customers during droughts would improve substantially over existing conditions. The results of the HH/LSM modeling of the proposed program indicate that the frequency of 20 percent systemwide rationing would be about 2 out of the 82 years, or 1 in 41 years (Vol. 4, Chapter 9, Table 9.5, p. 9-13). This infrequent rationing would not result in substantial physical environmental effects.

Furthermore, the possibility that a lower rationing objective (e.g., 15 percent) might result in a different future economic scenario than the 20 percent objective does not translate into an adverse environmental effect of the 20 percent rationing objective proposed under the WSIP. For CEQA purposes, the key comparison is between existing conditions and future conditions with the WSIP (and its 20 percent rationing objective), and this comparison shows a very considerable improvement over current conditions rather than any adverse effects. This improvement would in part take the form of reduced economic consequences compared with those that would occur in the event of a major earthquake or similar disaster under the No Program Alternative. Any economic impacts under a future 20 percent rationing scenario and a future 15 percent rationing scenario cannot be characterized as an adverse effect or consequence of adopting the 20 percent rationing objective.

The 20 percent maximum systemwide rationing objective proposed under the WSIP is lower than the maximum rationing objectives of other large water agencies in California. For example, the East Bay Municipal Utility District (EBMUD), which serves a population of approximately 1.3 million in parts of Alameda and Contra Costa Counties, and the Metropolitan Water District of Southern California, which serves a population of 14.8 million, both maintain a maximum rationing reduction goal of 25 percent during critical water supply shortages (EBMUD, 2005; Metropolitan Water District of Southern California, 2005). Most importantly, however, is the fact that implementation of the WSIP would also improve the performance of the regional water system under both drought and nondrought conditions, thus resulting in an overall benefit to retail and wholesale customers compared to the existing condition by reducing the magnitude and frequency of significant water shortages.

While economic evaluations are beyond the scope of the PEIR, the Draft PEIR does analyze the environmental effects that some commenters perceive could cause economic impacts for Tuolumne County residents, businesses, and tourism. The Draft PEIR analyzed the effects of the WSIP on Tuolumne River stream flows to identify any consequent impacts on recreational as well as other resources, and determined that the WSIP would not substantially alter stream flows such that they would be outside the range of pre-project conditions (Vol. 1, Chapter 5, pp. 5.3.1-21 to 5.3.1-39). The Draft PEIR (Vol. 3, Chapter 5, Section 5.3.8) also evaluated the effects of the WSIP on recreational resources, including whitewater rafting in the Tuolumne River and Cherry Creek. The analysis concluded that impacts on recreation would be less than significant, and that no mitigation was required. The impact of the WSIP on whitewater rafting was determined to be typically limited to a delay in releases from Hetch Hetchy Reservoir by an average of two days (and up to eight days) in May or June of most years. Thus, the impact analysis suggests that, because the alteration of stream flows under the WSIP would be within the range of pre-project conditions, and typically limited to a delay in releases by an average of two days, the economic effects would be very modest, if noticeable at all. The Draft PEIR analysis indicates that the WSIP would not result in economic effects that would in turn result in a significant degradation of the physical environment.

14.2 Master Response on Demand Projections, Conservation, and Recycling

14.2.1 Introduction

Overview

This master response addresses comments and questions about water demand projections, water use patterns, and the effectiveness and extent of conservation measures and recycled water programs within the SFPUC service area to offset demand for potable water. Commenters raised questions about the water demand models used in the wholesale and retail service areas and the differences between the two models, the levels of employment growth assumed in the demand models, the efforts of the SFPUC and its wholesale customers to implement conservation and recycled water programs, and whether more could be done in these areas to limit the increase in future demand for potable supplies. The demand projections and estimates of 2030 purchases necessarily entail the use of assumptions about factors that cannot be known or predicted with absolute certainty. With respect to forecasting, CEQA Guidelines Section 15144 states the following:

> Drafting an EIR or preparing a Negative Declaration necessarily involves some degree of forecasting. While foreseeing the unforeseeable is not possible, an agency must use its best efforts to find out and disclose all that it reasonably can.

The analysis in the Draft PEIR is consistent with CEQA Guidelines Section 15144. The Draft PEIR analysis describes in detail the demand methodology (Vol. 5, Appendix E.2) and presents a detailed review and comparison of the demographic projections used in the demand models with more recent projections (Vol. 4, Chapter 7, p. 7-22, and Vol. 5, Appendix E.3).

The comments addressed in this master response largely critique the SFPUC's demand projections as too high and the conclusions regarding conservation and recycled water potential as too low. As discussed in this response, the SFPUC and its technical consultants relied on reasonable assumptions and used accepted methodologies to forecast demand and conservation and recycled water potential within the service area, and the Draft PEIR reflects the City and County of San Francisco's (CCSF) best efforts at analysis and disclosure. Even if the SFPUC overestimated demand and underestimated conservation and recycled water potential, the likely effect would be a reduction in the use of water from the Tuolumne River and local watersheds, which could result in a reduction in impacts on those watersheds. Also, to the extent the SFPUC has overestimated demand based on growth projections, the PEIR may overestimate the impacts associated with induced growth. The comments regarding the accuracy of conservation and recycled water potential may be taken into account by decision-makers in evaluating the feasibility of alternatives, but do not indicate that the PEIR underestimated the impacts of the WSIP.

This master response is organized by the following subtopics:

14.2.2 Demand Projections and Methodology
14.2.3 Conservation and Recycling

Commenters

Table 14.2-13, presented at the end of Section 14.2, lists the commenters that submitted comments on water demand projections, conservation, and recycling.

PEIR Section Reference

The Draft PEIR addresses demand projections, conservation, and recycling in the following locations: Vol. 1, Chapter 3, Section 3.3 (introduction) and Section 3.4.4, pp. 3-8 and 3-16 to 3-22; Vol. 4, Chapter 7, Sections 7.1.2, 7.2.2, 7.3 (introduction), 7.3.1, 7.3.2, 7.3.3, 7.3.4, and 7.3.6, pp. 7-6 to 7-8, 7-14 to 7-33, and 7-34 to 7-58; and Vol. 5, Appendices E.2 and E.3.

14.2.2 Demand Projections and Methodology

Comment Summary

This section of this master response responds to all or part of the following comments:

L_ACFCWD-07
L_BAWSCA1-69
L_BAWSCA1-104
L_BAWSCA1-107
L_BAWSCA1-108
L_BAWSCA1-109
L_BAWSCA2-03
L_BAWSCA3-01
L_DalyCty-04
L_DalyCty-19
L_DalyCty-49
L_PaloAlto-07
L_SFCPC2-02
L_SFCPC3-02
L_Tuol1-03
L_TUD1-02
L_TUD2-01
L_TUD3-02
L_TUD3-05
L_Tuol1-02
L_Tuol1-03
L_Tuol2-04
SI_ACT-04
SI_ACT-05
SI_ACT-06
SI_CAC2-0
SI_Caltrout-02
SI_CNPS-EB1-03
SI_CNPS-EB1-04
SI_CNPS-EB1-17
SI_CNPS-EB1-28
SI_CNPS-EB2-04
SI_CNPS-SCV1-01
SI_CNPS-SCV1-03
SI_CNPS-SCV1-11
SI_CNPS-SCV2-07
SI_CRS-05
SI_GreenP-02
SI_NCFFSC-04
SI_PacInst-01
SI_PacInst-02
SI_PacInst-03
SI_PacInst-04
SI_PacInst-05
SI_PacInst-06
SI_PacInst-07
SI_PacInst-08
SI_PacInst-12
SI_PacInst-13
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SI_PacInst-89
SI_SCCCC-02
SI_SierraC4-03
SI_SierraC6-02
SI_SierraC7-03
SI_SierraC7-07
SI_SPUR-03
SI_TRT2-02
SI_TRT3-02
SI_TRT6-02
SI_TRT7-03
SI_TRT7-04
SI_TRT7-05
SI_TRT8-02
SI_TRT8-03
SI_TRT9-02
SI_TRT9-04
SI_TRT9-05
SI_TRT-CWA-SierraC-32
SI_TRT-CWA-SierraC-37
SI_TRT-CWA-SierraC-72
SI_TRT-CWA-SierraC-195
SI_TRT-CWA-SierraC-199
C_Agarw-01
C_Bail-02
C_Barbe1-04
C_Berg-01
C_Berko-02
C_BramlD2-02
C_Bucki-01
C_Chiap-03
C_Clark1-09
C_Eddy1-01
C_Eddy2-01
C_Eddy2-02
C_Garba-01
C_Gelma-01
C_Genov-01
C_GreenD-01
C_Hamil-01
C_Hanke-02
C_Hasso-02
C_Hasso-03
C_Helld-01
C_Ikemo-01
C_Lee-03
C_MartiM-02
C_Means2-01
C_Means2-02
C_MindeN-01
C_Okuzu-03
C_Oneil-01
C_Parke-02
C_Raffa-03
C_Raffa-04
C_Raffa-10
C_Ross-08
C_Schri-01
C_Stein-02
C_Tubma-01
C_Unreadable4-01
C_Willi-02

Summary of Issues Raised by Commenters

Numerous comments asserted that the modeling used to project future water demand was flawed. The more specific comments asserting that "the demand analysis is flawed" or that the analysis results in "inflated demand" stem from three main criticisms of the demand methodology: (1) the use of the Association of Bay Area Government's (ABAG) *Projections 2002* as the source of nonresidential (employment) growth rates; (2) the use, in the wholesale customer service area, of ABAG's forecasts of total jobs rather than industry-specific projections, which (commenters assert) (a) fails to capture differences in growth rates of different nonresidential sectors, and (b) fails to account for different water use rates by different sectors; and (3) the fact that the future price of water is not included as a factor in the demand models. Other comments focused on the results of the demand projections. On the whole, the comments fell into the following categories:

- Employment projections – use of ABAG's *Projections 2002*
- Use of total jobs projections for the wholesale customer service area
- Effects of the future cost of water on projected demand
- Per-capita demand
- Substantiation of the need for sizable water supply increases
- Outdoor water use
- Requests that demand projections be reevaluated

This master response presents an overview of the demand projections and related studies conducted for the WSIP, followed by a discussion of each of the topics listed above; specific comments addressing these issues are summarized, followed by a response.

Overview of Demand Projections Conducted for the WSIP

As described in the Draft PEIR (Vol. 1, Chapter 3, p. 3-16 and 3-17, and Vol. 5, Appendix E.2), the SFPUC, in collaboration with its wholesale customers and the Bay Area Water Supply and Conservation Agency (BAWSCA), conducted comprehensive planning studies from 2002 to 2006 to assess future water demands as well as the potential for water conservation programs and the use of recycled water to offset demand for potable water supplies in its retail and wholesale customer service areas. These studies, which provided a basis for 2030 water purchase estimates from the SFPUC regional water system, include the following:

- SFPUC Wholesale Customer Water Demand Projections Technical Report (URS, 2004a)
- SFPUC Wholesale Customer Water Conservation Potential Technical Report (URS, 2004b)
- SFPUC Wholesale Customer Recycled Water Potential Technical Memorandum (RMC, 2004)
- City and County of San Francisco Retail Water Demands and Conservation Potential (Hannaford and Hydroconsult, 2004)
- City and County of San Francisco Recycled Water Master Plan (RMC, 2006)
- SFPUC 2030 Purchase Estimates Technical Memorandum (URS, 2004c)

The studies established total demand for the 2000/2001 base year in the entire SFPUC service area from all water sources (about 366 million gallons per day [mgd]), of which about 261 mgd was purchased from the SFPUC regional water system. SFPUC wholesale customers met the balance of their supply needs from other water sources and conservation. The demand studies project that total service area demand in 2030 is approximately 417 mgd.[1] Of this total, approximately 300 mgd would be purchased from the SFPUC system; the remaining 117 mgd would be met through other supply sources available to customers, primarily water purchases from other agencies, customers' local groundwater sources, additional water recycling, and conservation. For the water conservation and recycled water potential studies, the SFPUC and its technical consultants worked in close consultation with the wholesale customers to identify suites of theoretically feasible and cost-effective conservation programs for each customer and to determine each customer's potential to develop recycled water projects that might replace part of their demand that would otherwise be met by potable supplies. Based on this information, the customers submitted their best estimates of 2030 water purchases from the SFPUC. Each customer's estimates of conservation savings and the use of recycled water, groundwater, and other supply sources as well as its 2030 purchase estimate is shown in Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18) as well as Table 7.2 (Vol. 4, Chapter 7, p. 7-18).

The Draft PEIR (Vol. 1, Chapter 3, pp. 3-17 to 3-20 and Vol. 5, Appendix E.2) summarizes the steps involved in establishing base-year water usage and projecting future demand to 2030 using end-use demand models for the wholesale and retail customer service areas. Demand Side Management Least-Cost Planning Decision Support System (DSS) end-use models[2] were used in the wholesale service area and a similar end-use model was used in the retail service area. As the PEIR indicates, the SFPUC selected the end-use models over other forecasting methods (such as forecasting water use by land use type or on a simple per-capita basis) because end-use models allow for a more accurate representation of changing conditions, such as the future impact of plumbing and appliance codes and the effects of additional specific-use planned conservation (URS, 2004a).

In addition, as described in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-47 to 9-51), the SFPUC, in cooperation with its wholesale customers and BAWSCA, undertook a study to assess the potential for additional conservation and recycled water projects, including potential regional projects, that were not already considered to be implemented locally by 2030 as part of the WSIP purchase estimates. The results of this study provided the basis for the Aggressive Conservation/ Water Recycling and Local Groundwater Alternative evaluated in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-47 to 9-59) as well as an element of the Modified WSIP Alternative (Vol. 4, Chapter 9, pp. 9-78 to 9-84).

1 Total 2030 demand (417 mgd) includes expected savings due to compliance with existing plumbing codes, which contain efficiency requirements. Total SFPUC service area 2030 demand without plumbing code savings is estimated at 453 mgd.

2 A DSS model was prepared to forecast demand for each wholesale customer (URS, 2004a).

Employment Projections – Use of ABAG's *Projections 2002*

Representative comments on this topic include:

- *Wholesale demand study may overestimate future employment, thereby inflating 2030 nonresidential demand. [SI_PacInst-08, SI_TRT-CWA-SierraC-01]*
- *Employment projections used in the demand model were based on ABAG employment projections released in 2002. In 2005, ABAG revised the employment projections for the nine-county San Francisco Bay Area:* Projections 2005 *forecasts over 46,000 fewer jobs than* Projections 2002. *[SI_PacInst-76]*
- *The wholesale demand study may overestimate future employment, thereby inflating 2030 nonresidential demand. Recent data indicate that the economic recovery in the San Francisco Bay Area has been slower than expected and consequently the job outlook for the region has been adjusted downward. A slower economy would reduce projected water demand for the nonresidential sector. The demand forecast should be adjusted according to the most current information available. [SI_TRT-CWA-SierraC-31]*
- *Demand modeling methodology used employment projections from ABAG that are inflated. The SFPUC used employment projections from 2002 that were updated in 2005. The later projections showed 48,000 fewer jobs[3] in the Bay Area. Using the projections published by ABAG in 2005 would result in another lower projected demand for water. In going from Draft to Final PEIR, the latest employment projections should be incorporated and the water demand projections altered accordingly. [SI_TRT6-02]*
- *Outdated ABAG employment projections from 2002 were used. 2005 data became available, which decreased the employment projections moving into the future, which means less growth in the commercial sector, which means less water use. [SI_TRT9-04]*
- *The projected employment growth is substantially greater than the projected population growth. While employment growth can exceed population growth, such a large discrepancy is highly unusual given the low unemployment rate in the region. This suggests the need for a reevaluation with another more realistic employment projection. [SI_PacInst-77]*
- *The projections rely on faulty urban growth statements that in turn rely on published studies that don't cover the time period up to 2030 and have not undergone environmental review. [SI_SierraC6-02, SI_SierraC7-03]*

Response

Comparison of Projections 2002 and Projections 2005

Projections 2002 was the current ABAG projections series at the time the water demand estimates were prepared. As such, it was the appropriate projections series to use at that time. Since then, *Projections 2003*, *2005*, and *2007* have been released. The Draft PEIR (Vol. 4, Chapter 7, pp. 7-22 to 7-26, and Vol. 5, Appendix E.3, pp. E.3-9 to E.3-35) reviews changes between ABAG *Projections 2002*, *2003*, and *2005* and compares the later projections to the

[3] Because *Projections 2005* reports a finding of 46,000 fewer new jobs compared to *Projections 2002* and does not indicate a difference of 48,000 jobs in its analysis, it is assumed that this reference to 48,000 jobs is a misstatement, and that the commenter refers to the comparison of the two projections series discussed in *Projections 2005* and this response.

assumptions used in projecting 2030 water demand. (*Projections 2007* was released after Draft PEIR preparation and could not be considered prior to publication of the environmental document.) The review indicates that, although the later projections series (2003 and 2005) have lower estimates of current (2005) employment and somewhat steeper growth curves between 2005 and 2030, the general trends for the three are similar; the net result of the two principal changes in the later projections series (lower current population and employment combined with more growth between now and 2030) is that the estimates for the WSIP horizon year of 2030 are similar (Vol. 4, Chapter 7, p. 7-22 to 7-25).

Table 14.2-1 presents the comparison shown in Draft PEIR Table E.3.31 (Vol. 5, Appendix E.3, p. E.3-33) with supplementary information on percentages. The table quantifies the variation in employment estimates for the nine-county Bay Area, the four-county area served in whole or part by SFPUC water, and the area generally served by SFPUC water customers.

TABLE 14.2-1
ABAG PROJECTIONS OF EMPLOYMENT IN 2025 AND 2030: SUMMARY COMPARISON

Area	Year	Projections 2002	Projections 2003	Projections 2005	Projections 2003 as % of Projections 2002	Projections 2005 as % of Projections 2002	Projections 2005 as % of Projections 2003
Nine-County Bay Area	2025	4,932,590	4,982,800	4,788,330	101%	97%	96%
	2030		5,226,400	5,120,600			98%
Four-County Area	2025	3,682,510	3,739,920	3,516,890	102%	96%	94%
	2030		3,911,320	3,765,020			96%
SFPUC Water Customers[a]	2025	2,169,600	2,184,360	2,032,650	101%	94%	93%
	2030		2,265,410	2,173,400			96%

[a] Estimates for the wholesale service area are based on the geographic area assignments used in the Draft PEIR (see Vol. 5, Appendix E.3, Tables E.3.A.1 and E.3.A.2, pp. E.3-48 and E.3-49), which are more generalized than those used for the actual demand projections.

SOURCE: Draft PEIR, Vol. 5, Appendix E.3, Table E.3.31, p. E.3-33.

Although *Projections 2002* does not provide forecasts for 2030, the text discussion in *Projections 2005* presents a comparison of the expectations of job growth from 2000 to 2030 for the two projections series. According to that discussion, *Projections 2005* forecasts 46,000 fewer new jobs for the nine-county Bay Area by 2030 than does *Projections 2002*, as noted in some comments.[4] *Projections 2005* provides this comparison of *Projections 2002* and *Projections 2005* employment (and population) growth for the period from 2000 to 2030 as a way to highlight the changes resulting from the smart-growth assumptions that were incorporated into the ABAG methodology beginning with *Projections 2003*. With respect to this comparison, ABAG states:

[4] The website cited by one commenter as the source for the *Projections 2002–Projections 2005* comparison (http://planning.abag.ca.gove/currentfcst/summary1.html) no longer provides the information cited in the comment. It is assumed that the information cited ("ABAG Projections 2005: Summary of Findings") is similar to the text discussion introducing and summarizing *Projections 2005* discussed herein.

> The earlier forecast, with some caveats, can be viewed as a "base-case" forecast. In other words, *Projections 2002* is an estimate of future activity in the Bay Area without the implementation of Smart Growth policies (ABAG, 2004, p. 4).

The comparison of *Projections 2002* and *Projections 2005* presented in *Projections 2005* includes a table comparing the projected job growth of the two projections series by county, as well as for the nine-county region as a whole (ABAG, 2004, pp. 4 to 7). Information from this table for the four counties served in whole or part by SFPUC water is presented in **Table 14.2-2**. As shown, *Projections 2005* forecasts 22,930 fewer new jobs for the four-county area by 2030 than does *Projections 2002* (as compared to 46,000 fewer for the nine-county region).

TABLE 14.2-2
COMPARISON OF PROJECTED EMPLOYMENT GROWTH (NEW JOBS): PROJECTIONS 2005 AND PROJECTIONS 2002

	Change in Employment, 2000–2030 (Number of New Jobs)		
County	**Projections 2002**	**Projections 2005**	**Difference**
Alameda County	314,540	338,710	24,170
San Francisco County	161,810	186,590	24,780
San Mateo County	128,060	120,500	-7,560
Santa Clara County	360,160	295,840	-64,320
Total	**964,570**	**941,640**	**-22,930**

NOTE: Information shown is for the entire county.

SOURCE: ABAG, 2004, Table 2, p. 7.

The comparison of the two projections series for the four counties indicates that *Projections 2005* anticipates greater job gains for Alameda and San Francisco Counties than does *Projections 2002*, while San Mateo and Santa Clara Counties are expected to gain fewer jobs. These changes in expectations are consistent with the detailed comparisons of *Projections 2002*, *Projections 2003*, and *Projections 2005* presented in Draft PEIR Appendix E.3 (Vol. 5, pp. E.3-9 to E.3-35), and with the characterization of the job losses in the early part of this decade as the "dot-com bust": San Mateo and Santa Clara Counties, the heart of Silicon Valley, lost the greatest number of jobs.

Table 14.2-3 compares the difference in the projections of *total* employment in each of the four counties for all years that are reported in both *Projections 2002* and *Projections 2005* (2000 through 2025) as well as for 2030.[5] Similar to the comparison of new jobs above, this table shows that the job loss was most severe in Santa Clara County (employment estimate for 2005) and that Santa Clara and San Mateo Counties are not expected to recover the lost existing and projected jobs by 2030. In Alameda and San Francisco Counties, in contrast, the lost jobs are expected to be

5 *Projections 2002* does not provide projections for 2030; county-level data for 2030 presented here are based on the comparison of *Projections 2002* and *Projections 2005* forecasts of new jobs presented in *Projections 2005* (ABAG, 2004).

TABLE 14.2-3
DIFFERENCE IN EXISTING AND PROJECTED TOTAL EMPLOYMENT: PROJECTIONS 2005 MINUS PROJECTIONS 2002

	2000	2005	2010	2015	2020	2025	2030[a]
Alameda[b]	-1,520	-42,900	-38,610	-29,820	-11,430	7,770	22,650
San Francisco[b]	8,070	-80,680	-66,370	-45,940	-21,750	5,600	32,850
San Mateo[b]	-9,300	-75,170	-65,430	-58,050	-47,110	-32,250	-16,860
Santa Clara[b]	-48,200	-227,020	-223,780	-211,750	-179,500	-146,740	-112,520
Four-County Total	-50,950	-425,770	-394,190	-345,560	-259,790	-165,620	-73,880

[a] The comparison of *Projections 2002* and *Projections 2005* for 2030 is based on information presented in *Projections 2005*.
[b] Information shown is for the entire county.

SOURCES: ABAG, 2001; ABAG, 2004.

recovered by 2025; that is, in those two counties, *Projections 2005* forecasts greater employment by 2025 than does *Projections 2002*. In *Projections 2005*, ABAG estimates that the four-county area had 50,950 fewer jobs in 2000 than were estimated in *Projections 2002* and nearly 426,000 fewer jobs in 2005 than were expected when *Projections 2002* was published. The difference in total employment in 2030 (73,880) reflects the difference in expectations of job growth in the four counties from 2000 to 2030 (22,930 fewer new jobs forecasted, discussed above) plus the lower estimate of jobs in 2000 assumed in *Projections 2005* (50,950 fewer than were estimated for 2000 in *Projections 2002*).

As discussed in the Draft PEIR (Vol. 4, Chapter 7, p. 7-22), ABAG updates its projections series frequently (typically, every other year) to reflect new information about existing conditions as well as recent and emerging trends. Projections may be revised upward or downward depending on the understanding of a variety of factors and conditions that influence future growth. In terms of the PEIR analysis, even if the SFPUC overestimated demand based on employment projections that have been lowered in ABAG's subsequent projections, the likely effect would be a reduction in the use of water from the Tuolumne River and local watersheds, which could result in a reduction in impacts on those watersheds, not an underestimation of the WSIP's impacts. To the extent the SFPUC has overestimated demand based on employment growth projections, the WSIP PEIR may overestimate the impacts associated with induced growth and with increased diversions of imported water.

In addition, at the same time *Projections 2005* reduced the estimates of total employment in 2030, the estimates of total population in 2030 were increased. According to *Projections 2005*, the projected growth in population for the nine-county Bay Area will result in 330,000 more residents in 2030 than were projected in *Projections 2002.* The population increase is based on an expectation that Bay Area communities, recognizing the pressures on natural and fiscal resources created by the growth of urban areas, would adopt smart growth policies that would lead to more intensive development in the existing urbanized areas.

Table 14.2-4, which is based on Draft PEIR Tables E.3.31 and E.3.32 (Vol. 5, Appendix E.3, pp. E.3-33 and E.3-34), summarizes the changes in expected employment and population growth between *Projections 2002* and *Projections 200*5 for 2025.[6] This table shows that ABAG reduced its forecast of total employment in 2025 by about 6 percent (a reduction of about 137,000 jobs for the areas generally served by the SFPUC's water customers), but increased its forecast of total population by about 5 percent (an increase of about 130,600 residents).

TABLE 14.2-4
ABAG PROJECTIONS OF EMPLOYMENT AND POPULATION IN 2025: SUMMARY COMPARISON

Area	Year	Projections 2002	Projections 2005	Projections 2005 as % of Projections 2002
		Employment		
SFPUC Water Customers	2025	2,169,600	2,032,650	94%
		Population		
SFPUC Water Customers	2025	2,693,000	2,823,600	105%

SOURCE: Draft PEIR, Vol. 5, Appendix E.3, Tables E.3.31 and E.3.32.

The net effect of the *Projections 2005* expectations (more population and less employment) on 2030 water demand is that the reduction in demand due to fewer jobs would be offset to some extent by an increase in demand due to increased population.

In any case, fluctuations in each successive ABAG *Projections* series are to be expected. As noted above, if it turns out that the SFPUC has overestimated demand, the likely effect would be that less water would be used than was projected, which could result in fewer or less severe impacts on the Tuolumne River and local watersheds and potentially fewer or less severe impacts associated with growth.

Projections 2007

While the Draft PEIR compares ABAG's *Projections 2002* forecasts with those of *Projections 2003* and *Projections 2005*, *Projections 2007* was released after Draft PEIR preparation and could not be considered prior to publication of the environmental document, as noted above. *Projections 2007* and *Projections 2005* use the same estimate of jobs in 2000 (which, as discussed above, are somewhat lower than was assumed in *Projections 2002* and *Projections 2003*). *Projections 2007* shows a slightly greater loss of jobs by 2005 than did *Projections 2005,* and a slightly slower recovery or growth in new jobs between 2005 and 2030 than was forecasted in *Projections 2005*. As a consequence, *Projections 2007* forecasts fewer jobs in 2030 for all four counties served (partly or entirely) by SFPUC water than were forecasted in *Projections 2002*.

6 Projections for 2025 rather than 2030 are presented because 2025 is the *Projections 2002* horizon year.

Similar to *Projections 2003* and *Projections 2005*, *Projections 2007* forecasts somewhat greater population growth than does *Projections 2002* (with about 200,000 more people forecasted in the four-county area by 2025, the last year for which *Projections 2002* provides forecasts). **Figure 14.2-1** presents a comparison of the expectations of job and population growth for the four counties served (partly or entirely) by SFPUC water in the four ABAG projections series.

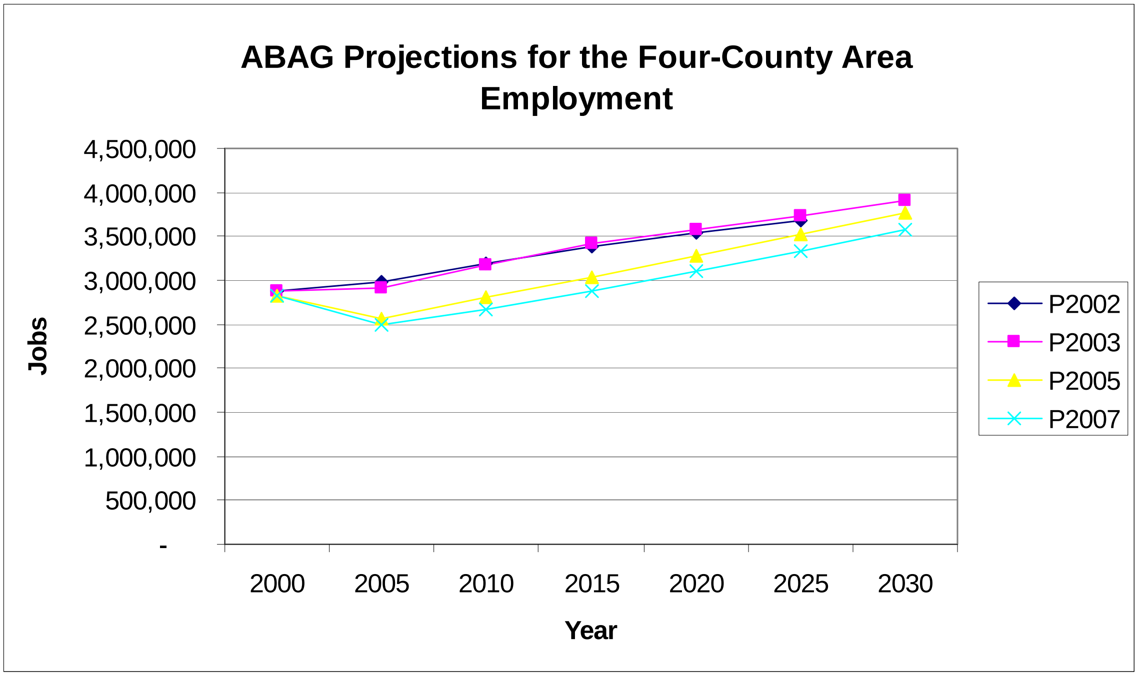
How Projections Were Used in the End-Use Demand Models

Although the demand modeling incorporated the retail service area and wholesale customer-selected projections of future employment and population levels to project future water demand, the models actually applied the *rate* of growth reflected in selected projections to existing water accounts in order to project growth in demand, as explained in Draft PEIR Chapter 7 (Vol. 4, p. 7-14). The demand models are not based on per-capita consumption, but rather are end-use models. Therefore, the estimates of future population and employment were not used to calculate future demand on a per-capita basis. *Projections 2002* forecasts a slower rate of growth from 2005 to 2030 than does *Projections 2003*, *Projections 2005*, or *Projections 2007*. As discussed above and in Draft PEIR Chapter 7 (Vol. 4, pp. 7-23 and 7-24), the estimates of employment in 2005 provided in *Projections 2005* are noticeably lower than those of *Projections 2002* or the customer-selected estimates of employment for that same year. This is due to the decline in jobs between 2000 and 2005 reflected in *Projections 2005* as compared to *Projections 2002*. Overall, *Projections 2002* and *Projections 2005* show a similar growth rate between 2000 and 2030.[7] The population and employment estimates incorporated in the demand modeling are used in the PEIR because they provide a reasonable expression of growth assumptions that allows for comparisons with other forecasts of future growth, such as those in general plans and ABAG projections. However, as noted, it was the growth rates reflected in the projections that were applied in the demand models.

ABAG as Projections Source

Some comments assert that the employment projections are unrealistic or that the difference in employment and population growth rates is unusual and that the demand projections should be reevaluated using “more realistic” employment projections. The demand modeling for the wholesale customers relied on ABAG projections, which are based on a consensus-driven process to validate ABAG’s work with local cities, as the best source of employment projections; the ABAG numbers were not altered. ABAG is the official regional planning agency of the San Francisco Bay region; it was selected as a credible source, as its projections are relied on by many agencies throughout the Bay Area. The comments asserting that the ABAG projections are unrealistic provide no evidence in support of this assertion, nor do they suggest an alternative source that would have more credibility than ABAG as a source of regional employment projections for the wholesale customer service area. The demand modeling for San Francisco also relied on ABAG data, in conjunction with County Business Patterns data.

[7] As noted previously, assumptions about *Projections 2002* estimates for 2030 are based on ABAG’s comparison of *Projections 2002* and *Projections 2005* for the period 2000 to 2030.



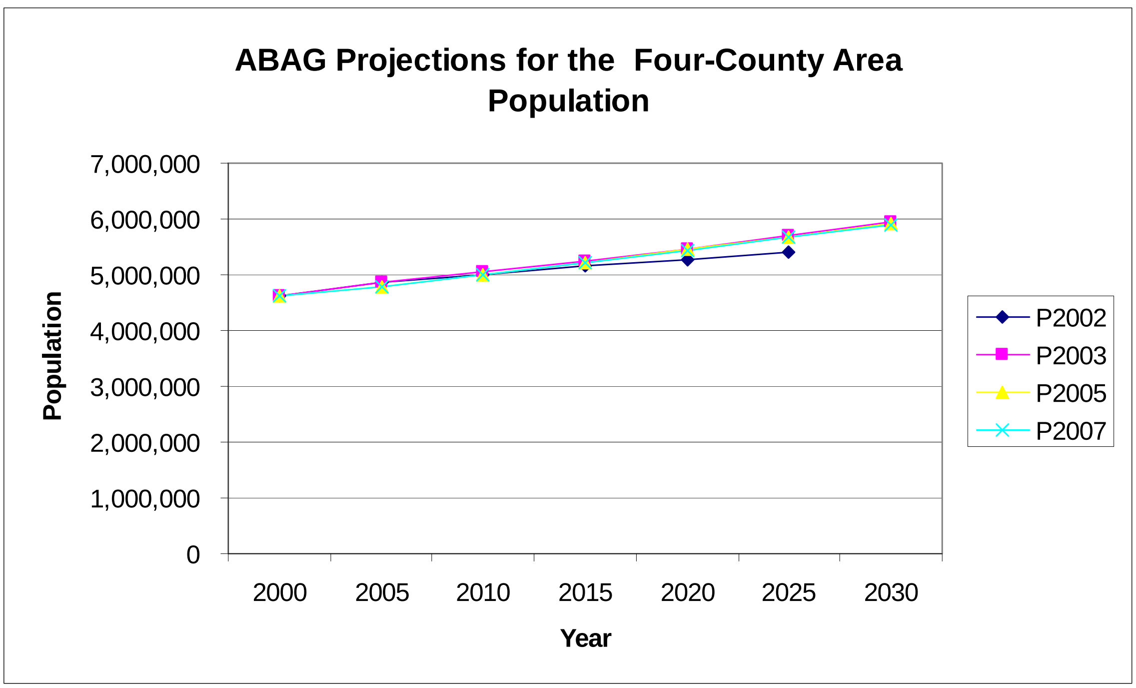


Figure 14.2-1
ABAG Employment and Population Projections
for the Four-County Area

Projections to 2030

The comments that "growth statements" rely on published studies that do not cover the time period up to 2030 and have not undergone environmental review apparently refer to the use of ABAG's *Projections 2002* in the water demand models. The statement that ABAG's *Projections 2002*—the source of many of the population and employment projections used in the water demand models—only provides forecasts to 2025 is correct. Similarly, most of the other projections sources selected by the water customers[8] did not extend to 2030, the WSIP planning horizon. As described in the Draft PEIR (Vol. 5, Appendix E.2, p. E.2-6), it was therefore necessary to extend the projections to 2030 for use in the demand models (refer to the referenced page in Appendix E.2 for a summary of the methodology used to extend the forecasts to 2030). Thus, contrary to the implication of several comments on this issue, the level of growth assumed in the WSIP demand projections extends to the WSIP horizon year of 2030. This is the level of growth that was considered in Draft PEIR Chapter 7, Analysis of Growth-Inducement Potential and Indirect Effects of Growth (Vol. 4, pp. 7-1 to 7-91). The Draft PEIR compares the population and employment projections assumed in the water demand modeling with ABAG's *Projections 2005* forecasts—which include projections for 2030—for the years 2005, 2025, and 2030; refer to Draft PEIR pp. 7-23 to 7-26 (Vol. 4, Chapter 7).

Environmental Review of ABAG Projections

Some comments correctly noted that ABAG projections are not subject to environmental review. This fact does not, by itself, make such projections unreliable, nor do such projections constitute a "project" that would normally be subject to environmental review. They constitute information, not policies, and have been treated as such in the PEIR and in the demand modeling. In any event, despite not being subject to CEQA, ABAG projections are frequently cited as the projections source in general plans and similar planning documents, which are subject to environmental review under CEQA. Here, the Draft PEIR growth-inducement analysis (Vol. 4, Chapter 7, pp. 7-19 to 7-59) compares projections assumed in the SPFUC demand study with those of jurisdictions' adopted general plans.

Use of Total Jobs Projections for the Wholesale Customer Service Area

Representative comments on this topic include:

- *The forecasting methodology has two important errors that can lead to potentially large inaccuracies in forecasted demand: it assumes that the current composition of commercial and industrial businesses within the nonresidential sector will not change over time, and it ignores the variability in water use in both quantity and purpose among users in the nonresidential sector. [SI_PacInst-07, SI_PacInst-79, SI_TRT-CWA-SierraC-31] The DSS model applies the economic growth rate to all nonresidential accounts equally, thereby assuming that all subsectors grow at the same rate. This is highly unlikely. [SI_PacInst 79]The SFPUC should reevaluate nonresidential demand projections for its*

[8] As discussed in the Draft PEIR (Vol. 4, Chapter 7, p. 7-14), although *Projections 2002* was used for all but two water customers for employment forecasts and for most of the population forecasts used in the demand models, about one-third of the wholesale customers used other projections sources for their population forecasts.

wholesale customers using industry-specific economic growth projections, water use, and conservation potential. [SI_PacInst-12]

- *A more accurate, comprehensive analysis based on industry-specific growth and water-use rates, such as the analysis performed for the SFPUC retail customers, should be employed and applied to the wholesale customers. [SI_PacInst-79] The projected increase in water demand for the 2.4 million people who consume Hetch Hetchy water is inflated. The studies of projected water demand are looking at old technology. The shift from manufacturing to service and information, which use considerably less water, wasn't taken into consideration. [SI_TRT8-02]*

Response

Comments that the DSS modeling ignores differences in water use among users in the nonresidential sector are incorrect. The DSS models used the monthly billing data classifications provided by the individual water agencies. Typical classifications included the following:

- Commercial
- Industrial
- Public or Institutional
- Municipal

The modelers verified the classification of certain types of accounts, such as hospitals and schools, and collected data to quantify water used by certain types of users, such as restaurants and hotels.

One comment refers to Standard Industrial Classification (SIC) code water use coefficients to illustrate differences in water use by different types of businesses. The fact that different types of land uses entail different levels of water use is acknowledged and reflected in the demand modeling. However, unless more is known about given enterprises, such per-employee water use coefficients can be misleading. For example, hospitals have a low water use coefficient (refer to Table 8 of Comment SI_PacInst-79 [Vol. 6, Chapter 12, Section 12.4]); however, because hospitals have so many employees, water use by hospitals can be very high. As a type of business, hospitals would be ranked by the DSS modelers near the top of the list for nonresidential water users in the wholesale service area, contrary to their ranking by SIC code water use coefficients. Therefore, unless no baseline nonresidential water use data were available, and employment projections by SIC code were available, per-employee water use coefficients would be of little value in a demand projection. Baseline water usage provides a more reliable measure of actual nonresidential water use for different types of accounts. The DSS models used actual water use data for existing accounts to establish baseline water usage for each wholesale customer.

With respect to nonresidential growth rates, the DSS demand models did not use the overall job-growth rate for ABAG's entire nine-county area (or the job-growth rate for the four-county area served by the SFPUC) in modeling the growth in nonresidential demand in the wholesale customer service area, as some comments imply. The DSS modeling was conducted at the individual wholesale customer service area level.

Industry-specific growth projections were used to model demand for the retail service area[9] (the city of San Francisco). Some commenters stated that this methodology should have been used in the wholesale service area, and that failure to use industry-specific projections and water use rates resulted in inflated demand projections. However, while it was possible to take this approach for the retail service area demand projections, the SFPUC determined that using industry-specific projections in the wholesale service area would be impractical and would likely result in projections that are no more reliable (or even less reliable) than the methodology used. The industry-specific methodology cannot currently be used in the wholesale service area for the following reasons:

a) ABAG projections are tabulated by jurisdictional boundaries.[10] In contrast to San Francisco, whose jurisdictional boundaries coincide with the retail service area for which demand projections were developed, few of the wholesale customers' service area boundaries coincide with jurisdictional boundaries, and some of the service areas include large areas of unincorporated county lands (refer to Draft PEIR Table 7.1, Vol. 4, Chapter 7, p. 7-12). While it is possible to assign population and total employment to service areas based on the percentage of a service area within a jurisdiction, the assignment of jobs by specific classifications would be much more problematic because jobs (especially certain categories of jobs) tend to be concentrated within small subsections of the service areas.

b) The wholesale customers assign a billing category (such as commercial, industrial, public or institutional, and municipal) to individual meter accounts. However, the categories used by each of the 27 wholesale customers are not necessarily consistent with the categories used by the other wholesale customers. Nor are the categories used by the wholesale customers consistent with the industry-specific employment categories used by ABAG, which makes a direct correlation of accounts with ABAG industry categories impossible. Each meter account has an "identifier" that includes the address of the water meter and the name of the person and organization who receives the water bill. In some cases, it is possible to correlate a particular account to an ABAG category based on the account name; however, such instances are the exception rather that the rule.

   Because appropriate data are not currently available, a door-to-door survey of businesses would be required, in many cases, in order to use industry-specific projections. Such a survey could require the breakdown of a single water account into multiple categories to conform with ABAG's classification system (for example, if "professional and managerial" and "financial and leasing" businesses occur within a single building, the water account currently categorized as "commercial" would require multiple ABAG categories). Assuming such surveys were conducted and the billing systems would accommodate it, a code could then be added to the accounts to allow the sorting of data by the new classifications. While it may be possible and desirable to do this in the future, it would be a costly and time-consuming task that the SFPUC deemed infeasible to implement for all of the wholesale customers at this time. In addition, even with business categories that are comparable to ABAG's, the problem of appropriately apportioning a jurisdiction's job projections by category to the service area discussed in (a), above, would remain.

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9 The retail service area model used composite employee water use rates with ABAG industry-specific employment projections to project nonresidential water demand, as described in the Draft PEIR (Vol. 1, Chapter 3, Section 3.4.4, p. 3-20).

10 This includes projections for each incorporated city and for the city plus any unincorporated area within the city's planning area.

Moreover, it is not apparent that this approach would contribute significantly to the accuracy of the demand projections. ABAG's employment projections use a shift-share methodology that incorporates assumptions about future shifts in employment among economic sectors. As noted above, the DSS modeling was conducted at the level of individual water agency service areas, which would capture projected employment dynamics at that level.

The wholesale service area currently has over 1.1 million jobs, and total service area water demand (for residential and nonresidential use) in 2030 is expected to increase by 52 mgd, or 19 percent. Current water use (i.e., 2001 base-year demand) accounts for 84 percent of the water demand projected for 2030. Given the percentage of overall demand represented by future demand, the issues discussed above, and the fact that the DSS modeling relied on reasonable assumptions based on ABAG employment projections for each wholesale customer service area, the San Francisco Planning Department believes that the modeling effort provided a reasonable, conservative forecast for use in the Draft PEIR, which reflects the CCSF's best effort at analysis and disclosure. Furthermore, in light of the impracticality of the suggested approach, there is no evidence that this approach would yield a more reliable result.

Effects of the Future Price of Water on Projected Demand

Representative comments on this topic include:

- *Flaws in modeling demand include ignoring the effect the expected price increase will have on future demand. [SI_TRT2-02]*

- *The analysis of future water demand does not include price-driven efficiency improvements, despite an estimated quadrupling of the price of water from the SFPUC by 2015. [SI_PacInst-04, SI_TRT-CWA-SierraC-01]*

- *As the price of water increases demand decreases, particularly for nonresidential and outdoor uses. Because the SFPUC expects to quadruple the price of water by 2015, the effects of water price increases should be integrated into the demand projections. Failing to do so may result in an overestimate of future demand and revenue shortfalls. [SI_PacInst-13]*

- *Given the projected increase in water price, price will likely be an important driver of conservation in the coming years, but neither the wholesale nor retail demand analyses consider price-driven efficiency due to concerns about double counting. [SI_PacInst-62]*

Response

Some comments criticized the end-use demand models for not incorporating the effects of the future price of water on projected demand. Such comments are based on the economic premise that water demand is price-elastic, meaning that as the price of water increases, demand will decrease. According to these comments, the demand models fail to incorporate the expected quadrupling of the price of water by 2015, resulting in demand projections that are higher than if the future price of water had been adequately considered.

It is acknowledged that water use is influenced to some extent by changes in price. Price elasticity studies indicate that while water users respond to price increases by decreasing use, declines in use are small compared to the changes in price; that is, these studies indicate that water demand is relatively price-inelastic (DWR, 1998). The price elasticity of water demand can vary by region, water use, customer type, and other factors, as one comment correctly states (refer to Comment SI_PacInst-62 [Vol. 6, Chapter 12, Section 12.4]). Since outdoor water use is commonly assumed to be discretionary, the low outdoor water use within San Francisco suggests that water demand in the retail service area is less price-elastic than in other parts of the state. Please refer to **Response SI_PacInst-62** (Vol. 7, Chapter 15, Section 15.4) for a more detailed discussion of the price elasticity of water demand.

Consideration of Water Price in WSIP Background Studies

Even if water demand is relatively inelastic, it is expected that price will be an important driver of conservation in coming years. However, in the background technical studies conducted for the WSIP, price is considered in the *conservation potential* studies rather than in the end-use water *demand* models used in the retail and wholesale service areas. As described in the Draft PEIR (Vol. 5, Appendix E.2, pp. E.2-12 to E.2-15), cost-benefit analyses were conducted in both the wholesale and retail service areas to determine whether given conservation measures would be cost-effective. In the analysis of whether given conservation measures would be cost-effective and therefore selected for implementation (assuming the measures were also determined to be effective and feasible for the individual agencies to implement), "the major benefit to wholesale customers was the avoided price of purchased SFPUC water. Because the cost of water is scheduled to increase… the estimated future (2015) price was used in [the] study" (URS, 2004b). The projected water savings from the conservation measures selected for implementation, along with supplies from other water sources, were deducted from projected demand to arrive at the customers' 2030 purchase estimate, and the wholesale customers were aware of the estimated future price of water when they submitted the purchase estimates. Thus, "price-driven efficiency improvements"—that is, conservation measures to which customers have committed in order to avoid future water costs—have been incorporated in the *purchase estimates* submitted to the SFPUC. However, the mechanism through which these price-driven efficiency improvements were identified was the cost-benefit analyses conducted as part of the conservation potential studies, not as part of the water demand studies. This approach provides a reliable method of quantifying the effects of price-driven efficiency improvements.

Some comments suggest that price needs to be factored into the demand modeling as well as considered in the cost-benefit analyses of conservation measures. However, the SFPUC and its technical consultants are concerned that factoring price into both the demand models and the cost-benefit analyses would result in the double-counting of conservation savings. In modeling demand (as opposed to conservation potential), the challenge would include assessing the degree to which a water customer reduces water use in response to the price of water *apart from* participating in a conservation program—installing water saving fixtures or equipment under a rebate program, for example. To date there are no known studies that would allow the modelers to separate the effects of price and the rebate program (Maddaus, 2008).

According to the SFPUC's DSS technical consultant (Mr. Bill Maddaus of Maddaus Water Management), most literature on the responsiveness of demand to price assumes that all water savings are due to price policies. For example, a study of water use in Seattle, Phoenix, and Tucson concluded that "[a]n examination of the long-term water usage by these three water utilities demonstrates that significant reductions in water usage are possible with the support of conservation-oriented rates. This appears particularly true if these rates are implemented in conjunction with active water conservation programs" (Cuthbert, 1996). The three water utilities in this study have had long-standing water conservation programs, and although the author was able to detect a water reduction, he could not separate the reductions due to price or non-price conservation programs (Maddaus, 2008). Thus, the approach taken by the SFPUC and its technical consultants of considering the effects of the future cost of water in the evaluation of conservation potential provides a more reliable and quantifiable means to estimate the effects of future water costs than would consideration of the effects of cost on demand, for which a tested and reliable methodology has not yet been demonstrated.

Revised Estimate of the Future Price of Water

As discussed above and in the Draft PEIR (Vol. 5, Appendix E.2, p. E.2-12 and E.2-15), cost-benefit analyses were prepared for the conservation measures that were considered for implementation in the wholesale and retail service areas, and cost-benefit analyses were also conducted for each of the three programs of conservation measures (Programs A, B, and C) that were compiled for the retail service area and each wholesale customer, in order to determine program cost-effectiveness (URS, 2004c). As discussed above, because the price of water is expected to increase, the estimated future price of water was used in these evaluations. Although the cost-benefit analyses showed that many of the individual conservation measures and each of the compiled conservation programs was cost-effective, the incremental cost of adopting conservation measures in addition to those measures the agency had selected for implementation (or for moving from implementing Program A to B or from Program B to C) was a less important factor in an agency's decision not to adopt additional measures than were concerns about the feasibility of implementing additional measures. Practical constraints related to implementing additional measures, such as the need to add additional conservation program staff that might be triggered by the addition of one or more measures (to those already selected for implementation), was a more important consideration, especially for smaller water districts with limited staff. The measures and programs of compiled measures were found to be cost-effective based on the estimated future (2015) cost of water at the time the technical studies were prepared. Since then, the SFPUC's estimate of the future (2015) price of water has increased, from approximately three times the 2003 price assumed in the conservation potential study to approximately four times the 2003 price, according to the price quoted by SFPUC staff cited in Comment SI_PacInst-62 (Vol. 6, Chapter 12, Section 12.4).

Because many of the conservation measures were found to be cost-effective based on the earlier (lower) estimated future price, the effect of the revised future price on the number of measures and conservation programs implemented by the wholesale customers may be minor. Some of the individual measures previously found not to be cost-effective are now likely to be found cost-effective, and those already found to be cost-effective would be more cost-effective. However, since the wholesale customers identified feasibility constraints rather than costs as a limitation to implementing additional measures, the increase in future cost will not necessarily translate into more measures being implemented. Nevertheless, it is reasonable to expect that as the price of water increases and measures become more cost-effective as a result, some existing barriers to implementing additional conservation measures may be overcome, at least in some cases. It would be up to each wholesale customer, not the SFPUC, to determine whether additional conservation would be feasible as well as cost-effective in light of rising water prices.

Finally, in considering the effect of the future cost of water, it should also be noted that the rise in raw water cost will translate into smaller increases in retail prices, on a percentage basis, because other costs (such as fixed costs, chemical costs, and salaries) are not forecasted to rise as quickly.

The purchase estimate submitted by each wholesale customer represents the customer's best estimate of water purchases in 2030. Acknowledging the role that the cost of water plays in purchase decisions, each estimate states that the "estimate is subject to change based on changed conditions, such as the future cost of water." The conservation potential studies incorporated the best information available at the time they were conducted, including the estimated future cost of water. If, due to revised estimates of the future cost of water or other factors, the SFPUC underestimated conservation potential, the effect of implementing more conservation than is currently considered feasible would likely be a reduction in the use of water from the Tuolumne River and local watersheds. As noted in the introduction to this response, comments about the accuracy of conservation potential may be taken into account by decision-makers in evaluating the feasibility of alternatives, but do not indicate that the PEIR underestimated the impacts of the WSIP. Please refer to **Response SI_PacInst-62** for additional information on the use of water pricing as a water agency tool and **Response SI_PacInst-47** regarding tiered pricing rate structures (these responses are provided Vol. 7, Chapter 15, Section 15.4).

Per-Capita Demand

Representative comments include the following:

- *Per-capita demand for the wholesale customers is projected to increase over current (2001) per-capita demand, despite numerous studies showing that substantial cost-effective reductions in per-capita demand are possible with available technology and policies. [SI_PacInst-03]*

- *The increase in per-capita demand is simply out of step. It demonstrates inefficient use of water and of a resource that's held in public trust. [SI_TRT6-02]*

- *It's telling that projected per-capita consumption is expected to increase in this area. [SI_TRT8-02*]

Response

Some comments cited an alleged projected increase in per-capita demand in the SFPUC wholesale customer service area as evidence that the demand studies are faulty, based on the supposition that per-capita demand should not be expected to increase given improvements in technology, plumbing code effects, and other factors. Some comments also cite the Draft PEIR as the source of per-capita figures in making this claim. However, the statement that per-capita demand in the SFPUC service area is increasing is incorrect. The weighted average per-capita values in all sectors[11] are projected to decrease between 2001 and 2030, both *without* active conservation programs (due to implementation of plumbing codes) and *with* active conservation; in the latter case the decrease is greater. For example, the gross per-capita weighted average demand for the wholesale customer service area calculated for the 2001 base year is 168 gallons per-capita per day (gpcd) (SFPUC, 2006, p. 150); projected demand for 2030 is 167 gpcd without planned conservation (SFPUC, 2006, p. 156) and 160 gpcd with planned conservation (SFPUC, 2006, p. 162). While it is the case that per-capita demand is projected to increase for some individual wholesale customers, the trend within the service area as a whole shows a decrease in per-capita demand, as these figures demonstrate. In the retail service area, projected gross per-capita demand with plumbing codes, without additional conservation, is 103 gpcd in 2005[12] and 96 gpcd in 2030 (SFPUC, 2006, p. 129); with additional conservation, projected gross per-capita demand is 102 gpcd in 2005 and 91 gpcd in 2030 (SFPUC, 2006, p. 130). In addition, the Draft PEIR does not present per-capita information. The information cited in this response is based on SFPUC calculations using the demand models, but wholesale customer demand was not projected based on per-capita consumption but rather on the end-use of water and growth in water accounts (as discussed above in this master response). Per-capita demand information was prepared by the SFPUC in response to specific requests by participants at the September 2006 Sustainable Water Supply Briefing; for more information on this briefing, refer to the introduction to the **Responses to Pacific Institute Comments** (Vol. 7, Chapter 15, Section 15.4). Increases in demand for the individual wholesale customers and the retail service area are shown in Draft PEIR Table 7.3 (Vol. 4, Chapter 7, p. 7-18) and described in Section 7.3.6, Customer-Specific Summaries (pp. 7-34 to 7-59).

The following two more specific comments were submitted on this topic:

- *For the wholesale customers, per-capita demand reached a high of 187 gpcd in the mid-1980s, declined precipitously during the drought of the late 1980s and early 1990s, and has been relatively constant since 1996. Projected 2030 per-capita demand increases slightly over 2005 levels but is similar to the per-capita estimates in previous years. [SI_PacInst-57]*

Response

The per-capita demand projections for 2030 are based on average annual demand projections assuming "normal year" precipitation levels in the service area, similar to the 2001 base-year conditions assumed for the modeling. Lower-than-normal water use in 2005 and 2006 is attributable to above-normal precipitation in the wholesale customer service area, which would

11 That is, total per-capita consumption and gross per-capita consumption for single-family residential, multifamily residential, and nonresidential sectors.

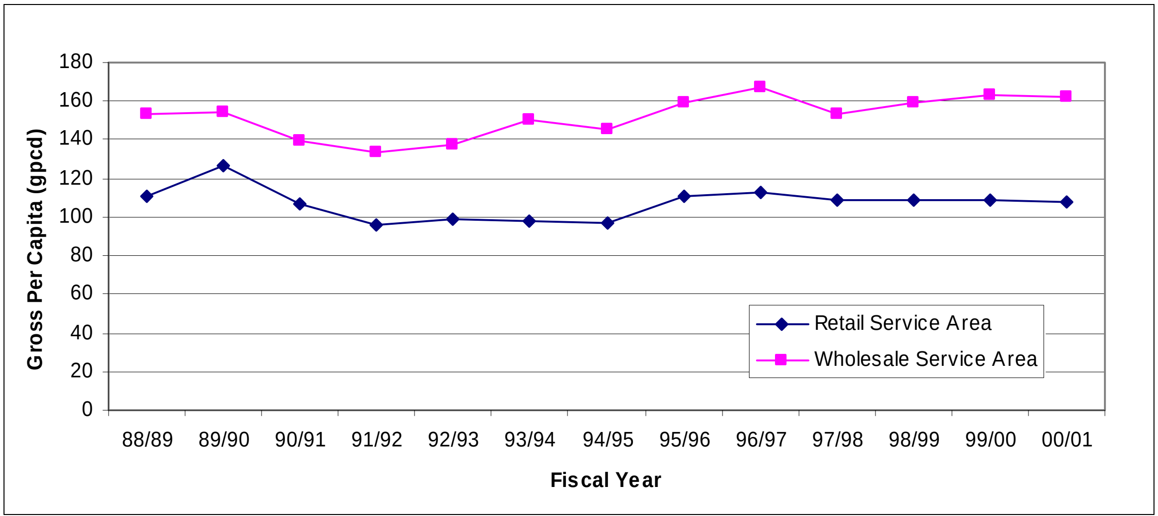
12 The Sustainable Water Supply Briefing materials (SFPUC, 2006) do not include an estimate of gross per-capita demand for 2000 (the base year for the retail service area demand study), which is why the 2005 estimate is presented here. Total per-capita *consumption* (i.e., not including unaccounted-for water losses) in the retail service area in fiscal year 2000/2001 was 97 gpcd (SFPUC, 2006, p. 128).

account for the dip in per-capita demand for those years (Maddaus, 2008). Refer also to the figure in following response.

- *For retail customers, gross per-capita demand has declined over time. Per-capita demand reached a peak of 127 gpcd in 1989, declined during the drought, and has declined steadily since 1996. By 2030, per-capita demand in the retail service area is projected to decline to 91 gpcd, nearly half of the per-capita demand of the wholesale customers. Simple comparisons of gross per-capita water demand between the wholesale and retail customers can be misleading because water use is affected by a variety of economic and demographic factors, such as housing type and density and the type of businesses present in a given region. Local climate conditions and water-use efficiency also affect demand. [SI_PacInst-58]*

Response

For fiscal years 1988/1989 through 2000/2001 (the years that available data were provided to the Pacific Institute for retail and wholesale customers), gross per-capita demand values show similar patterns, as illustrated in **Figure 14.2-2**, below. These patterns indicate that use declined during the drought period of the late 1980s through the early 1990s and increased thereafter to a peak in the mid-1990s; between the mid-1990s peak and fiscal year 2000/2001, use patterns diverged slightly, with more variability in the wholesale customer service area, although usage in both the wholesale and retail areas remained lower than during the mid-1990s peak. The decline in use for fiscal year 1994/1995 per-capita was due to a wet year (Maddaus, 2008). As noted in the comment, a variety of economic and demographic factors, including housing type and density, the type of commercial and industrial activities in the region, climate, and existing levels of water use efficiency can affect per-capita demand. Some of these factors are likely responsible for the differences in the degree of change in per-capita demand over time in the retail and wholesale customer service areas.



SFPUC Water System Improvement Program ▪ 203287

SOURCE: Maddaus, 2008.

Figure 14.2-2
Historical Gross Per-Capita Demand – SFPUC Customers

Substantiation of the Need for Sizable Water Supply Increases and Documentation of Water Conservation Efforts

Representative comments on this topic include:

- *Communities requesting sizable water supply increases should be questioned for some substantiation of need and for documentation of water conservation efforts. [SI_CNPS-SCV2-07]*

Response

Some comments suggested that communities requesting sizable water supply increases should be questioned and required to substantiate the need for the increased water and to document their water conservation efforts. As discussed above and described in the Draft PEIR (Vol. 5, Appendix E.2), the demand projections were developed following reasonable, accepted methodologies and based on the best demographic information available at the time. The SFPUC and its DSS modeling consultant worked in close consultation with the wholesale customers to develop the demand projections, and evaluated any requests for customer-specific model adjustments to ensure such adjustments were reasonable, could be substantiated, and were in agreement with land use planning documents. For example, for some wholesale customers, one or more new account categories with higher usage rates were included in the service area demand modeling. The rationale for the new account categories is discussed in the Draft PEIR (Vol. 5, Appendix E.2, p. E.2-7), and the specific reasons for each new category are summarized in Table E.2.2 (pp. E.2-8 and E.2-9). The adjustments made to customers' accounts are also discussed, if applicable, in the customer-specific summaries in Chapter 7 (Vol. 4, pp. 7-35 to 7-59). The Draft PEIR also discusses SFPUC Policy 00-0110, which encourages the wise use of water resources by the CCSF and the SFPUC's suburban customers, including conservation, water recycling, and groundwater development (Vol. 1, Chapter 2, p. 2-46). For information on the conservation efforts in the SFPUC service area, refer to Section 14.2.3, below.)

Outdoor Water Use

Representative comments on this topic include:

- *Increases in residential demand are largely due to outdoor water use. For wholesale and retail customers, per-capita outdoor use is projected to increase, indicating that the proposed conservation does not adequately address this use. [SI_PacInst-05]*
- *The nonresidential sector is responsible for over 80 percent of the projected 2030 demand increase. About 35 percent of that increase is due to outdoor use. [SI_PacInst-06]*
- *For wholesale customers, the total demand increase is 38 mgd between 2000 and 2030. The nonresidential sector accounts for about two-thirds of that increase, or 24.1 mgd. Over 40 percent of the increase in nonresidential demand is due to outdoor use. Residential demand growth, largely due to increases in outdoor water use, accounts for the remaining one-third of total demand growth in the wholesale service area. [SI_PacInst-63]*
- *Outdoor water use alone is driving 60 percent of the anticipated increase in water demand. [SI-TRT8-03, C_Raffa-03]*

Response

Because these figures could not have been derived from information presented in the Draft PEIR or the technical memoranda prepared for the wholesale and retail customer service areas, it is assumed that the comments and figures on outdoor demand are based on material provided by the SFPUC and BAWSCA (SFPUC, 2006) as background information for the September 2006 Sustainable Water Supply Briefing; for a description of this briefing, refer to the introduction to the **Responses to Pacific Institute Comments** (Vol. 7, Chapter 15, Section 15.4).

Residential

Regarding the references to increased residential demand, note that although residential demand among several customers is projected to increase, the increases are relatively small. The SFPUC calculates that overall, with plumbing codes and planned conservation programs, residential demand in the entire SFPUC service area would increase by only 3 mgd,[13] despite the estimated 17 percent increase in population in the service area over the planning horizon.

On a per-capita basis, residential demand would decrease. The SFPUC calculated the following estimates of outdoor residential per-capita demand based on the per-capita demand tables presented in the background information for the Sustainable Water Supply Briefing (SFPUC, 2006, Section 6, Attachments 1 and 3):

- For the retail service area, despite a projected increase in the outdoor residential per-capita demand of 0.2 gpcd,[14] the overall residential per-capita demand would decrease approximately 14 gpcd.
- For the wholesale service area, despite a projected increase in the outdoor residential per-capita demand of about 1 gpcd, the overall weighted average wholesale residential per-capita demand (with conservation and plumbing codes) would decrease by 21 gpcd.[15]

Proposed conservation measures would address residential outdoor use. As shown in Table 14.2-7 in Section 14.2.3 below, most of the wholesale customers have included conservation measures that address residential outdoor use in conjunction with their "high-range" purchase estimate.[16] Of the three that did not, Estero Municipal Improvement District and North Coast County Water District included conservation and outdoor measures in conjunction with their "low-range" purchase estimate, and Los Trancos County Water District has since merged with California

[13] This calculation is based on the tables showing projected demand by individual customer presented in the background information for the Sustainable Water Supply Briefing (SFPUC, 2006, Section 3, Attachment 4).

[14] Due to rounding, the figures presented in Section 6, Attachment 1 of SFPUC 2006 (pp. 128 and 130) suggest that outdoor residential demand is projected to increase by 1 gpcd; however, the actual projected increase is 0.2 gpcd (from 1.43 to 1.61 gpcd). (The projected 1.61 gpcd outdoor residential per-capita demand in 2030 is an estimate based on 3 percent outdoor use.)

[15] Note that this calculation is based on the overall weighted average wholesale *residential* per-capita demand excluding unaccounted-for water and, obviously, nonresidential per-capita demand. The data in Response SI_PacInst-30 includes residential and nonresidential as well as unaccounted-for water.

[16] As shown in Draft PEIR Table 3.3 (Vo1. 1, Chapter 3, p. 3-18) and Table 7.2 (Vol. 4, Chapter 7, p. 7-15), some customers submitted a purchase estimate range for 2030, depending on achievement of a range of potential savings from conservation and recycled water use. (That is, the high end of the purchase estimate range would correspond to achievement of the low end of the conservation/recycling estimate and vice versa.)

Water Service–Bear Gulch, which has included outdoor measures in its purchase estimate baseline conservation program.

The conservation savings associated with these outdoor measures is summarized as follows:

- For the retail service area, the per-capita retail residential outdoor use is projected to increase by 0.3 gpcd without additional conservation and by 0.2 gpcd with additional conservation.
- For the wholesale service area, the weighted average per-capita wholesale residential outdoor use is projected to increase by 3 gpcd without additional conservation and by 1 gpcd with additional conservation.

Therefore, implementation of the conservation measures to which the SFPUC and the wholesale customers have committed would save approximately 0.1 gpcd of retail customer residential outdoor use and 2 gpcd of wholesale customer residential outdoor use.

Nonresidential

The statement that the nonresidential sector in the SFPUC service area is responsible for over 80 percent of the projected 2030 demand increase and that about 35 percent of that increase is due to outdoor use is correct. These figures refer to the combined demand of the nonresidential sector in the retail and wholesale customer service areas, taking into account plumbing code and projected conservation savings. The statement that the increase in nonresidential demand in the wholesale customer service area accounts for about two-thirds of the increase in the wholesale customer service area is correct. However, using the DSS models, the SFPUC calculated the slightly different figures indicated below. Demand referenced here takes into account plumbing code savings and active conservation. (Refer to **Response SI_PacInst-63** [Vol. 7, Chapter 15, Section 15.4] for additional specific calculations.)

- The total demand increase in the wholesale customer service area is 36.8 mgd, not 38 mgd.
- The nonresidential sector in the accounts for 23.6, not 24.1 mgd, of the increase in demand in the wholesale customer service area.
- About 39 percent, not over 40 percent, of the increase in wholesale customer nonresidential demand is due to outdoor use.

Overall Outdoor Demand

The statement that 60 percent of 2030 water demand is for outdoor irrigation appears to be based on information provided by BAWSCA for the Sustainable Water Supply Briefing. The BAWSCA information was provided as part of a package of material (SFPUC, 2006) requested by briefing participants. According to BAWSCA, the increase in outdoor consumption from 2001 to 2030 (20.2 mgd) represents 58 percent of the total increase in consumption over that period (34.6 mgd) (SFPUC, 2006, p. 32). Note that the figures in the cited reference refer to consumption for 2001 and 2030, which is somewhat different from the figures of total demand (which includes consumption and unaccounted-for water) shown in the Draft PEIR. Some comments on increased outdoor water use imply that outdoor water use is equivalent to water use for irrigation and landscaping. In addition to these uses, nonresidential outdoor uses also include cooling, pools and fountains, wash-down of facilities, and external leakage; residential outdoor uses also include pools and fountains, wash-down of houses, car washing, and external leakage. Some comments recommend that recycled water be used to replace potable supplies for nonresidential outdoor uses. Please refer to Section 14.2.3 for a discussion of conservation measures and recycled water use addressing outdoor water demand. Tables 14.2-7 and 14.2-8, below, show the conservation measures, including outdoor measures, to which the SFPUC and the wholesale customers have committed.

Requests for Reevaluation of Demand Projections

Representative comments on this topic include:

- *The SFPUC should reevaluate its projections for future water demand and conservation potential in light of flaws and inaccuracies in its studies. [SI_CNPS-EB1-17, SI_CRS-05, C-Raffa-10]*
- *These flaws led to inflated demand projections and they need to be corrected in the Final PEIR. [SI_TRT2-02]*
- *In going from Draft to Final PEIR, the analysis should incorporate the latest employment projections and then alter the water demand projections accordingly. [SI_TRT6-02]*

Response

The SFPUC's demand projection effort was comprehensive, thorough, and appropriate for long-range planning purposes. The demand methodology utilized reasonable assumptions and the best information available at the time. The PEIR reflects the CCSF's best efforts to disclose information about the demand studies and their results as well as the environmental impacts of the WSIP as required under CEQA. As the responses to the specific comments above indicate, revision or reevaluation of the 2030 demand projections is not warranted.

14.2.3 Conservation and Recycling

Comment Summary

This section of this master response responds to all or part of the following comments:

L_ACFCWD-08	SI_PacInst-72	C_Dippe-02	C_Means2-01
L_BAWSCA1-29	SI_PacInst-80	C_Dough-01	C_Means2-02
L_BAWSCA1-67	SI_PacInst-81	C_Dulma-03	C_Melna-01
L_BAWSCA1-69	SI_RHH1-03	C_Duper-01	C_Menuz-01
L_BAWSCA1-104	SI_SFNeigh-03	C_Eddy1-03	C_Merlo-01
L_BAWSCA1-106	SI_SierraC4-02	C_Elbiz-02	C_Mijac-01
L_BAWSCA1-110	SI_SierraC4-03	C_EllioC-03	C_Mille-01
L_BAWSCA1-111	SI_TRT1-01	C_Ellis-01	C_MindeN-01
L_BAWSCA2-03	SI_TRT1-02	C_Farnu-01	C_MindeR-01
L_DalyCty-04	SI_TRT5-05	C_Field-01	C_Nore-01

L_DalyCty-49
L_PaloAlto-07
L_SCVWD1-03
L_SCVWD2-02
L_SFCPC3-02
L_TUD1-02
L_TUD1-04
L_TUD2-01
L_TUD3-02
L_TUD3-05
L_Tuol1-02
L_Tuol1-03
L_Tuol2-04
SI_ACA1-15
SI_ACA1-26
SI_ACA2-02
SI_ACT-03
SI_ACT-05
SI_CAC2-03
SI_Caltrout-02
SI_CAREP-04
SI_CI-01
SI_CNPS-01
SI_CNPS-EB1-03
SI_CNPS-EB1-04
SI_CNPS-EB1-12
SI_CNPS-EB1-15
SI_CNPS-SCV1-03
SI_CNPS-SCV1-13
SI_CNPS-SCV2-07
SI_CNPS-WLJ-02
SI_CRS-03
SI_CRS-05
SI_CSERC-02
SI_D3Dem1-02
SI_D3Dem2-03
SI_EcoCtr-02
SI_EnvDef-10
SI_GreenP-05
SI_KSWC-02
SI_NCFFSC-04
SI_PacInst-09
SI_PacInst-15
SI_PacInst-20
SI_PacInst-24
SI_PacInst-36
SI_PacInst-43
SI_PacInst-46
SI_PacInst-51
SI_PacInst-53
SI_PacInst-59
SI_PacInst-62
SI_PacInst-68
SI_PacInst-71
SI_TRT7-02
SI_TRT8-02
SI_TRT9-03
SI_TRT-CWA-SierraC-31
SI_TRT-CWA-SierraC-37
SI_TRT-CWA-SierraC-38
SI_TRT-CWA-SierraC-39
SI_TRT-CWA-SierraC-40
SI_TRT-CWA-SierraC-41
SI_TRT-CWA-SierraC-198
C_AdamsA-02
C_Agarw-01
C_Allis-01
C_Alter-01
C_Bail-02
C_Barbel-03
C_Barsa-02
C_Beauj-01
C_Berg-01
C_Berko-02
C_Bevia-01
C_Bigos-02
C_Blake-01
C_BoutiF-02
C_BramlD2-02
C_BramlD3-02
C_Breso-02
C_Britt-01
C_BrookL-01
C_Bucki-02
C_Byron-01
C_Byron-03
C_Byron-09
C_Cant-01
C_Cant-03
C_Chase-01
C_Chiap-01
C_Chiap-02
C_Chiap-03
C_Clark1-07
C_Clark1-08
C_Clark1-09
C_Clark1-10
C_Clark1-11
C_Clark1-14
C_Clark1-16
C_Closs-01
C_Colem2-01
C_Colli-03
C_Dahli-01
C_Davey-01
C_David-01
C_DayL-01
C_Dippe-01
C_Flani-01
C_Flynn-02
C_Gado-02
C_Garci-01
C_Genov-01
C_Genov-02
C_Goite-02
C_Goldf-01
C_Goodm-02
C_Grave-02
C_GreenD-01
C_GreenD-04
C_GreenK-01
C_GrinnJ-01
C_Hall-01
C_Hall-02
C_Hamil-01
C_Hanke-02
C_Hasso-03
C_Helld-01
C_HerroK-01
C_Hsiun-01
C_Hsiun-02
C_Ikemo-01
C_Issac-01
C_JohnsM-01
C_JohnsSie-01
C_Joye-01
C_Kahn-01
C_Kalin-01
C_Keebr-02
C_Kim-01
C_KingC-01
C_KingK-01
C_Lee-03
C_Leet-01
C_Lewin-02
C_Lim-01
C_Look-01
C_LoVuo-01
C_Lowry-01
C_Lubin-01
C_Maddau-01
C_Magol-01
C_Marcu-01
C_Margo-01
C_Marsh-01
C_MartiM-05
C_MartiS-01
C_McCle-01
C_McCol-02
C_McCon-01
C_McKee-01
C_Means1-01
C_Noren1-03
C_Noren1-04
C_Okuzu-03
C_Oneil-01
C_Pagli-01
C_Parke-02
C_Parke-03
C_Perl-01
C_Picku-01
C_Poult-01
C_Raffa-04
C_Raffa-07
C_Raffa-11
C_Raube-01
C_Reedy-01
C_Reich-01
C_Richa-02
C_Richa-03
C_Ross-02
C_Ross-05
C_Ross-08
C_Ross-09
C_Schri-02
C_Schul-01
C_Shea-01
C_SmithE-01
C_Sprin-02
C_Stein-02
C_Sturt-01
C_Sugar-02
C_TayloS-01
C_Teves-01
C_Thaga-02
C_Thoma-01
C_Tubma-02
C_Tubma-04
C_Tucke-01
C_Unreadable1-01
C_Unreadable3-01
C_Unreadable4-01
C_Urdan-02
C_VermeJ-01
C_Vrana-01
C_Walke-02
C_Walls-02
C_Weiss-02
C_Willi-01
C_Willi-02
C_Willi-05
C_Zimme-01

Summary of Issues Raised by Commenters

Submittals on the Draft PEIR contained several hundred comments addressing conservation and recycling in some manner. Many (about 150) of these comments stated that any additional demand should be met through increased conservation, efficiency, and recycling.[17] While these comments stem from concerns about impacts on the Tuolumne River, Alameda Creek, and Peninsula watersheds (including Pilarcitos Creek), they essentially conveyed an opinion about the WSIP and the program alternatives; a number of the comments expressed support for the Aggressive Conservation/Water Recycling and Local Groundwater Alternative evaluated in Draft PEIR Chapter 9 (Vol. 4, pp. 9-47 to 9-59). These comments regarding how conservation and recycling will be incorporated into the WSIP or an alternative of the WSIP are acknowledged. As described in Chapter 1 (Vol. 1, p. 1-12), Chapter 3 (Vol. 1, pp. 3-86 to 3-88), and Chapter 11 (Vol. 6, pp. 11-1 and 11-2), the San Francisco Planning Commission will consider all comments received on the Draft PEIR as well as these responses in considering certification of the Final PEIR. If the SFPUC accepts the certified Final PEIR and associated CEQA findings, the SFPUC would adopt the CEQA findings and then approve and adopt the WSIP or an alternative of the WSIP analyzed in the PEIR. Other comments on conservation and recycling were more specific, raising issues that in part pertained to the content of the PEIR. Examples of these comments included requests for additional studies on feasible conservation and recycling, and criticisms of conservation levels in the Bay Area compared to conservation levels in other metropolitan areas.

Many of these comments suggested a lack of information regarding existing and planned conservation and recycling among the wholesale and retail customers, and the technical studies undertaken by the SFPUC. Accordingly, this section of the master response is organized as follows:

- *Background*. This section presents an overview of conservation and recycling associated with the WSIP and related studies conducted by the SFPUC.
- *Frequently Submitted Comments Addressing Conservation and Recycling*. This section presents the most frequently submitted comments expressing specific concerns about conservation and recycling.

Background

Existing and planned conservation in the SFPUC retail and wholesale customer services areas breaks down as follows:

1) *Plumbing Code Savings* – Water savings assumed to occur as a result of the natural replacement of fixtures under current plumbing codes (passive conservation).

2) *Existing and Planned Conservation Measures*

   a. *Projected Conservation Measures* – Water savings that will occur from the continued implementation of conservation programs already in place.

[17] Examples include C_Raffa-11, C_Breso-02, C_GreenD-02, C_Ross-09, C_Thaga-02, C_VermeJ-01, and C_Willi-02.

b. *Additional Conservation Measures* – Water savings that will result from implementation of additional conservation measures planned by the SFPUC and its wholesale customers.

Table 14.2-5 summarizes 2030 water savings associated with conservation. Table 14.2-5 contains references to Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18) to assist the reader in correlating the numbers with the information presented in the Draft PEIR.

TABLE 14.2-5
SUMMARY OF 2030 WATER SAVINGS DUE TO EXISTING AND PROPOSED CONSERVATION (in mgd)

	Wholesale	Retail	Total
Plumbing Code Savings (not explicitly shown in Draft PEIR Table 3.3)	25.4	10.3	35.7
Projected Conservation Savings (programs in place)[a] (included in Table 3.3)	7.7	0.64	8.34
Savings from Additional Conservation Measures (planned)[b] (included in Table 3.3)	5 – 7.3	0 – 3.36	5 – 10.7
Total Conservation Savings, excluding plumbing code savings (Column B, Table 3.3)	13 – 15	0 – 4	13 – 19
Total Conservation Savings, including plumbing code savings	38 – 40	10 – 14	49 – 55

[a] Existing savings based on savings identified for Program/Package A in URS, 2004b and Hannaford and Hydroconsult, 2004.
[b] Additional savings based on the difference between total 2030 conservation savings shown in Draft PEIR Table 3.3 and savings from measures currently being implemented.

SOURCES: URS, 2004b; Hannaford and Hydroconsult, 2004; SFPUC, 2004.

Plumbing Code Savings (Passive Conservation)

Water fixtures are replaced over time due to failure, aging, or remodeling and must be replaced by more efficient models, as required by plumbing codes. Future water savings from plumbing code implementation were estimated based on assumptions regarding the average annual rate of fixture replacement (as discussed in Draft PEIR Appendix E.2, Vol. 5, pp. E.2-7 to E.2-10). The water savings due to compliance with existing plumbing codes in the SFPUC service area was estimated to be approximately 36 mgd in 2030. However, because the end-use models used in the demand analyses incorporated the effects of plumbing codes on demand, the estimated 36 mgd savings from this "passive conservation" has already been subtracted from estimates of future water demand (Vol. 1, Chapter 3, p. 3-17, footnote). Because these savings are reflected in reduced demand,[18] they are not shown as "2030 Projected Conservation Savings" (column B) in Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18) and therefore are not apparent.

[18] 2030 demand unadjusted for plumbing code savings would be 453 mgd, as compared to 417 mgd shown in Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18).

Conservation Studies

As part of its water supply planning efforts for the WSIP, the SFPUC conducted comprehensive studies (listed in Section 14.2.2, above) to assess future water conservation potential in the wholesale and retail service areas. The studies assessed potential savings from continued implementation of existing conservation practices and from implementation of potential additional indoor and outdoor conservation measures for residential and nonresidential customers. The wholesale service area conservation potential was evaluated in close consultation with the wholesale customers.

The conservation potential studies for the wholesale and retail service areas are summarized in the Draft PEIR (Vol. 1, Chapter 3, p. 3-21) and described in more detail in Appendix E.2 (Vol. 5, pp. E.2-10 to E.2-16). Conservation measures were initially screened for various factors, such as the commercial availability of technology, customer acceptance/equity, the relative effectiveness of the measures, and the appropriateness of the measure or technology considering such factors as climate, building stock, and lifestyle. Following this initial qualitative screening, the remaining measures were combined together to avoid duplication and to take advantage of economies of scale, and some measures that had failed the initial screening were combined with similar measures that had passed the screening to create an equitable and workable program (URS, 2004b, p. 2-4). Eventually, 48 measures in the retail service area and 32 measures in the wholesale service area were retained for further consideration. The measures were evaluated for feasibility and cost-effectiveness. The cost-benefit analysis considered costs and benefits from both the standpoint of the water agency and the standpoint of the retail water customers (URS, 2004b). Measures included rebate and incentive programs for installing water-saving devices, city/county ordinances requiring the installation of water-saving devices, and educational outreach and award programs that promote water use reduction in businesses and landscaping. The conservation measures were compiled into three "programs" or "packages"[19] of measures generally considered to be feasible and cost-effective, as follows:

- Program/Package A – Conservation measures currently being implemented. Program/ Package A measures were estimated to result in savings of 7.7 mgd in the wholesale service area and 0.64 mgd in the retail service area; refer to Draft PEIR Table E.2.4 (Vol. 5, Appendix E.2, p. E.2-14) and Table 14.2-5, above.

- Program/Package B – Program A measures plus additional conservation measures considered to be the most readily implemented and achievable; considerations included social acceptance of the measures and the costs of implementation. Program/Package B measures (including measures in Program/Package A) were estimated to result in savings of 14.5 mgd in the wholesale service area and 3.9 mgd in the retail service area; refer to Draft PEIR Table E.2.4 (Vol. 5, Appendix E.2, p. E.2-14).

- Program/Package C – Program A and B measures plus conservation measures considered to be the upper bound of potentially feasible and cost-effective measures. Although all measures included in Programs/Packages A, B, and C were, by definition, assumed to be feasible and cost-effective (at least theoretically), some measures in Program/Package C are not presently

[19] The retail service area study used the term "package" while the wholesale service area study used "program" to describe the three suites of measures compiled for each customer.

technologically or financially feasible, but were included based on the assumption that the technology would improve (Hannaford and Hydroconsult, 2004). Program/Package C measures (including measures in Programs/Packages A and B) were estimated to result in additional savings of 19.6 mgd in the wholesale service area and 4.45 mgd in the retail service area; refer to Draft PEIR Table E.2.4 (Vol. 5, Appendix E.2, p. E.2-14).

The actual conservation measures that met the customers' screening criteria differed for each water customer; as a result, each Program/Package A, B, and C was unique to the water customer.

Existing and Planned Conservation Measures

Following the assessments of potential conservation savings (URS, 2004b; Hannaford and Hydroconsult, 2004), the SFPUC and each wholesale customer submitted their specific estimates of 2030 conservation savings with their estimates of 2030 water purchases from the SFPUC. These estimates of conservation savings are shown in Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18). In general, the wholesale customers' estimates of conservation savings are similar to Program B savings levels, whereas the SFPUC submitted an estimated savings range of 0.64 to 4.02 mgd for the retail service area.[20] Table 14.2-5, above, shows the total projected 2030 savings from implementation of conservation measures and includes a breakdown in the savings expected from the continuation of existing measures and from the additional measures to which the SFPUC and the wholesale customers have committed under the WSIP.

Table 14.2-6 describes the existing and planned conservation measures for the SFPUC service area. **Table 14.2-7** and **Table 14.2-8** show existing and planned conservation measures for the retail service area and the wholesale customers, respectively, and indicate those measures that are California Urban Water Conservation Council (CUWCC) best management practices (BMPs) and those measures identified as part of the *SFPUC Wholesale Customer Water Conservation Potential* (URS, 2004b) and *City and County of San Francisco Retail Water Demands and Conservation Potential* (Hannaford and Hydroconsult, 2004). The projected 2030 conservation savings from existing and proposed conservation programs (excluding passive conservation) totals 13–15 mgd for the wholesale area and 0–4 mgd for the retail area, as shown in Table 14.2-5, above, and Draft PEIR Table 3.3.

In addition, as discussed below under the heading Additional Conservation and Recycling Potential, subsequent to completion of the conservation potential studies and the customers' submittal of estimated 2030 conservation savings, the SFPUC, in conjunction with its wholesale customers and BAWSCA, undertook a study to assess the potential to develop a regional program to implement additional conservation and recycling programs in the SFPUC service area.

Existing Recycled Water Projects

In the wholesale service area, 14 recycled water projects currently produce approximately 12.6 mgd of recycled water. Recycled water is used for stream flow augmentation, wetlands

[20] This range reflects the original estimates of Programs A and C for the retail service area; errata published on August 28, 2005 (after the purchase estimates were submitted) adjusted Program C to 4.45 mgd. The SFPUC has subsequently committed to implementing the Program C measures in the retail service area.

restoration, and irrigation at commercial/industrial facilities, golf courses, cemeteries, and parks; the use of recycled water does not always replace a potable water supply (this is typically the case when recycled water is used for environmental purposes like stream flow augmentation and wetland restoration). According to the *SFPUC Wholesale Customer Recycled Water Potential Technical Memorandum* (RMC, 2004), of the 12.6 mgd produced by current (2004) recycled water projects, an estimated 4.3 mgd replaces potable supplies. There are no existing recycled water projects in the SFPUC retail service area.

Proposed Recycled Water Projects

As part of its water supply planning efforts, the SFPUC also conducted studies (listed in Section 14.2.2, above) to evaluate recycled water potential in the wholesale and retail service areas. The recycled water potential studies identified additional projects that were considered relatively certain to be implemented in the near future, as well as projects in the early planning stages that were considered possible but less certain. The studies indicated that potentially feasible recycled water projects could produce from 6.3 to 33.4 mgd in the wholesale customer service area and up to 6 mgd in the retail customer service area. Draft PEIR Table E.2.5 (Vol. 5, Appendix E.2, p. E.2-17) summarizes the recycled water potential for the SFPUC service area. Challenges associated with implementing the recycled water projects include costs and funding, gaining public support, establishing new partnerships to improve feasibility, and managing water quality (RMC, 2004). As shown in Draft PEIR Table 3.3 (Vol. 1, Chapter 3, p. 3-18), the wholesale customers estimate that about 10 mgd of recycled water will replace potable supplies in 2030. Additional recycled water projects that do not replace potable supplies (e.g., recycled water used for marsh or wetland restoration projects) are not shown in Table 3.3.

The *Recycled Water Master Plan* (RMC, 2006) assesses the feasibility of recycled water projects in the Westside area of San Francisco and identifies projects with the potential to provide approximately 6.2 mgd of recycled water. The first phase of these projects, which provides 4.1 mgd of recycled water, is included in the WSIP, as shown in the 2030 demand projections.

Summary of Projected 2030 Conservation and Recycling

Table 14.2-9 summarizes the estimated savings from conservation and recycled water projects to which the SFPUC and the wholesale customers have committed as part of WSIP planning. As shown, existing and planned conservation and recycled water use is expected to offset demand for potable water by a minimum of 22.3 mgd, excluding savings from plumbing codes (and by a minimum of 58 mgd with savings from plumbing codes included).

Additional Conservation and Water Recycling Potential

As part of the WSIP planning process, the SFPUC, in cooperation with its wholesale customers and BAWSCA, also undertook a study to assess the potential for additional conservation and recycled water projects, including potential regional projects that were not identified in the previous studies or already considered to be implemented locally by 2030. This study considered projects that could be feasible if implemented regionally, including ones that may have been found to be infeasible for individual customers. This study, *Investigation of Regional Water*

TABLE 14.2-6
DESCRIPTION OF EXISTING AND PROPOSED/PLANNED BEST MANAGEMENT PRACTICES AND CONSERVATION MEASURES WHOLESALE AND RETAIL CUSTOMERS

MEASURES FOR INDOOR WATER USE

Residential Measures

- Clothes Washer Rebate/Homeowners. Provide a rebate on new water-efficient clothes washers for homeowners.
- Clothes Washer Rebate/Apartment Complexes. Provide a rebate to new apartment complexes over a certain size with a common laundry room equipped with efficient washing machines.
- Dishwasher Rebate. Provide a rebate or voucher for high-efficiency dishwashers (4.5 gallons per load).
- Residential ULF Toilet Rebate. Provide a rebate to homeowners to replace an existing high-volume toilet with a new ultra-low-flow toilet.
- Require 1.6-gal/flush Toilets Replace on Sale. Work with the real-estate industry to require a certificate of compliance be submitted to the water utility verifying that a plumber has inspected single-family and multifamily properties and that efficient fixtures were either present or installed at the time of sale, before the close of escrow.
- Rebates for 6/3 Dual-Flush or 4-liter Toilets. Provide a rebate or voucher for the retrofit of a 6/3 dual-flush, 4-liter, or equivalent very low water use toilet. Rebate amounts would reflect the incremental purchase cost and would be in the range of $50 to $100 per toilet replaced.

Other Residential Measures

- Residential Plumbing Retrofits. Provide owners of pre-1992 homes with retrofit kits that contain easy-to-install low-flow showerheads, faucet aerators, and toilet tank retrofit devices.
- Home Leak Detection and Repair. Use leak detection equipment to determine whether and where leaks are occurring on the premises and provide a plumber to the customer to repair leaks for free.
- Incentives for Retrofitting Sub-metering. Rescind any regulations that prohibit sub-metering of multifamily buildings and encourage sub-metering (a method in which multi-tenant properties bill tenants for individual measured utility usage) through water audits and direct mail promotions and/or incentives to building owners.
- Require Sub-metering in New Multifamily Units. Require all new multifamily units to provide sub-meters on individual units.
- Metering with Commodity Rates. Require meters for all new service connections. Establish a program for retrofitting existing unmetered service connections, and read meters and bill customers by volume of use.

Nonresidential Audit Measures

- Hotel/Motel Water Audits. Provide free water audits to hotels and motels covering bathrooms, kitchens, ice machines, cooling towers, and irrigation system schedules.
- Water Audit. Provide conservation potential goals for nonresidential accounts and offer assistance in the form of audits and employee education.
- Audits – Hospitals. Provide water audits to hospitals.
- Audits – Laundry Self-Serve Rebates. Offer laundromat managers or washing machine leasing companies incentives to retrofit or use efficient clothes washers.
- Audits – Schools and Universities. Provide water audits to schools and universities.
- Audits – Schools and Universities, Toilets. Provide toilet rebates or vouchers to schools and universities.

Other Nonresidential Measures

- Low-Flow Spray Rinse Nozzles. Provide free installation of 1.6-gal/minute spray nozzles for the rinse/clean operations in restaurants and other commercial kitchens.
- Hotel Retrofits (w/ financial assistance). Following a free water audit, offer participating hotels a rebate for identified water savings. Provide a rebate schedule for certain efficient equipment such as air-cooled ice machines for hotels that do not participate in an audit.
- Replace Inefficient Water-Using Equipment. Provide a rebate for a standard list of water-efficient equipment, including icemakers, dishwashers, and cooling towers, to replace once-through cooling, irrigation controllers, and certain process equipment.
- Cooling Tower Regulations. Prohibit the discharge of cooling tower blowdown unless the total dissolved solids in the water are at least a certain level (ensures 5 to 10 cycles of concentration).
- New Hotel Water Audit (WAVE). This program encourages hotels to do their own water audit and then analyze their water use with the software provided. The software identifies water saving projects and computes paybacks. Hotels that agree to participate in the program also agree to install cost-effective water conserving equipment.
- Steamers – Restaurants. Provide rebates or vouchers to restaurants that purchase electric steam cookers.
- Coin-op Laundry Incentive. Offer incentives to apartment and coin-op laundry managers to retrofit or use efficient clothes washers. The rebate would either go to the manager or the washing machine leasing company.
- ULF Toilet and Urinal Rebates. Provide rebates to pre-1994 businesses with high-use fixtures for commercial ULF toilets (1.6-gal/flush) and commercial ULF urinals (1.0-gal/flush).
- Require 0.5-gal/flush Urinals in New Buildings. Require new buildings be fitted with 0.5-gal/flush urinals.

MEASURES FOR OUTDOOR WATER USE

Homeowner Landscaping Measures

- New Home Efficient Irrigation. Provide information for planting water-efficient landscaping, including avoiding strip turf sections that are difficult to water efficiently and using native plants that do not require supplemental watering. Information would be mailed or provided in brochures with the water bill. Informational displays at water utility offices and nurseries could also be provided.
- Landscape Requirements (turf limitations / regulations). Enforce existing requirements on the use of native or low-water-using plants for landscaping purposes. Proof of compliance would be necessary to obtain a water connection on all new multifamily residential and commercial projects. Non-compliers would face a surcharge on their water bill until they complied.
- Xeriscape Education. Sponsor training for the staff of stores where plants and irrigation equipment are sold to educate sales people about the benefits of native (low-water-use) plants and efficient irrigation.
- Homeowner Irrigation Classes. Sponsor classes at stores where irrigation equipment is sold or other suitable venues on the selection and installation of efficient equipment (drip irrigation, smart controllers, low-volume sprinklers, etc.) and low-water-use plants.

Measures for Large-Scale Irrigation

- Water Budgets. Provide a monthly irrigation water use budget as information on the water bill for all irrigators of landscapes larger than one acre with separate irrigation accounts.
- ET Controller Rebates. Provide a rebate for the latest state-of-the-art irrigation controllers with onsite temperature sensors or a signal from a central weather station that modifies irrigation times at least weekly (preferably daily) as the weather changes.
- Financial Incentives for Complying with Water Use Budget. Link a landscape water budget to a rate schedule that penalizes the account holder for exceeding its water budget and rewards them for using less than the budget.
- Irrigation Upgrade Incentives. Provide rebates for selected types of irrigation equipment upgrade.
- Require Dedicated Irrigation Meters. Require new accounts with a substantial amount of irrigated landscape to have dedicated landscape meters, and charge on a separate rate schedule that recognizes the high peak demand placed on the system by irrigators.
- Large Landscape Conservation Audits. Provide free landscape water audits to all public and private irrigators of landscapes larger than one acre with separate irrigation accounts upon request.

Nonresidential Measures

- Water Brooms. Provide water brooms to nonresidential customers. Savings are based on reduced flow rate and labor time. It is estimated that water brooms reduce the flow rate from 8.4 gal/minute to 3.6 gal/minute and labor time is reduced in half.
- Artificial Turf Program for Schools and Universities. Provide incentives for schools and universities to use artificial turf in playgrounds/athletic fields.
- City/SFPUC Landscaping. Provide free landscape water audits and financial incentives for irrigation upgrades to all city departments.

OTHER MEASURES

Residential Measure

- Residential Water Surveys. Offer indoor and outdoor water surveys to existing single-family and multifamily residential retail customers with high water use; provide customized report to homeowners.

Public Information / Education Measures

- Public Information Program. Provide public education to raise awareness of conservation measures available to retail customers. Programs could include poster contests, speakers to community groups, radio and television time, and printed educational material such as bill inserts, etc.
- School Education Programs. Implement a school education program to promote water conservation and water-conservation-related benefits. Programs include working with school districts and private schools in the water suppliers' service area to provide instructional assistance, educational materials, and classroom presentations that identify urban, agricultural, and environmental issues and conditions in the local watershed.

Water Utility / City Department Measures

- Water Utility / City Department Water Reduction Goals. Provide water use reduction goals for metered city and county accounts and offer audits and employee education.
- Retail Conservation Pricing. Promote water-conserving retail water rate structures. Recognize that each agency or water enterprise fund has a unique rate-setting system and history.
- Conservation Coordinator. Designate a water conservation coordinator and support staff whose duties include coordinating and overseeing conservation programs and best management practice (BMP) implementation, preparing and submitting the Council BMP Implementation Report, and communicating and promoting water conservation issues to agency senior management.
- Water Waste Prohibition. Enact and enforce measures prohibiting gutter flooding, single-pass cooling systems in new connections, non-recirculating systems in all new conveyer car wash and commercial laundry systems, and non-recycling decorative water fountains.
- System Audits, Leaks. Complete an annual prescreening system audit to determine the need for a full-scale system audit. Agencies shall advise customers whenever it appears possible that leaks exist on the customer's side of the meter, perform distribution system leak detection when warranted and cost-effective, and repair leaks when detected.

Nonresidential Measures

- Commercial Water Audits. Provide a free water audit to high-water-use commercial accounts that evaluates ways for the business to save water and money.
- Business Award Program. Sponsor an annual awards program for businesses that significantly reduce water use. Provide a plaque, presented at a lunch with the mayor.
- Large New Project Incentives. Provide incentives for conservation on new/proposed large nonresidential projects.

SOURCES: SFPUC, 2004b; Hannaford and Hydroconsult, 2004.

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TABLE 14.2-7
EXISTING AND PROPOSED CONSERVATION MEASURES AND BEST MANAGEMENT PRACTICES
SFPUC RETAIL SERVICE AREA

Measure / BMP No.	Measure	Implemented?
RESIDENTIAL SINGLE-FAMILY		
BMP 2	Residential Plumbing Retrofits	E
BMP 4	Metering with Commodity Rates	E
1a / BMP 6	Clothes Washer Rebate – 25 gal/load rebate	E
1b / BMP 6	Clothes Washer Rebate – 17 gal/load rebate	E
1c / BMP 6	Clothes Washer Rebate – 17 gal/load rebate	E
2	Toilets – 6/3 or 4-liter Rebates	P
3 / BMP 14	Toilets – ULF Rebate	E
7	Toilets – Retrofit	N
8	Toilets – 1.6-gal/flush Replace on Sale	P
4 / BMP 7	Public Information	E
5	Leak Detection/Repair	N
6 / BMP 1	Water Surveys	E
7	Retrofit: 1.75-gal/minute showerheads	N
45	Dishwasher Rebate	P
BMP 11	Retail Conservation Pricing	E
BMP 12	Conservation Coordinator	E
RESIDENTIAL MULTIFAMILY		
BMP 2	Residential Plumbing Retrofits	E
BMP 4	Metering with Commodity Rates	E
9a / BMP 6	Clothes Washer Rebate – 25 gal/load rebate	E
9b / BMP 6	Clothes Washer Rebate – 17 gal/load rebate	E
9c / BMP 6	Clothes Washer Rebate – 17 gal/load rebate	E
2	Toilets – 6/3 or 4-liter Rebates	P
3 / BMP 14	Toilets – ULF Rebate	E
7	Toilets – Retrofit	N
8	Toilets – 1.6- gal/flush Replace on Sale	P
10	Incentives for Retrofitting Sub-metering	N
11	Require Sub-metering in New Units	P
6 / BMP 1	Water Surveys	E
7	Retrofit: 1.75-gal/minute Showerheads	N
BMP 11	Retail Conservation Pricing	E
BMP 12	Conservation Coordinator	E
NONRESIDENTIAL MEASURES		
BMP 4	Metering with Commodity Rates	E
BMP 5	Large Landscape Audits	E
BMP 8	School Education Programs	E
BMP 9	Commercial, Industrial, and Institutional Water Conservation	E
BMP 11	Retail Conservation Pricing	E
BMP 12	Conservation Coordinator	E
BMP 13	Water Waste Prohibition	E
14	Landscape Audits	P
16	Business Award Program	P
17	Water Audits	P
19	Urinals – ULF Rebate	P

TABLE 14.2-7 (Continued)
EXISTING AND PROPOSED CONSERVATION MEASURES AND BEST MANAGEMENT PRACTICES
SFPUC RETAIL SERVICE AREA

Measure / BMP No.	Measure	Implemented?
NONRESIDENTIAL MEASURES (cont.)		
37	Urinals – Require 0.5-gal/flush	P
19	Toilets – ULF Rebate	P
20	Replace Inefficient Water-Using Equipment	P
21	Large New Project Incentives	P
24	Audits – Hospitals	P
25	Audits – Laundry Self-Serve Rebates	E
26	Audits – Schools/Universities	P
27	Audits – School/University Toilets	N
28	Audits – School/University Landscaping	P
29	School/University Artificial Turf	N
31	Low-Flow Sprayers – Grocery/Flower	P
32	Low-Flow Sprayers – Restaurants	P
46	Steamers – Restaurants	P
42	Cooling Towers	N
44	City/SFPUC – Water Broom	P
14	City/SFPUC – Landscaping	P
44	Water Broom	P
33	Audits – Hotels/Motels	P
34	New Hotel Water Audit (WAVE) Program	N
35	Require Toilet Retrofit on Sale	P
36	Hotel Retrofit with Financial Assistance	P

KEY:
E = Conservation measure currently being implemented. Existing program information is based on measures shown as California Urban Water Conservation Council (CUWCC) Best Management Practices (BMPs) currently being implemented or listed in Program A (measures currently being implemented) in the *City and County of San Francisco Retail Water Demands and Conservation Potential* (Hannaford and Hydroconsult, 2004, pp. 26 and 43). For more information on the CUWCC BMPs, refer to www.cuwcc.org.
P = Additional measures committed to. Future program information is based on measures listed in either Program B or C (and not already identified as an existing program) in Appendix B30 of *Investigation of Regional Water Supply Option No. 4 Technical Memorandum* (SFPUC, 2007, Appendix D).
N = Measure listed in *City and County of San Francisco Retail Water Demands and Conservation Potential* (Hannaford and Hydroconsult, 2004, p. 43) and Appendix B30 of *Investigation of Regional Water Supply Option No. 4 Technical Memorandum* (SFPUC, 2007, Appendix D) but not selected for implementation as part of Program A, B, or C.

Outdoor Measure
Indoor Measure
Indoor and/or Outdoor Measure

SOURCES: SFPUC, 2007; Hannaford and Hydroconsult, 2004.

TABLE 14.2-8
EXISTING AND PLANNED CONSERVATION MEASURES AND BEST MANAGEMENT PRACTICES
SFPUC WHOLESALE CUSTOMERS

	RESIDENTIAL MEASURES																	NONRESIDENTIAL MEAURES																				
SFPUC WHOLESALE CUSTOMER	Residential Plumbing Retrofit	Clothes Washer Rebate	Residential ULF Toilet Rebate	Require 1.6-gal/flush Toilets Replace on Sale	Rebates for 6/3 Dual-Flush or 4-liter Toilets	Incentives for Retrofitting and Sub-metering	Require Sub-metering Multifamily Units	Rebate Efficient Clothes Washers	Metering with Commodity Rates	New Home Efficient Irrigation	Xeriscape Education	Homeowner Irrigation Classes	ET Controller Rebates	Landscape Requirements	Home Leak Detection and Repair	Residential Water Surveys	Public Information Program	ULF Toilet and Urinal Rebates	Require 0.5-gal/flush Urinals	Coin-op Laundry Incentive	Restaurant Low-Flow Spray Rinse Nozzles	New Hotel Water Audit (WAVE)	Hotel Retrofit (with financial assistance)	Replace Inefficient Water-Using Equipment	Large Landscape Conservation Audits	Water Budgets	Financial Incentives for Complying with Water Use Budgets	Require Dedicated Irrigation Meters	Irrigation Upgrade Incentives	Hotel / Motel Water Audits	Commercial Water Audits	Business Award Program	Water Utility / City Department Water Reduction Goals	System Audits, Leaks	School Education	Conservation Pricing	Conservation Coordinator	Water Waste Prohibition
SFPUC No.	2	5	9	10	12	18	19	20		16	14	15	13	21	11	1	6	8	28	17	22	24	25	27	3	4	29	31	30	23	7	26	32					
CUWCC BMP No.	2	6	14						4							1	7	9b							5a	5b					9a			3	8	11	12	13
Alameda County Water District	E	E	NCE		P			P	E				P			P	E	E		P	P				E	E	P		P	P	E			E	E	E	E	E
Brisbane		E							E								E									P										E		E
Burlingame	E	E	E						E		P					E	E	E								E					E			E	E	E		
CWS Company – Bear Gulch District[a]	E	E	E		P				E		P	P				P	E	P			P													E	E	E	E	E
CWS Company – Mid-Peninsula District	E	E	E		P			P	E		P					P	E	P			P									P				E	E	E	E	E
CWS Company – South San Francisco District	E	E	E		P				E		P						E				P				P					P	P			E	E	E	E	E
Coastside County Water District	E	E	E						E		P					P	E	E			P				E	E	P							E	E	E	E	E
Daly City	E	E	P		P			P	E		P					NCE	E	P			P				E	E	P				E			E	E	E	E	E
East Palo Alto	E	E	P		P	P		P	E		P	P				P	E			P					P						P			E	E	E	E	
Estero Municipal Improvement District[b]		E							E								E																	E		E		E
Guadalupe Valley Municipal Improvement District		E							E								E									P										E		E
Hayward	E	E	E						E	P	P	P	P				E	P			P				P					P	P			E		E	E	E
Hillsborough		E							E	P	P		P			P	E																			E		
Menlo Park	P	E							E		P						E				P					P								E		E	E	E
Mid-Peninsula Water District	E	E							E							E	E				P													E	E	E		
Millbrae	E	E	E						E				P			E	E	E			P				E	P								E	E	E	E	E
Milpitas	E	E	E						E							E	E	P			P				E	P				P	E			E	E	E	E	E
Mountain View	E	E	E						E							E	E	E			P				E						E			E	E	E	E	E
North Coast County Water District	E	E	E						E							E	E																	E	E	E	E	E
Palo Alto	E	E	E		P				E				P			E	E	E		P	P				E					P	E	P		E	E	E	E	E
Purissima Hills Water District	E	E	E						E				P			E	E																	E		E		E
Redwood City	E	E	E					P	E				P			E	E	E		P	P				E	E	P		P		P			E	E	E	E	
San Bruno		E	P		P				E		P						E	P			P														E	E		
San Jose North	E	E	E		P				E				P			E	E	E			P			P	E				P	P	E			E	E	E	E	E
Santa Clara	E	E	E						E		P		P			E	E	P			P				E					P	E			E	E	E	E	E
Skyline County Water District	E	E	E						E							P		P			P									P				E		E		
Stanford University	E	E	E		P				E				P	P		E	E	E	P		P				E	P								E		E	E	E
Sunnyvale	E	E	E					P								E	E	P			P				E						E			E	E	E		E
Westborough Water District		E	E						E							E	P																	E		E	E	E

[a] Includes Los Trancos County Water District.
[b] Implementation in 2030 of the existing programs shown is not assumed under the high end of the purchase estimate range submitted by Estero Municipal Improvement District and the corresponding low end of the submitted conservation savings range estimate (0 mgd).
E = Conservation measure currently being implemented. Existing program information is based on measures shown as current conservation BMPs being implemented by SFPUC wholesale customers or listed in Program A (measures currently being implemented) in *SFPUC Wholesale Customer Water Conservation Potential Technical Report* (URS, 2004b, pp. A-8 to A-9 and Appendix D). (With a few exceptions the existing programs are also shown as included in purchase estimate baseline program for 2030 in Appendix B of *Investigation of Regional Water Supply Option No. 4 Technical Memorandum*, the based in for information on future measures shown in this table.)
P = Additional measures committed to. Future program information is based on measures shown as included in purchase estimates baseline program (and not already identified as an existing program) in Appendix B of *Investigation of Regional Water Supply Option No. 4 Technical Memorandum* (SFPUC, 2007, Appendix D).
NCE = Not cost-effective, based on information on current conservation BMPs being implemented by SFPUC wholesale customers in *SFPUC Wholesale Customer Water Conservation Potential Technical Report* (URS, 2004b, pp. A-8 to A-9). (Measures identified as currently not cost effective but included in the purchase estimates baseline program in Appendix B of *Investigation of Regional Water Supply Option No. 4 Technical Memorandum* [SFPUC, 2007, Appendix D] are shown here as P.)

Crosshatching = Measure is both residential and nonresidential.
Outdoor Measure
Indoor Measure
Indoor and/or Outdoor Measure

SOURCES: URS, 2004b; SFPUC, 2007.

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TABLE 14.2-9
TOTAL ESTIMATED 2030 WATER SAVINGS FROM CONSERVATION AND RECYCLING
(in mgd)

	Wholesale	Retail	Total
Plumbing Code Savings (passive conservation)	25.4	10.3	35.7
Projected Conservation Savings (programs in place)[a]	7.7	0.64	8.3
Savings from Additional Conservation Measures (planned)[b]	5 – 7.3	0 – 3.36	5 – 10.7
Savings from Existing Recycled Water Projects that Offset Potable Water Use	4.3	0	4.3
Savings from Additional Recycled Water Projects that will Offset Potable Water Use (planned)[c]	4.7 – 5.7	0 – 4	4.7 – 9.7
Total Savings from Conservation and Recycling, excluding Plumbing Code Savings	21.7 – 25	0.6 – 8.0	22.3 – 33.0
Total Savings from Conservation and Recycling, including Plumbing Code Savings	47.1 – 50.4	10.9 – 18.3	58 – 68.7

[a] Existing savings based on savings identified for Program/Package A in URS, 2004b and Hannaford and Hydroconsult, 2004.
[b] Additional savings based on the difference between total 2030 conservation savings shown in Draft PEIR Table 3.3 and savings from measures currently being implemented.
[c] Additional recycled water in the wholesale service area is based on the projected 2030 use of 9 to 10 mgd, which is an increase of 4.7 to 5.7 mgd from what was being done in 2004.

SOURCES: URS, 2004b; Hannaford and Hydroconsult, 2004; SFPUC, 2004, RMC 2004.

Supply Option No. 4 Technical Memorandum (SFPUC, 2007, Appendix D), provided the basis for the Aggressive Conservation/Water Recycling and Local Groundwater Alternative analyzed in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-47 to 9-59).

The Regional Water Supply Option No. 4 study identified and evaluated 53 recycled water and groundwater projects for their potential to offset demand on the SFPUC regional water system, and evaluated regional conservation programs consisting of between 8 and 23 conservation measures to be implemented in addition to the conservation programs already planned locally by SFPUC customers. The SFPUC assessed these 53 potential projects to determine their eligibility for the Regional Water Supply Option No. 4 program. Eligibility was based on the ability of the project to offset SFPUC supplies. Projects that were determined to be ineligible were not considered further. Projects that were considered eligible or potentially eligible were evaluated for likelihood of implementation based on available information derived during the early planning stages, such as information on feasibility, cost, conceptual engineering, environmental review, community support, and specifications. These projects were categorized as follows: Category 1 (about 11 mgd) included projects likely to be implemented by 2030; Category 2 (15.2 mgd) included eligible projects in the early planning stages; and Category 3 (2.25 mgd) included potentially eligible future projects that might offset SFPUC regional water system supplies by 2030. The SFPUC subsequently incorporated the Category 1 San Francisco local projects into the WSIP.[21]

The remaining projects that could potentially provide up to 19 mgd of water supply have varying degrees of feasibility. As the analysis of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative indicated, there are numerous uncertainties with regard to water quality, end-users, long-term sustainable yield, and public acceptance issues (related to the use of recycled water for nonpotable uses). In addition, issues related to institutional arrangements, funding sources, or permitting requirements could render any one of these projects infeasible. Further, the proposed levels of service under the WSIP assume that, during drought years, the SFPUC would be able to impose systemwide rationing of up to 20 percent; the feasibility of requiring 20 percent rationing during drought periods would be questionable under this alternative due to demand hardening.[22] Elements of this alternative were also incorporated into the Modified WSIP Alternative (see Vol. 4, Chapter 9, pp. 9-78 to 9-84), which the Draft PEIR identified as the environmentally superior alternative. Please also refer to **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14, Section 14.10.3).

Frequently Submitted Comments Addressing Conservation and Recycling[23]

As indicated in the introductory text to Section 14.2.3, many comments expressed the opinion that any additional demand should be met through increased conservation, efficiency, and recycling; a smaller number of comments specifically advocated that the SFPUC adopt the Aggressive Conservation/Water Recycling and Local Groundwater Alternative or the Modified WSIP Alternative (both of which include more conservation and recycling than would occur with the proposed program). Those opinions are acknowledged. The comments addressed below represent the most frequently submitted comments on this topic *beyond* those expressing that opinion. In this section, each comment (or summary of like comments) is presented in italics and followed by a response. In addition, numerous comments suggested specific conservation measures that the SFPUC and/or the wholesale customers should undertake; these suggested measures are grouped at the end of this subsection.

[21] These include recycled water projects that provide about 4 mgd, local groundwater projects in San Francisco, and participation in a regional conjunctive-use project providing about 3 to 5 mgd (Draft PEIR, Vol. 1, Chapter 3, pp. 3-55 and 3-56).

[22] Demand hardening refers to the increasing inelasticity of demand as additional conservation measures are implemented (refer to Draft PEIR Vol. 4, Chapter 9, p. 9-28).

[23] Several related topics are not addressed in this master response. Comments specifically addressing the wholesale customers with the largest share of the projected increase in demand were submitted and addressed in the responses to individual letters. Refer to the following comments/responses for more information on this topic: **SI_CNPS-EB1-11** through **SI_CNPS-EB1-14** (Vol. 7, Chapter 15, Section 15.4). A number of comments addressed Raker Act requirements related to the development of water supplies in the SFPUC service area prior to additional diversions from the Tuolumne River. For information on this topic, refer to **Response L_TUD1-05** (Vol. 7, Chapter 15, Section 15.3). Lastly, BAWSCA submitted numerous comments describing its objections to the Aggressive Conservation/Water Recycling and Local Groundwater Alternative. For more information on this topic, refer to **Comments/Responses L_BAWSCA-27** through **L_BAWSCA-39** (Vol. 6, Chapter 12, Section 12.3 and Vol. 7, Chapter 15, Section 15.3).

- *The SFPUC's preferred alternative ignores conservation and efficiency recycling measures that their own studies found could eliminate the need to divert more water from the Tuolumne River by at least 74 percent. [Representative comments: C_Raffa-07, C_Breso-02, C_Ross-05, C_Stein-02, C_Hasso-03, C_Picku-01, C_Poult-01]*

The reference in these comments is to the report *Investigation of Regional Water Supply Option No. 4 Technical Memorandum* (SFPUC, 2007, Appendix D) described above. The preceding discussion describes the conservation and recycling associated with the proposed program; the Aggressive Conservation/Water Recycling and Local Groundwater Alternative (Draft PEIR Vol. 4, Chapter 9, pp. 9-47 to 9-59) includes additional conservation and recycling projects described in the Water Supply Option No. 4 report, but not included in the proposed program. As indicated in the Draft PEIR (p. 9-49), this alternative could meet up to 74 percent of the additional projected 2030 average annual water supply need; however, at least 6 mgd of this projected demand would be unmet, and this alternative would also provide less drought reliability compared to the WSIP, requiring an increased frequency of rationing.

- *The SFPUC should conduct a study to determine the maximum technical potential for conservation and efficiency savings within the SFPUC service territory. [Representative comments: SI_CRS-05, C_Berko-02, C_BoutiF-02, C_Dippe-02, C_Hsiun-02, C_Raffa-11, C_Ross-09, C_Thaga-02]*

The SFPUC did conduct such a study—the *Investigation of Regional Water Supply Option No. 4 Technical Memorandum* described above.

- *Water conservation measures are the cheapest, easiest, and least destructive ways to meet demand and extend supply. [Representative comments: SI_SierraC4-02, C_Hasso-03, C_Means1-01, C_Raffa-07, C_Ross-05, C_Walk-03, C_Willi-05]*

Comments acknowledged. The PEIR authors concur that conservation measures are less detrimental to the environment than the development of water supplies; this is one of the reasons the Draft PEIR included multiple alternatives involving higher levels of conservation and recycling and reduced diversions from the Tuolumne River, including the Aggressive Conservation/Water Recycling and Local Groundwater Alternative and the Modified WSIP Alternative. (The Draft PEIR does not address the costs of conservation measures.)

- *Per-capita water use is projected to increase for wholesale customers, indicating they lack effective conservation programs. [Representative comments: C_Raffa-07, C_Ross-05]*

The Draft PEIR does not present per-capita information, nor were future demands projected based on per-capita consumption, as discussed in Section 14.2.2, above. As that discussion indicates, per-capita demand for the wholesale customer service area is not projected to increase; the average weighted per-capita demand for residential and nonresidential sectors is projected to decrease, both with and without additional conservation programs. While it is the case that per-capita demand is projected to increase for some individual wholesale customers, the overall trend within the service area shows a decrease in per-capita demand.

Per-capita demand is influenced by a range of factors, including economic, demographic, and climatic conditions. Consequently, comparisons between different areas can be misleading unless the specific factors influencing the demand are understood. In addition, the methodology used to measure water use and calculate per-capita demand may vary. Numerous comments assert that per-capita demand in the wholesale service area is high compared to other areas, with some comments citing per-capita demand as evidence that conservation measures are ineffective. The DWR's California Water Plans provide useful information on how the Bay Area compares with the rest of the state. Per-capita demand in each hydrologic region in the state, based on information in the 1995 and 2005 California Water Plans (DWR, 1998; DWR, 2005), is shown in **Tables 14.2-10** and **14.2-11**, below. As the tables indicate, the San Francisco Bay region had the second lowest per-capita water usage in the state in 1995, and the lowest urban and residential per-capita usage in the state in 2000.[24] The information in each table is from the same source, and the per-capita estimates shown in each table were calculated using consistent factors and methodology; therefore, these tables provide a reasonable means to compare average usage rates in different parts of the state.

The San Francisco Bay hydrologic region includes more than the SFPUC service area, and low per-capita residential demand within the city of San Francisco (where there is comparatively less outdoor water use than in other areas) would serve to lower the average per-capita rate for the region as a whole. Therefore, the per-capita information for the San Francisco Bay hydrologic region does not definitively establish that per-capita demand in the wholesale customer service area is relatively low. Per-capita demand information provided by the SFPUC for the September 2006 Sustainable Water Supply Briefing does, however, suggest that per-capita demand in the wholesale service area compares favorably to that in other parts of the state.

Table 14.2-12 presents 2001 and 2030 estimates for single-family and multifamily residential per-capita use for the wholesale customers. As noted above, comparisons between different areas can be misleading unless the underlying dynamics of the given areas, as well as the factors and methodology used to calculate given statistics, are understood. In addition to these constraints, per-capita demand information provided for the Sustainable Water Supply Briefing (SFPUC, 2006) does not include estimates for total residential per-capita consumption, preventing a direct comparison of total residential demand. Nevertheless, based on the 2001 per-capita estimates of single-family residential use in the wholesale service area (which would be higher than total residential use) and the 2000 DWR information on residential usage (Table 14.2-11), it appears that the per-capita residential use for the wholesale customers is relatively low. The wholesale customers' weighted average gross per-capita demand for the 2001 base year—166 gpcd (SFPUC, 2006)—also compares favorably to urban per-capita usage in other parts of the state.

24 Although the information in Tables 14.2-10 and 14.2-11 is from two editions of the *California Water Plan*, it should be noted that the per-capita information for 1995 (Table 14.2-10) is provided as shown in the 1995 *California Water Plan* (DWR, 1998), whereas the per-capita information for 2000 (Table 14.2-11) was calculated from information on the hydrologic regions provided in the *California Water Plan Update 2005* (DWR, 2005). Therefore, while each table provides a means for comparing different regions for the given year, comparisons *between* the tables would be misleading, since somewhat different methodologies and factors were used to calculate the per-capita information. For example, weather-normalized data were used to compute the 1995 per-capita information and conveyance losses were excluded, whereas the 2000 per-capita information was calculated for this PEIR based on total urban water use (and the subset of residential water use) data and population data provided for each hydrologic region in the 2005 plan.

TABLE 14.2-10
PER-CAPITA WATER USE[a] BY HYDROLOGIC REGION – 1995
(in gpcd)

Hydrologic Region	Usage
Colorado River	564
North Lahontan	411
San Joaquin River	310
Tulare Lake	298
Sacramento River	286
South Lahontan	282
North Coast	249
South Coast	208
San Francisco Bay	**192**
Central Coast	179

[a] Includes residential, commercial, industrial, and landscape use supplied by public water systems and self-produced surface and groundwater. Does not include recreational use, energy production use, and losses from major conveyance facilities. Data are normalized.

SOURCE: DWR, 1998,Table 4.10.

TABLE 14.2-11
TOTAL URBAN AND RESIDENTIAL PER-CAPITA WATER USE
BY HYDROLOGIC REGION – 2000
(in gpcd)

Hydrologic Region	Total Urban Use[a]	Residential Use[b]
Colorado River	1,006	338
South Lahontan	333	265
Tulare Lake	310	242
San Joaquin	306	216
Sacramento River	296	177
Mountain Counties[c]	259	171
North Lahontan	361	138
South Coast	208	132
North Coast Hydrogeologic Region	208	123
Central Coast	181	116
San Francisco Bay	**156**	**97**

[a] Total urban per-capita water use is based on urban water use data (including residential, commercial, industrial, landscape, energy production, and related usage) and population data provided for each hydrologic region in the *California Water Plan Update 2005*.
[b] Residential per-capita water use is based on interior and exterior residential water use (components of total urban use) and population data provided for each hydrologic region in *California Water Plan Update 2005*.
[c] Mountain Counties hydrologic region, shown in the 2005 plan, is not included as a region in the 1995 plan.

SOURCE: DWR, 2005.

TABLE 14.2-12
WEIGHTED AVERAGE RESIDENTIAL PER-CAPITA DEMAND
WHOLESALE CUSTOMER SERVICE AREA, 2001 AND 2030
(in gpcd)

Wholesale Customers	2001 Single-Family Residential	2001 Multifamily Residential	2030 Single-Family Residential (without additional conservation)	2030 Multifamily Residential (without additional conservation)	2030 Single-Family Residential (with conservation)	2030 Multifamily Residential (with conservation)
Weighted Average	108	75	103	67	98	64

SOURCE: SFPUC, 2006.

The above evidence suggests that per-capita water use in the wholesale service area is, in fact, relatively low. Lower per-capita use, however, may suggest that the potential for additional conservation would also be relatively low. The information on projected 2030 per-capita residential demand shown in Table 14.2-12 indicates that the continued implementation of plumbing codes and planned conservation measures will continue to reduce per-capita demand within the service area. Regarding changes in per-capita outdoor demand in the wholesale and retail service areas, refer to the discussion in Section 14.2.2, above, under the heading Outdoor Water Use. For additional response on this topic, refer to Section 14.2.3 under the heading Per-Capita Demand.

Many comments compared the Bay Area's water consumption and conservation to that of other areas or water utilities.

- *In contrast to other metropolitan areas that have managed to reduce water demand in the face of growth, the anticipated 14 percent increase in demand projected by the SFPUC is large and out of step for the Bay Area. [Representative comments: C_Elbizri-02, C_Garba-01, C_Hasso-03, C_Raffa-04, C_Ross-02, C_Schri-01, C_Thoma-01]*

- *The conservation savings identified in the analysis are low in comparison to savings achieved in recent water conservation assessments and in other water districts. [SI_PacInst-62]*

- *When it comes to conservation, the Bay Area lags far behind other metropolitan areas such as Seattle and Los Angeles that are reducing water consumption even in the face of growth. As a region known for a strong environmental ethic, the Bay Area should be a leader in water efficiency and conservation. [Representative comments: C_Breso-02, C_Bucki-02, C_Cant-01, C_Dippe-01, C_Garba-01, C_Hanke-02, C_Hasso-02, C_Hsuin-02, C_Picku-01, C_Raffa-07, C_Reich-01, C_Ross-05, C_Sugar-02, C_Shea-01, C_Thoma-01, C_Willi-02, C_Unreadable1-01]*

These comparisons with other areas apparently refer to studies of water conservation and other demand management programs cited in comments submitted by the Pacific Institute and possibly studies identified in Comment SI_TRT-CWA-SierraC-196,[25] although this latter comment presents a list of studies with no discussion or analysis. As discussed above, statewide studies conducted by the DWR indicate that per-capita consumption in the Bay Area is lower, not higher, than in Los Angeles. Where comments addressed specific studies from other areas, the SFPUC's DSS technical consultant reviewed the examples in-depth and found, for various reasons (summarized in the responses below), that the studies do not support the assertion that the Bay Area is conserving less than other areas (Maddaus, 2008).

The water savings achieved in one area may not be directly transferable to another area. Water use can vary widely between regions, and even within a region, due to differences in the factors that influence water use (e.g., climate, land use—including the type, density, and size of residential housing, and the types of commercial, industrial, and other nonresidential land uses—and economic factors), specific characteristics of water use patterns (e.g., average gallons per flush for existing fixtures), and differences in the methodology used to report demand (e.g., whether/how factors such as existing conservation and unaccounted-for water are reflected in demand). Consequently, absent an understanding of such factors, the assumption that a percent reduction through conservation achieved in one area can be achieved in another is overly simplistic. As noted above, the lower existing usage in the Bay Area suggests that water savings or reductions achieved in areas that use water more intensively are not comparable to the Bay Area.

Note also that these comments and the ones citing more specific examples from other areas (discussed below) do not address the rationing that would be imposed during drought periods under the WSIP and the attendant demand hardening that could occur. Refer to **Response SI_PacInst-27** (Vol. 7, Chapter 15, Section 15.4) for more information on demand hardening.

- *Projections to 2030 indicate that water use efficiency improvements are still not being implemented effectively for the wholesale customers despite the development of numerous technologies and policies to cost-effectively reduce water waste. For example, Seattle Public Utilities successfully reduced per-capita demand from 150 gpcd in 1985 to 105 gpcd in 2004 through higher water rates, plumbing codes, conservation, and improved system operation. Likewise, EBMUD reduced per-capita demand from 210 gpcd in 1970 to 155 gpcd in 2005 through a variety of conservation measures. [SI_PacInst-59]*

Comparisons of long-term per-capita demand between areas with substantially different economic, demographic, and climatic conditions can be misleading, unless the comparisons can be substantiated by a scientific analysis that accounts for the different conditions. The reasons for changes in per-capita demand are unique to the dynamics of an individual water service area and its customers. Regarding the decrease in per-capita demand experienced by EBMUD, one relevant factor is that during the time period cited (1970–2005) one of EBMUD's largest industrial users, a refinery, began to recycle water. The use of recycled water dramatically cut the refinery's water use and reduced overall usage in EBMUD's service area. Regarding the experience of Seattle Public Utilities, again, as noted, comparisons between utilities that have different economic, demographic, and climatic conditions can be misleading, and may be

[25] These comment letters are provided in Vol. 6, Chapter 12, Section 12.4.

especially problematic when the methodology used to measure water use and calculate per-capita demand (which can vary) is not known. Table 14.2-10, above, summarizes DWR's comparison of per-capita water use among the state's hydrologic regions; as noted in the table, the DWR used normalized water use data for its calculations and a consistent methodology to calculate the per-capita estimates.

- *Recent conservation assessments indicate that there are a substantial number of cost-effective technologies that can drastically reduce indoor and outdoor residential water demand to levels far below those projected for the wholesale and retail customers. A 1997 study by the American Water Works Association (AWWA) found that conservation could reduce indoor water use from 65 gpcd to 45 gpcd for single-family homes, a savings of over 30 percent. The largest reductions were realized by replacing inefficient toilets and clothes washers with more efficient models. A Seattle study found that installing new, water-efficient fixtures and appliances reduced single-family indoor water use from 64 gpcd to 40 gpcd, a savings of nearly 40 percent and far below the 2030 levels projected in the SFPUC studies. The savings achieved in these studies are supported by a recent Pacific Institute study that quantified the potential for water conservation and efficiency improvements in California's urban water use and concluded that existing cost-effective technologies could substantially reduce California's current residential indoor and outdoor water use. [SI_PacInst-71]*

As discussed above, the water savings achieved in one area may not be directly transferable to another area, and an understanding of the factors that influence water use is necessary to avoid overly simplistic comparisons. The specific water conservation measures mentioned in the comment (replacement of fixtures and appliances with less water-intensive models and water-efficient landscaping) have already been considered by the SFPUC and its wholesale customers and are included in existing and proposed conservation programs (refer to Tables 14.2-6 through 14.2-8). (As shown in the tables, the SFPUC and all of the wholesale customers participate in clothes washer rebate programs, and nearly all participate in low-flow toilet rebate programs.) The SFPUC's DSS technical consultant prepared the following information on the studies cited (Maddaus, 2008).

American Water Works Association Study. The 1997 AWWA study cited in this comment is actually a WaterWiser website posting that was based on preliminary data. The final report on the study, entitled *Residential End Uses of Water*, was published by the AWWA Research Foundation and AWWA in 1999. The results presented in the final report indicated that, for the 12 cities where measurements were made, the average usage for single-family residences was 69 gcpd, and the range was 57 to 84 gcpd (AwwaRF and AWWA, 1999). The report did not conclude that water use could be reduced by 30 percent (to 45 gcpd) through conservation measures such as replacing toilets and clothes washers; this conclusion is an extrapolation based on certain assumptions and on preliminary data, rather than on the final reported data.

Seattle Study. Although the "Seattle study" is cited as documentation for a general indoor water use reduction potential of 40 percent, it was a small pilot study that involved retrofitting 37 homes (DeOreo et al., 2001). The study documented a water savings of 37.7 percent in clothes washer use and computed a water savings of about 5.6 gpcd, which is the value used in the SFPUC conservation potential technical assessment. Other significant water savings were achieved by replacing toilets (10.9 gpcd) and fixing leaks (4.3 gpcd), although showerheads and faucet aerators were also replaced. The Seattle study reported an average pre-retrofit flush volume of 3.6 gallons per flush and a post-retrofit flush volume of 1.4 gallons per flush. SFPUC studies determined the 2001 average flush volume in the wholesale customer service area to be 3 gallons per flush, and therefore the level of savings reported in the Seattle study would not apply; if this retrofit project had been conducted in the wholesale customer area, less water would have been saved. The toilets used in the Seattle study, called high-efficiency toilets, were considered in the SFPUC conservation potential analysis (URS, 2004b) as conservation measure 12 (rebates), and as New Measure NM1 (direct installations) in the Regional Water Supply Option No. 4 study (SFPUC, 2007, Appendix D) (which provided the basis for the additional savings considered in the Aggressive Conservation/Water Recycling and Local Groundwater Alternative). The post-retrofit period measurements for the Seattle study were made within one year of the original retrofit, and no follow-up measurements have been conducted. However, the experience of the SFPUC and the DSS technical consultant has shown that the reported savings due to leak reduction in toilets are not permanent, but disappear over time as the new toilets begin to leak. Some of the savings reported in the Seattle study apparently resulted from behavioral changes, such as a 1.7 gpcd savings due to a reduction in the number of baths. Studies of other conservation measures involving behavioral changes have documented that such savings are not permanent.[26]

Pacific Institute Report. The commenter states that the AWWA and Seattle studies are supported by the water savings potential for California reported in Pacific Institute's 2003 report *Waste Not, Want Not: The Potential for Urban Water Conservation in California*. The shortcomings of the cited AWWA and Seattle studies with respect to their applicability and relevance to the Bay Area are discussed above. This Pacific Institute report is not applicable because it estimates savings for the state of California as a whole and includes individual measures that are not applicable to the wholesale customers, such as installation of water meters in Central Valley communities. Estimates of water savings potential based on a peer-reviewed summary of all published literature is available in the CUWCC *BMP Cost and Savings Study* (A&N Technical Services, 2005); the October 2004 version of this study was used in the SFPUC conservation potential technical analysis (URS, 2004b, Table 3-2).

- *Studies in Austin, Texas and Las Vegas, Nevada, and in the Irvine Ranch Water District, City of Santa Monica, and Municipal Water District of Orange County in California, show that a number of outdoor conservation measures are cost-effective and yield substantial water savings, providing evidence that more can be done in the wholesale customer service area to reduce outdoor water use. Examples of measures include rebates or direct payments for removing water-intensive grass and maintaining water use budgets below levels established by the city (Austin and Las Vegas); use of evapotransporation (ET) controllers (Irvine Ranch Water District); funding for new and remodeled garden design that uses native plants, water-efficient plants, water-efficient irrigation systems, landscape*

[26] For example, the decline in residential water audit savings, which rely on behavioral changes, is well documented in the literature (refer to the *BMP Costs and Savings Study*, A&N Technical Services, 2005). Consequently, the reported savings of 23.7 gpcd will likely decline substantially over time. The wholesale customer conservation potential study accounted for the decline in savings that is expected to occur over time, as documented in relevant studies (Maddaus, 2008).

> *audits, stormwater catchment systems, or graywater systems as well as other innovative water-saving features (City of Santa Monica); and programs to train landscape professionals (Municipal Water District of Orange County). [SI_PacInst-72]*

As discussed above, because of differences in the factors that influence water use (e.g., climate and land use), comparisons between water savings in different areas can be misleading. Water savings achieved in arid places like Austin and Las Vegas are not transferable to the Bay Area, where the climate is substantially different. The DSS technical consultant prepared the following information on the other studies cited in this comment (Maddaus, 2008).

Irvine Ranch Study. The Irvine Ranch study of ET controllers mentioned in the comment found a range of savings that were reported over a number of years in different reports. The later reports in the series were more scientific in that they addressed some anomalies in the data and had more post-retrofit data. The correct, final figure for the reduction in outdoor use is 16 percent, as reported in the CUWCC's *BMP Costs and Savings Study* (A&N Technical Services, 2005). This savings is compatible with the values used in the wholesale customer conservation potential study (URS, 2004b, Table 3-2).

Please also refer to Comment L_BAWSCA1-110 (Vol. 6, Chapter 12, Section 12.3), in which BAWSCA indicates that the results of a three-year study on the effectiveness of ET controllers in the Bay Area are expected in about a year. As stated in this comment, BAWSCA is awaiting these results to inform its decisions regarding any ET controller rebate program. Table 14.2-8, above, shows the wholesale customers currently committed to implementing ET controllers.

Municipal Water District of Orange County's Landscape Program. According to the comment, Orange County's Landscape Performance Certification Program targets large landscape customers that have dedicated irrigation meters. The program provides technical training sessions for landscape contractors and property managers, prepares water budgets, and follows up with site assessments for compliance with the water budgets. Based on compliance with the water budgets, bronze, silver, or gold certificates are awarded, and companies that achieve certification are promoted. The program is estimated to save each customer an average of 765 gallons per day, a 20 percent reduction in outdoor use.

For the SFPUC conservation potential study conducted for the wholesale customers, the amount of turf (grass lawn, field, etc.) within each customer area was estimated. Various conservation measures—including CUWCC BMP 5 (Large Landscape Conservation), water budgets (with a unit savings of 15 percent), and ET controllers (with a unit savings of 15 percent)—similar to those in the Orange County program—were applied to sites with large areas of turf. The latter two measures combined were estimated to produce more savings per unit than the 20 percent savings cited for the Orange County program. Because the wholesale customers, for the most part, have far fewer large turf areas and a cooler climate than Orange County, the overall effect for all wholesale customers is likely to be less than for all of Orange County (refer to Table 14.2-8, above, which shows the wholesale customers currently committed to implementing these measures).

- *The conservation potential identified for the SFPUC wholesale and retail customers is weak and misses important efficiency opportunities. Other conservation assessments [citing a 2003 statewide study by the Pacific Institute and a survey conducted by the Santa Clara Valley Water District (SCVWD)] have concluded that the actual conservation potential of the nonresidential sector is substantially higher. [SI_PacInst-80]*

For reasons noted above, the estimated savings identified in the Pacific Institute study cited in this comment are not directly applicable to the wholesale service area. The Pacific Institute study's estimated savings are for the state of California as a whole, and the study includes individual measures that are not applicable to the wholesale customers, such as the installation of water meters in Central Valley communities. Regarding the three examples of promising technologies cited in this comment (pre-rinse spray valves, cooling towers, and x-ray machines), the SFPUC and BAWSCA are implementing a pre-rinse spray valve program in the SFPUC service area (as noted in Comment SI_PacInst-38 [Vol. 6, Chapter 12, Section 12.4]), and the SFPUC participates in a regional program that offers rebates for a range of water saving devices, including cooling towers and x-ray machines (SFPUC, 2006, p. 7).[27]

The SCVWD survey cited in this comment (of 26 commercial, industrial, and institutional facilities) is not representative of all nonresidential customers in that water district or of the SFPUC wholesale customers. Twenty-six customers is a small sample, and the sample was self-selected (participants volunteered for a water survey). The comment states that the Santa Clara survey identified a "conservation potential of 38 percent." It has been the experience of the DSS technical consultant and other water supply professionals that only a fraction of identified conservation potential is actually implemented. For example, in the mid-1990s the Metropolitan Water District of Southern California conducted the most comprehensive Commercial, Industrial, and Institutional (CII) study ever undertaken. Sweeten and Chaput (1997) analyzed the results of 179 CII surveys taken at a broad range of sites, from large industrial facilities to smaller commercial and institutional sites. Overall, the surveys identified a potential savings of 29 percent; however follow-up telephone surveys found that only 30 percent of this estimated savings (i.e., less than one-third of the estimated 29 percent) was reported to have been implemented (Sweeten and Chaput, 1997). Thus, the overall savings from this intensive effort was estimated to be 8.7 percent of pre-survey water use. Actual water use reductions or persistence were not measured, and long-term savings may be less (Maddaus, 2008).

Over the past nine years, the DSS technical consultant (Maddaus Water Management) who conducted the wholesale customer demand and wholesale customer conservation potential studies (URS, 2004a, 2004b) has prepared water conservation assessments for over 115 communities in the United States, including 67 in California. In the past five years, this firm has completed studies in multiple Bay Area communities, including studies for Sonoma County and the Marin Municipal Water District (MMWD). The savings in these other areas are comparable to the savings identified in the wholesale customer service area, particularly considering that per-capita water use in the wholesale area is low compared to California averages. For example, in 2006 and

[27] In addition, BAWSCA has indicated interest in joining the SFPUC to launch a cooling tower feasibility study to assess the water savings that could be achieved from a cooling tower retrofit program; refer to Comment L_BAWSCA-114 (Vol. 6, Chapter 12, Section 12.3).

2007, Maddaus worked with MMWD to develop four conservation program alternatives (Programs A through D). For programs with comparable conservation measures, the projected 2030 water savings (including the conservation programs and the effects of plumbing codes) ranged from 13 percent (Program A) to 17 percent (Program D). This is 3 percent higher than the total savings identified for the SFPUC service area of 10 to 14 percent (Maddaus, 2008).

Regarding the relationship between the implementation of long-term conservation measures and the imposition of short-term cutbacks in water use during drought periods, refer to **Response SI_PacInst-27** (Vol. 7, Chapter 15, Section 15.4).

- *Additional mandatory conservation will not be required for the wholesale customers, but will be required for retail customers. The wholesale model does not penalize additional water usage. [Representative comment: C_Clark1-09]*

This and similar comments warrant clarification regarding (1) the actions proposed by the SFPUC as part of the WSIP versus the actions proposed by the wholesale customers, and (2) the CCSF's authority to require wholesale customers to do more conservation. The future conservation programs described above for the wholesale customer service area are proposed by, and would be carried out by, the wholesale customers; those in the retail service area would be carried out by the SFPUC as part of the WSIP. The two alternatives that require greater levels of conservation and recycling than the proposed program—the Aggressive Conservation/Water Recycling and Local Groundwater Alternative and the Modified WSIP Alternative—assume that the wholesale customers would actively and willingly participate, in coordination with the SFPUC, in developing additional conservation and recycling programs. However, although BAWSCA supports the Modified WSIP Alternative (with changes outlined in Comments L_BAWSCA-51 through L_BAWSCA-53), it opposes the Aggressive Conservation/Water Recycling and Local Groundwater Alternative based on the wholesale customers' current low water use and the conservation and local supply projects they already have in place (see Comment L_BAWSCA1-27 [Vol. 6, Chapter 12, Section 12.3]). Regarding the SFPUC's authority to require more conservation, the SFPUC does have the regulatory authority to impose conservation programs in the retail customer service area; however the SFPUC's ability to influence the wholesale customers is limited to its contractual agreements with them.

- *Over half of the demand is outdoor water use and is a major cause for the increased demand. Water conservation and efficiency measures, along with recycling, should eliminate the need for additional future water supplies. [Representative comments: C_MartiM-02, C_Chiap-03, C_Hanke-02, C_Helld-01, C_Parke-02, C_Raffa-03]*

As indicated in Section 14.2.2, outdoor water use does account for 58 percent of the increase in projected demand in the wholesale customer service area, according to BAWSCA data; outdoor water use includes irrigation as well as uses such as cooling. Table 14.2-8 of this master response shows the conservation measures to which the wholesale customers have committed during normal and wet years; the measures in green apply to outdoor water uses. These measures reduce but do not eliminate the projected increase in demand associated with outdoor use. For example, in the retail service area, the per-capita residential outdoor use is projected to increase by 0.3 gpcd without additional conservation and by 0.2 gpcd with additional conservation; in the wholesale service area, the weighted average per-capita wholesale residential outdoor use is projected to increase by 3 gpcd without additional conservation and by 1 gpcd with additional conservation. The potential to use recycled water in nonresidential outdoor applications (such as for cooling and landscape irrigation) is recognized; however, some constraints limit the potential to use recycled water in specific areas or applications. As discussed above, challenges associated with implementing recycled water projects include costs and funding, public acceptance, development of partnerships to improve the feasibility of recycled water projects, and managing water quality.

As discussed in the Draft PEIR, during prolonged dry years, SFPUC customers would be subject to 20 percent systemwide rationing under the WSIP. Although drought management strategies would likely differ somewhat among customers, urban rationing programs typically shift the worst impacts to outdoor water uses, particularly residential exterior and commercial landscaping uses. Consequently, short-term, dry-year conservation measures implemented by SFPUC customers in response to rationing are very likely to target outdoor use.

Conservation Measures Suggested by Commenters

A number of commenters suggested the following specific conservation measures that could help reduce diversions from the Tuolumne River:

- *Prevent individuals from hosing down sidewalks. [C_BrookL-01]*
- *Offer rebates to residents that replace lawns with native plants. [C_Lubin-01]*
- *Provide incentives to conserve water. [C_Byron-09, C_Joye-01]*
- *Provide public education about the need for and methods of water conservation. [C_Britt-01, C_BrookL-01, C_Ellis-01]*
- *Raise water rates in a tiered manner. [C_Byron-01, C_Eddy2-02]*

As shown in Tables 14.2-6, 14.2-7, and 14.2-8, the SFPUC and the wholesale customers are currently implementing or committed to implementing conservation measures similar to those suggested above. The SFPUC and most of the wholesale customers have landscaping requirements and offer programs to encourage residents to switch to low-water-use plants and implement efficient irrigation, such as homeowner irrigation classes, xeriscape education, and irrigation upgrade incentives. Almost all of the wholesale customers (along with the SFPUC) implement conservation education programs. For its nonresidential customers, the SFPUC has planned programs for landscape audits and water-broom measures. The SFPUC and all of the wholesale customers currently implement conservation pricing (the CUWCC’s BMP 11). These water conservation programs are also described in Comment L_BAWSCA1-114 (Vol. 6, Chapter 12, Section 12.3). The programs vary by agency, as each agency has evaluated the programs it believes would be most cost-effective based the characteristics of the service area.

Comments from special interest groups also suggested several programmatic water conservation measures. These comments include the following:

- *Each agency should assess what is driving demand growth and measures to reduce that demand. Agencies must take a more proactive role in identifying ways to reduce demand growth, particularly in new developments. [SI_PacInst-19]*

The factors that contribute to future demand were assessed in the end-use demand models used to develop the demand projections in the wholesale and retail service areas. These factors typically included the specific water use characteristics of single-family and multifamily residential, commercial, and industrial uses within each service area, other factors that applied to the given service area, and the extent of future population and job growth expected in each service area. The SFPUC conducted studies to identify the potential for conservation measures and the use of recycled water to offset demand, working closely with each customer to identify all feasible conservation potential. The projected conservation savings, use of recycled water, and use of other potable sources were factored into the purchase estimates submitted by San Francisco and each wholesale customer to the SFPUC. The Draft PEIR thoroughly describes, evaluates, and discloses the assumptions, methodologies, and results of these studies consistent with CEQA requirements (CEQA Guidelines Section 15144).

- *All agencies should sign the CUWCC's Memorandum of Understanding Regarding Urban Water Conservation in California (MOU) and work to implement all BMPs. [SI_PacInst-21]*

The SFPUC and 14 wholesale customers are signatories to the MOU, and three other wholesale customers (not signatories themselves) participate via the SCVWD, which is a CUWCC signatory. Tables 4.2-7 and 14.2-8, above, indicate the CUWCC BMPs currently being implemented in the wholesale and retail service areas.

- *Purchases from the SFPUC should be capped at current levels and financial incentives/disincentives should be instituted to encourage conservation/discourage growth in demand. [SI_PacInst-24]*

A No Purchase Request Increase Alternative was evaluated in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-40 to 9-47), as were two variations of the Aggressive Conservation/Water Recycling and Local Groundwater Alternative, one with and one without supplemental water from the Tuolumne River (pp. 9-47 to 9-59). None of these was identified as the environmentally superior program alternative (pp. 9-95 and 9-96). Refer to **Responses SI_PacInst-47** and **SI_PacInst-62** (Vol. 7, Chapter 15, Section 15.4) regarding conservation pricing and tiered rate structures, and to Tables 14.2.7 and 14.2.8, above, regarding conservation measures the SFPUC and its wholesale customers are implementing or have committed to implement under the WSIP.

- *Local governments should be provided incentives to change their construction permitting to allow greywater systems for individual homes and to limit large irrigation systems. [SI_CI-01]*

The current state standards provide for the use of graywater for subsurface irrigation only (California Code of Regulations, Title 24, Part 5, Appendix G). The SFPUC has no legislative or permit authority over individual wholesale customer service areas. Refer to "Measures for Large-Scale Irrigation" in Table 14.2-6 regarding large irrigation systems.

- *The SFPUC and its wholesale customers should implement water and wastewater rate structures that encourage water conservation among their customers and fund conservation programs. [SI_PacInst-20]*

The SFPUC and each of the wholesale customers have adopted the CUWCC's BMP 11, Conservation Pricing (refer to Tables 14.2-7 and 14.2-8). Please also refer to **Response SI_PacInst-62** and **Response SI_PacInst-47** (Vol. 7, Chapter 15, Section 15.4) regarding the use of water pricing as a water agency tool and tiered pricing rate structures, respectively. The SFPUC and the wholesale customers currently fund and implement conservation programs, and the 2030 purchase estimates reflect savings from the implementation of additional measures to which the customers have committed.

- *The SFPUC and BAWSCA should work together to establish more effective regional conservation and recycling programs; institutional mechanisms should be developed to encourage wholesale customers to move more effectively toward efficiency improvements. [SI_PacInst-22]*

The SFPUC is currently evaluating methods of encouraging additional conservation among its wholesale water customers; refer to the description of the Modified WSIP Alternative (Vol. 4, Chapter 9, pp. 9-78 to 9-84).

TABLE 14.2-13
SUBMITTALS CONTAINING COMMENTS ON
WATER DEMAND PROJECTIONS, CONSERVATION, AND RECYCLING
ADDRESSED IN THIS MASTER RESPONSE

Comment Letter ID	**Name of Commenter**
Federal Agencies	
None	
State Agencies	
None	
Local and Regional Agencies	
L_ACFCWD	Alameda County Flood Control and Water Conservation District (ACFCWD)
L_BAWSCA1, L_BAWSCA2	Bay Area Water Supply and Conservation Agency (BAWSCA)
L_DalyCty	City of Daly City
L_PaloAlto	City of Palo Alto
L_SFCPC2, L_SFCPC3	San Francisco City Planning Commission
L_SCVWD1, L_SCVWD2	Santa Clara Valley Water District
L_Tuol1, L_Tuol2	Tuolumne County
L_TUD1, L_TUD2, L_TUD3	Tuolumne Utilities District
Groups	
SI_ACA1, SI_ACA2	Alameda Creek Alliance
SI_ACT	Acterra Action for a Sustainable Earth
SI_CAC2	Citizens Advisory Committee to PUC
SI_Caltrout	California Trout
SI_CAREP	Republicans for Environmental Protection
SI_CI	Commonwealth Institute
SI_CNPS, SI_CNPS-EB1, SI_CNPS-EB2, SI_CNPS-SCV1, SI_CNPS-SCV2, SI_CNPS-WLJ	California Native Plant Society
SI_CRS	Center for Resource Solutions
SI_CSERC	Central Sierra Environmental Resource Center
SI_D3Dem1, SI_D3Dem2	District 3 Democratic Club
SI_EcoCtr	Ecology Center
SI_EnvDef	Environmental Defense
SI_Greenp	Greenpeace
SI_KSWC	Klamath-Siskiyou Wildlands Center
SI_NCFFSC	Northern California/Nevada Council of the Federation of Fly Fishers Steelhead Committee
SI_PacInst	Pacific Institute
SI_RHH1	Restore Hetch Hetchy
SI_SCCCC	Santa Clara County Creeks Coalition

TABLE 14.2-13 (Continued)
SUBMITTALS CONTAINING COMMENTS ON
WATER DEMAND PROJECTIONS, CONSERVATION, AND RECYCLING
ADDRESSED IN THIS MASTER RESPONSE

Comment Letter ID	Name of Commenter
Groups (cont.)	
SI_SFNeigh	Coalition for San Francisco Neighborhoods
SI_ SierraC4, SI_SierraC6, SI_SierraC7	Sierra Club
SI_SPUR	San Francisco Planning and Urban Research Association
SI_TRT1, SI_TRT2, SI_TRT3, SI_TRT5, SI_TRT6, SI_TRT7, SI_TRT8, SI_TRT9	Tuolumne River Trust
SI_TRT-CWA-SierraC	Tuolumne River Trust/Clean Water Action/Sierra Club, SF Bay Chapter
Citizens	
C_AdamsA	Adams, Amy
C_Agarw	Agarwala, Sambhu
C_Allis	Allison, Rita
C_Alter	Alter, Grudy
C_Bail	Bail, Christopher
C_Barbe1	Barbey, John
C_Barsa	Barsanti, Cris
C_Beauj	De La Beaujardiere, Cedric, and Sustan Stansbury
C_Berg	Berg, Bonnie
C_Berko	Berkowitz, Allan
C_Bevia	Beviacqua, John
C_Bigos	Bigos, Marty
C_Blake	Blake, Martin
C_BoutiF	Boutin, Fred
C_BramlD1, C_BramlD2, C_BramlD3	Bramlette, Darryl
C_Breso	Bresolin, Mark
C_Britt	Britts, Beverly
C_BrookL	Brooking, Liz
C_Bucki	Buckingham, Keith
C_Byron	Byron, Juan
C_Cant	Cant, John
C_Chase	Chase, Birgit
C_Chiap	Lynn Chiapella
C_Clark1	Clark, Anne, and Katherine Howard
C_Closs	Clossman, Gary
C_Colem2	Coleman, Caroline

**TABLE 14.2-13 (Continued)
SUBMITTALS CONTAINING COMMENTS ON
WATER DEMAND PROJECTIONS, CONSERVATION, AND RECYCLING
ADDRESSED IN THIS MASTER RESPONSE**

Comment Letter ID	Name of Commenter
Citizens (cont.)	
C_Colli	Collin, Robert
C_Dahli	Dahlin, Leland and Shirley
C_Davey	Davey, Mary
C_David	Davidson, Joel
C_DayL	Day, Lisa
C_Dippe	Dippery, Dan
C_Dough	Dougherty, Denise
C_Dulma	Dulmage, Diane
C_Duper	Duperrault, Fred
C_Eddy1, C_Eddy2	Eddy, Jeb
C_Elbiz	Elbizri, Elanie
C_EllioC	Elliott, Claire
C_Ellis	Ellison, Dave
C_Farnu	Farnum, Benjamin L.
C_Field	Fielding, David
C_Flani	Flanigan, M.
C_Flynn	Flynn, Kirsten
C_Gado	Gado, Jimmy
C_Garba	Garbarino, Caroline
C_Garci	Garcia, Ruben
C_Gelma	Gelman, Robert
C_Genov	Genovese, Marylyn
C_Goite	Goitein, Ernest
C_Goldf	Goldfein, Kathleen
C_Goodm	Goodman, Rebecca
C_Grave	Graves, Ben
C_GreenD	Greene, David
C_GreenK	Greene, Katherine
C_GrinnJ	Grinnell, Jim
C_Hall	Hall, Diana
C_Hamil	Hamilton-Lam, Kimberly
C_Hanke	Hankermeyer, Carol
C_Hasso	Hasson, Tomer
C_Helld	Helldoevker, Alex
C_HerroK	Herron, Kristin

**TABLE 14.2-13 (Continued)
SUBMITTALS CONTAINING COMMENTS ON
WATER DEMAND PROJECTIONS, CONSERVATION, AND RECYCLING
ADDRESSED IN THIS MASTER RESPONSE**

Comment Letter ID	Name of Commenter
Citizens (cont.)	
C_Hsiun	Hsiung, Pei-Lin
C_Ikemo	Ikemoto, Kile
C_Isaac	Isaac, Marian
C_JohnsM	Johnson, Mitchell
C_JohnSie	Johnson, Sieglinde
C_Joye	Joye, Lindsay and Ken
C_Kahn	Kahn, Mike
C_Kalin	Kaliner-MacKellen, Gwynn
C_Keebr	Keebra, Suzanne
C_Kim	Kim, Michelle
C_KingC	King, Carl
C_KingK	King, Kenneth
C_Lee	Lee, Aldora
C_Leet	Leet, Ben
C_Lewin	Lewin, Linda
C_Lim	Kingman, Lim
C_Look	Look, Carissa
C_LoVuo	LoVuolo-Bhushan, Judith
C_Lowry	Lowry, Janet
C_Lubin	Lubin, Sheri
C_Madou	Madou, Ramses
C_Magol	Magol, Nick
C_MartiM	Martin, Michael
C_Marcu	Marcus, Mary Jane
C_Margo	Margolies, Elliot
C_Marsh	Marshall, James
C_MartiM	Martin, Michael
C_MartiS	Martinez, Sofia
C_McCle	McClelland, Jonathan
C_McCol	McCollom, Karl
C_McCon	McConnell, Mike
C_McKee	McKee, Julie
C_Means1, C_Means2	Means, Robert
C_Melna	Melnarik, Chrstina and Chet
C_Menuz	Menuz, Karen

TABLE 14.2-13 (Continued)
SUBMITTALS CONTAINING COMMENTS ON
WATER DEMAND PROJECTIONS, CONSERVATION, AND RECYCLING
ADDRESSED IN THIS MASTER RESPONSE

Comment Letter ID	Name of Commenter
Citizens (cont.)	
C_Merlo	Merlo, Steven
C_Mijac	Mijac, Ivo
C_Mille	Millette, Eric
C_MindeN	Mindelzun, Naomi
C_MindeR	Mindelzun, Robert
C_Nore	Nore, Erna
C_Noren1	William, Noren
C_Okuzu	Okuzumi, Margaret
C_Oneil	O'Neill, Kay
C_Pagli	Pagliarulo, Anne
C_Parke	Parkes, Doug
C_Perl	Perl, Kathy
C_Picku	Pickup, Ron
C_Poult	Poulton, J.C.
C_Raffa	Raffaeli, Paul
C_Raube	Raube, David
C_Reedy	Reedy, Mark
C_Reich	Reichle, Stefani
C_Richa	Richardson, Matthew
C_Ross	Ross, Jim
C_Schri	Schriebman, Judy
C_Schul	Schuler, Urs
C_Shea	Shea, Kelly
C_SmithE	Smith, Evan Winslow
C_Sprin	Spring, Cindy
C_Stein	Steinhart, Peter
C_Sturt	Sturtevant, Jon
C_Sugar	Sugars, Marc
C_TayloS	Taylor, Scott
C_Teves	Teves, M.
C_Thaga	Thagard, Betsy
C_Thoma	Thomas, Dennis
C_Tubma	Tubman, Marianna
C_Tucke	Tucker, Kristen
C_Unreadable1	Unreadable commenter name

**TABLE 14.2-13 (Continued)
SUBMITTALS CONTAINING COMMENTS ON
WATER DEMAND PROJECTIONS, CONSERVATION, AND RECYCLING
ADDRESSED IN THIS MASTER RESPONSE**

Comment Letter ID	Name of Commenter
Citizens (cont.)	
C_Unreadable3	Unreadable commenter name
C_Unreadable4	Unreadable commenter name
C_Urdan	Urdan, Matthew
C_VermeJ	Vermeys, Jim
C_Vrana	Vrana, Leo
C_Walke	Walker, Patricia
C_Walls	Wallstrom, Pete
C_Weiss	Weiss, Richard
C_Willi	Williams, Doris
C_Zimme	Zimmerman, Benita

14.3 Master Response on Proposed Dry-Year Water Transfer

14.3.1 Introduction

Overview

This master response addresses questions about the proposed dry-year water transfer included as part of the WSIP's water supply option. Commenters raised questions regarding the feasibility of the proposed transfer; whether the Turlock Irrigation District (TID) and/or the Modesto Irrigation District (MID) have agreed to such a transfer; and the validity of evaluating the proposed transfer when no official agreement among the agencies has been made. This master response is organized by the following subtopics:

14.3.2 Description of Dry-Year Water Transfer Assumptions Analyzed in the PEIR
14.3.3 CEQA Review of the Proposed Dry-Year Transfer

Commenters also raised questions about proposed Mitigation Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water, which would lessen the environmental impacts of the dry-weather transfer on the lower Tuolumne River, downstream of La Grange Dam. Comments on Mitigation Measure 5.3.6-4a are addressed in **Section 14.7, Master Response on Lower Tuolumne River Issues**, and comments on the water transfer of conserved water included as part of the Modified WSIP Alternative are addressed in **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14).

Commenters

Commenters that addressed this topic include:

Federal Agencies

- None

State Agencies

- None

Local and Regional Agencies

- Bay Area Water Supply and Conservation Agency – L_BAWSCA1
- City of Palo Alto – L_PaloAlto
- Modesto Irrigation District – L_MID
- Modesto Irrigation District and Turlock Irrigation District – L_MIDTID1
- Tuolumne Utilities District – L_TUD1 and L_TUD3

Groups

- Citizens Advisory Committee to SFPUC – SI_CAC2
- California Native Plant Society, East Bay Chapter _ SI_CNPS-EB2
- Restore Hetch Hetchy – SI_RHH1
- Tuolumne River Trust/Clean Water Action/Sierra Club, San Francisco Bay Chapter – SI_TRT-CWA-SierraC
- Tuolumne River Trust –SI_TRT8, SI_TRT10

Citizens

- Clark, Anne & Katherine Howard – C_Clark1
- Day, Joseph – C_DayJ

PEIR Section Reference

The Draft PEIR describes the dry-year water transfer in Vol. 1, Chapter 3, Section 3.6.2, pp. 3-36 to 3-39. Because the dry-year transfer is an integral part of the proposed WSIP water supply and system operations, it was included in the modeling for the future with-WSIP condition. The impacts of the WSIP water supply and system operations on water resources in the Tuolumne River watershed are described in Vol. 3, Chapter 5, Section 5.3.1, pp. 5.3.1-1 to 5.3.1-39, and the impact analysis includes the effects of the dry-year water transfer. Modeling data for the future with-WSIP condition used in the Draft PEIR are presented in Vol. 5, Appendices H1 and H2, and results of the updated modeling conducted after publication of the Draft PEIR and used in the refined analyses provided in the Comments and Responses document are presented in Vol. 8, Appendix O. All model results include the effects of the dry-year transfer as part of the proposed program.

14.3.2 Description of Dry-Year Water Transfer Assumptions Analyzed in the PEIR

Comment Summary

This section of this master response responds to all or part of the following comments:

L_BAWSCA1-44	L_MIDTID1-23	SI_RHH1-07
L_BAWSCA1-46	L_TUD1-09	SI_TRT8-07
L_BAWSCA1-47	L_TUD3-03	SI_TRT10-02
L_PaloAlto-07	SI_CAC2-01	SI_TRT-CWA-SierraC-68
L_MIDTID1-05	SI_CAC2-04	SI_TRT-CWA-SierraC-178
L_MIDTID1-06	SI_CAC2-08	C_Clark1-05
L_MIDTID1-15	SI_CNPS-EB2-05	C_DayJ-01

Summary of Issues Raised by Commenters

- There is no formal agreement on a dry-year transfer with TID and/or MID.

- The dry-year transfer may not be feasible because no agreement for such a transfer has been executed.
- The details of the proposed dry-year transfer should be fully described.

Response

The City and County of San Francisco (CCSF), TID, and MID hold rights to Tuolumne River water. TID and MID are senior to the CCSF for some of their direct and storage water rights. The Raker Act granted rights-of-way to the CCSF to construct the Hetch Hetchy Project on federal lands provided certain conditions were met, including recognition of TID's and MID's senior water rights (Vol. 1, Chapter 2, pp. 2-33 and 2-34). To meet these conditions, the CCSF is required at certain times to release certain flows from its reservoirs in the upper Tuolumne River watershed for use by TID and MID.

The CCSF's reservoirs in the upper Tuolumne River watersheds are not sized to capture the CCSF's full entitlement of Tuolumne River water. When the Don Pedro Project was built in the early 1970s, the CCSF contributed to the project's cost to receive the right to "prepay" TID and MID for water the CCSF would otherwise have to release from its upstream reservoirs to meet its Raker Act obligations. The water bank acts as "virtual storage" that allows the CCSF to use a greater portion of the Tuolumne River water to which it is entitled. All water stored in Don Pedro Reservoir belongs to TID and MID, and the CCSF cannot divert water directly from the reservoir. The Don Pedro Reservoir water bank is described further in the Draft PEIR (Vol. 1, Chapter 2, pp. 2-37 to 2-39).

When inflow to Don Pedro Reservoir exceeds the TID's and MID's Raker Act entitlements and there is space available in the water bank, the excess water is credited to the CCSF's water bank account. When the CCSF would otherwise have to release water from its reservoirs in the upper Tuolumne River watershed to fulfill its Raker Act obligations to TID and MID, the CCSF's water bank account in Don Pedro Reservoir is debited so that TID and MID receive their full entitlement of Tuolumne River water. This water banking arrangement enables the CCSF to divert and store more water in Hetch Hetchy Reservoir than it otherwise would, preserving the water for use in the Bay Area.

As described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-33 to 3-39), the SFPUC's existing water supply sources are insufficient to satisfy the WSIP water supply goal of no greater than 20 percent systemwide rationing during droughts under current (2005) demand (purchase requests). This shortage will become more severe by 2030 with the projected increase in purchase requests. Under the WSIP, the SFPUC would establish supplemental dry-year water sources, one of which would be a transfer of water from TID and MID. Although the SFPUC would only need the dry-year transfer fairly infrequently, the transfer would need to occur administratively every year because at the beginning of a year it would not be possible to know when hydrologic circumstances would make a transfer necessary. The proposed dry-year water transfer under the WSIP would occur as follows. Each year TID and MID would transfer ownership of a block of water in Don Pedro Reservoir to the SFPUC. In many years, the SFPUC would be able to meet its customers' needs without using the transferred water, and ownership of the water would likely revert to TID and MID. Occasionally, the SFPUC would need the transferred water, which it would secure by decreasing releases from its reservoirs in the upper Tuolumne River watershed and using the block of water in Don Pedro Reservoir to meet its Raker Act obligations to TID and MID. This would enable the SFPUC to increase its diversions from Hetch Hetchy Reservoir during droughts, and, in combination with the Westside Basin conjunctive-use program, to meet customer purchase requests while limiting rationing to 20 percent systemwide, thereby achieving the WSIP level of service objective for deliveries during droughts.

The Hetch Hetchy/Local Simulation Model was used to estimate the size of the transfer needed to limit rationing to 20 percent systemwide during droughts. In the Draft PEIR, the size of the necessary transfer was estimated to be 25,765 acre-feet per year (23 million gallons per day) averaged over the 8.5-year design drought (Vol. 1, Chapter 3, p. 3-36). As described in Section 13.3 (Vol. 7, Chapter 13), the input assumptions for the model were improved and updated after publication of the Draft PEIR. Using the improved and updated input assumptions, the size of the necessary transfer was estimated to be 29,350 acre-feet per year (26 million gallons per day) averaged over the 8.5-year design drought. Due to the combination of updated input assumptions to the model, the overall level of diversions from the Tuolumne River remained unchanged, even with the revised size of the dry-year transfer. As discussed in Section 13.3, review of the updated model results confirmed that the change in the size of the transfer would not have any direct effect in terms of the environmental consequences of the WSIP. The original modeling for the Draft PEIR and the updated modeling produced similar results, and the PEIR conclusions with respect to the significance of the WSIP's environmental impacts remain valid.

Although the dry-year transfer described above is proposed as part of the WSIP, no agreement to make such a transfer has been executed among the CCSF, TID, and MID. In fact, as explained below in Section 14.3.3, it would be improper to enter into such an agreement in the absence of completed CEQA review.

The CCSF has cooperatively worked with TID and MID for many years in analyzing water supply availability from the Tuolumne River watershed, and the SFPUC's studies indicate that there could be water available for a dry-year transfer without a loss of water to these agencies. The CCSF understands that neither TID nor MID have confirmed the availability of water for this transfer or made any commitments to the CCSF for such a transfer. If the San Francisco Planning Commission certifies the Final PEIR and the SFPUC adopts the WSIP, CCSF staff will pursue a formal agreement with TID and MID for the proposed dry-year transfer. Nonetheless, agreements or approvals from TID or MID regarding the proposed water transfer are not required, nor could final agreements be executed, prior to certification of the PEIR and adoption of the WSIP (or any alternative or variation of it). The absence of such agreements does not affect the validity of the environmental analysis presented in the Draft PEIR. Reasonable assumptions were made in the Draft PEIR with respect to the SFPUC's ability to secure a dry-year water transfer from TID and MID, and they provided sufficient information to perform the environmental analysis.

14.3.3 CEQA Review of the Proposed Dry-Year Transfer

Comment Summary

This section of this master response responds to all or part of the following comments:

L_MID-02	L_MIDTID1-28	C_Clark1-05
L_MIDTID1-05	L_TUD1-09	
L_MIDTID1-23	SI_TRT-CWA-SierraC-58	

Summary of Issues Raised by Commenters

- The dry-year transfer is insufficiently defined for CEQA purposes.
- The PEIR develops and supports alternatives and mitigation measures that are based on the assumed success of these transfer agreements.
- The proposed dry-year transfer would result in an additional drawdown of water from the Tuolumne River.

Response

As described in the Draft PEIR (Vol. 1, Chapter 3, p. 3-36), the dry-year transfer as proposed would be made from TID and MID to the SFPUC. In the Draft PEIR analysis, it was assumed that water owned by TID and MID and stored in Don Pedro Reservoir would be the source of the dry-year transfer. This assumption resulted in the greatest reduction in storage in Don Pedro Reservoir and the greatest impacts on the Tuolumne River, thereby depicting a worst-case scenario for CEQA purposes. As such, the impact analysis of the dry-year transfer presented in the Draft PEIR is conservative and adequate for CEQA review of the WSIP.

It is possible that TID and MID would provide some or all of the water for the dry-year transfer by conserving water or otherwise changing water management practices within their service areas. If this were the case, the environmental impacts on the Tuolumne River would be less than those described in the Draft PEIR. (The conserved water transfer is included in Mitigation Measure 5.3.6-4a and the Modified WSIP Alternative; for more information, refer to **Section 14.7, Master Response on Lower Tuolumne River Issues**, and **Section 14.10, Master Response on Modified WSIP Alternative**, respectively.)

The CCSF acknowledges that no agreement is in place for a dry-year transfer of water from TID and MID. For further information, please refer to Section 14.3.2, above.

It is appropriate to analyze the environmental effects of the proposed dry-year transfer before a formal agreement is made because neither TID and MID nor the CCSF can enter into or approve such an agreement before CEQA review is completed. Because the details of the dry-year water transfer were not known, the Draft PEIR evaluated a worst-case scenario of water supply and system operations impacts on the lower Tuolumne River, as noted above.

If an agreement for a dry-year water transfer was to be made among TID and MID and the SFPUC, as described in the Draft PEIR, additional project-level CEQA review would not be required. The transferring agencies, TID and MID, would serve as responsible agencies for CEQA compliance and could use the PEIR to make their own findings as required by CEQA Guidelines Section 15096. If the characteristics of the dry-year transfer were not as described and analyzed in the Draft PEIR, then additional CEQA review would likely be required. TID and/or MID would be the lead agency for the subsequent, project-specific CEQA review. However, the environmental impacts on the Tuolumne River and associated resources of any dry-year transfer considered as an alternative to the transfer described in the Draft PEIR would likely be less than those of the transfer included in the WSIP and analyzed in the Draft PEIR.

14.4 Master Response on PEIR Appropriate Level of Analysis

14.4.1 Introduction

Overview

This master response addresses the issues commenters raised about the impact analysis and implementation of mitigation measures related to individual facility improvement projects versus the overall program under the WSIP. In particular, numerous comments questioned the level and basis of analysis used for potential impacts on biological resources. Commenters also specifically requested changes to the project descriptions of facility improvement projects and coordination with the SFPUC during project planning and development of mitigation measures. This master response is organized by the following subtopics:

14.4.2 Intent of Programmatic Impact Analysis
14.4.3 SFPUC Coordination with Other Agencies
14.4.4 Biological Resources Level of Analysis

Commenters

Commenters that addressed this topic include:

Federal Agencies

- U.S. Fish and Wildlife Service, San Francisco Bay National Wildlife Refuge Complex – F_USFWS
- U.S. Department of the Interior, National Park Service, Golden Gate National Recreation Area – F_NPS-GGNRA

State Agencies

- Department of Transportation – S_Caltrans
- Coastal Conservancy – S_CC
- California Department of Fish and Game – S_CDFG2
- Department of Water Resources – S_DWR

Local and Regional Agencies

- Alameda County Community Development Agency – L_ACCDA
- Alameda County Flood Control and Water Conservation District – L_ACFCWCD
- Alameda County Water District – L_ACWD
- Bay Area Water Supply and Conservation Agency – L_BAWSCA1
- Bay Conservation and Development Commission – L_BCDC
- East Bay Regional Park District – L_EPRPD
- City of Fremont – L_Fremont
- City of Menlo Park – L_Menlo1

- City of Newark – L_Newark
- City of Palo Alto – L_PaloAlto
- San Francisco Bay Trail Project, Association of Bay Area Governments – L_SFBayTrl
- San Francisco City Planning Commission – L_SFCPC5
- San Francisco Landmarks Preservation Advisory Board – L_SFLandmarks
- Tuolumne County – L_Tuol2

Groups

- Alameda Creek Alliance – SI_ACA1
- California Trout – SI_Caltrout
- Center for Resource Solutions – SI_CRS
- Citizens Advisory Committee to SFPUC – SI_CAC2
- California Native Plant Society, East Bay Chapter – SI_CNPS-EB1
- California Native Pant Society, Santa Clara Valley Chapter – SI_CNPS-SCV1, SI_CNPS-SCV2
- Ecology Center – SI_EcoCtr
- Greenpeace – SI_GreenP
- Klamath-Siskyou Wildlands Center – SI_KSWC
- Menlo Business Park LLC – SI_MenloBP
- Republicans for Environmental Protection – SI_CAREP
- Santa Clara County Creeks Coalition – SI_SCCCC
- Sierra Club – SI_SierraC1, SI_SierraC6, SI_SierraC7
- Tuolumne River Trust – SI_TRT2, SI_TRT3, SI-TRT6, SI_TRT7, SI_TRT8, SI_TRT10

Citizens

- Berkowitz, Allan – C_Berko
- Bresolin, Mark – C_Breso
- Clark, Ann & Katherine Howard – C_Clark1
- Coleman, Caroline – C_Colem2
- Elbizri, Elanie – C_Elbiz
- Garbarino, Caroline – C_Garba
- Genovese, Marilyn – C_Genov
- Goldfein, Kathleen – C_Goldf
- Graves, Ben – C_Grave
- Joyce, Lindsay and Ken – C_Joye
- Martin, Michael – C_MartiM
- McCollom – C_McCol
- Mijac, Ivo – C_Mijac
- Noren, William – C_Noren1
- Okuzumi, Margaret – C_Okuzu
- Parkes, Doug – C_Parke
- Raffaeli, Paul – C_Raffa
- Ross, Jim – C_Ross
- Spring, Cindy – C_Spri
- Steinhart, Peter – C_Stein
- Sugars, Marc – C_Sugar
- Urdan, Matthew – C_Urdan
- Vermeys, Jim – C_VermeJ
- Weiss, Richard – C_Weiss
- Williams, Doris – C_Willi

PEIR Section Reference

The Draft PEIR addresses this topic area in the following locations: Vol. 1, Summary, Section S.2, pp. S-10 to S-47; Vol. 1, Chapter 3, Sections 3.8 through 3.13, pp. 3-48 to 3-88; Vol. 2, Chapter 4 (entire chapter); and Vol. 4, Chapter 6, Sections 6.2 and 6.3, pp. 6-4 to 6-47 and pp. 6-65 to 6-170.

14.4.2 Intent of Programmatic Impact Analysis

Comment Summary

This section of this master response responds to all or part of the following comments:

F_NPS-GGNRA-03	L_ACWD-06	L_Fremont-04	SI_CNPS-EB1-09
F_USFWS-01	L_BCDC-01	L_Fremont-05	SI_CNPS-SCV1-01
F_USFWS-02	L_BCDC-02	L_Menlo1-02	SI_CNPS-SCV1-06
F_USFWS-03	L_EBRPD-03	L_Menlo1-06	SI_CNPS-SCV1-07
F_USFWS-04	L_EBRPD-04	L_Menlo1-07	SI_CNPS-SCV2-01
F_USFWS-05	L_EBRPD-05	L_Newark-01	SI_MenloBP-02
S_CC-02	L_EBRPD-08	L_PaloAlto-12	SI_MenloBP-03
S_CC-03	L_EBRPD-09	L_PaloAlto-13	SI_MenloBP-04
S_CC-04	L_EBRPD-11	L_SFBayTrl-05	SI_MenloBP-05
S_CDFG2-01	L_EBRPD-21	L_SFLandmarks-02	SI_MenloBP-07
S_DWR-01	L_EBRPD-22	L_SFLandmarks-07	SI_TRT-CWA-SierraC-30
L_ACCDA-03	L_EBRPD-24	SI_ACA1-23	
L_ACWD-05	L_Fremont-01	SI_CAC2-05	

Summary of Issues Raised by Commenters

- More detailed design information needed on specific WSIP projects along with more detailed project locations in order to better determine jurisdiction, encroachments, etc.
- More detailed impact assessment needed under certain environmental resource areas for specific projects.
- The adequacy of program mitigation measures for specific projects and specific situations as well as for the WSIP as a whole is questionable.

Response

Section 15168 of the CEQA Guidelines allows a Program EIR to be prepared on a series of actions that can be characterized as one project for the purpose of analysis under CEQA. A Program EIR enables a lead agency to examine the overall effects of a proposed course of action and take steps to avoid unnecessary adverse environmental effects by considering the series of actions, or project, as a whole. Chapter 4 (Vol. 2) of the Draft PEIR considers the WSIP facility improvement projects as series of related actions and identifies general, program-level types of impacts that could occur under the individual projects; in addition, Section 4.16 in Chapter 4 considers all of the WSIP projects as a whole and evaluates the overall impacts that could result from construction of all projects combined. Several discussions presented in the Draft PEIR explain the role of this PEIR as it relates to the individual WSIP facility projects; these discussions are summarized below:

- Section 1.2 (Vol. 1, Chapter 1, pp. 1-1 to 1-3) states that the PEIR provides a foundation for any necessary future environmental review documents that focus on the individual WSIP projects. As this section indicates, Chapter 4 of the Draft PEIR evaluates the major environmental effects of implementing the proposed facility improvement projects from a broad, *program-level* perspective, framing the nature and magnitude of the expected environmental impacts and identifying *program-level* mitigation measures to address these impacts. While the PEIR provides *project-level* CEQA analysis of certain combined program impacts that apply to all projects proposed under the WSIP (e.g., facility-related collective/cumulative impacts, water supply effects, regional influences, secondary effects of growth, and other factors that apply to the program as a whole), Section 1.2 indicates that *project-level* CEQA review will be conducted separately for the individual WSIP facility improvement projects when more detailed design, construction, and operation details become available for each project. In general, project-specific EIRs or negative declarations for site-specific activities will be completed after the Final PEIR is certified, as the act of certification carries with it the lead agency decision-making body's conclusion that the document fully satisfies the requirements of CEQA.

- Section 3.8 (Vol. 1, Chapter 3, pp. 3-48 to 3-73, including Tables 3.10, 3.11, and 3.12) and Appendix C (Vol. 5, pp. C-1 to C-26) present the facility descriptions, locations, and schedules that served as the basis for the program-level impact evaluation contained in Chapter 4 of the Draft PEIR (Vol. 2). Section 3.8 states that the purpose of the Chapter 4 analysis is to provide a comprehensive environmental review of the overall range of effects resulting from the WSIP facility improvement projects as a whole as well as to identify programmatic mitigation measures. As Section 3.8 indicates, once additional project details and site-specific information have been developed, it is possible that the individual project effects identified in the PEIR might not occur or that additional project effects not identified in the PEIR could in fact occur. Such changes in project details would be addressed during the project-specific environmental reviews.

- Section 4.1 (Vol. 2, Chapter 4, p. 4.1-1) notes that the Chapter 4 impact analysis is based on preliminary information about the individual projects that would be implemented following approval of the WSIP, and that the level of detail of the information presented is appropriate for the programmatic analysis of these projects. The Draft PEIR (p. 4.1-2) notes that many of the WSIP projects have been developed at the conceptual level only, and that only some projects have more detailed siting and design information. Accordingly, the Chapter 4 program-level evaluation addresses all projects from a broad, overview perspective. Section 4.1 states that all of the WSIP projects will be examined in more detail at the project level, and that if individual WSIP projects have additional significant impacts that were not addressed in the PEIR, the San Francisco Planning Department will prepare EIRs or negative declarations to examine the site-specific and project-specific effects of the individual projects. More detailed information about the individual projects (i.e., construction plans as well as siting and operational details) will be considered in the project-level environmental documents.

- Section 4.1 (p. 4.1-2) also states that Chapter 6 (Vol. 4) of the Draft PEIR identifies the appropriate program-level mitigation measures in general terms, and that these measures will be refined to specifically apply to each project as the projects are further refined.

Commenters requested more detailed information about specific WSIP project locations, boundaries, and design in order to define agency jurisdiction, determine ordinance compliance and general plan conformity, identify encroachments on other agencies' properties or facilities, or determine effects on existing infrastructure that crosses project facilities. Commenters also requested clarification regarding the disposition of certain existing facilities to be decommissioned after project completion, as well as more detailed impact assessment of specific projects on topics such as: effects on downstream water users in the Alameda Creek watershed due to construction-related dewatering and discharges in the Sunol Valley; site-specific flooding where construction could induce settlement of levees along the San Francisco Bay shoreline; specific historical resources that could be affected by the WSIP; construction-related traffic, access, and parking impacts on specific uses (including those with easements on SFPUC land); construction work hours, haul truck restrictions, and vibration monitoring; potential disruption of service during relocation of utilities that cross project facilities; and compliance with local noise ordinances.

However, as indicated in the above-listed sections of the Draft PEIR, such detailed project information was not available for all WSIP projects during preparation of the Draft PEIR, nor was this detailed information necessary to define the overall programmatic effects of the individual facility improvement projects. Therefore, a detailed impact analysis is more appropriately presented in the project-level CEQA documentation for each WSIP facility project when such information becomes available. The primary purpose of the PEIR is to evaluate the combined or collective impacts resulting from all of the WSIP projects—that is, the impacts of the WSIP as a whole (Vol. 2, Chapter 4, p. 4.16-1)—which will allow decision-makers to make an informed decision on the proposed program based its overall environmental effects. The PEIR also helps to define the scope of project-level impact evaluations by providing an overview of the broad impact categories that could be associated with implementation of the WSIP, by identifying the impact categories that could apply to each WSIP facility project, and by formulating program-level mitigation measures that could be translated into more specific measures as individual projects are proposed and analyzed. As part of the project-level CEQA review for each project, the impact significance determinations identified in the PEIR will be reevaluated. The programmatic mitigation measures will also be reevaluated and, if applicable, will be confirmed, refined, or replaced with an equivalent measure.

It should be noted that the PEIR significance determinations err on the conservative side, since the impact analyses at the program level must generalize the types and classes of impacts as well as the feasibility of mitigation measures to reduce impacts to a less-than-significant level. Some commenters recommended additional mitigation measures or clarification of program measures to: reduce impacts identified by the commenter; include a specific jurisdiction's standard conditions for construction; provide more protection from construction noise and vibration; minimize public inconvenience and ensure public safety; and ensure traffic and emergency access and parking are maintained for businesses affected by project facility construction. However, it would be premature to provide more detailed mitigation measures for project-specific impacts without more detailed impact analyses to justify the added requirements. These commenters' concerns will be addressed when project-level environmental documents are prepared for individual projects, at which time the project-level reviews may find that the commenters' recommended measures are appropriate mitigation.

As suggested above, program-level mitigation measures included in the PEIR are intended to be general in nature, commensurate with the program-level impact analysis. The SFPUC standard construction measures that will be applied to all proposed WSIP facility projects are listed in Section 6.2 of the Draft PEIR (Vol. 4, Chapter 6, pp. 6-4 to 6-6), and these measures will reduce some identified program-level impacts. Program-level mitigation measures are listed in Section 6.3 (Vol. 4, Chapter 6, pp. 6-7 to 6-47), and these measures will reduce many of the program-level impacts identified in Chapter 4 to a less-than-significant level. Additional program-level mitigation measures that address the WSIP's combined or collective impacts are also included in Section 6.3 (i.e., the measures numbered 4.16-x). The summary tables in Section 6.6 (Vol. 4, Chapter 6, Tables 6.3 to 6.9, pp. 6-64 to 6-170) list all of the program-level impacts and mitigation measures that would apply to each WSIP facility project.

14.4.3 SFPUC Coordination with Other Agencies

Comment Summary

This section of this master response responds to all or part of the following comments:

F_NPS-GGNRA-02	L_ACFCWCD-10	L_EBRPD-04	L_Menlo1-02
F_USFWS-03	L_ACWD-07	L_EBRPD-15	L_Menlo1-06
F_USFWS-05	L_ACWD-08	L_EBRPD-20	L_PaloAlto-12
S_Caltrans-01	L_ACWD-12	L_EBRPD-23	L_SFBayTrl-05
S_CC-01	L_ACWD-21	L_Fremont-01	SI_MenloBP-04
S_CC-03	L_ACWD-22	L_Fremont-03	SI_TRT-CWA-SierraC-172
S_CC-04	L_ACWD-25	L_Fremont-04	
S_CDFG2-01	L_CoastsideCWD-05	L_Fremont-05	

Summary of Issues Raised by Commenters

- Numerous agencies requested that the SFPUC coordinate with them during project planning and development of mitigation measures.

Response

As noted in Draft PEIR Section 3.13 (Vol. 1, Chapter 3, p. 3-86), each of the individual WSIP facility improvement projects will undergo project-level CEQA review, and each project's environmental documentation will provide more detailed and up-to-date information on needed approvals by local, state, and federal agencies. Section 3.13 also references Table C.6 (Vol. 5, Appendix C, p. C-26), which lists specific permits and approvals that could be required for individual projects. As shown below, this table is revised and expanded to include the commenting agencies that have requested consultation during the planning and design phases of certain WSIP projects. These agencies are listed below, along with a summary of the requested consultation or other information that these agencies indicate should be considered as part of project-level review.

- *U.S. Department of the Interior, National Park Service, Golden Gate National Recreation Area*. This agency requests consultation during project development and advance notification of meetings and would like to assist in creating mitigations for potential impacts for the following projects: Crystal Springs/San Andreas Transmission Upgrade (PN-2), HTWTP Long-Term Improvements (PN-3), Lower Crystal Springs Dam Improvements (PN-4), and Pulgas Balancing Reservoir Rehabilitation (PN-5).

- *U.S. Department of the Interior, Fish and Wildlife Service (USFWS) and Coastal Conservancy*. The USFWS and the Coastal Conservancy are interested in acquiring clean dredge material generated by the Bay Division Pipeline Reliability Upgrade project (BD-1) for use in wetland

TABLE 14.4-1
(REVISED DRAFT PEIR TABLE C.6)
PERMITS, APPROVALS, AND EARLY COORDINATION WITH OTHER AGENCIES THAT MAY BE REQUIRED[a]

Project Number	Project Name	ACOE Section 10	Individual or ACOE NWP Section 404	National Wildlife Refuge	SHPO Section 106	NMFS Section 7 / USFWS Section 7	USFWS FWCA	National Park Service, GGNRA[b]	State Lands Commission Lease/ Permit[c]	Caltrans[d]	DWR, Central Valley Flood Protection Board	DWR, Division of Safety of Dams	CDFG 1602, 2080.1, 2081, or MOA	DHS (Public Water System)	SWRCB (SWPPP)	RWQCB 401	RWQCB Discharge/ Dewatering	BAAQMD	BCDC	Local CUPA/ HazMat Business Plan
SJ-1	Advanced Disinfection		Possible		Possible	Possible							X	X	X	Possible		~~AQMD permit~~ TBD		
SJ-2	Lawrence Livermore Supply Improvements		X (TS site only)		Possible	X (TS site only)							X (TS site only)	X	X	X (TS site only)				X
SJ-3	San Joaquin Pipeline System		X	Possible	X	X			X	Possible	Possible		X		X	X				X
SJ-4	Rehabilitation of Existing San Joaquin Pipelines	Possible	Possible	Possible	Possible	Possible				Possible			Possible							
SJ-5	Tesla Portal Disinfection Station												X	X	X					X
SV-1	Alameda Creek Fishery Enhancement		TBD		TBD	TBD				Possible			X			TBD				
SV-2	Calaveras Dam Replacement		X		X	X	X					X	X		X	X	X			X
SV-3	Additional 40-mgd Treated Water Supply													X	X					X
SV-4	New Irvington Tunnel		X		X	X				Possible			X		X	X	X			X
SV-5	SVWTP – Treated Water Reservoirs													X	X					X
SV-6	San Antonio Backup Pipeline																			
BD-1	Bay Division Pipeline Reliability Upgrade	Possible	X	Possible	X	X	X[e]		X	Possible			X		X	X	X		Possible	X
BD-2	BDPL Nos. 3 and 4 Crossovers		X			X	X			Possible			X		X	X	X			
BD-3	Seismic Upgrade of BDPLs Nos. 3 and 4 at Hayward Fault	TBD	TBD		TBD	TBD	TBD		TBD	Possible			TBD	TBD	TBD	TBD	TBD	TBD		
PN-1	Baden and San Pedro Valve Lot Improvements									Possible				X			X			
PN-2	Crystal Springs/San Andreas Transmission Upgrade	X	X		X	X		EC[b]		Possible			X	X	X	X	X			X
PN-3	HTWTP Long-Term Improvements							EC[b]		Possible				X	X					
PN-4	Lower Crystal Springs Dam Improvements	X	X		X	X	X	EC[b]		Possible		X	X		X	X	X			X
PN-5	Pulgas Balancing Reservoir Rehabilitation							EC[b]					X							
SF-1	San Andreas Pipeline No. 3 Installation									Possible					X	X	X			
SF-2	Groundwater Projects (Local and Regional)									Possible				X				X		
SF-3	Recycled Water Projects									Possible				X		X				

NOTES: ACOE = U.S. Army Corps of Engineers; BAAQMD = Bay Area Air Quality Management District; BCDC = San Francisco Bay Conservation and Development Commission; Caltrans = California Department of Fish and Game Transportation; CDFG = California Department of Fish and Game; CUPA = Certified Unified Program Agency; DHS = California Department of Health Services; DWR = California Department of Water Resources; EC = Early Coordination Requested; (FWCA = Fish and Wildlife Coordination Act); GGNRA = Golden Gate National Recreation Area; MOA = Memorandum of Agreement; NMFS = U.S. National Marine Fisheries Service; (NWP = National Permit for Stream and Wetland Restoration Activities); RWQCB = Regional Water Quality Control Board; SHPO = State Historic Preservation Office; SWPPP = stormwater pollution prevention plan; SWRCB = State Water Resources Control Board; TBD = To Be Determined; TS = Thomas Shaft; USFWS = U.S. Fish and Wildlife Service.

[a] Additional approvals may be identified for WSIP facility projects when separate, project-level CEQA analysis is completed.

[b] The GGNRA requests consultation during project development and advance notification of meetings and would like to assist in creating mitigations for potential impacts from these projects.

[c] Section 6327 of the Public Resources Code provides that if a facility is for the "procurement of fresh-water from and construction of drainage facilities into navigable rivers, streams, lakes and bays," and if the applicant obtains a permit from the local reclamation district, State Reclamation Board, the U.S. Army Corps of Engineers, or the Department of Water Resources, then an application shall not be required by the State Lands Commission. Since the proposed program appears to fall within this section, a lease from the Commission would not be required, provided one of the above-listed permits is obtained.

[d] As part of project-level CEQA review, Caltrans requests that each facility improvement project be reviewed to determine if it encroaches on any state facilities. Any encroachment on Caltrans right-of-way would require an encroachment permit, and CEQA-related environmental studies may be necessary (including studies related to biological resources, cultural resources, and hazardous materials). A qualified professional must conduct these studies to satisfy Caltrans's environmental review policies. Ground-disturbing activities on the site prior to completing and/or approving the required environmental documents could affect Caltrans' ability to issue a permit for the project.

[e] The USFWS and the Coastal Conservancy are interested in acquiring clean dredge material generated by this project for use in wetland restoration associated with the South Bay Salt Pond Restoration Project, particularly within the Don Edwards San Francisco Bay National Wildlife Refuge (contact Clyde Morris, Manager, 510-792-0222, ext. 25). The USFWS recommends that the SFPUC coordinate with the USFWS's Division of Endangered Species at the Sacramento Fish and Wildlife Office (916-414-6600).

TABLE 14.4-1 (Continued)
(REVISED DRAFT PEIR TABLE C.6)
PERMITS, APPROVALS, AND EARLY COORDINATION WITH OTHER AGENCIES THAT MAY BE REQUIRED

Project Number	Project Name	San Mateo County Transit District	Coastal Conservancy[e]	Association of Bay Area Governments	Local Flood Control Districts[f]	Alameda County Flood Control and Water Conservation District	Alameda County Water District[g]	East Bay Regional Park District[h]	City of Fremont[i]	City of Menlo Park	City of Palo Alto	Coastside County Water District
SJ-1	Advanced Disinfection											
SJ-2	Lawrence Livermore Supply Improvements											
SJ-3	San Joaquin Pipeline System				Possible							
SJ-4	Rehabilitation of Existing San Joaquin Pipelines				Possible							
SJ-5	Tesla Portal Disinfection Station											
SV-1	Alameda Creek Fishery Enhancement				Possible		EC	EC				
SV-2	Calaveras Dam Replacement					EC[j]	EC	EC	EC			
SV-3	Additional 40-mgd Treated Water Supply						EC	EC				
SV-4	New Irvington Tunnel				Possible		EC	EC				
SV-5	SVWTP – Treated Water Reservoirs						EC	EC				
SV-6	San Antonio Backup Pipeline				Possible		EC	EC				
BD-1	Bay Division Pipeline Reliability Upgrade	EC[k]	EC[l]	EC[l]	Possible		EC	EC	EC	EC[m]		
BD-2	BDPL Nos. 3 and 4 Crossovers				Possible						EC[n]	
BD-3	Seismic Upgrade of BDPLs Nos. 3 and 4 at Hayward Fault				Possible				EC			
PN-1	Baden and San Pedro Valve Lot Improvements											
PN-2	Crystal Springs/San Andreas Transmission Upgrade				Possible							
PN-3	HTWTP Long-Term Improvements											
PN-4	Lower Crystal Springs Dam Improvements											EC[o]
PN-5	Pulgas Balancing Reservoir Rehabilitation											
SF-1	San Andreas Pipeline No. 3 Installation				Possible							
SF-2	Groundwater Projects (Local and Regional)				Possible							
SF-3	Recycled Water Projects				Possible							

NOTE: EC = Early Coordination Requested

[f] As part of project-level CEQA review, the Alameda County Flood Control and Water Conservation District requests that each facility improvement project that includes pipelines be reviewed to determine if an encroachment permit is required where the pipelines cross the District's channels and creek inverts.

[g] The ACWD requests that the BD-1 project be coordinated with the ACWD earlier (during project planning and design phases, rather than during the construction phase) to minimize impacts associated with conflicting water facilities and potential impacts on the ACWD's ability to meet customer demands and fire flow requirements. In addition, all Sunol Valley projects (SV-1 through SV-6) will need to take into account potential effects of facility construction on downstream water intakes at ACWD's facilities in the flood control channel. The project-level CEQA review for the SV-2 project will need to consider coordination and notification related to Calaveras Reservoir release protocols that could affect downstream groundwater recharge and the potential for flooding.

[h] As part of project-level CEQA review, each facility improvement project in the Sunol Valley region should be reviewed to determine if it encroaches on EBRPD property. The EBRPD requests coordination of construction mitigation measures for certain WSIP projects in the Sunol Valley to minimize construction impacts on recreational uses and allow coordination of fire suppression planning and response (including review of traffic control plans). As part of the project-level EIR for SV-2, the EBRPD states that the SFPUC needs to coordinate the timing of water releases from Calaveras Dam to maximize benefits to amphibians and anadromous fish species.

[i] The City of Fremont requests consultation (regarding the applicability of encroachment permits, and development and review of traffic control plans) during the planning and design phases of the SV-2, BD-1, and BD-3 projects as well as any other WSIP project that could affect the Fremont transportation network.

[j] As part of the project-level CEQA review, mitigation measures should be developed to establish coordination and notification protocols between the SFPUC and the ACFCWCD regarding Calaveras Reservoir releases that could affect the potential for downstream flooding.

[k] The USFWS requests that the BD-1 project be coordinated with the Transit District's Dumbarton Rail Project to minimize habitat impacts for both projects.

[l] The Coastal Conservancy requests that the SFPUC coordinate with the Coastal Conservancy and Association of Bay Area Government's Bay Trail project (regarding completion of the Bay Trail gap through SFPUC lands).

[m] The City of Menlo Park requests coordination of construction mitigation measures for the BD-1 project to minimize construction impacts (e.g., access and parking) on local residents and businesses, including the Menlo Business Park.

[n] The City of Palo Alto requests early consultation on the BD-2 project.

[o] The Coastside CWD requests consultation during development of the adaptive management program for Crystal Springs Reservoir as part of the operations phase of the PN-4 project.

restoration associated with the South Bay Salt Pond Restoration Project, particularly within the Don Edwards San Francisco Bay National Wildlife Refuge.

The USFWS also recommends that the SFPUC coordinate with the USFWS's Division of Endangered Species at the Sacramento Fish and Wildlife Office.

- *San Mateo County Transit District*. The USFWS requests that the Bay Division Pipeline Reliability Upgrade project (BD-1) be coordinated with the Transit District's Dumbarton Rail Project to minimize habitat impacts for both projects.

- *Coastal Conservancy and Association of Bay Area Governments (ABAG)*. The Coastal Conservancy requests that the SFPUC coordinate with the Conservancy and ABAG's Bay Trail project (regarding completion of the Bay Trail gap through SFPUC lands).

- *California Department of Water Resources (DWR)*. The DWR requests that the San Joaquin Pipeline System project (SJ-3) be reviewed as part of the project-level CEQA review to determine if it encroaches on the State Plan of Flood Control for the Central Valley (Designated Floodway maps at http://recbd.ca.gov).

- *California Department of Transportation (Caltrans)*. Caltrans requests that each facility improvement project be reviewed as part of the project-level CEQA review to determine if it encroaches on any state facilities. It also states that any encroachment on Caltrans right-of-way would require an encroachment permit, and that CEQA-related environmental studies may be necessary (such as studies related to biological resources, cultural resources, and hazardous materials). The agency indicates that a qualified professional must conduct these studies to satisfy Caltrans' environmental review policies, and that ground-disturbing activities on the site prior to completion and/or approval of the required environmental documents could affect Caltrans' ability to issue a permit for the project.

- *Alameda County Flood Control and Water Conservation District (ACFCWCD)*. The ACFCWCD requests that each facility improvement project that includes pipelines be reviewed as part of the project-level CEQA review to determine if an encroachment permit is required where the pipelines cross the District's channels and creek inverts. The ACFCWCD also states that the project-level CEQA review for the Calaveras Dam Replacement project (SV-2) should include mitigation measures establishing coordination and notification protocols between the SFPUC and the ACFCWCD regarding Calaveras Reservoir releases that could affect the potential for downstream flooding.

- *Alameda County Water District (ACWD)*. The ACWD requests that the Bay Division Pipeline Reliability Upgrade project (BD-1) be coordinated with the ACWD earlier (during the project planning and design phases, rather than during the construction phase) to minimize impacts associated with conflicting water facilities and potential impacts on the ACWD's ability to meet customer demand and fire flow requirements. In addition, the ACWD indicates that all Sunol Valley projects (Alameda Creek Fishery Enhancement, SV-1; Calaveras Dam Replacement, SV-2; Additional 40-mgd Treated Water Supply, SV-3; New Irvington Tunnel, SV-4; SVWTP – Treated Water Reservoirs, SV-5; San Antonio Backup Pipeline, SV-6) need to take into account the potential effects of facility construction on downstream water intakes at ACWD facilities in the flood control channel. The ACWD also states that the project-level CEQA review for the Calaveras Dam Replacement project needs to consider coordination and notification protocols related to Calaveras Reservoir releases that could affect downstream groundwater recharge and the potential for flooding.

- *East Bay Regional Park District (EBRPD)*. The EBRPD requests that each facility improvement project in the Sunol Valley Region be reviewed as part of the project-level CEQA review to determine if it encroaches on EBRPD property. The EBRPD also requests coordination of construction mitigation measures for certain WSIP projects in the Sunol Valley to minimize construction impacts on recreational uses and allow coordination of fire suppression planning and response (including review of traffic control plans). The EBRPD states that the SFPUC needs to coordinate the timing of water releases from Calaveras Dam to maximize benefits to amphibians and anadromous fish species. This issue will be addressed further in the project-level EIR for the Calaveras Dam Replacement project (SV-2).

- *City of Fremont*. The City requests consultation (regarding the applicability of encroachment permits, and development and review of traffic control plans) during the planning and design phases of the Bay Division Pipeline Reliability Upgrade (BD-1), New Irvington Tunnel (SV-4), Seismic Upgrade of BDPL Nos. 3 and 4 at Hayward Fault (BD-3), and any other WSIP projects that could affect the Fremont transportation network.

- *City of Menlo Park*. The City requests coordination of construction mitigation measures for the Bay Division Pipeline Reliability Upgrade project (BD-1) to minimize construction impacts (e.g., access and parking) on local residents and businesses, including the Menlo Business Park.

- *City of Palo Alto*. The City requests early consultation on the BDPL Nos. 3 and 4 Crossovers project (BD-2).

- *Coastside County Water District (CWD)*. Coastside CWD requests consultation during development of the adaptive management program for Crystal Springs Reservoir as part of the operations phase of the Lower Crystal Springs Dam Improvements project (PN-4).

The PEIR serves as a guidance document for all subsequent, project-level CEQA review. The Draft PEIR (Vol. 1, Chapter 3, p. 3-86) indicates that each of the individual WSIP facility improvement projects will undergo project-level CEQA review, and that the environmental documents developed through those reviews will identify needed approvals by local, state, and federal agencies for the individual projects. The SFPUC and the San Francisco Planning Department, Major Environmental Analysis Division will review the agencies identified in updated Table C.6 for applicability and will update the list of agencies as necessary at the time of each project-level review.

In response to comments by numerous agencies requesting early consultation, early coordination, or other information, the Draft PEIR (Vol. 1, Chapter 3, p. 3-86, fourth full paragraph) is revised as follows:

> Each of the individual WSIP facility improvement projects will undergo project-level CEQA review, and CEQA documents developed through those reviews will identify needed approvals by local, state, and federal agencies for individual projects. Table C.6 of Appendix C presents the specific permits and approvals that could be required for individual projects as well as the interested agencies that have requested early consultation and coordination with the SFPUC. Several projects are expected to require U.S. Department of the Army permits to comply with the Clean Water Act, which, in turn, will require compliance with the Federal Endangered Species Act, the Clean Water Act Section 401, and the National Historic Preservation Act. Several projects are expected to require Streambed Alteration Agreements from the California Department of Fish and Game and compliance with the California Endangered Species Act. When individual projects undergo CEQA review, the project’s environmental documentation will provide more detailed and up-to-date information on the

required approvals and need for consultation with interested agencies. The approval and adoption of the overall WSIP as a program and policy are distinct actions from the approvals for individual facility improvement projects.

14.4.4 Biological Resources Level of Analysis

Comment Summary

This section of this master response responds to all or part of the following comments:

S_CDFG2-01
L_ACFCWCD-11
L_EBRPD-05
L_Tuol2-03
SI_ACA1-18
SI_Caltrout-01
SI_CAREP-01
SI_CNPS-EB1-08
SI_CNPS-EB1-18
SI_CNPS-EB1-24
SI_CNPS-EB1-25
SI_CNPS-EB1-27
SI_CNPS-SCV1-04
SI_CNPS-SCV1-06
SI_CNPS-SCV1-07
SI_CRS-01
SI_EcoCtr-01
SI_GreenP-03
SI_KSWC-01
SI_SCCCC-03
SI_SierraC1-01
SI_SierraC6-03
SI_SierraC7-04
SI_TRT2-01
SI_TRT3-03
SI_TRT6-03
SI_TRT7-07
SI_TRT8-04
SI_TRT10-03
SI_TRT-CWA-SierraC-06
SI_TRT-CWA-SierraC-13
SI_TRT-CWA-SierraC-14
SI_TRT-CWA-SierraC-85
SI_TRT-CWA-SierraC-119
SI_TRT-CWA-SierraC-150
C_Berko-04
C_Breso-01
C_Clark1-13
C_Colem2-01
C_Elbiz-04
C_Garba-02
C_Genov-01
C_Goldf-02
C_Grave-01
C_Joye-01
C_MartiM-06
C_McCol-01
C_Mijac-01
C_Noren1-01
C_Okuzu-01
C_Parke-04
C_Raffa-05
C_Ross-03
C_Stein-04
C_Sugar-01
C_Urdan-01
C_VermeJ-01
C_Weiss-01
C_Willi-03

Summary of Issues Raised by Commenters

- The level of detail of biological information presented in the Draft PEIR was not sufficient to support the analysis of impacts, both for the program-level and project-level analyses.
- The baseline (or existing) condition did not take into account the already altered conditions in the Tuolumne River as a result of decades of Hetch Hetchy system operations.
- Using the brief time period when Calaveras Reservoir has been at less than full capacity minimizes the finding of impact.
- Mitigation for the WSIP projects cannot be determined at the current level of program description, so it is not clear how any mitigation (such as the Habitat Reserve Program) can be considered sufficient.

Response

Level of Detail of Data and Analysis for the PEIR

Commenters challenged the adequacy of the PEIR analysis as data-deficient in several ways. Comment SI_CNPS-EB1-18 states that biological surveys must be performed at all sites as part of impact evaluation; Comment SI_CNPS-SCV1-05 specifies the need for a comprehensive study of the Tuolumne River watershed, and Comment SI_CNPS-SCV1-07 specifies the need for quantitative impact assessments before suitable mitigation can be proposed. However, CEQA Guidelines Section 15151 imposes a standard of adequacy that is "reasonably feasible" and sufficient to allow decision-makers to make a decision that takes account of environmental consequences. Data gathering need not be "exhaustive." In cases where the Draft PEIR is a precursor to project-level CEQA analysis (see Section 14.4.2, above), only reasonably expected project impacts and widely applicable mitigations are discussed. It would be unwieldy and inappropriate to evaluate all of the special-status species for the entire program region, and many aspects of the proposed facility improvement projects are so undefined that impacts would be difficult to assess for most individual species. Therefore, where a project-level analysis will be performed in the future, the PEIR preparers concentrated on listed species and sensitive natural communities as representative of the habitat needs of other special-status species, many of which occur in the identified sensitive natural communities. The Draft PEIR's program-level evaluation of the regional WSIP facility projects presented in Chapter 4 defers to the subsequent, project-specific CEQA review of each facility improvement project, at which time impacts and impact receptors will be better defined based on more detailed and site-specific project information. To present more specific findings at the PEIR stage would be speculative, which is discouraged by CEQA Guidelines Section 15145.

Chapter 5 (Vol. 3) of the Draft PEIR addresses the impacts of WSIP water supply and system operations at the project level. Some reviewers commented that the level of detail for these components was insufficient; however, the PEIR impact analysis meets the "reasonably feasible" standard. The analysis of terrestrial biological resources presented in Chapter 5 focused on the current composition and condition of the riparian and wetland systems of the Tuolumne River, Alameda Creek, and Peninsula watersheds, then considered the interactive responses of plant and animal species to hydrologic changes resulting from the WSIP. In the face of this complexity, the PEIR preparers relied on ecological principles, scientific literature, existing data, and site visits to assess potential impacts and develop appropriate mitigation measures. The Draft PEIR analysis was conservative in finding that an impact could be potentially significant if there was any possibility of impacts resulting from predicted hydrologic changes under the proposed WSIP water supply and system operations.

CEQA Baseline

Some commenters (e.g., SI_CNPS-EB1-08) found that baseline conditions for biological resources were not clearly explained. CEQA Guidelines Section 15125 acknowledges the importance of identifying a baseline that best ensures meaningful environmental review. As described above, Chapter 4 of the Draft PEIR provides a programmatic analysis of the facility improvement projects and includes a program-level description of existing conditions for biological resources. More detailed, site-specific baseline conditions will be included in the subsequent, project-specific CEQA review for the individual projects as appropriate.

For the analysis of WSIP water supply and system operations impacts, the Draft PEIR (Vol. 3, Chapter 5) provides a description of baseline conditions tailored appropriately for the type and nature of each impact. Historical and ongoing operation of the Hetch Hetchy system is part of the baseline for the proposed program; however, the ecological impacts of ongoing operations are not relevant to the impact analysis of the WSIP, although they are considered in the cumulative analysis. Nonetheless, in making significance determinations, the PEIR authors did consider the possibility that existing conditions have increased the sensitivity or vulnerability of biological receptors to additional impacts. Riparian ecosystems on the Tuolumne River that are already stressed by water withdrawals could be more vulnerable or sensitive to even small, incremental changes. For example, in the Poopenaut Valley, located in the upper Tuolumne River immediately below O'Shaughnessy Dam, past and ongoing operations have reduced seasonal groundwater recharge below natural levels, with the result that shallow-rooted native meadow vegetation is already stressed and thus vulnerable to any future reduction in seasonal meadow groundwater recharge. Over the long term, water stress and prevailing dry conditions would allow upland species to invade the meadow, reducing the extent and quality of meadow vegetation. This in turn would reduce the meadow's ability to retain water in the root zone of wetland plants, accelerating the meadow degradation. As wetland and riparian habitats in the Poopenaut Valley are considered to be sensitive and are already degraded by ongoing operations, the Draft PEIR determined that any changes in the quantity and timing of releases from O'Shaughnessy Dam under the WSIP would be potentially significant. The analysis also determined that this impact could be mitigated to a less-than-significant level with implementation of Measure 5.3.7-2 (Vol. 4, Chapter 6, pp. 6-49 and 6-50).

In the lower Tuolumne River, the chief habitat effect of WSIP water supply and system operations would be on extant riparian vegetation, which is already greatly reduced and likely stressed. Its maintenance is dependent on the very modest discharges that fill the streams at least occasionally from bank to bank. Thus, the Draft PEIR determined that even an incremental reduction in "bankfull" events due to delayed or absent spring flows under the WSIP would put this vegetation at increased risk. This impact was determined to be potentially significant, but could be mitigated to a less-than-significant level with implementation of Measure 5.3.6-4a (Vol. 4, Chapter 6, p. 6-48) or Measure 5.3.7-6 (pp. 6-50 and 6-51).

With regard to the comment that use of the existing "Calaveras Down" baseline conditions could camouflage the effects of the WSIP on Alameda watershed riparian systems, the Draft PEIR discloses that the current riparian habitat reflects longer-term conditions, and analyzes the potential impacts of the WSIP with this fact in mind(Vol. 3, Chapter 5, p. 5.4.6-18). The Draft PEIR discussion of impacts on riparian vegetation along Alameda Creek, which compares existing "Calaveras Down" conditions to pre-2002 "Calaveras Up" conditions, addresses only willow and mixed riparian habitat along the creek channel (not sycamore alluvial woodland, which is formed and sustained only under very high periodic flows such as those found in unimpeded streams). The distribution of willow and mixed riparian habitats is primarily the result of prevailing flows over several decades: in other words, the operational conditions described as Calaveras Up, which maximized the diversions at the Alameda Creek Diversion Dam prior to the 2001 Division of Safety of Dams (DSOD) restrictions on Calaveras Reservoir and represents the operating conditions for over 70 years prior to the DSOD restriction. The CEQA baseline for the WSIP hydrologic modeling (i.e., Calaveras Down) reflects reduced diversions and therefore increased flows in Alameda Creek below the diversion dam. Although substantially lower than existing flows under the Calaveras Down scenario, the proposed WSIP flows would resemble prior Calaveras Up conditions (i.e., historical operating conditions). As a result, the PEIR concluded that the impact on these riparian habitats would be less than significant.

Consistent with CEQA guidelines, the Draft PEIR uses the conditions present in 2005 as the baseline condition for the analysis of impacts of WSIP water supply and system operations on Alameda Creek (Vol. 3, Chapter 5, p. 5.1-13). This baseline condition (referred to as Calaveras Down due to the DSOD restrictions on Calaveras Dam) provides for a worst-case environmental analysis for hydrological effects since it represents the greatest change in stream flow conditions from those proposed under the WSIP. As described in the Draft PEIR (Vol. 3, Chapter 5, Section 5.1), the impacts of WSIP water supply and system operations were analyzed using the Hetch Hetchy/Local Simulation Model, which uses the existing conditions (i.e., the SFPUC operating conditions and facilities restrictions in 2005) and predicts the reservoir spills and releases (i.e., stream flow conditions downstream from SFPUC reservoirs) over an 82-year period of historical hydrology, and not the actual "brief" period of time during which Calaveras Reservoir has been operated under restricted conditions (i.e., 2002 to the present).

Mitigation for Biological Impacts

Several points were raised (in Comments SI_CNPS-SCV1-04, SI_CNPS-SCV1-07, and others) regarding the adequacy of mitigation for WSIP impacts on biological resources. As described above, the site-specific type and extent of biological resource impacts resulting from the WSIP facility improvement projects can be analyzed only at the project level once the project descriptions have been fully developed. As a result, the type and extent of mitigation for those impacts must also be determined on a project-specific basis at the project EIR stage. As described above, the Draft PEIR provides programmatic mitigation measures for impacts associated with the facility improvement projects, and these measures will be reevaluated and, if applicable, will be confirmed, refined, or replaced with an equivalent measure as part of the subsequent, project-level CEQA review for the individual WSIP projects.

As part of the project-level review, consultation with resource agencies will ultimately determine the type and extent of appropriate mitigation measures. The SFPUC's proposed Habitat Reserve Program (HRP) does not purport to provide compensation for all WSIP impacts, regardless of type or quantity. Rather, the HRP proposes steps to restore, create, or enhance a variety of habitats in several geographic areas in advance of specific project impacts, and the resulting habitat values may be applied to the WSIP projects if deemed appropriate during project-specific agency consultation (see Draft PEIR, Vol. 1, Chapter 3, pp. 3-84 to 3-86). The policies of the California Department of Fish and Game and the USFWS place a priority on implementing mitigation *before* project impacts have occurred in order to reduce the temporal extent and quantity of lost habitat. To accomplish this goal, the HRP proposes to begin habitat improvements before WSIP project implementation.

The WSIP and the HRP are separate but parallel projects, each with its own objectives and environmental analysis. The HRP will receive CEQA analysis through an EIR as a project that is distinct from the WSIP. All HRP actions will be designed to be consistent with the Alameda and Peninsula Watershed Management Plans, Habitat Conservation Plans, and the Watershed and Environmental Improvement Program, but would not overlap with other habitat improvements. Thus, any habitat improvement or enhancement would not be credited twice. In addition, if mitigation opportunities provided by the HRP are not of the type or quantity required for mitigation of the biological resources impacts of a specific WSIP project or any portion of a WSIP project, then other means will be developed and employed to mitigate those impacts.

14.5 Master Response on Water Resources Modeling

14.5.1 Introduction

Overview

This master response addresses questions about the water resources model used for the impact analysis of proposed WSIP water supply and system operations. Commenters raised questions about the model itself, the appropriateness of its use for the Draft PEIR, the assumptions used in the modeling analysis, and the model output. This master response is organized by the following subtopics:

14.5.2 Model Availability
14.5.3 Model Time Interval
14.5.4 Use of Year Type Averages
14.5.5 Model Validation
14.5.6 Modeling Assumptions
14.5.7 Model Limitations for Pilarcitos Creek Watershed
14.5.8 Units of Measure
14.5.9 Model Results for Tuolumne River Diversions

Commenters

Commenters that addressed this topic include:

Federal Agencies

- None

State Agencies

- None

Local and Regional Agencies

- Modesto Irrigation District and Turlock Irrigation District – L_MIDTID
- Alameda County Water District – L_ACWD

Groups

- Republicans for Environmental Protection, Protection Commissioner – SI_CAREP
- California Native Plant Society – SI_CNPS
- California Native Plant Society, Santa Clara Valley Chapter – SI_CNPS-SCV1
- California Native Plant Society, Willis L. Jepson Chapter – SI_CNPS-WLJ
- Center for Resource Solutions – SI_CRS
- Environmental Defense – SI_EnvDef
- Northern California/Nevada Council of the Federation of Fly Fishers Steelhead Committee – SI_NCFFSC

- Pacific Institute – SI_PacInst
- Coalition for San Francisco Neighborhoods – SI_SFNeigh
- Sierra Club – SI_SierraC6, SI_SierraC7
- Tuolumne River Trust – SI_TRT3, SI_TRT6, SI_TRT7, SI_TRT8, SI_TRT9, SI_TRT10
- Tuolumne River Trust/Clean Water Action/Sierra Club, San Francisco Bay Chapter – SI_TRT-CWA-SierraC

Citizens

- Allison, Rita – C_Allis
- Berkowitz, Allan – C_Berko
- Beviacqua, John – C_Bevia
- Bourke, Sean – C_Bourk
- Boutin, Dolores – C_BoutiD
- Chiapella, Lynn – C_Chiap
- Collin, Robert – C_Colli
- Davey, Mary – C_Davey
- Duperrault, Fred – C_Duper
- Gelman, Robert – C_Gelma
- Hamilton-Lam, Kimberly – C_Hamil
- Hoffman, Jeff – C_Hoffm
- Kim, Michelle – C_Kim
- Lee, Aldora – C_Lee
- Maddock, Tyana – C_Maddo
- Madou, Ramses – C_Madou
- Mindelzun, Naomi – C_MindeN
- Mindelzun, Robert – C_MindeR
- Okuzumi, Margaret – C_Okuzu
- Raffaeli, Paul – C_Raffa
- Schmidt, Ron – C_SchmiR
- Schriebman, Judy – C_Schri
- Symons, Barbara – C_Symon
- Thollaugh, Julia – C_Tholl
- Unreadable commenter name – C_Unreadable4

The PEIR addresses this topic area in Vol. 3, Chapter 5, Section 5.1.4, pp. 5.1-7 to 5.1-18. Additional information on the model and the detailed modeling results are contained in Vol. 5, Appendices H1 and H2, with further updated model information in Vol. 8, Appendix O.

14.5.2 Model Availability

Comment Summary

This section of this master response responds to all or part of the following comments:

L_MIDTID-01

Summary of Issues Raised by Commenters

- TID and MID requested that the model used in the analysis be made available to them so they could check the assumptions, and requested a 60-day comment period after receipt of the model.

Response

In response to the request by TID and MID, on October 4, 2007 the San Francisco Planning Department sent both agencies a CD containing hydrologic model output as well as related files to help them understand the data. In addition, a meeting was held on November 28, 2007 to discuss the Hetch Hetchy/Local Simulation Model (HH/LSM) and its use for the Draft PEIR;

representatives from TID, MID, the SFPUC, and the PEIR consultant team (representing the San Francisco Planning Department) attended the meeting. The SFPUC representative described how the HH/LSM was used to analyze the WSIP water supply and system operations and to estimate its effects on Tuolumne River flows, and identified the assumptions used in the analysis. A slide presentation was made and hard copy of the presentation provided to meeting attendees (included as an attachment to **Response L_MID-TID1**). The meeting was conducted informally, and the TID and MID attendees asked questions throughout the presentation.

The SFPUC representative noted that the assumptions and modeling approach used in the HH/LSM for TID and MID are consistent with the assumptions and approach used by the California Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (USBR) in their modeling of the San Joaquin River using CalSim II, the statewide model developed by these agencies for planning purposes. The assumptions and approach used in the HH/LSM are also consistent with those used in modeling for MID's municipal water treatment plant.

At the end of the meeting, the TID and MID representatives indicated that the SFPUC representative had satisfactorily answered all of their questions with respect to the HH/LSM. The SFPUC transmitted an executable copy of the model to the Districts on December 21, 2007.

The San Francisco Planning Department declined to extend the comment period on the Draft PEIR as requested by the Districts.

14.5.3 Model Time Interval

Comment Summary

This section of this master response responds to all or part of the following comments:

L_ACWD-11	SI_TRT-CWA-SierraC-83	SI_TRT-CWA-SierraC-175
SI_TRT-CWA-SierraC-46	SI_TRT-CWA-SierraC-101	SI_TRT-CWA-SierraC-110
SI_TRT-CWA-SierraC-48	SI_TRT-CWA-SierraC-105	SI_TRT8-05
SI_TRT-CWA-SierraC-49	SI_TRT-CWA-SierraC-107	C_Hughe1-01
SI_TRT-CWA-SierraC-50	SI_TRT-CWA-SierraC-141	C_Hughe2-02
SI_TRT-CWA-SierraC-53	SI_TRT-CWA-SierraC-158	
SI_TRT-CWA-SierraC-82	SI_TRT-CWA-SierraC-167	

Summary of Issues Raised by Commenters

- The HH/LSM predicts monthly average values of river flow, which are inappropriate for analyzing environmental elements that may be affected by hourly, weekly, or daily flows (biological resources) or peak flows (geomorphology) that occur rarely.

Response

The impact analysis in the Draft PEIR used a combination of approaches as deemed appropriate for the specific impact and resource being analyzed. The analysis of WSIP water supply and system operations (Vol. 3, Chapter 5) was based on modeled monthly flow data using the

HH/LSM and supplemented with data derived from operational records and stream flow gages as needed. As described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.1-7 to 5.1-18), the HH/LSM is a state-of-the-art model of the regional water system developed by the SFPUC for water supply planning and is the best available tool for predicting reservoir releases/spills under various operating scenarios. It was used in the Draft PEIR to estimate the effects of the WSIP water supply and system operations on river and creek flows downstream of SFPUC reservoirs compared to the existing condition. The SFPUC has been improving and refining the model during more than 10 years of use (see Section 14.5.5, Model Validation, below), but like all models that simulate complex systems, it involves various simplifying assumptions, including the use of a monthly time-step.

As described below, monthly flow estimates derived from the HH/LSM output provide an accurate depiction of conditions in most cases and are appropriate for use in assessing impacts. During many months of the year, large portions of the regional system operations often do not vary on a daily or weekly basis. For those time periods, the HH/LSM results were useful and appropriate in assessing impacts on fish, wildlife, and riparian vegetation. However, for other times of the year, reservoir operations require adjustments more frequently than once per month due to circumstances such as changing hydrological and meteorological conditions. For the impact analysis during those periods, the HH/LSM data were supplemented with operational and daily flow records to estimate flow changes and to assess impacts. A more detailed description of how HH/LSM data were used in combination with other data in the impact analysis is presented below.

For the impact analysis of resources in the Tuolumne River between Hetch Hetchy and Don Pedro Reservoirs, monthly flow estimates derived from the HH/LSM provide an accurate depiction of actual conditions for most months of the year. Flow in this reach of the river consists entirely of releases from Hetch Hetchy Reservoir. During the late summer, fall, winter, and early spring, dam operators typically release only the required minimum instream flow. Currently, this condition exists about 84 percent of the time; with the WSIP, it would occur about 85 percent of the time. During periods when only minimum releases are being made, the release rate does not vary on a day-to-day or week-to-week basis. The SFPUC operators adjust the release rate monthly as necessary to comply with the minimum release schedule, which is specified in terms of monthly releases. Consequently, the monthly flows estimated using the HH/LSM and presented in the Draft PEIR provide an accurate characterization of flow in the Tuolumne River below O’Shaughnessy Dam more than 80 percent of the time. During such times, flow in the river below the dam varies very little, and the daily, weekly, and monthly average flow rates are essentially the same; as a result, the flow estimates from the HH/LSM are useful in assessing impacts on fish and riparian vegetation and wildlife.

The HH/LSM results for monthly reservoir releases during the snowmelt period do not provide a complete characterization of river flow because dam operators may adjust releases to the river more frequently than once per month. At the beginning of the snowmelt period, when storage in Hetch Hetchy Reservoir is at its seasonal minimum, operators typically use most of the inflowing snowmelt to fill the reservoir, releasing only the minimum required to the river below O’Shaughnessy Dam. Once the reservoir has filled, or it becomes apparent that the reservoir will fill based on projections of inflow, operators begin to release more than the minimum required to the river below the dam. The release rate may be adjusted every few days based on the volume of water flowing into the reservoir and the volume of water exiting the reservoir via the Canyon Tunnel. Consequently, monthly averages alone do not provide a good characterization of river flow during the snowmelt period. Therefore, the HH/LSM analysis for the snowmelt period was supplemented by performing a second analysis based on operational records of representative years, which enabled daily flows to be estimated. The estimates of daily flows in the Tuolumne River below O'Shaughnessy Dam in 1999 are shown in Draft PEIR Figure 5.3.1-10 (Vol. 3, Chapter 5, p. 5.3.1-28). For the snowmelt period, daily flow information was used in assessing impacts on fish and riparian vegetation and wildlife.

Circumstances in the Tuolumne River below La Grange Dam are similar to those in the river below O'Shaughnessy Dam. Flow in this reach of the river consists entirely of releases from La Grange Dam. During the late summer, fall, winter, and early spring, dam operators typically release only the required minimum instream flow. Currently, this condition occurs about 73 percent of the time; with the WSIP, it is estimated to occur about 74 percent of the time. Releases in excess of the minimum required occur primarily during the late spring snowmelt period, but may also occur in the late fall and winter as operators adjust storage in Don Pedro Reservoir in response to rainfall and to maintain compliance with flood storage requirements. When releases in excess of the minimum required are necessary, operators may adjust releases daily, and so the average monthly flow estimates from the HH/LSM do not by themselves provide a good characterization of flow in the river. Consequently, the analysis using the HH/LSM was supplemented by performing a second analysis based on TID's operational records, which enabled daily flows to be estimated (TID operates Don Pedro Reservoir and La Grange Dam). The estimates of daily flows in the Tuolumne River below La Grange Dam in 2000 are shown in Draft PEIR Figure 5.3.1-13 (Vol. 3, Chapter 5, p. 5.3.1-37). Again, for the snowmelt period, daily flow information was used in assessing impacts on fish and riparian vegetation and wildlife.

The HH/LSM was also used in the Draft PEIR to analyze the effects of the WSIP on local watersheds in the Bay Area, including watersheds of Alameda, San Mateo, and Pilarcitos Creeks. In each case, the average monthly flow estimates derived using the monthly time-step model were supplemented by performing additional analysis based on U.S. Geological Survey (USGS) gage data and/or operational records that provide insight into daily flows. Section 5.4.1 (Vol. 3, Chapter 5, pp. 5.4.1-10 to 5.4.1-33) relies on HH/LSM results in combination with daily flow gage data from the USGS, including instantaneous data (15-minute readings) from 1997 to 2007, to fully and appropriately analyze the effects of the WSIP on flows in Alameda Creek; this overall data, in turn, is used to analyze effects on downstream fish and riparian resources.

Estimates of monthly river flows derived from the HH/LSM output are only marginally useful for the assessment of impacts on geomorphology. Channel form and sediment transport are most influenced by peak flows, which the HH/LSM does not estimate. When estimates of peak flows were needed, they were derived through a statistical analysis of long-term flow gaging records.

It should be noted that the SFPUC's use of a monthly time-step model such as the HH/LSM is typical of many water systems. Water managers conventionally use monthly time-step models to simulate water system operations for planning purposes. For example, the CalSim II model used by the DWR and USBR for statewide water planning is a monthly time-step model. If monthly time-step model output does not reflect a water manager's experience or expectations, the manager may use professional judgment in refining and extrapolating from model results to provide insight into weekly or daily operations. Models with a shorter time interval than monthly typically tier off the results of a monthly time-step model. Models with a shorter time-step are not widely developed or used because monthly time-step models are sufficient for most planning purposes.

Monthly time-step models are also often used in CEQA documents. Two examples of CEQA documents that used CalSim II are the Draft EIR on the Monterey Amendment to the State Water Project Contracts (DWR, 2007) and the Environmental Water Account EIS/EIR (DWR and USBR, 2003).

14.5.4 Use of Year Type Averages

Comment Summary

This section of this master response responds to all or part of the following comments:

SI_SierraC6-03	SI_TRT-CWA-SierraC-102	C_Hughe2-02
SI_TRT-CWA-SierraC-47	SI_TRT-CWA-SierraC-110	
SI_TRT-CWA-SierraC-82	SI_TRT-CWA-SierraC-141	

Summary of Issues Raised by Commenters

- River flow data from the model are sorted into year types and presented as averages within year types; the use of averages within year types is inappropriate for the purpose of for environmental analysis because it conceals extreme values and understates impacts.

Response

The HH/LSM estimates reservoir releases in every month of the 82-year hydrologic record, which enables estimates to be made of river flow in 984 individual months. There is no single perfect way to examine and present data of this type. The data are voluminous and difficult to interpret without simplification, and describe highly variable phenomena—that is, river flow, reservoir storage, and other hydrologic information. Data from each month can be averaged, and the result provides a piece of information that helps to roughly characterize the phenomena. At the other end of the scale, each individual monthly flow estimate can be examined to provide a more refined characterization, but one that is limited to a single month in an 82-year period. According to the technical specialists who run the model, the most practical approach is to use some combination of averaging data and examining data from individual months. This was the approach used for the Draft PEIR, as described below. It was also used for the Monterey Amendment EIR and the Environmental Water Account EIS/EIR referred to above in Section 14.5.3.

Averaging data within year types often provides insight into how a water system operates under different hydrologic conditions. For example, Draft PEIR Table 5.3.1-5 shows estimated monthly flows in the Tuolumne River below O'Shaughnessy Dam (Vol. 3, Chapter 5, p. 5.3.1-26). The table indicates that flow in the river in October, November, and December of all hydrologic year types is about the same, but that average monthly flow in June of wet years may be as high as 4,500 cubic feet per second (cfs)—about 20 times greater than in dry years. Although this information helps to characterize the pattern of river flows, it is recognized that conditions in any one wet or dry year may deviate considerably from the average. Draft PEIR Figure 5.3.1-9 shows reservoir releases in each month in the 984-month hydrologic record (Vol. 3, Chapter 5, p. 5.3.1-23). As the figure shows, although the average monthly flow in June of wet years averages 4,500 cfs, it can be as great as 7,500 cfs on rare occasions.

The monthly data used to create Table 5.3.1-5 and Figure 5.3.1-9 (Vol. 3, Chapter 5, pp. 5.3.1-5 and 5.3.1-23) are provided in the Draft PEIR (Vol. 5, Appendix H2-1). Monthly flow data derived from the HH/LSM were supplemented by information on daily flows shown in Figures 5.3.1-10 and 5.3.1-13 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.1-28 and 5.3.1-37). The monthly and daily flow data were used in combination to determine environmental impacts.

14.5.5 Model Validation

Comment Summary

This section of this master response responds to all or part of the following comments:

SI_TRT-CWA-SierraC-47	SI_TRT-CWA-SierraC-100	SI_TRT-CWA-SierraC-102
SI_TRT-CWA-SierraC-52	SI_TRT-CWA-SierraC-101	SI_TRT-CWA-SierraC-158

Summary of Issues Raised by Commenters

- The model's error and accuracy should be specified.

Response

The evaluation of physics-based hydrologic models such as the HH/LSM (i.e., models relying on the physics of water movement) is generally based on three different measures: calibration, verification, and validation. Calibration of a model is needed when the hydrologic parameters required to simulate the water movement are not available, and the model must use those parameters during simulations; however, because historical stream flow and water demand data are explicitly incorporated in and formulated as part of the HH/LSM, separate calibration (as is typically required for a numerical model) was not required for the HH/LSM.

Verification refers to the accuracy of computations in a model; however, because the HH/LSM is not a numerical model based on complex equations, verification related to numerical stability is not an issue. The HH/LSM is a simple mass-balance model designed with checks and balances to ensure that the basic principle of "conservation of mass" is maintained (i.e., that all water is accounted for in the system at all times, and that inflow balances with outflow and storage). The

HH/LSM is a linked-node model wherein an input of water to one part of the system—such as inflow to a reservoir—must balance with the output/storage from that same part of the system—such as the combination of releases from the reservoir, evaporation or losses from the reservoir, and a change in storage in that same reservoir. Similarly, water diverted into a pipeline must be accounted for through releases from that same pipeline. This system of checks and balances provides a built-in verification of the underlying mass-balance principle that forms the basis for the HH/LSM.

Validation refers to how well the output of the model matches the experimental or observed data. The HH/LSM is a long-term planning model that provides a simulation of water system operations over a range of hydrologic conditions. It is based on a consistent set of physical and institutional constraints (e.g., reservoir and pipeline capacities, flow requirements below reservoirs, and unimpaired runoff) and a systematic set of operational protocols that direct the operation of the water system. The model was designed to inform and direct the *long-term planning* of the system and not its *short-term operations*. Consequently, comparing absolute values of simulated operations with actual reservoir storage at the end or beginning of every hydrologic year has not been the objective of the HH/LSM.

Therefore, validation of the accuracy of the HH/LSM relates to how well the model portrays SFPUC water system operations within the context of the model's purpose. The complex operational rules incorporated into the model are based on historical data and the experience of operators, and thus achieve the best possible representation of the system for reliable and efficient system planning. In other words, the operational rules incorporated into the model are not hypothetical. The HH/LSM has been continuously refined for more than 10 years based on the modelers' expert knowledge as well as SFPUC system operators' periodical review of the model output. The model has produced reasonable and consistent results that have been confirmed by system operators and validate not only the results of the model but also the representation of the system. This continuous refinement of the HH/LSM, based on periodic review of the accuracy of the model by system modelers and operators, encompasses the generally expected validation requirements for this type of mass-balance model. For example, as described in Section 13.3 (Vol. 7, Chapter 13), the SFPUC conducted updated model runs in 2008 following publication of the Draft PEIR using more recent input assumptions for several model parameters as part of its ongoing system planning and management. And, as discussed in that section, the resulting output data were generally consistent with the 2007 data used in the Draft PEIR. The refined HH/LSM results were incorporated as appropriate into the Comments and Responses document.

In addition, the HH/LSM has been externally verified and validated on a number of occasions. The model was used in support of an application to amend the license for the Don Pedro Project, which was submitted to the Federal Energy Regulatory Commission (FERC) in 1993 and 1994. FERC approved the use and results of the model. The model was reviewed again in 2005, as part of the *Water Supply Improvement Program Assessment* (Parsons-CH2MHILL, 2005). The model review focused on each element of the HH/LSM to determine if the model input data, assumptions, operational criteria, and results were within the expected range of practice for this type of model application. The review included verification and validation of input hydrology, system demands, reservoir target, storage levels and capacities, transmission system flow capacities, general operations criteria, and simulation procedure logic. The reviews concluded that the comparison of HH/LSM results with historical operations provides a reasonable simulation of system deliveries and reservoir storage values for the existing SFPUC regional water system. Similarly, as applied to the long-term planning purposes for which the model was designed, the reviews also concluded that the representation of the existing SFPUC system is reasonably incorporated by procedural simulation logic. Such external reviews have additionally and independently validated the HH/LSM.

In conclusion, use of a model to simulate actions in a water system is a valid and widely used practice employed by many water agencies in the United States, including the DWR, and model results can provide adequate and acceptable data for both system planning purposes as well as for environmental analysis. The SFPUC considers the HH/LSM results to reasonably portray the current and anticipated operation of the regional water system under the scenarios developed in the PEIR, and the San Francisco Planning Department has determined that the HH/LSM is a reasonable and appropriate tool to use in assessing environmental impacts of the proposed WSIP water supply and system operations on resources in the Tuolumne River, Alameda Creek, and Peninsula watersheds.

14.5.6 Model Assumptions

Comment Summary

This section of this master response responds to all or part of the following comments:

SI-TRT-CWA-SierraC-10	SI-TRT-CWA-SierraC-69	SI_TRT-CWA-SierraC-177
SI_TRT-CWA-SierraC-30	SI_TRT-CWA-SierraC-70	SI_TRT-CWA-SierraC-188
SI_TRT-CWA-SierraC-55	SI-TRT-CWA-SierraC-76	
SI-TRT-CWA-SierraC-68	SI-TRT-CWA-SierraC-79	

Summary of Issues Raised by Commenters

Questions regarding the model assumptions for:

- Future water demand and water conservation/recycling
- Future hydrology
- Future TID/MID diversions from the Tuolumne River
- Future instream flow releases at La Grange Dam

Response

Future Water Demand and Water Conservation/Recycling

For discussion of assumptions related to water demand and future water conservation and recycling, please refer to **Section 14.2, Master Response on Demand Projections, Conservation, and Recycling** (Vol. 7, Chapter 14). Those assumptions were incorporated into the HH/LSM input as part of the system customer purchase request/demand.

Future Hydrology

In the modeling performed for the Draft PEIR, future hydrology was assumed to be a recurrence of the historical hydrology. Although there is inherent uncertainty regarding whether historical hydrology will be repeated in the future—especially given the evolving information on the potential effects of global climate change—the use of historical data over 82 years provides a wide enough range of interannual variation to address the future hydrology with climate change effects expected by 2030 for the purposes of the PEIR. Use of historical hydrologic data is still the conventional practice in water supply system modeling, although many water agencies are examining potential climate change effects on future hydrology as well as on future water supply planning and management. Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for more information on the effects of global climate change as it relates to the Draft PEIR impact analysis.

Although the modeling for the WSIP relied on historical hydrologic data, the SFPUC's water supply planning does assume that future droughts could be more severe than historical droughts. The SFPUC chose a design drought more severe than any drought in the hydrologic record because of San Francisco's unusual vulnerability in droughts and its experiences during earlier droughts. Most agricultural water agencies and many municipal water agencies have both surface and groundwater supply sources. During droughts, these agencies can increase pumping from their groundwater sources to make up for any shortfall in surface water supplies. When planning for the future, these agencies typically establish their design drought based on the historical record. If the historical record proves to be unreliable, and droughts more severe than those in the historical record occur, these agencies can turn to their groundwater supplies or, in the case of the agricultural water agencies, fallow some land. In this way, these agencies can avoid severe economic losses.

Unlike these agencies, however, the SFPUC depends almost exclusively on surface water supplies, and its water rights are restricted in a manner that means little or no water is available to the SFPUC from its primary source, the Tuolumne River, in very dry years. As a result, the risk of a severe water shortage, with the attendant economic losses, is much greater for the SFPUC's retail and wholesale customers who rely solely on the regional system for their water than for most other urban or agricultural communities. Because of these circumstances, the SFPUC must take a more conservative posture than many water agencies when it chooses a design drought. Although the SFPUC's design drought was not selected with climate change in mind, it does provide the SFPUC with a margin of safety in water supply planning if the climate becomes drier.

Future TID/MID Diversions from the Tuolumne River

The assumptions regarding water diversions by the SFPUC, TID, and MID used in the Draft PEIR analysis of the WSIP are consistent with the assumptions used by the DWR in developing the *California Water Plan*; these data were used as input to the HH/LSM studies used in the Draft PEIR analysis. TID and MID's water use rates were based on a DWR model which, for a given crop pattern, estimates the amount of water farmers will need to grow crops in a given month, taking account of precipitation and evapotranspiration. Part of the farmers' water needs in the TID and MID service areas is met with groundwater and the remainder is supplied from the

Tuolumne River. Depending on conditions in Don Pedro Reservoir, TID and MID may not be able to supply all of the surface water that farmers need every year. Under existing conditions, the model estimates that TID and MID need to divert an average of 867,000 acre-feet per year at La Grange Dam for crop irrigation and delivery system operation.

With respect to future diversions of Tuolumne River water by TID and MID at La Grange, the analysis in the Draft PEIR assumed that the future (2030) need for water for agricultural irrigation would be the same as the present need. This assumption was based on the projection that agricultural lands in the TID and MID service areas are already fully developed, and so agricultural water use would not be expected to increase. Municipal use of Tuolumne River water in the TID and MID service areas is expected to increase considerably by 2030, but the increase would be offset by a reduction in agricultural use of Tuolumne River water.

Until recently, TID and MID provided surface water exclusively to agricultural users, and the municipalities in the TID and MID service areas obtained their water from groundwater wells. Farmers in the service areas obtained surface water from TID and MID and groundwater from wells. Because some of the wells in the TID and MID service areas are contaminated with small amounts of agricultural chemicals, they are more suitable for agricultural use than municipal use. The municipalities, together with TID and MID, have developed plans for regional surface water systems that would supply high-quality Tuolumne River water to municipal water users and reduce the municipal use of wells. Tuolumne River water flowing in the Turlock and Modesto Canals would be diverted to water treatment plants and, after treatment, delivered to municipal water users.

As described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-10 and 5.7-11), MID's municipal water treatment plant, which has a capacity of 30 million gallons per day (mgd) and serves the city of Modesto, was put in service in 1994. Its capacity is currently being expanded to 60 mgd, and the expanded plant will be in service in 2009. TID's water treatment plant is under construction and will have a capacity of 42.5 mgd. The plant will serve the city of Turlock and several other communities and will be operational in 2010. As municipalities increase their use of surface water and decrease their use of groundwater, more groundwater would become available for agricultural use. Agricultural users would increase their use of groundwater and decrease their use of Tuolumne River water.

Some reduction in agricultural water use and an increase in municipal water use is also expected as agricultural lands are converted to residential and commercial areas. But agricultural land and housing subdivisions use roughly equivalent amounts of water, so the land use change would not have much effect on overall water use.

A commenter notes that MID's urban water management plan indicates the District's demand for municipal water will increase by 70 percent by 2030, and that this figure seems inconsistent with the assumption of no increase in diversions by MID and TID at La Grange Dam. However, any projected increased use of Tuolumne River water to serve projected urban growth in the MID service area or to serve customers switching from groundwater to Tuolumne River water would be offset by a corresponding reduction in agricultural use of Tuolumne River water, as described above.

Although global climate change could cause an increase in future agricultural water use in the TID and MID service areas, other factors such as land use conversion and agricultural market forces make it too speculative at this time to quantify potential changes in agricultural water demand. Please refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for further discussion.

Future Instream Flow Releases at La Grange Dam

The SFPUC assumed that the required instream releases at La Grange Dam in support of fisheries would remain the same as the current releases. Continuation of the current releases is a reasonable future scenario, and any other assumption would be speculative. For further discussion of instream releases, please refer to **Section 14.7, Master Response on Lower Tuolumne River Issues** (Vol. 7, Chapter 14, Section 14.7.4).

14.5.7 Model Limitations for Pilarcitos Creek Watershed

Comment Summary

This section of this master response responds to all or part of the following comments:

SI_TRT-CWA-SierraC-79

Summary of Issues Raised by Commenters

- The model limitations for the Pilarcitos Creek watershed should be explained.

Response

Model limitations for the Pilarcitos Creek watershed are described briefly in the Draft PEIR (Vol. 3, Chapter 5, p. 5.1-14). The analysis in the Draft PEIR used the best available information from the 2007 HH/LSM model runs, even though it did not fully represent operations at Pilarcitos Reservoir. This element of the HH/LSM has been modified, and updated model runs have been conducted that provide an improved representation of that system, as described in Chapter 13, Section 13.3 of this document. The updated model runs did not identify any environmental impacts that were not reported in the Draft PEIR, but they did enable the impacts to be better described. Some text changes have been made in the sections of the Draft PEIR that describe the impacts of the WSIP in the Pilarcitos Creek watershed (see the staff-initiated text changes for Section 5.5 in Vol. 7, Chapter 16).

Although the modifications to the model improved the HH/LSM’s ability to simulate storage in Pilarcitos Reservoir and flows in Pilarcitos Creek, the changes to the model assumptions in the Pilarcitos system have a negligible effect on other elements of the SFPUC water system. This is because storage in Pilarcitos Reservoir represents only about 0.5 percent of the SFPUC’s total water storage capacity, and water production from its watershed represents only about 1.2 percent of the deliveries under the WSIP.

14.5.8 Units of Measure

Comment Summary

This section of this master response responds to all or part of the following comments:

L_MID-TID1-04   SI_TRT-CWA-SierraC-81

Summary of Issues Raised by Commenters

- Requests for the use of consistent units of measure in the Draft PEIR.

Response

No single unit of flow is the best descriptor of a hydrologic element in all cases. In describing their overall operations, agricultural water agencies typically use acre-feet per year as their primary unit, whereas municipal water agencies use million gallons per day (expressed as an average of all days in the year). Flow in rivers, on the other hand, is usually expressed in cubic feet per second. The Draft PEIR uses the units that were appropriate for the particular circumstances. However, it is recognized that readers may want to convert one unit to another for comparison purposes. Conversion factors are included in the Draft PEIR at the end of the glossary and acronyms (Vol. 1, p. xxxviii) and are as follows:

1 million gallons per day = 1,120 acre-feet per year = 1.55 cubic feet per second

14.5.9 Model Results for Tuolumne River Diversions

Comment Summary

This section of this master response responds to all or part of the following comments:

SI_CAC2-06
SI_CAREP-01
SI_CNPS-01
SI_CNPS-SCV1-05
SI_CNPS-WLJ-01
SI_CRS-02
SI_EnvDef-03
SI_PacInst-84
SI_NCFFSC-01
SI_SFNeigh-02
SI_SierraC6-01
SI_SierraC7-01
SI_TRT3-01
SI_TRT6-01
SI_TRT7-01
SI_TRT8-01
SI_TRT8-07
SI_TRT9-01
SI_TRT10-01
SI_TRT-CWA-SierraC-81
C_Allis-01
C_Berko-01
C_Bevia-01
C_Bourk-01
C_BoutiD-01
C_BramlD2-01
C_Chiap-03
C_Colli-03
C_Davey-01
C_Duper-01
C_Gelma-01
C_Hamil-01
C_Hoffm-01
C_Kim-01
C_Lee-02
C_Maddo-01
C_Madou-01
C_MindeN-01
C_MindeR-01
C_Okuzu-01
C_Okuzu-02
C_Raffa-03
C_SchmiR-01
C_Schri-01
C_Symon-01
C_Tholl-01
C_Unreadable4-01

Summary of Issues Raised by Commenters

- Confusion regarding the magnitude of increased diversions from the Tuolumne River compared to the increase in purchase requests in 2030.

Response

Many comments indicated confusion about the estimates provided in the Draft PEIR for the increase in customer purchase requests by 2030 compared to the increase in Tuolumne River diversions under the WSIP. The confusion derives from PEIR statements regarding a *25 mgd increase in purchase requests* and a *27 mgd increase in diversions from the Tuolumne River*. As explained below, these two estimates are different, since they represent distinct, though related, system parameters. For clarification, these system parameters are defined as follows:

- *Purchase requests* represent the customer demand for water from the SFPUC regional system; this term is used interchangeably with *demand on the regional system*. This concept differs from simple "demand," since demand for some customers is served by sources other than the SFPUC regional system.
- *Diversions* represent water from the supply sources (such as the Tuolumne River or Alameda Creek) that is transferred either to customers or to storage.
- *Deliveries* represent the portion of diversions that is transmitted to customers.

Purchase Requests

On an average annual basis, customer purchase requests from the regional water system are currently 265 mgd and, by 2030, are projected to be 300 mgd—an increase of 35 mgd over the existing condition (Vol. 1, Chapter 3, p. 3-33). Under the WSIP, 10 mgd of this increase in purchase requests would be met by recycled water, groundwater, and conservation in San Francisco, and the adjusted purchase requests under the WSIP would be 290 mgd. The SFPUC proposes to serve the remaining 25 mgd of increased purchase requests from a combination of increased diversions from the Tuolumne River and improvements to the local watershed system (primarily attributable to the restoration of full capacity at Calaveras and Crystal Springs Reservoirs). In summary, the estimates for determining the average annual increase in customer purchase requests are shown in **Table 14.5-1**, below.

Deliveries

Under the existing condition, the regional system does not have sufficient water supply, stored water, or supplemental water sources to fully meet customer purchase requests during extended dry periods, at which time the SFPUC must impose rationing. Therefore, during these periods, deliveries from the regional system are less than the customer purchase requests. The HH/LSM results indicate that over the 82-year historical hydrology, the SFPUC's average annual system deliveries to customers are approximately 258 mgd of the 265 mgd in purchase requests (approximately 97 percent) due to the shortfall in deliveries when rationing is imposed during droughts. The analysis in the Draft PEIR indicated that the source of the 258 mgd in system

TABLE 14.5-1
AVERAGE ANNUAL CUSTOMER PURCHASE REQUESTS FROM THE REGIONAL SYSTEM
(average annual, mgd)

Scenario	Customer Purchase Requests
WSIP, 2030	300
Amount of purchase requests to be met with recycled water/groundwater/conservation in San Francisco	10
Adjusted purchase requests, 2030	290
Existing condition, 2005	265
Total increase in purchase requests under the WSIP to be met by Tuolumne River and local watershed supplies	25

NOTE: Data shown from Draft PEIR, Vol. 1, Chapter 3.

deliveries consists of an average annual amount of 218 mgd from the Tuolumne River and 40 mgd from the local watersheds.

Under the WSIP by 2030, the SFPUC would substantially improve overall delivery reliability and would be able to meet customer purchase requests more consistently than it currently does. However, during extended droughts, the system would still be unable to fully meet customer purchase requests, even though it would implement supplemental dry-year water sources, including water transfers from TID and MID and a conjunctive-use program in the Westside Groundwater Basin. The SFPUC would still need to impose rationing, but it would be limited to 20 percent systemwide. The HH/LSM results indicate that over the 82-year historical hydrology, the average annual system deliveries to customers under the WSIP would be approximately 287 mgd of the 290 mgd in purchase requests (approximately 99 percent), indicating improved delivery reliability over existing conditions. The Draft PEIR analysis showed that on an average annual basis, the 287 mgd would consist of 245 mgd in deliveries from the Tuolumne River and 42 mgd in deliveries from the local watersheds. The estimates for determining the average annual system deliveries from the SFPUC's water sources under existing and proposed conditions are shown in **Table 14.5-2**.

TABLE 14.5-2
SOURCE OF CUSTOMER DELIVERIES FROM THE REGIONAL SYSTEM
(average annual, mgd)

Scenario	Total System Customer Deliveries	Tuolumne River Diversions for Customer Deliveries	Local Watershed Diversions for Customer Deliveries[a]
WSIP, 2030	287	245	42
Existing Condition, 2005	258	218	40
Increase under the WSIP	29	27	2

[a] The increase in local watershed diversions under the WSIP is due to the restored capacity in Calaveras and Crystal Springs Reservoirs.

NOTE: Data shown based on 2007 HH/LSM studies; refer to Appendix H (Vol. 5).

Diversions

As indicated in Table 14.5-2, the SFPUC currently diverts an estimated annual average of 218 mgd from the Tuolumne River, and, under the WSIP, this amount would increase to 245 mgd. Thus, as stated in the Draft PEIR (Vol. 4, Chapter 9, p. 9-13), the estimated increase in diversions from the Tuolumne River for customer deliveries would be 27 mgd.

14.6 Master Response on Upper Tuolumne River Issues

14.6.1 Introduction

Overview

This master response addresses questions and comments about the impact analysis for the upper Tuolumne River; that is, the river between O'Shaughnessy Dam and Don Pedro Reservoir. This master response is organized by the following subtopics:

14.6.2 Minimum Required Instream Flows
14.6.3 Adequacy of Data on Streamside Meadows
14.6.4 Mitigation Measure 5.3.7-2
14.6.5 Impacts on Flow/Hydrology
14.6.6 Impacts on Geomorphology
14.6.7 Impacts on Water Quality

Commenters

Commenters that addressed this topic include:

Federal Agencies

- None

State Agencies

- California State Assembly – S_CSA

Local and Regional Agencies

- Tuolumne County – L_Tuol2

Groups

- California Trout – SI_Caltrout
- Center for Resource Solutions – SI_CRS
- Ecology Center – SI_EcoCtr
- Greenpeace – SI_GreenP
- Klamath-Siskiyou Wildlands Center – SI_KSWC
- Republicans for Environmental Protection – SI_CAREP
- Santa Clara County Creeks Coalition – SI_SCCCC
- Sierra Club – SI_SierraC1, SI_SierraC6, SI_SierraC7
- San Francisco Planning and Urban Research Association – SI_SPUR
- Tuolumne River Trust – SI_TRT2, SI_TRT3, SI_TRT6, SI_TRT7, SI_TRT8, SI_TRT10
- Tuolumne River Trust/Clean Water Action/Sierra Club, San Francisco Bay Chapter – SI_TRT-CWA-SierraC

Citizens

- Alter, Grudy – C_Alter
- Bail, Christopher – C_Bail
- Berkowitz, Allan – C_Berko
- Beviacqua, John – C_Bevia
- Bramlette, Darryl – C_BramlD1
- Bresolin, Mark – C_Breso
- Chiapella, Lynn – C_Chiap
- Clark, Ann & Katherine Howard – C_Clark1
- Coleman, Caroline – C_Colem2
- Dulmage, Diana – C_Dulma
- Elbizri, Elanie – C_Elbiz
- Garbarino, Caroline – C_Garba
- Genovese, Marilyn – C_Genov
- Goitein, Ernest – C_Goite
- Goldfein, Kathleen – C_Goldf
- Goodman, Rebecca – C_Goodm
- Graves, Ben – C_Grave
- Hankermeyer, Carol – C_Hanke
- Hasson, Tomer – C_Hasso
- Hoffman, Jeff – C_Hoffm
- Joyce, Lindsay and Ken – C_Joye
- Martin, Michael – C_MartiM
- McCollom – C_McCol
- Means, Robert – C_Means2
- Mijac, Ivo – C_Mijac
- Noren, William – C_Noren1
- Okuzumi, Margaret – C_Okuzu
- Parkes, Doug – C_Parke
- Pickup, Ron – C_Picku
- Raffaeli, Paul – C_Raffa
- Ross, Jim – C_Ross
- Spring, Cindy – C_Sprin
- Steinhart, Peter – C_Stein
- Sugars, Marc – C_Sugar
- Urdan, Matthew – C_Urdan
- Vermeys, Jim – C_VermeJ
- Weiss, Richard – C_Weiss
- Williams, Doris – C_Willi
- Zimmerman, Benita – C_Zimme

PEIR Section Reference

The Draft PEIR addresses this topic area in Vol. 3, Chapter 5, Section 5.3, pp. 5.3.1-1 to 5.3.9-3.

14.6.2 Minimum Required Instream Flows

Comment Summary

This section of this master response responds to all or part of the following comments:

S_CSA-02	SI_TRT6-03	C_Berko-04	C_Noren1-01
L_Tuol2-03	SI_TRT7-07	C_Breso-01	C_Okuzu-01
SI_Caltrout-01	SI_TRT8-04	C_Bryan-01	C_Parke-04
SI_CAREP-01	SI_TRT10-03	C_Clark1-13	C_Raffa-05
SI_CRS-07	SI_TRT-CWA-SierraC-06	C_Colem2-01	C_Raffa-13
SI_EcoCtr-01	SI_TRT-CWA-SierraC-08	C_Dulma-01	C_Ross-03
SI_GreenP-03	SI_TRT-CWA-SierraC-14	C_Elbiz-04	C_Stein-04
SI_KSWC-01	SI_TRT-CWA-SierraC-66	C_Garba-02	C_Sugar-01
SI_SCCCC-03	SI_TRT-CWA-SierraC-85	C_Genov-01	C_Urdan-01
SI_SierraC1-01	SI_TRT-CWA-SierraC-86	C_Goldf-02	C_VermeJ-01
SI_SierraC6-03	SI_TRT-CWA-SierraC-87	C_Grave-01	C_Weiss-01
SI_SierraC7-04	SI_TRT-CWA-SierraC-146	C_Joye-01	C_Willi-03
SI_SPUR-07	SI_TRT-CWA-SierraC-148	C_MartiM-06	
SI_TRT2-01	SI_TRT-CWA-SierraC-157	C_McCol-01	
SI_TRT3-03	SI_TRT-CWA-SierraC-191	C_Mijac-01	

Summary of Issues Raised by Commenters

- The Draft PEIR lacks sufficient data to determine whether current flows support public trust values.
- The Draft PEIR lacks sufficient data to reach conclusions on the WSIP's impacts.

Response

The purpose of the Draft PEIR is to describe the consequences of the proposed WSIP relative to the existing condition. CEQA requires that an EIR contain a description of the existing "without project" condition, but does not require that an EIR determine whether the existing condition complies with current regulations or supports public trust values. The U.S. Geological Survey operates a stream gage below O'Shaughnessy Dam, which provided ample data to characterize the existing condition with respect to river flow.

The current minimum required releases from O'Shaughnessy Dam to support fisheries are shown in Table 5.3.1-2 of the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.1-12). The releases are made in accordance with an agreement between the City and County of San Francisco (CCSF) and the U.S. Department of the Interior (DOI), which determined the minimum flow schedules for resident trout. Anglers continue to catch trout in the reach of the river below the dam, but no detailed information on fish populations has been gathered since the U.S. Fish and Wildlife Service (USFWS) studies in the early 1990s. Obtaining new information on fish populations was determined to be unnecessary for the purpose of the PEIR based on the projected nature, frequency, and magnitude of flow changes attributable to the WSIP.

The SFPUC will adhere to the minimum release schedule whether or not the WSIP is implemented. As indicated in the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.1-25), implementation of the WSIP would not reduce river flow during those times when minimum releases are being made under the existing condition. It would increase the number of months during which only minimum releases are made, from 837 months in the 984-month hydrologic record to 843 months. The fisheries impact analysis in the Draft PEIR, which was performed by an expert fisheries biologist, was based on the hydrological changes that would occur under the WSIP and an understanding of species habitat requirements. The expert concluded that the small increase in the number of months when minimum releases are being made would not have a significant adverse effect on resident fisheries.

A draft report prepared by the USFWS in 1992 recommended an increase in minimum releases from O'Shaughnessy Dam, based on an Instream Flow Incremental Methodology (IFIM) study. The draft report concluded that resident trout populations could be increased if releases from O'Shaughnessy Dam were increased. As described in the Draft PEIR (Vol. 3, Chapter 5, p. 5.7-7), the CCSF provided comments on the draft study questioning the basis for some of the recommendations, but the matter was left unresolved. Beginning in 2005, the SFPUC began working with the USFWS to resolve issues regarding the recommended releases. Cooperative field studies are in progress, and the CCSF and USFWS expect to reach agreement on the releases in 2009. The new studies will include the use of IFIM or an alternative flow and habitat assessment methodology.

The 1987 CCSF and DOI agreement provided for supplemental releases of 4,400 to 15,000 acre-feet per year from O'Shaughnessy Dam, depending on hydrologic year type. The supplemental releases are shown in Draft PEIR Table 5.7-4 (Vol. 3, Chapter 5, p. 5.7-30). The supplemental releases have not been made since 1992 because the USFWS has yet to make a determination about the schedule needed for supplemental releases. Supplemental releases were made between 1989 and 1992 in support of the studies that resulted in the USFWS's 1992 draft report. Because these releases (or some other schedule of releases derived from the ongoing studies) will occur in the future, they were included in the cumulative impact analysis contained in the Draft PEIR (Vol. 3, Chapter 5, Section 5.7).

The analysis indicated that any increase in minimum releases for the benefit of resident trout during the minimum release period (more than 80 percent of the time) could have adverse biological effects. The release of more water from Hetch Hetchy Reservoir during the minimum release period would cause the reservoir to be drawn down farther just prior to the snowmelt than it would with the current schedule of minimum releases. Because more water would be needed to refill the reservoir, the total volume of water released in the spring snowmelt period would be reduced and the release would be delayed by a few days. The reduction and delay in the spring release could have an adverse effect on riparian and meadow vegetation in the Poopenaut Valley, as described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.7-21 and 5.3.7-22). Before recommending changes to the current release schedule, the SFPUC and USFWS will consider both the benefits and adverse effects of additional releases on fisheries and other biological resources during the spring, summer, fall, and winter.

14.6.3 Adequacy of Data on Streamside Meadows

Comment Summary

This section of this master response responds to all or part of the following comments:

SI_SPUR-07	SI_TRT-CWA-SierraC-15	C_Dulma-01
SI_TRT-CWA-SierraC-04	SI_TRT-CWA-SierraC-16	
SI_TRT-CWA-SierraC-14	SI_TRT-CWA-SierraC-18	

Summary of Issues Raised by Commenters

- The Draft PEIR lacks sufficient data to characterize impacts on streamside meadows.

Response

The San Francisco Planning Department (as the CEQA lead agency) and the SFPUC (as the project sponsor) both acknowledge that little published information is currently available on the flora and fauna of streamside meadows in the Poopenaut Valley, and that acquisition of comprehensive data would take several years. However, in the course of preparing the PEIR, the consulting biologists conducted a reconnaissance survey of the meadow and discussed conditions in the meadow with National Park Service biologists, who are beginning surveys of the Poopenaut Valley in coordination with the SFPUC. As described in **Section 14.4, Master**

Response on PEIR Appropriate Level of Analysis (Vol. 7, Chapter 14, Section 14.4.4), CEQA Guidelines Section 15151 imposes a standard of adequacy that is "reasonably feasible" and sufficient to allow decision-makers to make a decision that takes account of environmental consequences. Data gathering need not be "exhaustive." The Draft PEIR analysis of the WSIP water supply and system operations on biological resources in the Poopenaut Valley was based on current knowledge regarding the composition and condition of the riparian system, and a consideration of the interactive responses of plant and animal species to hydrologic changes resulting from the WSIP. The analysis relied on ecological principles, scientific literature, existing data, and site visits. The Draft PEIR analysis was conservative in finding that an impact could be potentially significant if there was a possibility of impacts from the WSIP water supply and system operations.

In general, it is known that the ecological health of mountain meadows depends on periodic recharge of the underlying groundwater, which supports vegetation through the dry summer months. In the Poopenaut Valley, groundwater recharge occurs as a result of runoff from the canyon sides into the valley, and when high flows in the Tuolumne River flood the meadow or otherwise raise groundwater levels. Little is known about the condition of the Poopenaut Valley before the construction of Hetch Hetchy Reservoir in the 1920s. The meadow itself, and its flora and fauna, have adapted to changes in the magnitude and seasonal pattern of river flow since the reservoir was built. From the 1920s to the late 1960s, Hetch Hetchy Reservoir affected the seasonal pattern but not the magnitude of flow in the river within the Poopenaut Valley. Water was diverted for municipal supply at Early Intake, several miles downstream of the Poopenaut Valley. In 1967, the completion of Canyon Tunnel enabled the diversion of water at Hetch Hetchy Reservoir for municipal water supply and hydropower generation several miles upstream of the Poopenaut Valley. Beginning in 1967, average annual flow in the Tuolumne River through the Poopenaut Valley was reduced by about 50 to 60 percent compared to pre-1967 flows.

Compared to the existing condition, the WSIP would reduce the total volume of flow in the Tuolumne River through the snowmelt period and delay releases from Hetch Hetchy Reservoir by a few days. With the WSIP, the average annual diversion from the river at Hetch Hetchy Reservoir would increase from the current 469,000 acre-feet to 478,500 acre-feet, an increase of about 2 percent. The increased average annual diversion would produce a corresponding reduction in average annual releases to and flow in the river. Because the change in flow and the delay in the initial release of snowmelt have the potential to reduce groundwater recharge and thus affect the flora and fauna of the meadow, the effect of the WSIP on biological resources in the Poopenaut Valley was determined to be potentially significant. Detailed knowledge of the meadow's flora and fauna was not necessary to reach this conclusion.

Mitigation Measure 5.3.7-2 (Vol. 4, Chapter 6, pp. 6-49 and 6-50) identified an approach to reduce the potential impacts of WSIP-induced flow changes in the Poopenaut Valley to a less-than-significant level. Currently, the operators of Hetch Hetchy Reservoir do not actively shape the late spring/early summer release from the reservoir to achieve any particular environmental goal. With Mitigation Measure 5.3.7-2 in place, operators would shape the release to recharge groundwater in the valley in a manner that approximates conditions characteristic of typical Sierra Nevada meadows. The performance standard to be achieved by this measure is no net loss of the extent, diversity, and condition of the existing meadow and wetland vegetation types in the Poopenaut Valley. The mitigation measure includes a monitoring and baseline data collection component.

The National Park Service, in coordination with the SFPUC, is currently conducting studies in the Poopenaut Valley that include vegetation surveys, rare species surveys, and groundwater level monitoring. The results of the studies will be available during the course of WSIP implementation and will enable monitoring of the WSIP's effects as well as refinement of how the proposed mitigation measure (Measure 5.3.7-2) would be implemented. Once the WSIP is adopted, the monitoring component of Measure 5.3.7-2 would provide the information necessary to determine if the performance goal is being met and if the release pattern needs to be modified.

14.6.4 Mitigation Measure 5.3.7-2

Comment Summary

This section of this master response responds to all or part of the following comments:

SI_SPUR-07	SI_TRT-CWA-SierraC-17	C_Dulma-01
SI_TRT5-03	SI_TRT-CWA-SierraC-18	

Summary of Issues Raised by Commenters

- The Draft PEIR does not specify the timing or magnitude of releases.

Response

Mitigation Measure 5.3.7-2 (Vol. 4, Chapter 6, pp. 6-49 and 6-50) would impose a specific release strategy on the reservoir operators and require releases sufficient to maintain the existing meadow communities.

It is not possible to specify exactly the timing and magnitude of controlled releases because they would vary from year to year. Under the existing condition, the SFPUC releases only the required minimum flows from Hetch Hetchy Reservoir for most of the time (837 months in the 984-month hydrologic record). During the spring snowmelt period, the SFPUC attempts to refill Hetch Hetchy Reservoir, and in most years (74 years in the 82-year hydrologic record) the reservoir fills completely. Once the reservoir is full, or it is apparent to the reservoir operators that it will fill, releases in excess of the minimum required release begin. The magnitude of the total release above the minimum required depends on the volume of runoff entering the reservoir from its watershed and the rate of diversion to Canyon Tunnel. The release pattern is not currently designed or deliberately shaped, but is simply a consequence of the operators' response to upstream hydrology and choices with respect to reservoir management and the consequent opening and closing of gates and valves.

With implementation of Measure 5.3.7-2, the water available for release would be released in a pattern that increases the chance of inundating the meadow in the Poopenaut Valley. Examination of the soil types in the valley indicate that the underlying groundwater in the meadow can probably be recharged in a matter of a few hours or a day, and that extended inundation would not increase recharge substantially. As an example, operators may currently choose to release water from Hetch Hetchy Reservoir during the snowmelt period at a rate of 1,000 cubic feet per second (cfs) for 10 days. With Mitigation Measure 5.3.7-2 in place, the reservoir operators could choose to release the same amount of water in the following pattern: 1,000 cfs for the first day, 2,000 cfs for the second day, 3,000 cfs for the third day, 2,000 cfs for the fourth day, and 1,000 cfs for the fifth and sixth days. The modified release pattern would increase the chance that the meadow would be inundated.

The most effective release pattern would be determined by monitoring the effect of releases and refined as information becomes available from the ongoing National Park Service/SFPUC studies in the Poopenaut Valley and baseline studies associated with Measure 5.3.7-2. An experimental release of 3,000 cfs made by the SFPUC in 2007 raised the river level in the Poopenaut Valley by 11 feet, sufficient to flood the meadow. The SFPUC operators made additional experimental releases in the spring of 2008 that showed similar results.

The third full paragraph of Mitigation Measure 5.3.7-2, Controlled Releases to Recharge Groundwater in Streamside Meadows and Other Alluvial Deposits (Vol. 4, Chapter 6, p. 6-50, first full paragraph) is revised as follows for clarification. There are no revisions to the footnote in this paragraph, so it is not included here but should be retained as part of the text.

> As part of this measure the SFPUC will gather baseline data regarding the extent, species composition and condition of the existing meadow vegetation within the Poopenaut Valley. Some of these environmental baseline data may be available as a result of current study efforts in the Poopenaut Valley. As needed, the SFPUC will augment this information by carrying out vegetation composition surveys in the meadow before implementing the WSIP and at 5 year intervals after WSIP implementation to assess the efficacy of mitigation releases in maintaining or improving the percentage cover of meadow species as described by Ratliff (1985). The basic methodology for baseline vegetation survey and subsequent mitigation monitoring will be generally accepted quantitative vegetation sampling methods to permit statistical comparison of vegetation composition over time, as well as mapping the meadow vegetation in the Poopenaut Valley. The SFPUC will consult with a qualified biologist to assist in shaping the releases from Hetch Hetchy Reservoir in consideration of baseline and future meadow vegetation data. If a significant decline in the extent or diversity of native meadow vegetation occurs, releases will be modified as needed to achieve the mitigating effect of sustaining the existing meadow communities.

14.6.5 Impacts on Flow/Hydrology

Comment Summary

This section of this master response responds to all or part of the following comments:

L_BAWSCA2-04	SI_TRT-CWA-SierraC-103	C_BramlD1-01	C_Hoffm-01
SI_GreenP-01	SI_TRT-CWA-SierraC-104	C_Chiap-01	C_MartiM-06
SI_GWWF2-01	SI_TRT-CWA-SierraC-105	C_Dulma-01	C_Means2-
SI_SPUR-07	SI_TRT-CWA-SierraC-106	C_Elbiz-01	01C_Picku-01

SI_TRT7-01	SI_TRT-CWA-SierraC-122	C_Goite-01	C_Raffa-03
SI_TRT-CWA-SierraC-42	SI_TRT-CWA-SierraC-123	C_Goodm-	C_Sprin-01
SI_TRT-CWA-SierraC-45	C_Alter-01	02C_Hanke-01	C_Zimme-01
SI_TRT-CWA-SierraC-97	C_Bail-02	C_Hasso-02	

Summary of Issues Raised by Commenters

- Numerous comments expressed confusion about the existing and proposed levels of diversions by the SFPUC from the Tuolumne River.
- The Draft PEIR's conclusions regarding the flow impacts and significance of hydrology impacts are questionable.

Response

Level of Diversions

The average annual unimpaired flow in the Tuolumne River at Hetch Hetchy Reservoir is estimated to be 749,600 acre-feet. Currently, the SFPUC diverts about 63 percent of the average annual unimpaired flow into Canyon Tunnel at Hetch Hetchy Reservoir. Thus, flow in the Tuolumne River immediately below O'Shaughnessy Dam is about 37 percent of its average annual unimpaired value. Water flows through Canyon Tunnel to the Kirkwood Powerhouse. After passing through the turbines at the powerhouse, about two-thirds of the flow enters Mountain Tunnel for conveyance to the Bay Area; the other third is returned to the river at Early Intake. Flow in the Tuolumne River below Early Intake is at least 50 percent of its average annual unimpaired value.

With the WSIP in place, the SFPUC would divert about 64 percent of the average annual unimpaired flow in the Tuolumne River into Canyon Tunnel at Hetch Hetchy Reservoir. Thus, flow in the Tuolumne River immediately below O'Shaughnessy Dam would be about 36 percent of its average annual unimpaired value. Flow in the Tuolumne River below Early Intake would be at least 49 percent of its average annual unimpaired value.

Note that the values presented in the two paragraphs above are slightly different from those provided in the Draft PEIR. After completion of the Draft PEIR, some improvements were made to the Hetch Hetchy/Local Simulation Model, and the values in the preceding paragraphs were obtained using the update model, as described in Section 13.3 (Vol. 7, Chapter 13) of the Comments and Responses document.

Flow Impacts and Significance of Hydrology Impacts

Under the existing condition, flow in the Tuolumne River between O'Shaughnessy Dam and Early Intake consists almost entirely of releases from the dam. Minimum releases from the dam and minimum flows in the river are specified in an agreement between the CCSF and DOI, as shown in Draft PEIR Table 5.3.1-1 (Vol. 3, Chapter 5, p. 5.3.1-12). The minimum releases represent the low end of the range of flows in this reach of the river. The minimum flow is 35 cfs under the schedule for critically dry years (8 percent of all years). The minimum flow occurs in most months of years when precipitation at Hetch Hetchy Reservoir is less than certain values specified in the CCSF/DOI agreement. If the WSIP is implemented, the SFPUC would still have to adhere to the minimum release schedules specified in the agreement; therefore, the WSIP would not affect the low end of the range of flows in this reach of the river.

Typically, flows in the Tuolumne River below O'Shaughnessy Dam are at their seasonal maximum in the late spring and early summer when the snowpack melts. One of the dam operators' goals is to fill Hetch Hetchy Reservoir by the end of the snowmelt period. Another goal is keep flow in the river below the dam to no more than 8,000 cfs to prevent flooding at the Kirkwood Powerhouse. The dam operators monitor the depth of the snowpack, measure inflow to the reservoir, and adjust releases from the dam as necessary to meet these goals. Water can be diverted from the reservoir to the Canyon Tunnel at a maximum rate of about 1,400 cfs, and released to the river via eight valves at a maximum rate of about 9,000 cfs. Above these values, water passes over the spillway to the river in an uncontrolled manner. This is a rare occurrence, and dam operators are usually able to manage the reservoir without uncontrolled releases.

Maximum flows in the river below O'Shaughnessy Dam typically occur in the spring of years when the snowpack in the Sierra Nevada is heavy and melts rapidly. Modeled average monthly flows in the river below O'Shaughnessy Dam under the existing condition and with the WSIP are shown in Figure 5.3.1-9 (Vol. 3, Chapter 5, p. 5.3.1-23). The figure shows that average monthly flows under the existing condition and with the WSIP would exceed 5,000 cfs eight times in the 82-year hydrologic record.

A red line on Figure 5.3.1-9 shows the average monthly release from Hetch Hetchy Reservoir to the river with the WSIP. A blue line shows the average monthly release from Hetch Hetchy Reservoir to the river under the existing condition. Where the red and blue lines occupy the same space, the red line overwrites the blue line. Examination of the figure for the years in which average monthly flow exceeded 5,000 cfs (1922, 1938, 1956, 1969, 1978, 1983, 1995, and 1998) indicates that the red line overwrites the blue line in all eight years. This shows that in very high flow years, the WSIP would have no effect on the peak average monthly flow.

The reason the WSIP would have no effect on the highest average monthly peak flows is that the capacity of Hetch Hetchy Reservoir is small relative the amount of runoff produced in its watershed in very high runoff years. In years when the snowpack is deep, the reservoir fills rapidly at the beginning of the snowmelt period, after which operators must release any additional runoff to the river below the dam. The peak release to the river usually occurs after the reservoir is full or is close to full.

Average daily flows in the river below O'Shaughnessy Dam typically exceed average monthly flows because, in the snowmelt period, reservoir operators may adjust releases to the river every few days. U.S. Geological Survey gaging records show that average daily flows in the river below the dam equaled or exceeded 10,000 cfs on at least one day in 1929, 1933, 1935, 1938, 1943, 1950, 1951, 1983, 1995, and 1997, usually in May or June. A maximum average daily flow of 16,400 cfs occurred in 1997 in an unusual storm that caused rain to fall on the snowpack in January. Operators of the dam estimate that the instantaneous peak release on January 3, 2007 was probably about 20,000 cfs. It is unlikely that the WSIP would have any effect on the highest average daily peak or instantaneous peak flows for the same reason that it would not have any effect on average monthly peak flows.

In summary, the WSIP would have no effect on either the low or high ends of the range of current flows in the Tuolumne River below O'Shaughnessy Dam. The WSIP would not "substantially alter stream flows such that they are outside the range of pre-project conditions," and its impact on flows was therefore judged to be less than significant.

Although the WSIP would not affect the magnitude of relatively rare, very large peak flows, it would affect the magnitude of the smaller average monthly peak flows that occur more frequently than once every 10 years. The modeled flows shown in Figure 5.3.1-9 of the Draft PEIR indicate that the WSIP would not have any effect on average monthly peak flows during the large runoff events that occur about once every 10 years (eight times in the 82-year hydrologic record); this would be the case under conditions that occurred in 1922, 1938, 1956, 1969, 1978, 1983, 1995, and 1998. Average monthly peak flows during runoff events with a frequency of more than once in 10 years may be affected at times. For example, as shown in Figure 5.3.1-9, average monthly peak flows with the WSIP under conditions that occurred in 1989, 1991, 2001, and 2002 would be lower than under the existing condition.

Except on rare occasions, daily and instantaneous peak flows are a result of management decisions by dam operators. If there were no change in current reservoir management practices with the WSIP, average daily and instantaneous peak flows during runoff events with a higher frequency than once in 10 years would be reduced. However, Mitigation Measure 5.3.7-2 calls for a change in reservoir management practices; that is, the shaping of releases from O'Shaughnessy Dam to increase the chance of recharging groundwater in the Poopenaut Valley. Implementation of this measure would also reduce or eliminate the effects of the WSIP on daily or instantaneous peak flows during runoff events with a higher frequency than once in 10 years.

14.6.6 Impacts on Geomorphology

Comment Summary

This section of this master response responds to all or part of the following comments:

SI_SPUR-07	SI_TRT-CWA-SierraC-119	C_Goite-01
SI_TRT-CWA-SierraC-42	SI_TRT-CWS-SierraC-122	C_Goodm-02
SI_TRT-CWA-SierraC-48	SI_TRT-CWA-SierraC-123	C_Noren-01
SI_TRT-CWA-SierraC-49	C_BramlD1-01	C_Sprin-01
SI_TRT-CWA-SierraC-99	C_Dulma-01	
SI_TRT-CWA-SierraC-110	C_Elbiz-01	

Summary of Issues Raised by Commenters

- The PEIR should not reference average flow data.
- The Draft PEIR's conclusions regarding sediment transport are speculative.

Response

The average monthly flow data provided in Table 5.3.1-5 of the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.1-26) played only a minor role in the assessment of the WSIP's effects on the geomorphology of the Tuolumne River below O'Shaughnessy Dam. Changes in peak flows attributable to the WSIP provided the primary informational basis for reaching conclusions regarding impacts on geomorphology. The WSIP would have little effect on the range of flows experienced in the Tuolumne River below O'Shaughnessy Dam. It would have no effect on the magnitude of infrequent, very large flows because Hetch Hetchy Reservoir is small relative to the volume of runoff produced in its watershed. However, the WSIP could have an effect on the frequency of smaller peak flows. Please see Section 14.6.5, above, for more information.

A commenter opines that the analysis of sediment transport and gravel bed conditions in the Draft PEIR is qualitative and largely speculative. The San Francisco Planning Department acknowledges that the analysis is qualitative but disagrees that it is speculative. Although little data are available on substrate conditions in the upper Tuolumne River between Hetch Hetchy and Don Pedro Reservoirs, it is the San Francisco Planning Department's view that the data are sufficient to make a reasonable analysis, without excessive speculation, of the WSIP's impacts on sediment movement.

The information on existing sediment conditions in the Tuolumne River between Hetch Hetchy and Don Pedro Reservoirs provided in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.2-1 to 5.3.2-3) was obtained from reports prepared for the SFPUC by McBain and Trush and RMC. The most recent in a series of reports summarized available data on the ecosystem in the upper Tuolumne River and provided recommendations for monitoring (McBain and Trush and RMC, 2007). The report confirmed the general description contained in the Draft PEIR of channel and sediment characteristics in this reach of the river.

Much of the upper Tuolumne River flows in a bedrock channel in a deep canyon. Alluvial deposits and riparian vegetation are limited along most of this river reach, but generally increase somewhat in a downstream direction. The only location where the floodplain broadens is in the Poopenaut Valley where an extensive streamside meadow has developed. For about 80 years, O'Shaughnessy, Cherry, and Eleanor Dams have prevented the downstream movement of bedload from the watersheds upstream of Hetch Hetchy Reservoir, Lake Lloyd, and Lake Eleanor. The reservoirs have also reduced peak daily flows in the river in all but the very largest floods.

Little information is available on the relationship between peak flows and the movement of sediment, gravel, and boulders in this reach of the Tuolumne River. As noted in the Draft PEIR, limited studies of the Clavey River, a Tuolumne River tributary, provide some information on the relationship between peak flows and bedload transport in the Clavey River. Because the Clavey River and the Tuolumne River share some characteristics (they both have a relatively steep bedrock channel confined within a canyon), the Clavey River data provide some insight into the geomorphology of the Tuolumne River.

As indicated in the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.2-3), the Clavey River data suggest that:

- Common small floods that occur every one to three years scour and deposit sand in pools and bars.
- Moderate-sized floods that occur every 12 to 17 years move gravel and cobbles, reshape side channels, and move large woody debris.
- Very large floods that occur every 70 to 100 years erode large bars, remove and create side channels, and move large boulders over short distances.

As described in Section 14.6.5, above, the WSIP would have no effect on infrequent, large peak flows in the Tuolumne River below O'Shaughnessy Dam, but it would have some effect on smaller and more frequent peak flows. The WSIP would have no effect on moderate-sized or very large floods and would therefore have no impact on the transport of gravel, cobbles, and boulders. It could reduce the transport of sand somewhat relative to existing conditions. However, despite this minor effect on sediment movement, the Draft PEIR concludes that the WSIP would not result in substantial changes in erosion or siltation rates, and this impact was determined to be less than significant.

14.6.7 Impacts on Water Quality

Comment Summary

This section of this master response responds to all or part of the following comments:

SI_SPUR-07	SI_TRT-CWA-SierraC-160	C_Goite-01
SI_TRT-CWA-SierraC-131	C_BramlD1-01	C_Goodm-02
SI_TRT-CWA-SierraC-132	C_Dulma-01	C_Noren-01
SI_TRT-CWA-SierraC-159	C_Elbiz-01	C_Sprin-01

Summary of Issues Raised by Commenters

- The Draft PEIR's conclusions regarding water temperature are questionable.
- The WSIP would violate water quality objectives.

Response

As described in the Draft PEIR, Hetch Hetchy Reservoir is typically filled in the late spring and early summer and is drawn down during the rest of the year. Under ordinary conditions, the required releases to support coldwater fish in the Tuolumne River below the reservoir during the warm summer and early fall months are drawn from the pool of cool water, deep within the reservoir. During droughts, the reservoir is drawn down farther than in more typical conditions. Under existing conditions and with the WSIP, the pool of cool water in the reservoir is great enough to enable releases of cool water throughout the summer and early fall in all but one drought, the 1976–1977 drought. In a drought like the 1976–1977 drought, the reservoir would probably destratify in September, and warmer water would be released to the river from the reservoir. Both under the existing condition and with the WSIP, water temperature in the river below O'Shaughnessy Dam would increase by more than the water quality objective of 5 degrees Fahrenheit. With the WSIP, elevated water temperatures could persist for several days or weeks longer than under the existing condition.

The conclusion in the Draft PEIR that the WSIP would have a less-than-significant impact on water quality was based on an assessment of whether the beneficial use that the objective is intended to protect—coldwater fish—would be significantly harmed. Both the severity and the frequency of exceedances entered into the assessment. Under typical conditions, water released from the bottom of Hetch Hetchy Reservoir in the summer is quite cool, about 8 degrees Celsius (ºC). This is probably considerably cooler than the summer water temperature in the river under natural (i.e., pre-O'Shaughnessy Dam) conditions. While this water temperature is suitable for resident trout, it is below the optimum for rearing juvenile trout, which is 13 to 21 ºC. In a severe drought, the temperature of water released from O'Shaughnessy Dam would be 10 to 12 ºC warmer and would raise water temperature in the river to 18 to 20 ºC, toward the upper end of the acceptable range for resident trout. It is not expected that the temperature increase, which would occur over a week or two, would harm resident trout, because water temperatures would remain within the acceptable range. Even if the temperature rise increased stress on resident trout, the rise would occur very infrequently, about one fall in every 82 years. Because the risk to resident trout when water temperatures rise is small, and because WSIP-caused temperature increases would be very infrequent, it was concluded that the WSIP's impact on water quality in the Tuolumne River between Hetch Hetchy and Don Pedro Reservoirs would be less than significant.

14.7 Master Response on Lower Tuolumne River Issues

14.7.1 Introduction

Overview

This master response addresses questions and comments about the impact analysis for the lower Tuolumne River; that is, the river between La Grange Dam and the San Joaquin River. This master response is organized by the following subtopics:

14.7.2 Chinook Salmon in the Lower Tuolumne River
14.7.3 Steelhead in the Lower Tuolumne River
14.7.4 FERC-Required Minimum Flows
14.7.5 Impacts on Water Quality
14.7.6 Impacts on Flow/Hydrology
14.7.7 Impacts on Geomorphology
14.7.8 Mitigation Measure 5.3.6-4a
14.7.9 Mitigation Measure 5.3.6-4b

Commenters

Commenters that addressed this topic include:

Federal Agencies

- None

State Agencies

- California Department of Fish and Game – S_CDFG2

Local and Regional Agencies

- Modesto Irrigation District and Turlock Irrigation District – L_MIDTID
- Tuolumne County – L_Tuol2

Groups

- California Trout – SI_Caltrout
- Center for Resource Solutions – SI_CRS
- Ecology Center – SI_EcoCtr
- Environmental Defense – SI_EnvDef
- Golden West Women Flyfishers – SI_GWWF1, SI_GWWF2
- Klamath-Siskiyou Wildlands Center – SI_KSWC
- Northern California/Nevada Council of the Federation of Fly Fishers Steelhead Committee – SI_NCFFSC
- Republicans for Environmental Protection – SI_CAREP
- Santa Clara County Creeks Coalition – SI_SCCCC
- Sierra Club – SI_SierraC1, SI_SierraC6, SI_SierraC7

- Tuolumne River Trust – SI_TRT2, SI_TRT3, SI_TRT5, SI_TRT6, SI_TRT7, SI_TRT8, SI_TRT10
- Tuolumne River Trust/Clean Water Action/Sierra Club, San Francisco Bay Chapter – SI_TRT-CWA-SierraC

Citizens

- Alter, Grudy – C_Alter
- Bail, Christopher – C_Bail
- Berkowitz, Allan – C_Berko
- Beviacqua, John – C_Bevia
- Bramlette, Darryl – C_BramlD1
- Bresolin, Mark – C_Breso
- Chiapella, Lynn – C_Chiap
- Clark, Ann & Katherine Howard – C_Clark1
- Coleman, Caroline – C_Colem2
- Dulmage, Diana – C_Dulma
- Elbizri, Elanie – C_Elbiz
- Garbarino, Caroline – C_Garba
- Genovese, Marilyn – C_Genov
- Goitein, Ernest – C_Goite
- Goldfein, Kathleen – C_Goldf
- Goodman, Rebecca – C_Goodm
- Graves, Ben – C_Grave
- Hankermeyer, Carol – C_Hanke
- Hasson, Tomer – C_Hasso
- Hoffman, Jeff – C_Hoffm
- Joyce, Lindsay and Ken – C_Joye
- Martin, Michael – C_MartiM
- McCollom – C_McCol
- Means, Robert – C_Means2
- Mijac, Ivo – C_Mijac
- Noren, William – C_Noren1
- Okuzumi, Margaret – C_Okuzu
- Parkes, Doug – C_Parke
- Pickup, Ron – C_Picku
- Raffaeli, Paul – C_Raffa
- Ross, Jim – C_Ross
- Spring, Cindy – C_Sprin
- Steinhart, Peter – C_Stein
- Sugars, Marc – C_Sugar
- Urdan, Matthew – C_Urdan
- Vermeys, Jim – C_VermeJ
- Weiss, Richard – C_Weiss
- Williams, Doris – C_Willi
- Zimmerman, Benita – C_Zimme

PEIR Section Reference

The Draft PEIR addresses this topic area in Vol. 3, Chapter 5, Section 5.3, pp. 5.3.1-1 to 5.3.9-3.

14.7.2 Chinook Salmon in the Lower Tuolumne River

Comment Summary

This section of this master response responds to all or part of the following comments:

S_CDFG2_05	SI_TRT7-07	C_MartiM
L_Tuol2-03	SI_TRT8-04	C_McCol
SI_Caltrout-01	SI_TRT10-03	C_Mijac
SI_CAREP-01	SI_TRT-CWA-SierraC-149	C_Noren1
SI_CRS-01	SI_TRT-CWA-SierraC-09	C_Okuzu
SI_EcoCtr-01	C_Berko	C_Parke
SI_GWWF1-02	C_Breso	C_Raffa
SI_KSWC-01	C_Bryan	C_Raffa
SI_SCCCC-03	C_Clark1	C_Ross
SI_SierraC1-01	C_Colem2	C_Stein
SI_SierraC6-03	C_Dulma	C_Sugar
SI_SierraC7-04	C_Elbiz	C_Urdan
SI_TRT2-01	C_Garba	C_VermeJ

SI_TRT3-03	C_Genov	C_Weiss
SI_TRT5-01	C_Goldf	C_Willi
SI_TRT5-02	C_Grave	
SI_TRT6-03	C_Joye	

Summary of Issues Raised by Commenters

- More up-to-date information on salmon needs to be presented.
- More complete data on the historical occurrence of salmon need to be presented.
- The WSIP has the potential to harm already declining anadromous fish populations.

Response

The Draft PEIR provides information on Chinook salmon populations in the Tuolumne River (Vol. 3, Chapter 5, pp. 5.3.6-13 to 5.3.6-17). Table 5.3.6-2 shows the results of spawning surveys for the period 1971 to 2004, which show a declining trend in Chinook salmon production. A commenter provided similar information that also shows a declining trend; the receipt of this information is acknowledged (see **Response SI_TRT-CWA-SierraC-194**).

The information on Chinook salmon provided in the Draft PEIR was sufficient to reach the conclusion that the WSIP could have a potentially significant adverse impact on salmonids in the Tuolumne River below La Grange Dam. As stated in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.6-28 to 5.3.6-32), overall flow reductions coupled with the projected infrequent water temperature increases that could result from the WSIP would have an adverse impact on habitat conditions for juvenile salmonids. The *Habitat Restoration Plan for the Lower Tuolumne River Corridor* (McBain and Trush, 2000) establishes goals for fishery habitat restoration, and the National Marine Fisheries Service (NMFS) and others have identified goals for fishery enhancement in this reach of the river. The WSIP's small but incremental contribution to adverse effects on the lower river would make planned restoration of habitat and fishery resources more difficult. Thus, the Draft PEIR reflects the view of a commenter that the WSIP has the potential to cause a significant adverse effect on anadromous fish in the Tuolumne River below La Grange Dam.

Although the information in the Draft PEIR was sufficient to reach the conclusion referred to above, the following supplementary information is provided to augment and clarify the discussion in the Draft PEIR in response to the comments.

The San Joaquin River and its major tributaries historically supported large populations of both spring-run and fall-run Chinook salmon. During the late 1800s and early 1900s, construction of a number of dams and impoundments within the watershed to provide hydroelectric power generation as well as water supplies for agricultural and municipal usage substantially altered the hydrologic regime of the rivers in terms of the seasonal timing and magnitude of instream flows. The dams also created complete impassable barriers to the upstream migration of adult salmonids, thereby precluding access to otherwise suitable spawning and juvenile rearing habitat located farther upstream within the watershed. The construction of various dams and impoundments coupled with land use changes within the watershed cumulatively contributed to the declining abundance of Chinook salmon, ultimately leading to the extirpation of both spring-run and fall-run Chinook salmon on the mainstem San Joaquin River downstream of Friant Dam. Fall-run Chinook salmon continued to persist within the three major tributaries to the San Joaquin River, including the Stanislaus, Merced, and Tuolumne Rivers, within habitat reaches located downstream of major dams on each of these three tributaries. In addition to naturally spawning, self-sustaining populations of Chinook salmon within the three tributaries, a mitigation hatchery was constructed on the Merced River for the production of Chinook salmon, which has also contributed to the population abundance and dynamics of Chinook salmon within the lower watershed.

Since completion of the major dams in the San Joaquin River watershed during the late 1940s, the Chinook salmon population inhabiting the Tuolumne, Merced, and Stanislaus Rivers has been characterized by highly variable and fluctuating numbers of adult salmon returning to the tributaries each year to spawn. Adult Chinook salmon population abundance within the three tributaries over the past six decades has fluctuated from a low of several hundred fish to a high of over 40,000 adult salmon. Recent fall-run Chinook salmon escapement averages from 1992 through 2006 were 3,700 adults for the Stanislaus River, 4,600 for the Tuolumne River, and 3,800 for the Merced River. Maximum fall-run escapement over the period from 1967 to 2006 was between 10,000 and 14,000 adults for the Stanislaus River, between 10,000 and 20,000 for the Tuolumne River, and between 10,000 and 15,000 for the Merced River. The fluctuations in adult abundance appear to follow a long-term cyclical pattern, which has been hypothesized to be related to a variety of environmental factors. During the two most recent years, 2006 and 2007, adult Chinook salmon returns to the three tributaries have declined substantially to near-record lows.

There is a high degree of uncertainty and disagreement on the causal mechanisms that have contributed to the high fluctuations in adult returns to the Tuolumne River and other San Joaquin River tributaries. Research on the Tuolumne River suggests that numerous in-river mortality factors may be affecting the abundance and survival of Chinook salmon within the Tuolumne River and other tributaries, including the following: predation by piscivorous fish such as largemouth and smallmouth bass, striped bass, and Sacramento pikeminnow, both within the river and associated with gravel pits; exposure to seasonally elevated water temperatures, particularly during drier water years; low water velocities; habitat degradation within the tributaries; reduced instream flows supporting spawning, egg incubation, juvenile rearing, and adult and juvenile migration; redd superimposition; lack of turbidity during smolt outmigration; and limitations on available juvenile rearing habitat.

It appears that much of the fry and smolt mortality takes place after the juvenile Chinook salmon emigrate from the tributary rivers to the mainstem San Joaquin River, the Delta, or the ocean where there are a number of adverse conditions. Potential sources of mortality within the mainstem San Joaquin River and Delta include exposure to seasonally elevated water temperatures; exposure to potential entrainment risk at unscreened water diversions; entrainment and salvage risk as a result of operation of the State Water Project (SWP) and Central Valley Project (CVP) water export facilities; exposure to contaminants and toxics; vulnerability to predation mortality by striped bass, largemouth bass, Sacramento pikeminnow, and other predatory fish and birds; and delays in adult and juvenile migration as a result of changes in Delta hydrologic conditions associated with water export operations. In addition, the availability of suitable food supplies may be reduced for emigrating juvenile salmon within the lower San Joaquin River and the Delta. Furthermore, the results of correlation analyses between hydrologic conditions within the San Joaquin River basin during the spring period of juvenile emigration and the subsequent number of adult Chinook salmon returning to the tributaries two and one-half years later suggest the importance of river flow as a factor affecting the survival of juvenile Chinook salmon as they migrate downstream from the San Joaquin River tributaries through the lower mainstem and Delta.

There is growing scientific evidence that coastal oceanographic conditions, such as changes in water currents, changes in ocean water temperatures, and changes in ocean upwelling, are important influences on coastal productivity. They affect the species composition and abundance of zooplankton, macroinvertebrates, and fish inhabiting coastal marine waters. Changes in oceanographic conditions and coastal productivity have been related to salmon survival and ultimately the population abundance of adults. Within Pacific coastal waters, changes in oceanographic conditions associated with the Pacific decadal oscillation have been used to predict the abundance of returning adult Chinook salmon to inland tributaries to spawn. Ocean commercial and recreational harvesting of adult Chinook salmon has also been identified as a factor affecting the population dynamics and abundance of Central Valley Chinook salmon stocks.

Concern has been expressed that the hatchery production of Chinook salmon in the Merced River and other Central Valley hatcheries could affect the genetic integrity and population dynamics of Chinook salmon stocks within the San Joaquin River watershed and throughout the Central Valley. The NMFS and California Department of Fish and Game (CDFG) are working cooperatively to identify hatchery management practices that will reduce the potential effects of hatchery production on the genetic integrity of Central Valley Chinook salmon populations, as well as the effects of hatchery planting practices and the ocean harvesting of hatchery-produced salmon on the health and abundance of wild in-river Chinook salmon produced within the Central Valley tributaries.

A variety of scientific investigations and management programs have been implemented recently in an effort to better understand the factors affecting the survival and population dynamics of Chinook salmon within San Joaquin River tributaries, including the Tuolumne River, as well as programs designed to protect and enhance habitat conditions for Chinook salmon spawning, egg incubation, juvenile rearing, and adult and juvenile migration. For example, the Vernalis Adaptive Management Program (VAMP, described in Vol. 3, Chapter 5, pp. 5.2-17 and 5.2-18) was specifically designed to: (1) provide improved protection and survival of juvenile Chinook salmon emigrating from the San Joaquin River tributaries through the Delta during the spring months, and (2) provide a scientific framework for testing and evaluating the potential relationship between changes in stream flows within the San Joaquin River at Vernalis, installation of the Head of Old River barrier, and reductions in SWP and CVP export rates during the spring months on juvenile Chinook salmon survival. The VAMP investigations are ongoing.

Investigations have also been conducted to monitor the seasonal loading and concentrations of various toxics and potential pollutants within the mainstem San Joaquin River and its tributaries. Land use within the San Joaquin River watershed includes both urban populations as well as extensive agricultural production. Runoff within the watershed may include a variety of water quality contaminants, including pesticides and herbicides, petroleum products, selenium, and salts. Scientific investigations in combination with various regulatory programs have been designed to characterize the potential effects of these water quality constituents on the health and survival of aquatic resources, including San Joaquin River basin Chinook salmon, as well as to identify management actions to reduce or avoid the potential risk of exposure to these water quality constituents.

Large-scale management and habitat restoration programs, such as the CALFED Bay-Delta Program, have invested substantial staff and financial resources in conducting scientific investigations and in supporting habitat enhancement and improvement projects designed to benefit Chinook salmon and other aquatic resources in the lower Tuolumne River and other Central Valley rivers. In addition, the Anadromous Fish Restoration Program under the Central Valley Project Improvement Act has invested substantial time and financial resources to improve the scientific understanding of various factors affecting Chinook salmon in the San Joaquin River tributaries as well as to implement various management actions and habitat restoration and enhancement programs designed to improve the quality and availability of suitable habitat for Chinook salmon and other fish species.

One of the significant environmental factors that affects habitat quality and availability within the Tuolumne River and other San Joaquin River tributaries for Chinook salmon spawning, egg incubation, juvenile rearing, and adult and juvenile migration is exposure to seasonally elevated water temperatures. A variety of scientific programs designed to develop simulation and predictive models have been implemented in recent years; these models can be used to assess the effects of various reservoir operating strategies, stream flow schedules, coldwater pool management strategies, and other factors influencing the seasonal and longitudinal gradients of water temperatures within the tributaries that potentially affect the health and survival of Chinook salmon in the watershed.

As part of previous State Water Resources Control Board Bay-Delta water quality and water-right proceedings as well as the Federal Energy Regulatory Commission (FERC) hydroelectric project relicensing, considerable emphasis has been placed on evaluating and potentially modifying instream flow schedules for the Tuolumne River and other San Joaquin River tributaries. These management changes to instream flows were intended to improve the physical habitat for various life-history stages of Chinook salmon and other fishery resources as well as to provide more suitable seasonal water temperature conditions in an effort to improve the overall health and survival of Chinook salmon. Investigations into the relationship between instream flows and the hatching success, abundance of fry, abundance of smolts, juvenile emigration survival, and ultimately the abundance of adult Chinook salmon returning to the tributaries to spawn are continuing.

Ongoing investigations are also being performed by the CDFG, NMFS, and the Pacific Fishery Management Council to better identify the effects of recreational and commercial harvesting of Chinook salmon from various river systems, including the Tuolumne River, on population dynamics and adult escapement. Since the Central Valley Chinook salmon populations are comprised of both naturally spawning, in-river-produced salmon as well as fish produced within the Central Valley hatcheries, including the Merced River Fish Hatchery, regulation of commercial and recreational harvesting is an important factor in protecting weaker stocks, such as the wild, in-river Chinook salmon produced in the Tuolumne River. Since 2007, a large-scale constant fractional marking program has been implemented at Central Valley hatcheries to provide additional information on the contribution of various hatcheries to adult salmon populations in the ocean, the effects of harvest on various salmon stocks, adult straying among Central Valley rivers, and the relationship between various environmental factors within the rivers, the Delta, and ocean environments that ultimately affect the health and survival of Central Valley populations.

In recent years, a settlement was reached in federal court that is intended to restore instream flows and self-sustaining populations of spring-run and fall-run Chinook salmon to the mainstem San Joaquin River downstream of Friant Dam. The San Joaquin River Restoration Program is in its early stages, but has identified a number of physical features within the mainstem San Joaquin River that need to be modified or altered in order to reestablish Chinook salmon populations. The restoration program is seeking funding to implement the various restoration elements of the program, which are ultimately expected to support long-term fishery restoration within the river. There are, however, a number of uncertainties regarding the performance and effectiveness of the proposed restoration actions as well as the relationship between Chinook salmon populations and physical habitat within the mainstem and the survival of fall-run Chinook salmon inhabiting the lower tributaries. Full implementation of the San Joaquin River Restoration Program is expected to take a decade or longer.

Currently, the California Department of Water Resources and U.S. Bureau of Reclamation are engaged in a formal Section 7 consultation with the U.S. Fish and Wildlife Service regarding the potential effects of SWP and CVP export operations on the health and survival of delta smelt. The NMFS is responsible for issuing biological opinions under the Federal Endangered Species Act regarding the coordinated operations of the SWP and CVP for the protection of listed stocks of Chinook salmon, steelhead, and green sturgeon. The current Section 7 re-consultation process is expected to result in modifications to SWP and CVP export operations and other facilities within the Delta estuary, such as installation of the Head of Old River barrier and the south Delta barrier project, which may also have direct and indirect effects on the survival of juvenile Chinook salmon emigrating from the San Joaquin River tributaries downstream through the Delta.

The environmental and biological factors affecting the abundance of adult Chinook salmon returning to spawn in the Tuolumne River and other San Joaquin tributaries are dynamic and vary within and among years. An understanding of these various factors and their associated level of uncertainty provides, in part, the framework used in the Draft PEIR to assess potential impacts of the WSIP operations on habitat quality and availability for various life-history stages of Chinook salmon inhabiting the lower Tuolumne River.

14.7.3 Steelhead in the Lower Tuolumne River

Comment Summary

This section of this master response responds to all or part of the following comments:

SI_GWWF1-02	SI_TRT-CWA-SierraC-12	SI_TRT-CWA-SierraC-172
SI_NCFFSC-01	SI_TRT-CWA-SierraC-150	SI_TRT5-02
SI_SierraC7-10	SI_TRT-CWA-SierraC-151	SI_TRT8-04
SI_TRT-CWA-SierraC-11	SI_TRT-CWA-SierraC-152	

Summary of Issues Raised by Commenters

- No data on steelhead trout are included in the Draft PEIR.
- Recent studies indicate that some steelhead are present in the Tuolumne River.

Response

A comment on the Draft PEIR refers to the lack of data on steelhead trout and cites McEwan (2001) as a source of information on current steelhead presence and population in the Tuolumne River. The comment notes that the McEwan study provides more recent information on steelhead presence in the Tuolumne River than the data included in the Draft PEIR from the FERC study (1996).

Section 5.3.6.1 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.6-1 to 5.3.6-24) provides setting information and discussion on the presence of steelhead trout in the Tuolumne River. The data presented in the Draft PEIR on habitat conditions in the lower Tuolumne River indicate that this reach of the river is unsuitable for significant populations of steelhead trout due to high temperatures over summer months. The studies by FERC (1996) concluded that no significant populations of steelhead or rainbow trout are present within the lower Tuolumne River system.

The McEwan study includes a discussion on the historical distribution of steelhead and documents historical evidence of steelhead in the lower Tuolumne River. The study also estimates the present range of likely steelhead occurrence, including in the Tuolumne River. Consistent with the Draft PEIR, the McEwan study states that high water temperatures are a primary stressor for juvenile steelhead through the summer months. Dam construction over the last century has made coldwater spawning and rearing habitat at mid-range and high elevations in the Tuolumne River watershed inaccessible to steelhead. Steelhead are now confined to the lower elevation reaches, where high summer water temperatures are a major stressor (McEwan, 2001).

Additionally, consistent with the Draft PEIR, McEwan found that no significant populations of steelhead/rainbow trout are present in the lower Tuolumne River system. Section 5.3.6.1 of the Draft PEIR presents the findings of rainbow trout surveys conducted between 1982 and 2004. These findings concluded that, while rainbow trout are present and their range has been moderately extended downstream as a result of FERC Settlement Agreement flows, large anadromous steelhead occur in the system very infrequently. Also consistent with the Draft PEIR, McEwan presents data from surveys on the Tuolumne River that established the presence of rainbow trout. However, the surveys (conducted by a CDFG biologist in 2001) documented only a single rainbow trout of 28 inches and a single steelhead smolt of 11 inches, captured in the same location within a few days of each other. These findings by McEwan (2001) on steelhead presence in the lower Tuolumne River are consistent with those provided in the Draft PEIR in showing that no significant populations of steelhead are present within the lower Tuolumne River system.

14.7.4 FERC-Required Minimum Flows

Comment Summary

This section of this master response responds to all or part of the following comments:

S_CDFG2-05	SI_TRT-CWA-SierraC-172	SI_TRT6-04
L_MIDTID-08	SI_TRT-SWA-SierraC-64	C_Sprin-01

Summary of Issues Raised by Commenters

- The FERC-imposed minimum instream flows will probably increase when Don Pedro Reservoir is relicensed.
- The analysis in the Draft PEIR should assume greater FERC-imposed minimum flows.

Response

Table 5.3.1-3 in the Draft PEIR shows current minimum stream flow requirements for the Tuolumne River below La Grange Dam (Vol. 3, Chapter 5, p. 5.3.1-12). The minimum flows are a condition of the license issued by the FERC in 1996 for the Don Pedro Project. Various other conditions are contained in the settlement agreement that led to issuance of the license, including a requirement that water quality and fish populations be monitored and certain fish habitat restoration projects completed. The Don Pedro Project is scheduled for relicensing in 2016, at which time the FERC will review the results of the monitoring program and the minimum instream flow requirements.

Several commenters indicated that because fall-run Chinook salmon populations in the Tuolumne River below La Grange Dam have declined in the last 10 years, it is likely that the FERC will increase the minimum instream flow requirements. Therefore, the commenters stated that the analysis of the WSIP in the Draft PEIR should have allowed for an increase in minimum flows.

The Draft PEIR did not incorporate a possible increase in the future minimum flow requirement in its primary analysis of the WSIP (Vol. 3, Chapter 5, Section 5.3.6), although it did consider the possibility of an increase in the future minimum flow requirement in the cumulative impact analysis (Vol. 3, Chapter 5, Section 5.7). The PEIR did not include an increase in the future minimum instream flow in its primary analysis of the WSIP for two reasons. First, it is impossible to predict what the future minimum instream flow requirements might be, and to assume flow requirements other than the current minimum flows would be speculative. Secondly, an increase in the minimum instream flows would likely have both beneficial and adverse effects on salmonids. Increased stream flow would likely benefit salmonids at times, such as providing increased quality and quantity of spawning and rearing habitat, but would also cause Don Pedro Reservoir to be drawn down farther than it is under the current minimum flow regime. This would reduce the magnitude of pulse flows in excess of the minimum required during the winter months and delay the typical large spring release during the snowmelt period. The changes in pulse flows and the delay in spring release could harm salmonids. The delay in spring release due to an increase in the minimum flow requirement would be additive to the delay in spring release caused by the WSIP, producing a longer delay than the WSIP alone. The combined delay would have a more severe adverse effect on salmonids in the river below La Grange Dam than the WSIP alone. Therefore, while the Draft PEIR acknowledges that the FERC relicensing process will likely result in minimum flow requirements remaining the same or increasing, the San Francisco Planning Department determined that, in the absence of any information, the most reliable (and least speculative) assumption to use in the impact analysis was the existing, known minimum instream flow requirements.

A commenter notes that the SFPUC currently pays the Turlock Irrigation District (TID) and Modesto Irrigation District (MID) to make minimum instream release below La Grange Dam; this is consistent with information presented in the Draft PEIR (Vol. 1, Chapter 2, p. 2-42). The commenter further notes that this arrangement may not be acceptable to the Districts in the future if minimum instream flow requirements are increased. As the terms of any future agreements with the Districts are unknown, it would be speculative for the Draft PEIR to assume anything other than a continuation of the existing arrangements. Currently, the need to make releases for minimum instream flows causes Don Pedro Reservoir to be drawn down farther than it would without the releases. However, if TID and MID declined to make releases from Don Pedro Reservoir on the SFPUC's behalf in the future, then the SFPUC's water bank account could be reduced to provide a portion of the releases, if the Districts demonstrated that their water entitlements would be adversely affected by making the releases without an adjustment in the SFPUC's water bank account. This would likely require the SFPUC to draw down Hetch Hetchy Reservoir farther than it does currently. The result would be to transfer some of the environmental consequences of delayed spring releases from the lower to the upper Tuolumne River. The SFPUC's obligation with respect to FERC minimum required flows is described in the Draft PEIR (Vol. 1, Chapter 2, p. 2-42).

14.7.5 Impacts on Water Quality

Comment Summary

This section of this master response responds to all or part of the following comments:

SI_TRT-CWA-SierraC-128	C_BramlD1-01	C_Goodm-02
SI_TRT-CWA-SierraC-129	C_Dulma-01	C_Sprin-01
SI_TRT-CWA-SierraC-130	C_Elbiz-01	
SI_TRT-CWA-SierraC-167	C_Goite-01	

Summary of Issues Raised by Commenters

- The analysis of the WSIP on water temperature is inadequate.
- The occasional increases in water temperature could still have significant effects.

Response

A comment states that the information contained in Table 5.3.3-2 (Vol. 3, Chapter 5, p. 5.3.3-3) is not comprehensive or well explained. The table shows maximum summer and fall water temperatures in the Tuolumne River at five locations between La Grange Dam and Modesto for the period 1996 through 2004. The data summarized in Table 5.3.3-2 were obtained in the course of studies conducted by TID and MID pursuant to the 1995 FERC Settlement Agreement with respect to licensing for the Don Pedro Project. The water temperature data were obtained from thermographs installed in the river. Thermographs are typically set to record water temperature every few minutes. The table shows the maximum temperatures recorded at five stations from 1996 to 2004. The values are not instantaneous maxima but are close to them. For graphs showing daily maximum, minimum, and average water temperatures, please see *2005 Ten Year Summary Report*, FERC Project No. 2299-024, TID/MID, 2005.

The temperatures shown in Table 5.3.3-2 are not cut off at 20 degrees Celsius (ºC). The footnote on the table simply indicates that maximum temperatures equal to or greater than 20 ºC are shown in bold print.

A comment notes that Table 5.3.3-2 contains information on summer maximum water temperatures, and that water temperatures in the winter and spring are also important for the development and out-migration of juvenile salmon. Under the existing condition, the operators of Don Pedro Reservoir sometimes release pulses of water to the lower Tuolumne River in the winter months as they seek to preserve the flood control reservation in the face of winter storms. The pulse releases are in addition to the minimum required releases. Because Don Pedro Reservoir would be drawn down somewhat farther with the WSIP than under the existing condition, the winter pulse releases with the WSIP would be smaller than under the existing condition. Water released from the reservoir in the winter is cool, typically between 9 and 11 ºC. It is not expected that the WSIP would have any effect on the temperature of these winter releases.

As noted above, Don Pedro Reservoir would be drawn down farther with the WSIP than under the existing condition, resulting in a delay in the release of water in excess of the minimum required in the spring as snowmelt runoff reaches the reservoir. The delay could cause water temperatures below the reservoir in the spring to rise above the values that occur under the current condition. Water temperatures in the river with and without the WSIP were modeled and are shown in Figures 5.3.3-3 and 5.3.3-4 (Vol. 3, Chapter 5, pp. 5.3.3-18 and 5.3.3-19). In most years, the WSIP would have little effect on water temperature below La Grange Dam. Sometimes (in 12 months in the 82-year hydrologic record) the WSIP could cause average daily water temperatures to rise by 1 or 2 ºC. Very rarely (in one month in the 82-year hydrologic record), the WSIP could cause average daily water temperatures to rise by 10 ºC. In terms of a water quality impact (Vol. 3, Chapter 5, pp. 5.3.3-17 to 5.3.3-19), the Draft PEIR concluded that the rare exceedances of the water temperature objective would not impair the river's ability to support the designated beneficial uses that the objective is designed to protect, including coldwater fisheries. However, the occasional increases in water temperature in the Tuolumne River below La Grange Dam, together with other factors, contributed to the conclusion that the WSIP could have a significant adverse effect on salmonids in this reach of the river (Vol. 3, Chapter 5, pp. 5.3.6-28 to 5.3.6-32).

14.7.6 Impacts on Flow/Hydrology

Comment Summary

This section of this master response responds to all or part of the following comments:

L_BAWSCA2-04
SI_GreenP-01
SI_GWWF2-01
SI_TRT-CWA-SierraC-45
SI_TRT-CWA-SierraC-113
SI_TRT-CWA-SierraC-114
SI_TRT-CWA-SierraC-115
SI_TRT-CWA-SierraC-118
SI_TRT-CWA-SierraC-163
SI_TRT-CWA-SierraC-188
SI_TRT7-01
C_Alter-01
C_Bail-02
C_BramlD1-01
C_Chiap-01
C_Dulma-01
C_Elbiz-01
C_Goite-01
C_Goodm-02
C_Hanke-01
C_Hasso-02
C_Hoffm-01
C_MartiM-06
C_Means2-01
C_Picku-01
C_Raffa-03
C_Sprin-01
C_Zimme-01

Summary of Issues Raised by Commenters

- Numerous comments were raised about the existing and proposed levels of diversions by the SFPUC from the Tuolumne River.
- Objection to the rationale for the Draft PEIR's significance determination for hydrology impacts (the "within current range" argument).

Response

Level of Diversions

The average annual unimpaired flow in the Tuolumne River at La Grange Dam is estimated to be 1,850,000 acre-feet. Currently, TID and MID divert about 47 percent of the average annual unimpaired flow into the Turlock and Modesto Canals at La Grange Dam. The SFPUC's current diversion of water from its reservoirs in the upper Tuolumne River watershed represents about 13 percent of the average annual unimpaired flow at La Grange Dam. Together, current diversions by the SFPUC, TID, and MID represent about 60 percent of the average annual unimpaired flow. Thus, flow in the Tuolumne River immediately below La Grange Dam is about 40 percent of its average annual unimpaired value.

With the WSIP in place, it is assumed that diversions by TID and MID at La Grange Dam would be unchanged, while diversions by the SFPUC in the upper Tuolumne River watershed would increase. With the WSIP, the SFPUC's diversion of water from its reservoirs in the upper Tuolumne River watershed would represent about 15 percent of the average annual unimpaired flow at La Grange Dam. Together, diversions by the SFPUC, TID, and MID would represent about 62 percent of the average annual unimpaired flow. Thus, flow in the Tuolumne River immediately below La Grange Dam would be about 38 percent of its average annual unimpaired value.

Note that the values presented in the two paragraphs above are slightly different from those provided in the Draft PEIR. After completion of the Draft PEIR, some improvements were made to the Hetch Hetchy/Local Simulation Model, and the values in the preceding paragraphs were obtained using the updated model as described in Section 13.3 (Vol. 7, Chapter 13) of the Comments and Responses document.

Range of Flows

Several comments challenged the conclusion in the Draft PEIR that river flows with the WSIP would remain within the range experienced under the existing condition, and therefore that the impacts on hydrology would be less than significant.

Flow in the Tuolumne River below La Grange Dam consists entirely of releases from the dam. Minimum releases from the dam and minimum flows in the river are specified in an agreement among TID, MID, and FERC, and are shown in Draft PEIR Table 5.3.1-2 (Vol. 3, Chapter 5, p. 5.3.1-13). The minimum releases represent the low end of the range of flows in this reach of the river. The minimum flow is 50 cubic feet per second (cfs), which occurs between June 1 and September 30 in the driest years. TID, the operator of La Grange Dam, would continue to adhere to the minimum releases specified in the agreement whether or not the WSIP is implemented. Therefore, the WSIP would not affect the low end of the range of flows in this reach of the river.

Typically, flows in the Tuolumne River below La Grange Dam are at their seasonal maximum in the winter and spring. One of the goals of dam operators is to fill Don Pedro Reservoir by the end of the snowmelt period if possible. The operators' ability to meet this goal is constrained by the requirement that space be retained in Don Pedro Reservoir to reduce possible flooding downstream of La Grange Dam. The flood control reservation requirement increases from zero on September 8 to 340,000 acre-feet on October 7, and is again reduced to zero between April 27 and June 3. Another goal is to keep flow in the river below La Grange Dam to no more than 9,000 cfs to prevent flooding in the Modesto area. The dam operators monitor the depth of the snowpack in the upper watershed, measure inflow to Don Pedro Reservoir, and adjust releases from Don Pedro Reservoir as necessary to meet the operating goals. At times when inflow to the reservoir is high, the capacity of the gates and valves at Don Pedro Dam can be exceeded, causing water to flow over the dam spillway. Water released from Don Pedro Reservoir flows two miles to La Grange Dam. Water can be diverted at La Grange Dam into the Turlock and Modesto Canals and released to the river through a number of valves. If very large releases from Don Pedro Reservoir are made, water can pass over La Grange Dam to the river in an uncontrolled manner. Uncontrolled releases over the spillways at Don Pedro and La Grange Dams are rare and are usually avoided by the dam operators.

Maximum flows in the river below La Grange Dam typically occur in the winter or spring of years when the snowpack in the Sierra Nevada is heavy and it melts rapidly or is subject to rainfall. Modeled average monthly flows in the river below La Grange Dam under the existing condition and with the WSIP are shown in Draft PEIR Figure 5.3.1-12 (Vol. 3, Chapter 5, p. 5.3.1-33). The figure shows that average monthly flows under both the existing condition and with the WSIP would exceed 6,000 cfs in 14 years in the 82-year hydrologic record.

A red line on Figure 5.3.1-12 shows the average monthly release from La Grange Dam to the river under the WSIP. A blue line shows the average monthly release from La Grange Dam under the existing condition. Where the red and blue lines occupy the same space, the red line overwrites the blue line. Examination of the figure for the years in which average monthly flow exceeded 6,000 cfs (1922, 1938, 1956, 1967, 1969, 1970, 1980, 1982, 1983, 1984, 1986, 1995, 1997, and 1998) indicates that the red line overwrites or almost overwrites the blue line in all 14 years. This shows that in very high flow years, the WSIP would have little or no effect on the peak average monthly flow.

The reason the WSIP would have little or no effect on the highest average monthly peak flows is that the operators of Don Pedro Reservoir must limit the capture of runoff during the winter and spring in order to maintain the required flood control reservation. In years when rainfall is abundant, the reservoir fills rapidly and reaches the maximum storage permitted consistent with the flood control requirements. Operators must release any additional inflow to the reservoir to the river below La Grange Dam. The peak release to the river usually occurs after the reservoir is at the maximum storage permitted consistent with flood control requirements.

Average daily flows in the river below La Grange Dam typically exceed average monthly flows because, in the winter and spring, reservoir operators may adjust releases to the river every few days to maintain the flood storage reservation. U.S. Geological Survey gaging records show that average daily flows in the river below the dam equaled or exceeded 10,000 cfs on at least one day in 1983 and 1997. A maximum average daily flow of 58,900 cfs occurred in 1997 in an unusual storm that caused rain to fall on the snowpack in January. It is unlikely that the WSIP would have any effect on the highest average daily peak or instantaneous peak flows for the same reason that it would not have any effect on average monthly peak flows.

In summary, the WSIP would have little or no effect on either the low or high ends of the range of current flows in the Tuolumne River below La Grange Dam. The WSIP would not "substantially alter stream flows such that they are outside the range of pre-project conditions," and its impact on flows was therefore judged to be less than significant.

Although the WSIP would not affect the magnitude of relatively rare, very large peak flows, it would affect the magnitude of the smaller average monthly peak flows that occur more frequently than once every 10 years. The modeled flows shown in Figure 5.3.1-12 of the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.1-33) indicate that the WSIP would not have any effect on average monthly peak flows in large runoff events that occur about once every six years (14 times in the 82-year hydrologic record). This would be the case during conditions that occurred in 1922, 1938, 1956, 1967, 1969, 1970, 1980, 1982, 1983, 1984, 1986, 1995, 1997, and 1998. Average monthly peak flows in runoff events with a higher frequency than once in six years may be affected at times. For example, as shown in Figure 5.3.1-12, average monthly peak flows with the WSIP under conditions that occurred in 1936, 1950, 1965, 1978, and 1993 would be lower than under the existing condition.

14.7.7 Impacts on Geomorphology

Comment Summary

This section of this master response responds to all or part of the following comments:

SI_TRT-CWA-SierraC-119	C_BramdlD1-01	C_Goodm-02
SI_TRT-CWA-SierraC-125	C_Dulma-01	C_Hoffm-01
SI_TRT-CWA-SierraC-126	C_Elbiz-01	C_Sprin-01
SI_TRT-CWA-SierraC-164	C_Goite-01	

Summary of Issues Raised by Commenters

- Objection to the rationale for the Draft PEIR's significance determination for geomorphology impacts (the "within current range" argument).
- The sediment transport analysis is not quantitative and is speculative.

Response

The average monthly flow data provided in Table 5.3.1-6 of the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.1-35) played only a minor role in the assessment of the WSIP's effects on the geomorphology of the Tuolumne River below La Grange Dam. Changes in peak flow attributable to the WSIP provided the primary informational basis for reaching conclusions regarding impacts on geomorphology. The WSIP would have little effect on the range of flows experienced in the Tuolumne River below La Grange Dam. It would have no effect on the magnitude of infrequent, very large flows for the reasons described in Section 14.7.6, above.

A commenter opines that the analysis of sediment transport and gravel bed conditions in the Draft PEIR is qualitative and largely speculative. The San Francisco Planning Department acknowledges that the analysis is qualitative but disagrees that it is speculative. Although limited data are available on substrate conditions in the lower Tuolumne River below La Grange Dam, it is the San Francisco Planning Department's view that the data are sufficient to make a reasonable analysis, without excessive speculation, of the WSIP's impact on sediment movement.

The information on existing sediment conditions in the lower Tuolumne River provided in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.2-3 and 5.3.2-4) was obtained from reports prepared by McBain and Trush (McBain and Trush, 2000; McBain and Trush and J. Vick, 2004). The lower Tuolumne River extends from La Grange Dam to the confluence with the San Joaquin River. The uppermost half of the reach, between La Grange Dam and the community of Hughson, has a gravel bed and banks. From Hughson to the confluence with the San Joaquin River, the river has a sand bed and banks. The broad riparian forest that once existed has been largely removed, and levees and agricultural encroachment confine much of the river corridor. The channel itself has been reshaped by gold mining in the 19th century and by gravel mining in the 20th century. For more than 130 years, the La Grange, Don Pedro, and New Don Pedro Dams have prevented the downstream movement of bedload from the upper Tuolumne River watershed. Abandoned gold and gravel mining pits within the river corridor below La Grange Dam also impede the movement of bedload. The pits trap gravel and prevent its downstream migration. Don Pedro Reservoir has also reduced peak flows in the river below La Grange Dam, which reduces the rate of downstream movement of bedload in this reach of the river.

As noted in the Draft PEIR, the WSIP would have very little effect on large infrequent floods, such as the flood that occurred in 1997. It would reduce the magnitude of the smaller bankfull peak flows that occur every one to three years and are the primary channel-forming events. This reduction would slow the rate of downstream fine sediment movement and affect channel formation, but the scale of the changes would be small relative to the changes wrought by past water management and mining activities and the clearing of the riparian forest. Therefore, the San Francisco Planning Department concluded that the impacts of the WSIP on the geomorphology of the lower Tuolumne River would be less than significant.

The quality of salmonid spawning gravels in the Tuolumne River below La Grange Dam has been greatly degraded by the past practices referred to above. Conditions suitable for salmonid spawning occur in a 25-mile-long gravel-bedded river reach between La Grange Dam and the community of Hughson, but most salmon spawn in the five-mile reach immediately below La Grange Dam. Salmonid spawning is most successful in gravel-bedded rivers with relatively small amounts of fine silt and sand. The quality of salmon-spawning habitat in the gravel-bedded reach of the river is impaired by a lack of coarse sediment from the watershed above and by an excess of fine sediment. More than 130 years ago, the construction of the first dam on the Tuolumne River, near the site of La Grange Dam, halted the downstream transport of coarse sediment from the upper watershed. Fine sediment enters the Tuolumne River below La Grange Dam from Gasburg Creek and Peaslee Creek, both of which drain agricultural areas. The WSIP-induced reduction in the magnitude of the bankfull peak flows that occur every one to three years may reduce the rate at which fine sediments are washed out of the gravel-bedded reach of the river.

In terms of a geomorphology impact (Vol. 3, Chapter 5, p. 5.3.2-7), the Draft PEIR concluded that the WSIP would not result in substantial changes in erosion or siltation rates or channel form, and this impact was determined to be less than significant. However, the WSIP-caused reduction in the rate of fine sediment movement in the Tuolumne River below La Grange Dam, together with other factors, contributed to the conclusion that the WSIP could have a significant adverse effect on salmonids in this reach of the river (Vol. 3, Chapter 5, pp. 5.3.6-28 to 5.3.6-32).

14.7.8 Mitigation Measure 5.3.6-4a

Comment Summary

This section of this master response responds to all or part of the following comments:

S_CDFG2-07	SI_TRT2-03	SI_TRT-CWA-SierraC-170
SI_CRS-07	SI_TRT5-03	SI_TRT-CWA-SierraC-155
SI_EnvDef-04	SI_TRT-CWA-SierraC-58	SI_TRT-CWA-SierraC-188

Summary of Issues Raised by Commenters

- Expression of uncertainty related to the feasibility of Mitigation Measure 5.3.6-4a.

Response

As stated in the Draft PEIR, the WSIP-caused reductions in flow and increases in water temperature in the reach of the Tuolumne River below La Grange Dam would have a potentially significant adverse effect on salmonids (Vol. 3, Chapter 5, p. 5.3.6-28 to 5.3.6-32). The Draft PEIR identified Mitigation Measure 5.3.6-4a as the preferred approach to reduce the impacts on salmonids to a less-than-significant level (Vol. 4, Chapter 6, p. 6-48). Several comments noted that, as acknowledged in the Draft PEIR, there is uncertainty regarding the feasibility of Mitigation Measure 5.3.6-4a. Because of this uncertainty, the Draft PEIR also identified an alternative mitigation measure, Measure 5.3.6-4b (see Section 14.7.9, below).

In order for Measure 5.3.6-4a to be effective, water levels in Don Pedro Reservoir with the WSIP would have to be essentially the same as they are under the existing condition. This could only be accomplished by reducing TID's and MID's use of water from Don Pedro Reservoir by an amount equal to the SFPUC's increased diversion from the Tuolumne River under the WSIP. Surface water use in the TID and MID service areas could be reduced through conservation efforts, such as installing more efficient irrigation systems, lining irrigation canals, recycling irrigation tailwater, improving conjunctive use of surface and groundwaters, planting crops that need less water, permanently or temporarily fallowing land, and by water savings in urban areas. The SFPUC could pay for these measures, and TID and MID could transfer the water saved to the SFPUC. Projects of this type are difficult but not impossible to implement; an example of such a project is an agreement between the Imperial Irrigation District and San Diego County Water Authority, whereby the Authority financed agricultural water conservation measures within the Imperial Irrigation District in order to secure the conserved water for its customers.

Another possible approach would be for the SFPUC to obtain water from a water agency other than TID and MID. The water acquired by the SFPUC would be conveyed to TID and MID so that the Districts would be able to reduce their use of Don Pedro Reservoir water. As indicated in the Draft PEIR, additional CEQA compliance might be required on a specific proposal to develop and transfer conserved water; it is expected that the transferring agency would serve as the CEQA lead agency for project-level review if required.

Mitigation Measure 5.3.6-4a is the San Francisco Planning Department's preferred measure to lessen the impacts of the WSIP on salmonids and riparian resources. Accordingly, the City and County of San Francisco has begun discussions with TID, MID, and other water agencies' staff in an initial effort to obtain commitments and reduce uncertainty with respect to Measure 5.3.6-4a. **Section 14.10, Master Response on Modified WSIP Alternative** (Vol. 7, Chapter 14) provides more information on the conserved water transfer under Measure 5.3.6-4a.

14.7.9 Mitigation Measure 5.3.6-4b

Comment Summary

This section of this master response responds to all or part of the following comments:

S_CDFG2-08	SI_TRT5-04	SI_TRT-CWA-SierraC-171
S_CDFG2-10	SI_TRT-CWA-SierraC-59	SI_TRT-CWA-SierraC-189
SI_EnvDef-04	SI_TRT-CWA-SierraC-60	SI_TRT-CWA-SierraC-190
SI_NCFFSC-01	SI_TRT-CWA-SierraC-62	
SI_TRT2-03	SI_TRT-CWA-SierraC-170	

Summary of Issues Raised by Commenters

- Mitigation Measure 5.3.6-4b does not reflect the latest knowledge on fish predation.
- Mitigation Measure 5.3.6-4b is inadequate because it is not similar in kind to the impact.

Response

As stated in the Draft PEIR, the WSIP-caused reductions in flow and increases in water temperature in the reach of the Tuolumne River below La Grange Dam would have a potentially significant adverse effect on salmonids (Vol. 3, Chapter 5, p. 5.3.6-28 to 5.3.6-32). The Draft PEIR identified Mitigation Measure 5.3.6-4a as the preferred approach to reduce the impacts on salmonids to a less-than-significant level (Vol. 4, Chapter 6, p. 6-48). However, there is some uncertainty associated with this measure because it cannot be implemented by the SFPUC alone, but requires the cooperation of another water agency (see Section 14.7.8, above). Although Measure 5.3.6-4a is the preferred measure, the Draft PEIR also identified an alternative measure (Mitigation Measure 5.3.6-4b) in the event that Measure 5.3.6-4a cannot be implemented. Measure 5.3.6-4b would reduce the impacts of the WSIP on salmonids by making habitat improvements in the reach of the river below La Grange Dam that would offset the potential habitat degradation attributable to the WSIP-induced flow reductions (Vol. 4, Chapter 6, pp. 6-48 and 6-49).

Mitigation Measure 5.3.6-4b, as described in the Draft PEIR, would either implement a spawning gravel augmentation project or eliminate one of the former gravel pits harboring fish that prey on juvenile salmonids. Several comments received on the Draft PEIR were critical of Measure 5.3.6-4b. These comments stated that the mitigation measure poorly matches the impact it is designed to mitigate and questioned the effectiveness of quarry pit removal from the river in benefiting salmonids. As indicated in the Draft PEIR and this response, Measure 5.3.6-4a is the preferred mitigation and would most directly addresses the nature of the WSIP impact on the lower river fisheries (i.e., an incremental flow reduction that would infrequently result in elevated water temperatures that could adversely affect salmonids). However, as discussed in the Draft PEIR analysis, since the flow reductions coupled with the projected infrequent water temperature increases that could occur under the WSIP would have an adverse impact on habitat conditions for juvenile salmonids, mitigation that improves habitat for juvenile salmonids is appropriate under CEQA.

Measure 5.3.6-4b would provide for implementation of an action that would improve habitat for juvenile salmonids. The measure calls for the SFPUC to implement one of two specific actions: gravel augmentation or gravel pit removal from the river. These actions, which were designed to either increase habitat quality and availability or reduce the vulnerability of juvenile salmonids to potential predation mortality, were selected in part based on (1) a review of the *Habitat Restoration Plan for the Lower Tuolumne River*, (2) information provided by Mesick et al. (2007), (3) discussions with the Anadromous Fish Restoration Program and resource agencies, and (4) a review of existing physical habitat conditions in the lower river and the ability of mitigation measures to reduce the effects of various potentially limiting factors related to the successful production of juvenile salmonids in the lower river. The two alternative actions described in Measure 5.3.6-4b would offer important long-term benefits to salmonid production that would enhance habitat conditions in the lower river in every year. Implementation of this measure would provide an incremental benefit in every year as a tradeoff for a potentially adverse periodic impact with a low frequency of occurrence.

A commenter observed that restoring spawning gravel would not mitigate impacts on later salmonid life stages and could harm later life stages by causing overcrowding of rearing habitat. The WSIP would reduce flow and increase water temperatures in May and June of some years, which could have adverse effects on juvenile Chinook salmon that are rearing in the stream and have yet to migrate downstream. There is no reason to believe that a gravel augmentation project that resulted in the production of larger numbers of juvenile salmon would have an adverse effect on later life stages; on the contrary, increased production of juvenile salmon could increase the chance of more salmon surviving to return to spawn.

The intent of the gravel augmentation action is to directly contribute to an increase in the availability and quality of habitat for various life-history stages of salmonids, which would result in increased reproductive success, better health and survival of rearing juveniles, and increased overall productivity in the lower river. The benefits of a multifaceted habitat enhancement action involving gravel augmentation are as follows: it would contribute to the improved quality and availability of spawning gravels for adult Chinook salmon and steelhead, increase suitable substrate available for macroinvertebrate production as a food resource for juvenile rearing salmonids, improve habitat quality and availability for juvenile salmonid rearing, increase instream cover and velocity refuges for rearing juveniles, and provide an overall increase in the habitat carrying capacity of the lower river for juvenile salmonid rearing. Observations of similar multifaceted habitat enhancement projects in the lower Mokelumne River have demonstrated benefits to both spawning and juvenile rearing for salmonids as well as increased macroinvertebrate production (Merz, 2004).

It has been hypothesized that the availability and quality of juvenile rearing habitat may be a factor limiting the production of salmonids in the lower Tuolumne River. Gravel augmentation and associated habitat enhancement would help directly address the carrying capacity for juvenile rearing by providing increased habitat quality and availability, increased habitat complexity and diversity, and increased instream cover for juvenile rearing, and would be expected to contribute to an increase in the health, growth rates, and survival of juvenile salmonids produced in the lower river. The benefits of such a physical habitat enhancement project would be present within the lower river year-round under all hydrologic-year type conditions and would provide long-term habitat benefits to salmonids spawning and rearing in the lower river.

Implementation of the gravel pit removal action would directly contribute to a reduction in predation mortality for those juvenile salmonids rearing in the lower Tuolumne River or emigrating downstream and could result in cooler water and greater food production as a result of improved riparian habitat. Comments on this measure raised questions about the effectiveness of this measure in benefiting salmonids. Although pilot studies conducted by TID on a similar action have shown disappointing results, the concept remains promising, and further study may prove to be more successful. Results of screw trap monitoring and other investigations in the lower Tuolumne River have identified predation mortality by a variety of piscivorous fish, including largemouth and smallmouth bass, striped bass, and Sacramento pikeminnow, in addition to avian predation as a factor contributing to the high mortality rates for juvenile salmonids rearing and emigrating from the lower river. Juvenile salmonids experience an increased vulnerability to predation associated with certain physical habitat structures, including captured gravel pits and incised pool habitat, where turbulent flow can cause disorientation of juvenile salmonids and increase their vulnerability to predation mortality. Physical structures such as gravel pits provide suitable habitat for many of the predatory fish as well as areas where prey can accumulate and concentrate, thereby increasing their vulnerability to predation mortality.

As part of the quarry pit removal action identified in this mitigation measure, physical modifications would be made to one or more existing structures within the lower Tuolumne River. These modifications, which could include gravel pit isolation, removal of physical structures that provide habitat for predatory fish, modifications to existing scour pools that provide holding habitat and ambush points for predators, or other physical and structural modifications to existing habitat conditions within the lower river, would be aimed specifically at reducing predation mortality for juvenile salmonids, thereby increasing their survival and potential contribution to the adult population. Modifications to decrease predation vulnerability within the lower river would benefit juvenile salmonids year-round in all hydrologic-year types, thus resulting in a long-term benefit by increasing the survival of salmonid fry and smolts produced in the lower river.

In response to comments on Mitigation Measure 5.3.6-4b (Vol. 4, Chapter 4, pp. 6-48 and 6-49), the following text revisions are made to clarify the method of implementation:

Fishery Habitat Enhancement

Measure 5.3.6-4b: If Measure 5.3.6-4a is not implemented, then the SFPUC will mitigate potential fishery effects on the lower Tuolumne River by implementing (or funding) one of the following two habitat enhancement actions ~~directed at fish habitat improvements~~ that are designed to sustain fishery resources under the river's flow regime, which are consistent with the Habitat Restoration Plan for the Lower Tuolumne River Corridor: gravel augmentation/habitat enhancement to provide salmonid spawning and rearing habitat, or isolating or filling a captured former gravel quarry pit along the river that provides habitat for salmonid predators.

The gravel augmentation/habitat enhancement project Spawning gravel enhancement will be implemented to increase salmonid spawning success and to improve the survival of rearing salmonids in the reach of the river downstream of La Grange Dam. Spawning success will be improved by the addition of suitable gravel to the stream channel. Other habitat features will be created to provide cover for juvenile salmonids and to increase the availability of substrate for macroinvertebrates production that would be used as an enhanced food supply by rearing juvenile salmon and steelheadand other species. The spawning gravel augmentation/habitat enhancement project will involve the planning, design, permitting, purchase, placement, and monitoring of suitable gravel and associated habitat enhancements to be placed at three riffle locations within the spawning reach between Basso Bridge and La Grange Dam. The three locations will meet that meets the criteria for suitable habitat as described in the Habitat Restoration Plan for the Lower Tuolumne River Corridor at each location. The gravel will preferentially be rounded river rock of native origin that would be sized and pre-washed before placement into the river. The gravel augmentation/habitat enhancement project will also involve the addition of large woody debris and boulders to create increased habitat complexity and diversity at each of the three enhancement sites. After construction of the gravel augmentation/habitat enhancement project, it will be surveyed to establish its baseline condition. A survey of the three sites will be made at a minimum of five-year intervals by a qualified fisheries biologist. The fisheries biologist will determine whether the three sites continue to meet established criteria for salmonid spawning and rearing habitat. If the sites do not meet the criteria, as part of its long-term operations, the SFPUC will make the improvements necessary to return it to baseline conditions. The depth and quality (e.g., percentage fines and cementation) of gravel will be monitored at five-year intervals and if the gravel deposits do not meet the criteria for suitable habitat SFPUC will be obligated to further augment or enhance the gravel deposits. The SFPUC will continue this gravel augmentation project and periodic monitoring as part of long-term system operations.

AlternatelyAs an alternative to the gravel augmentation project, the SFPUC will remove from the lower river channel one of the former gravel quarry pits that has been “captured” by the river and acts as predator zones for fish such as largemouth and striped bass to prey on rearing and emigrating juvenile salmonids. ThisRemoval could be accomplished by filling the pit or installing a levee berm around the pit to isolate it permanently from the river channel. The SFPUC could implement this action directly or fund implementation by another entity involved in river restoration.

The performance standard for gravel pit removal would be an established permanent reduction in area of salmonid predator habitat. The SFPUC will monitor the pit removal project at five-year intervals. If floods have eroded the fil1 or damaged the levees in a manner that restores salmonid predator habitat, the SFPUC will make the necessary repairs. The SFPUC will continue periodic monitoring and repair as part of long-term system operations.

14.8 Master Response on Delta and San Joaquin River Issues

14.8.1 Introduction

Overview

This master response addresses issues raised by commenters regarding the WSIP's effects on the San Joaquin River and Sacramento–San Joaquin River Delta, and, as a consequence, on the State Water Project (SWP) operated by the California Department of Water Resources (DWR) and Central Valley Project (CVP) operated by the U.S. Bureau of Reclamation (USBR), both of which convey water through the Delta to customers south of the Delta. This master response is organized by the following subtopics:

14.8.2 Review of WSIP Effects on the San Joaquin River and Delta
14.8.3 Potential Effects on CVP and SWP Operations and Related Indirect Effects

Commenters

Commenters that addressed this topic include:

Federal Agencies

- U.S. Bureau of Reclamation – F_USBR

State Agencies

- None

Local and Regional Agencies

- San Francisco Bay Conservation and Development Commission – L_BCDC
- Contra Costa Water District – L_CCWD
- Santa Clara Valley Water District – L_SCVWD
- San Luis and Delta-Mendota Water Authority, Westlands Water District, and Kern County Water Agency – L_SLDWWKC
- Tuolumne Utilities District – L_TUD2
- Alameda County Flood Control and Water Conservation District, Zone 7 – L_Zone7

Groups

- Environmental Defense – SI_EnvDef
- Northern California / Nevada Council of the Federation of Fly Fishers Steelhead Committee – SI_NCFFSC
- Sierra Club – SI_SierraC2, SI_SierraC7
- State Water Contractors – SI_SWC
- Tuolumne River Trust – SI_TRT3, and SI_TRT6

- Tuolumne River Trust, Clean Water Action, and Sierra Club, SF Bay Chapter – SI_TRT-CWA-SierraC

Citizens

- Collin, Robert – C_Colli
- Dulmage, Diane – C_Dulma
- Hankemeyer, Carol – C_Hanke
- Martin, Michael – C_MartiM
- Toth, Tibor – C_Toth

PEIR Section Reference

The Draft PEIR addresses this topic area in the following locations: Vol. 1, Summary, pp. S-47 to S-62; Vol. 3, Chapter 5, pp. 5.3.1-38 and 5-3.1-39 (hydrology/flow), pp. 5.3.3-19 and 5.3.3-20 (water quality), pp. 5.3.4-5 to 5.3.4-9 (water supply), pp. 5.3.6-32 and 5.3.6-33 (fisheries), and pp. 5.7-45 to 5.7-52 (cumulative effects).

14.8.2 Review of WSIP Effects on the San Joaquin River and Delta

Comment Summary

This section of this master response responds to all or part of the following comments:

F_USBR-01	L_Zone7-02	SI_TRT-CWA-SierraC-138
F_USBR-06	SI_CNPS-01	SI_TRT-CWA-SierraC-139
L_BCDC-04	SI_NCFFSC-02	SI_TRT-CWA-SierraC-145
L_CCWD-01	SI_SierraC7-08	C_Colli-03
L_CCWD-02	SI_TRT3-05	C_Dulma-02
L_SLDWWKC-01	SI_TRT6-05	C_Hanke-03
L_SLDWWKC-04	SI_TRT-CWA-SierraC-65	C_MartiM-04
L_SLDWWKC-05	SI_TRT-CWA-SierraC-66	C_Toth-01
L_SLDWWKC-06	SI_TRT-CWA-SierraC-67	
L_SLDWWKC-07	SI_TRT-CWA-SierraC-137	

Summary of Issues Raised by Commenters

- The Draft PEIR analysis of impacts on the San Joaquin River and Delta is inadequate; it does not provide enough information.
- The Draft PEIR does not identify significant impacts on flow or water quality in the San Joaquin River and/or Delta because it assumes that the CVP and/or SWP operations will be modified to maintain compliance with regulatory flow and quality standards.
- The Draft PEIR baseline of 2005 is inadequate because of changes that have occurred since that time.
- The PEIR has significance criteria for impacts on water supplies but does not apply these criteria to impacts on the San Joaquin River or Delta.

Response

Draft PEIR Impact Assessment for the San Joaquin River and Delta

The effects of the WSIP on the San Joaquin River and Delta are addressed in several sections of the Draft PEIR, as listed above under the heading PEIR Section Reference. The analysis of effects on flows in the San Joaquin River and Delta is based on the detailed modeling and assessment of the WSIP's effects on Tuolumne River flows presented in the Draft PEIR (Vol. 3, Chapter 5, Section 5.3, with additional detail provided in Vol. 5, Appendix H).[1]

As described in Impact 5.3.1-4 (Vol. 3, Chapter 5, p. 5.3.1-30), the WSIP would indirectly result in flow changes in the lower Tuolumne River. Increased diversions under the WSIP would not directly result in reduced flow downstream in the lower Tuolumne River; rather, under the WSIP the increased water diversion at Hetch Hetchy Reservoir upstream of Don Pedro Reservoir to meet 2030 SFPUC customer purchase requests would cause a reduction in inflow to Don Pedro Reservoir thus leading to a reduction in reservoir storage at Don Pedro Reservoir. The way in which the WSIP would result in indirect effects on flow in the lower Tuolumne River is described below.

Don Pedro Reservoir, which is owned and operated by the Modesto Irrigation District (MID) and Turlock Irrigation District (TID) (together, "the Districts"), stores water from the upper Tuolumne River. In most below-normal or drier years, all of the runoff from the watershed upstream of Don Pedro Reservoir is captured and stored in the reservoir. The Districts make releases from the reservoir to the Modesto and Turlock Canals to make deliveries to their agricultural customers and also to the lower Tuolumne River in accordance with FERC requirements. In some years, usually wet or above normal years, the runoff volume is too great to either be used by the Districts or stored in the reservoir. In these years, water in excess of the FERC requirements is released to the lower Tuolumne River below La Grange Dam. As a result, in the future with the WSIP, the Districts would draw Don Pedro Reservoir down farther in many years than it would have been drawn down under the existing condition. Consequently, the Districts would have to capture a greater proportion of spring runoff to refill the reservoir, and the volume of excess water released to the lower Tuolumne River would be reduced compared to the existing condition. The SFPUC does not have any authority over the operation of Don Pedro Reservoir. The PEIR impact analysis assumes that, in the future, the Districts would continue to divert water from the reservoir into the canals that serve their agricultural customers as they do now, without adjustment; thus, the reduction in reservoir storage resulting from the WSIP would in turn cause a reduction, in some months and years, in the amount of excess water released by TID from the reservoir to the lower Tuolumne River. In this way, the WSIP would indirectly result in flow reductions in the lower Tuolumne River. The following discussion uses the term "WSIP-induced" flow reductions to refer to fact that the WSIP would not directly reduce flow in

1 The Draft PEIR analysis was performed using the Hetch Hetchy/Local Simulation Model (HH/LSM), a state-of-the-art model of the regional water system developed by the SFPUC for water supply planning. The model provides information on reservoir releases, and this information was used in the Draft PEIR to estimate the effects of the WSIP on stream flows downstream of SFPUC reservoirs. The SFPUC has been improving and refining the model during more than 10 years of use.

the lower Tuolumne River or farther downstream in the San Joaquin River and into the Delta, but would do so indirectly.

As discussed in Impact 5.3.1-5 (Vol. 3, Chapter 5, p. 5.3.1-38), the WSIP-induced flow reductions described in detail for the lower Tuolumne River would also occur downstream in the San Joaquin River in the reach between the confluence with the Tuolumne River and the confluence with the Stanislaus River. Downstream of the confluence with the Stanislaus River, flow conditions in the San Joaquin River would reflect a combination of effects resulting from both the WSIP and the USBR's water releases from New Melones Reservoir. In the Delta, hydrologic conditions would reflect the combined effects of the WSIP and the actions taken by the USBR and/or DWR in accordance with their regulatory obligations for the CVP and SWP, respectively (along with actions by many others that affect the Delta).[2]

As described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.4-1 and 5.3.4-2), the USBR and DWR hold post-1914 appropriative water rights, subject to the continuing jurisdiction of the State Water Resources Control Board (SWRCB), under which these agencies divert water into CVP and SWP reservoirs and canals upstream of the Delta and from the Delta itself. Because of the size of the diversions made by the CVP and SWP, the nature of their authorizing legislation, and the priority level of their water rights, the SWRCB has assigned unique responsibilities to the USBR and DWR for compliance with Delta water quality and flow objectives. Under preceding SWRCB water-rights decisions and current Water Right Decision 1641, the CVP and SWP must be operated in a manner that maintains compliance with Delta water quality and flow objectives. The USBR's and DWR's water rights are conditioned such that they can not be exercised in a manner that would cause a violation of the Delta objectives. These regulatory requirements are not mitigation measures, as suggested by some commenters, but rather regulatory obligations established in existing decisions and orders.[3] The water rights for the CVP and SWP are junior to the City and County of San Francisco's (CCSF's) Tuolumne River water rights. For this reason, too, the USBR and DWR must accommodate their operations to the lawful exercise by CCSF of its more senior water rights.

Draft PEIR Table 5.3.1-6 (Vol. 3, Chapter 5, p. 5.3.1-35) and Figure 5.3.1-12 (p. 5.3.1-33) present detailed information on the projected timing, frequency, and magnitude of the WSIP-induced flow reductions that could affect the San Joaquin River and Delta. As discussed in the Draft PEIR (p. 5.3.1-38), the WSIP-induced flow reductions affecting the San Joaquin River and Delta would primarily occur from January through June in wet or above-normal years, and during the season when flow in the San Joaquin River is at its annual maximum. As stated in the

2 Regulatory flow and water quality objectives established by the SWRCB for the San Joaquin River and Delta are described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.1-18 to 5.3.1-19, pp. 5.3.4-3 to 5.3.4-4, and pp. 5.3.3-9 to 5.3.3-12)

3 In the early and late 1990s, the SWRCB considered alternatives to requiring the CVP and SWP to maintain water quality objectives in the Bay-Delta, including allocation of responsibility on a watershed-by-watershed basis, a strict water-rights priority basis, and equitable apportionment based on diversions. Any SWRCB initiative to implement Bay-Delta water quality objectives by assigning responsibilities to senior water-rights holders would require lengthy regulatory proceedings and even longer litigation. As a practical matter, the CVP and SWP are the only projects large enough to control water quality conditions in the Delta; therefore, it would be speculative to assume regulatory conditions for the WSIP other than the current regulatory regime.

Draft PEIR (p. 5.3.1-38), in most cases (except in three months over the 82-year [984-month] historical record), the WSIP-induced flow reductions would not result in conditions in the San Joaquin River upstream of the Delta that would affect the achievement of regulatory objectives established to maintain flow levels and water quality parameters protective of beneficial uses. In these few such instances, the USBR would act to ensure compliance with the regulatory objectives. The WSIP-induced flow reductions during these periods would have a less-than-significant effect on hydrology and the related areas of water quality, water supply, and fisheries.

Concerning the Delta, WSIP-induced flow changes within the San Joaquin River could affect the operation of the CVP and SWP if operational adjustments are needed to comply with regulatory obligations. The effect on operations could be a change in releases from upstream reservoirs, a change in the level of CVP or SWP Delta diversions, or a combination of both. As discussed in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.1-38 and 5.3.1-39), the USBR and DWR, as operators of the CVP and SWP, would be required to take action to maintain compliance with flow and water quality objectives in accordance with their regulatory obligations by either increasing releases from upstream reservoirs or reducing the level of Delta diversions. The PEIR assumes that these agencies would continue to meet the applicable regulatory requirements for the San Joaquin River and Delta following WSIP implementation, and concludes that the WSIP-induced flow reductions would result in a less-than-significant impact on these downstream water bodies and the environmental resources they support. Further discussion of the potential WSIP effects on CVP and SWP operations and related indirect effects is presented below in Section 14.8.3.

Some commenters questioned whether "frequency of occurrence" should be considered in determining impact significance and suggested that only "severity" or magnitude should be considered. Evaluating environmental impacts and determining their significance involves consideration of several factors, including the nature of the impact, the sensitivity of the affected resources, the local and regional environmental context, as well as impact magnitude, frequency, and duration. Other factors may be important in determining impact significance, depending on the environmental resource or issue under review. In general, the impact significance criteria used in the Draft PEIR provide guidance on what could constitute a significant impact and, where appropriate, identify the specific metrics for evaluation. For each project, the impact analysis provides a project-specific discussion of relevant information to substantiate whether or not a potential effect would be significant. The frequency of impact, along with other factors, was relevant to the analysis of WSIP effects on flows to the San Joaquin River and Delta and on the related issues of water quality, fisheries and aquatic resources, and water supply. Section 14.8.3, below, provides further discussion of potential WSIP effects on CVP and SWP operations and on water contractors that receive supply deliveries for agricultural, municipal, and industrial uses.

An example of how frequency of effect can be relevant to determining impact significance arises in the analysis of a project's effect on water supply to other users. A substantial reduction in supply delivery to a customer that occurs infrequently and lasts for a short period (such as a single year) has different consequences than a substantial frequent or chronic reduction in supply that reduces the overall long-term supply reliability. The customer can often make short-term arrangements to address an infrequent, short-term supply reduction (e.g., using conservation and/or other supply reserves such as groundwater) without experiencing lasting land use or environmental changes or damage, while a chronic reduction in previously available supply could result in more permanent effects. In the first scenario, an infrequent, short-term supply reduction would not constitute a significant impact on water deliveries, while the second scenario—a recurring supply reduction of sufficient frequency to appreciably reduce the long-term supply reliability—could represent a significant impact. In this and many other examples, frequency of impact is an important and relevant factor for determining impact significance. The following review of the potential WSIP effects clarifies when and why frequency of effect is relevant in determining impact significance.

Baseline for Impact Assessment

In accordance with CEQA guidance regarding the selection of an appropriate baseline for analysis, the year 2005 is used in the assessment of potential WSIP effects. The CEQA Guidelines indicate that, in most cases, the potential environmental impacts of a project should be determined relative to the existing conditions that exist at the time the environmental process is initiated. This baseline year was selected because the Notice of Preparation for the PEIR was published in 2005, and because it represented the most current, complete year for which information about water resource conditions was available for use in the Draft PEIR impact analysis (which was conducted primarily in 2006 and early 2007 prior to release of the Draft PEIR in June 2007).

In addition, model information for CalSim II, which was relevant to portions of the PEIR analysis, was updated in 2005. CalSim II, a model developed jointly by the USBR and DWR to assess CVP and SWP operations and resulting conditions in the Delta, is the central tool and source of comprehensive information used for water resources planning and impact assessment related to the Sacramento and San Joaquin Rivers and the Delta. While the PEIR analysis did not employ the CalSim II model—which does not address the Tuolumne River system or overall SFPUC water system operations in detail the way the Hetch Hetchy/Local Simulation Model [HH/LSM][4] does—the analysis makes use of information compiled for the 2005 update of the CalSim II model.

Comment SI_SLDWWKC-06 suggests that the 2005 baseline is inadequate because of changes that have occurred since then, but does not identify any specific changes of concern for consideration. Numerous ongoing activities and proposed actions are affecting the San Joaquin River and Delta, as summarized in the Draft PEIR cumulative impact analysis (Vol. 3, Chapter 5, pp. 5.7-5 to 5.7-52). Key events or activities that have occurred or are now in progress since Draft PEIR publication in mid-2007 include: (1) the Judge Wanger decision in late 2007 regarding delta smelt, which imposed interim export pumping restrictions tied to flow conditions on Old and Middle Rivers in the Delta; (2) the Endangered Species Act reconsultation now in progress for

4 The Draft PEIR analysis was performed using the HH/LSM, a state-of-the-art model of the regional water system developed by the SFPUC for water supply planning. The model provides information on reservoir releases, which was used in the Draft PEIR to estimate the effects of the WSIP on stream flows downstream of SFPUC reservoirs.

the coordinated operations of the CVP and SWP (known as the “OCAP” [Operations Criteria & Plan] reconsultation), which will establish revised, long-term operating requirements for the CVP and SWP operations to protect endangered species (replacing Judge Wanger’s interim measures for delta smelt and establishing other operational constraints for the protection of additional endangered species, including salmon); (3) the Judge Wanger decision to invalidate the OCAP Biological Opinion for anadromous salmonids, including steelhead, and winter-run and spring-run salmon[5]; and (4) the proposed Bay Delta Conservation Plan (BDCP), for which the state and federal environmental review processes have recently been initiated (spring 2008) with release of a Notice of Preparation for an Environmental Impact Report and a Notice of Intent for an Environmental Impact Statement, respectively.

Among these four recent developments, only the Judge Wanger decision provides adequate information for use in reevaluating potential WSIP effects. The SFPUC has prepared a supplemental modeling assessment of potential WSIP effects on the San Joaquin River and Delta for this master response that addresses the interim export pumping restrictions imposed by the 2007 Judge Wanger decision (see Section 14.8.3, below, for a discussion of the supplemental analysis). As described in detail below, the supplemental analysis using this updated information corroborates the Draft PEIR findings regarding the WSIP’s effects on the San Joaquin River and Delta. Based on this supplemental modeling assessment, the baseline information used in the Draft PEIR analysis of the WSIP effectively addresses current 2008 baseline conditions; the PEIR baseline is adequate and supports a meaningful assessment of the potential effects of WSIP implementation on the San Joaquin River and Delta.

There is insufficient information regarding either the description or the consequences of the other three activities listed above for use in evaluating potential WSIP effects. It would be speculative to describe how these other potential actions might affect the Delta and/or tributary rivers or to assess potential effects related to these activities. For the OCAP reconsultation process now in progress, there are no specific results or decisions regarding modified CVP and SWP operations that could be effectively incorporated into the WSIP impact analysis. The interim export pumping restrictions represent the best available information regarding potential changes in CVP and SWP Delta operations as they relate to the WSIP. For the BDCP, this program proposes substantial modification of the existing water supply conveyance through the Delta, including consideration of both through-Delta conveyance as well as isolated-conveyance and dual-conveyance system alternatives. However, at this time, there is insufficient information about the proposed BDCP alternatives to incorporate into a meaningful impact analysis of the WSIP. As noted, the environmental review process for the BDCP alternatives was initiated this spring (2008), and a draft environmental analysis is not expected until 2009. In the review presented below of potential WSIP effects on the Delta, CVP and SWP operations, and water contractors, there are references made, where appropriate, to how the OCAP reconsultation, the Wanger decision on salmonids, and the BDCP might influence WSIP effects or the response to WSIP effects;

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5 Judge Wanger has yet to issue a remedy in the salmonid case, and any interim remedy will be superceded by the Endangered Species Act reconsultation now in progress for the OCAP, which will establish revised, long-term operating requirements for the CVP and SWP operations to protect endangered species. It would be speculative to posit Judge Wanger’s remedy in the salmonid case or what conditions may be imposed under the OCAP Biological Opinion.

however, technical analysis of such effects is not possible given the lack of current information on these activities.

Similarly, while the PEIR addresses the issue of climate change and potential effects on water resources and water supply (see Vol. 3, Chapter 5, pp. 5.7-92 to 5.7-96, and Vol. 7, Chapter 14, Section 14.11, Master Response on Climate Change), it does not include a detailed technical analysis of the potential effects of climate change on the San Joaquin River or the Delta because there is insufficient information to do so. The USBR and DWR are currently updating the modeling tools used to evaluate water resources and impacts on the Delta in order to incorporate potential climate change scenarios (as required in part by the Judge Wanger decisions on OCAP Biological Opinions addressing delta smelt and salmonid species). This process involves development and peer review of appropriate assumptions about climate change with respect to the Delta and tributary river system and of the modeling approach, which will begin to provide the analytical tools necessary to evaluate potential climate change scenarios. In the absence of these analytical tools and information, the PEIR provides a qualitative assessment of WSIP impacts with consideration of climate change effects and determines that near-term climate change effects (through 2030) would not change the conclusions of the impact analysis presented in the Draft PEIR on the lower Tuolumne River as well as on downstream effects on the San Joaquin River and Delta (see Vol. 7, Section 14.11.4).

Effects on Delta Water Users

Comments related to the WSIP’s effects on Delta surface water supplies delivered to water users for agricultural and municipal/industrial use purposes were received from water agencies that are “in-Delta” diverters, such as the Contra Costa Water District (CCWD); from the USBR, which operates the CVP; and from agencies that receive water from the CVP and/or SWP water systems that export water from the Delta, including the San Luis & Delta-Mendota Water Authority, Westlands Water District, Kern County Water Agency, Santa Clara Valley Water District, Zone 7, and the State Water Contractors (representing all SWP contractors). The following discussion responds to comments from the CCWD, which diverts water directly from the Delta into its system. Section 14.8.3, below, addresses comments about the WSIP’s effects on the CVP and SWP and associated water contractors.

Comments L_CCWD-01 and L_CCWD-02 stated that the PEIR does not adequately analyze changes in Delta water quality, and that changes in Delta water quality could affect its water supply operations and, in turn, its supply reliability. The Draft PEIR discusses WSIP effects on Delta water quality in Section 5.3.3, Surface Water Quality (Vol. 3, Chapter 5, pp. 5.3.3-19 and 5.3.3-20) as well as in Section 5.3.4, Surface Water Supplies (Vol. 3, Chapter 5, pp. 5.3.4-9 to 5.3.4-11). Based on the detailed analysis of WSIP-induced flow effects, the PEIR concludes that the potential effects on Delta water quality would be less than significant for several reasons.

First, WSIP-induced flow reductions affecting the Delta would occur primarily in wet and above-normal year types, and in the winter and spring periods, in the season when flows are at their annual maximum. Given the magnitude of flow through the Delta during these periods, WSIP-related flow reductions would not appreciably affect Delta water quality. The impact analysis presented in the Draft PEIR (p. 5.3.4-11) indicates that WSIP-induced flow reductions affecting the Delta would be minimal, typically on the order of 500 cubic feet per second (cfs) as compared to a Delta outflow that is greater that 10,000 cfs. On rare occasions, the WSIP-induced flow reductions could range from 1,000 cfs to 4,000 cfs. Detailed modeling of the WSIP indicated that this type of flow reduction could occur in seven months out of the 984-month hydrologic record. Additional modeling (including use of the DSM2 model) was not considered necessary because information available from the HH/LSM modeling effort provided evidence that impacts on Delta water quality would be less than significant.

The CCWD operates its Delta intakes to meet both water supply and water quality criteria. In addition to the SWRCB's water quality objectives for the Delta, the CCWD has established a delivered water quality goal for its customers and manages its water supply diversions to help achieve this goal. The CCWD uses the Los Vaqueros Reservoir project to help manage the quality of its delivered water. The CCWD diverts high-quality Delta water to storage in the first months of each year and uses this stored water to blend with lower quality supply being diverted from the Delta later in the year; in this way, CCWD compensates for periods of lower Delta water quality and maintains delivered water quality to meets its standards. CCWD adjusts Delta diversions, storage, and the timing and extent of supply blending each year to manage for variations in Delta water quality and maintain a consistent delivered water quality to its customers. Under the WSIP, it is assumed the CCWD would continue this same type of water supply diversion, storage, blending, and delivery operation. In most years, the WSIP would not affect CCWD water diversion operations; very infrequently (less than 1 percent of the time), WSIP effects on the Delta might affect water quality such that the CCWD would make some adjustment in Delta pumping and/or blending, as it does now to address the constant variations in Delta water quality. Based on the impact significance presented in the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.4-4), this very infrequent potential effect on Delta water quality would not represent a substantial change in water quality that would result in a substantial adverse change in CCWD water diversion operations or decreases in water deliveries for its customers.

14.8.3 Potential Effects on CVP and SWP Operations and Related Indirect Environmental Effects

Comment Summary

This section of this master response responds to all or part of the following comments:

F_USBR-01	L_SLDWWKC-04	SI_SWC-01
F_USBR-02	L_SLDWWKC-05	SI_SWC-03
F_USBR-03	L_SLDWWKC-06	SI_TRT3-05
F_USBR-04	L_SLDWWKC-07	SI_TRT6-05
F_USBR-05	L_TUD2-01	SI_TRT-CWA-SierraC-65
F_USBR-06	L_Zone7-02	SI_TRT-CWA-SierraC-67
L_CCWD-01	SI_EnvDef-05	SI_TRT-CWA-SierraC-91
L_CCWD-02	SI_SierraC2-02	SI_TRT-CWA-SierraC-137
L_SLDWWKC-01	SI_SierraC7-08	

Summary of Issues Raised by Commenters

- The Draft PEIR does not address WSIP effects on CVP and SWP operations, which might have environmental effects.
- The Draft PEIR does not address WSIP effects on CVP and SWP operations, which might affect water supply deliveries. The Draft PEIR does not properly apply impact significance criteria related to surface water supplies to the San Joaquin River or Delta (i.e., to the CVP and SWP).

Response

Introduction

The Draft PEIR analyzes effects on the San Joaquin River and the Delta and, as discussed above in Section 14.8.2, indicates that WSIP-induced flow reductions to these water bodies could in some cases require the USBR and/or DWR to adjust CVP and/or SWP operations in order to meet their obligations to maintain compliance with regulatory flow and water quality objectives. Adjustments to CVP or SWP operations could include increasing water releases from system reservoirs and/or reducing export pumping of supply from the Delta. The Draft PEIR analysis indicates that WSIP-induced flow reductions could require adjustment of CVP or SWP operations. In response to comments received on this topic, the SFPUC conducted a supplemental modeling assessment to help the San Francisco Planning Department further examine the potential WSIP-induced effects on the San Joaquin River and the Delta and, in turn, on CVP and SWP operations (Vol. 8, Appendix O4). This supplemental modeling assessment is presented in Appendix O (Vol. 8) of the PEIR. This supplemental assessment uses information on the WSIP derived from the HH/LSM in combination with information from the 2005 CalSim II model.

Focused primarily on operations of the CVP and SWP, CalSim II incorporates the simulated operations of non-CVP/SWP water projects that exist on tributaries to the San Joaquin and Sacramento Rivers. Development of the CalSim II model during 2005 included a refinement of the depiction of San Joaquin River basin operations and hydrology. On the Tuolumne River, CalSim II models operation of the Don Pedro Project (including releases below Don Pedro Reservoir at La Grange Dam that affect Tuolumne River flow contributions to the San Joaquin River and Delta). Although the HH/LSM and CalSim II are different models, the underlying logic of operations for the Don Pedro Project in each of the models was developed coincidentally and the models produce similar results. For this supplemental analysis, the CalSim II model was used to further evaluate the effect that WSIP-induced flow reductions in the lower Tuolumne River would have on the San Joaquin River and Delta. The findings of this supplemental modeling assessment, described here, corroborate the impact findings of the Draft PEIR.

Effects on the San Joaquin River and on CVP Operations at New Melones Reservoir

The supplemental modeling analysis corroborates the findings that WSIP-induced flow reductions affecting the San Joaquin River would typically occur during wetter years, and that the more sizeable changes in flow would occur during years when the flows in the river are relatively large.

To further assess potential WSIP effects on the USBR's CVP operations at New Melones Reservoir due to flow reductions in the San Joaquin River, modeling results indicating when and to what extent the WSIP would result in flow reductions in the San Joaquin River were compared to modeling results for the "base case" (without WSIP implementation) that estimates periods over the 82-year (984-month) historical hydrologic record when the USBR would have to make releases from New Melones Reservoir on the Stanislaus River to maintain either flow or water quality objectives for the San Joaquin River. This comparison identified those instances when WSIP effects would "trigger" a response from the CVP system and require the USBR to make a release from New Melones Reservoir that it otherwise would not have been required to make.

This analysis identifies three monthly instances (over the 984-month record) when the WSIP would trigger the need for a release from New Melones Reservoir; in two instances, the WSIP-induced flow reductions occurred during a period when flow objectives were a controlling condition of the USBR's operations, and in one instance the reductions occurred when water quality objectives were the controlling condition. This finding corroborates the analysis presented in the PEIR that only very infrequently would reductions in San Joaquin River flow attributable to the WSIP be sufficient to cause flow in the San Joaquin River to fall below the established objectives and trigger a compensatory reaction from the USBR's CVP New Melones Reservoir. In most months modeled over the 82-year period of hydrologic record, the WSIP's effect on flow in the San Joaquin River would not require any changes in CVP operations at New Melones Reservoir. The supplemental modeling reaffirms the result that the WSIP could affect CVP operations on the San Joaquin River upstream of the Delta only rarely—less than 1 percent of the time.

Based on the PEIR impact significance criteria regarding potential effects on surface water supplies and water users (Vol. 3, Chapter 5, p. 5.3.4-4), the WSIP's effects on USBR CVP operations at New Melones Reservoir would not result in substantial adverse changes in operations or substantial decreases in water supply deliveries for water users. The WSIP's effects would be very infrequent and of a limited magnitude and duration. The WSIP would not result in the need for a frequent or sustained schedule of release from New Melones Reservoir that would chronically reduce the available supply for CVP contractors. Rather, the WSIP would very rarely require a release of water from New Melones Reservoir, and the resulting reduction in stored water might or might not affect supply deliveries to CVP contractors the following year. Depending on the timing of the required reservoir release and the climate and hydrology of that year and the following year, the reservoir could refill and restore storage levels without any reduction in deliveries to CVP contractors. If the reservoir did not refill and restore the amount of water released, then some CVP contractors could experience a reduction in supply delivery in the following year due to the WSIP-induced flow changes downstream in the San Joaquin River.

The eastside CVP contractors that receive water from New Melones Reservoir include Stockton East Water District and Central San Joaquin Water District. At present, the supply delivered to these contractors from the CVP system varies from year to year. Very infrequently, the WSIP could contribute to a short-term reduction in deliveries to these contractors. As they do now to address year-to-year variations in supply from the CVP New Melones system, these contractors would implement various actions, including the use of other supplies (groundwater and other surface water supplies); short-term reductions in crop acreage, the number of crop rotations, or crop type; and increased conservation (irrigation improvements). These contractors are already actively pursuing the development and acquisition of supplemental water supply sources and are engaged in ongoing conservation efforts to address several factors, including the following: the need to remedy existing groundwater overdraft in the San Joaquin Valley region and develop an effective regional conjunctive-use program; the growing long-term CVP system water delivery reliability issues due to regulatory requirements for addressing special-status fishery resources in the Delta (delta smelt) and its tributary rivers (salmonid species); and overall surface water reliability issues such as the potential future effects of climate change on water supply availability. These contractors have identified the need to pursue multiple conservation and supplemental water supply strategies regardless of WSIP implementation. While the potential effects of the WSIP would contribute to possible supply delivery reductions to CVP contractors, the WSIP contribution is not considered to be cumulatively considerable, given how infrequently the reductions would occur coupled with their limited magnitude and duration.

Effects on the Delta and on the CVP and SWP Systems

With respect to WSIP-induced effects on the Delta, a supplemental analysis was conducted using CalSim II modeling information to identify periods when the Delta is in “excess condition” versus “balanced condition” (see Vol. 8, Appendix O). The term “excess condition” is used to describe those periods when there is more water flowing through the Delta than is needed to meet Delta environmental standards (for flow and water quality) and the needs of water diverters. The term “balanced condition” is used to describe periods when there is not enough water flow through the Delta, and the USBR and DWR have to actively operate the CVP and SWP to balance reservoir releases with export operations in order to provide specific Delta outflow to meet either the flow or water quality objectives. A WSIP-induced flow reduction that affected Delta inflow during excess conditions would possibly require the USBR or DWR to alter its CVP or SWP export operations but would not necessarily require a change in upstream reservoir releases. During these excess conditions, a WSIP-induced flow reduction could affect Delta outflow. A WSIP-induced flow reduction that affected Delta inflow during balanced conditions could require the USBR and DWR to make either upstream reservoir releases or adjustments to CVP and SWP export operations.

Modeling analysis indicates that WSIP-caused flow reductions would affect Delta inflow about 15 percent of the time, or in 145 months in the 984-month hydrologic record (see Vol. 8, Appendix O for more information). Most of the WSIP-caused reductions in Delta inflow would occur during excess conditions (118 months in the 984-month hydrologic record, or about 12 percent of the time) and thus would result in reductions in Delta outflow and could but would not necessarily affect CVP or SWP export operations. These reductions in Delta outflow would occur during periods of relatively high flow through the Delta and would not result in significant adverse effects on Delta environmental resources, as illustrated by the location of the freshwater/brackish water interface (referred to as “X2,” an important indicator of the health of aquatic life in the Delta). When Delta outflow is large, X2 moves downstream deep into Suisun

Bay; when outflow is small, X2 moves into the western Delta. The Delta environmental standards include a provision specifying that X2 should not be located upstream of certain locations between February and June to protect aquatic life. In effect, the standard requires that the SWP and CVP operate their facilities in a manner that causes Delta outflow to be great enough to maintain X2 in a downstream location between February and June.

When the Delta is in an excess condition, more water is flowing through the Delta than is needed to meet Delta standards and, consequently, X2 is located downstream of the specified locations. In 127 months out of the 145 months in the 984-month hydrological record, when modeling indicates that the WSIP would affect Delta inflow, the WSIP-caused reductions in monthly Delta outflow would be less than 20,000 acre-feet, insufficient to have much effect on Delta outflow or the position of X2. Occasionally (occurring in 4 months out of the 984 months modeled), relatively large WSIP-caused reductions in monthly Delta outflow of more than 100,000 acre-feet would occur. However, since monthly Delta outflow during excess conditions typically exceeds 1,000,000 acre-feet, the outflow reductions would likely cause X2 to move upstream, but it would still remain downstream of the locations specified in the Delta standards. Because of this, the impacts of WSIP-caused reductions in Delta outflow on biological resources would be less than significant.

Although during excess conditions a change in Delta inflow due to WSIP-induced flow changes in the San Joaquin River may not affect CVP and SWP upstream release operations, CVP and SWP export operations may be affected. This effect is described later below.

Concerning WSIP-induced effects on the Delta that could affect CVP and SWP operations during balanced conditions, the supplemental analysis used CalSim II modeling information to identify periods when the Delta is in a balanced condition, which could require the USBR and DWR to make adjustments in CVP and SWP operations to address the flow or water quality effects of the WSIP. The supplemental modeling analysis identified 26 months out of the 984-month (82-year) record in which WSIP-induced flow reductions would occur during Delta balanced conditions (less than 3 percent of the time). The average annual reduction in inflow during these balanced conditions would be 7,000 acre-feet. When these flow reductions occur, the USBR and DWR might elect to increase reservoir releases, decrease Delta exports, or a combination of both to maintain the required Delta outflow and achieve required flow and water quality objectives.

The CVP and SWP systems include multiple reservoirs upstream of the Delta and two major export pumping facilities in the Delta (Jones Pumping Plant and Banks Pumping Plant, respectively), which the USBR and DWR use in a coordinated manner to meet their environmental obligations as well as contract delivery responsibilities. The CVP and SWP together deliver an annual average of about 5 million acre-feet of water to users south of the Delta, about 3 million acre-feet to farmers, and the rest to urban areas. The two projects pump water from the south Delta and convey it directly to users or (when water availability exceeds users' needs) into storage at their jointly owned south-of-the-Delta reservoir, San Luis Reservoir, near Los Banos. Because of the size and complexity of these two federal and state water systems, it is not possible to determine exactly how the USBR and DWR would adjust system operations to respond to a WSIP-induced flow change in the Delta. The analysis of potential WSIP effects on the San Joaquin River, summarized above, is able to consider specific effects on the New Melones Reservoir, since it is the only CVP facility that would respond to flow changes in the San Joaquin River. By contrast, this discussion of possible effects on the CVP and SWP systems, the Delta, and south-of-Delta contractors in response to a WSIP-induced flow change in the Delta must address various possible impact scenarios rather than a specific impact on a particular facility or user(s). Under existing conditions, it is expected that the USBR and DWR would primarily increase reservoir releases rather than reduce exports to achieve Delta standards; however, in the future, it is possible that the CVP and SWP operational changes necessary to address the pending requirements of the Judge Wanger decision on salmonid species protection could limit the ability of the USBR and DWR to use reservoir releases to meet Delta standards, thus leading to a greater reliance on export reductions.

Whether the USBR and DWR choose to increase reservoir releases or reduce export pumping, the WSIP-induced Delta inflow reductions that occur during balanced conditions in the Delta would not necessarily reduce the amount of water available in the short term for delivery to CVP and SWP contractors. Whether actual deliveries to contractors would be reduced would depend on hydrological and year-to-year system operation objectives. For example, a release of water from a CVP and/or SWP reservoir upstream of the Delta would reduce the amount of water in storage that year. However, that reduction in storage might not immediately lead to a reduction in contractor deliveries and the reservoir might refill the following year, in which case storage levels would be restored with no resulting shortage in actual water deliveries to contractors. Releases from upstream reservoirs to address WSIP-induced effects would increase the risk of a supply delivery reduction by reducing the amount of water in storage, but would not necessarily result in an actual delivery reduction.

While the USBR and DWR could decide to restrict Delta export pumping to address flow and water quality objectives in those occasional instances when WSIP-induced flow reductions occur during Delta balanced conditions, there are also other constraints on the CVP and SWP systems that limit water exports from the Delta based on hydraulic conditions in the south Delta whether the Delta is in an excess or balanced condition. In particular, the emergency remedy measures to protect delta smelt imposed by Judge Wanger establish allowable reverse flows in Old and Middle Rivers between January and June. These flows are dependent on the hydraulics of the south Delta, including the amount of water that enters the Delta from the San Joaquin River. A general rule-of-thumb is that approximately 50 percent of the flow at Vernalis in the San Joaquin River (downstream of the confluence with the Tuolumne River) affects the flow in Old and Middle Rivers, and exports have an almost direct (1:1) effect on flow in Old and Middle Rivers. As a result, about one-half of the change in flow in the San Joaquin River will affect the amount of allowed water export.

A conservative assessment was undertaken of the average effect per year of WSIP-induced flow reductions in the San Joaquin River. The assessment is conservative in that it includes WSIP-induced flow reductions in years with extremely high flow when the WSIP reductions might not constrain Delta exports, and no adjustment is made for the fact that in some wet years a reduction in allowable Delta water export might not affect south of Delta deliveries. Using this conservative assessment, the average annual effect of the WSIP on CVP and SWP exports amounts to approximately 10,000 acre-feet per year. This is the amount of water that, on an average annual basis, the CVP and SWP would not have available to export to contractors south of the Delta with the implementation of the WSIP. The amount of water exported from the Delta by the CVP and SWP varies annually. Between 1995 and 2004, the SWP diverted an average of 2.4 million acre-feet per year from the Delta; the CVP diverts an average of 1.7 million acre-feet per year. Based on the impact significance criteria presented in the Draft PEIR (Vol. 3, Chapter 5, p. 5.3.4-4), this potential indirect WSIP effect on the CVP and SWP water supply deliveries does not represent a substantial change in CVP and SWP operations or a substantial decrease in water deliveries for water users.

On the occasions when WSIP-caused reductions in Delta inflow could affect deliveries to SWP and CVP water users, adverse environmental impacts could occur if the users were forced by this loss of water supply to substantially alter their water management practices. For example, if the WSIP effects resulted in a sustained, long-term reduction in supply availability, then agricultural users might take land permanently out of production, which could then cause dust emissions, at least in the few years before native vegetation became established. Agricultural and municipal water users might replace the lost SWP or CVP water with water from other sources, and the use of the other sources could itself have environmental impacts. However, for the reasons described below, SWP and CVP water users would not be likely to substantially alter their water management practices as a result of the WSIP.

WSIP-induced reductions in CVP and SWP deliveries would be small in magnitude compared to the differences in year-to-year deliveries that result due to hydrological factors. SWP and CVP deliveries often vary widely from year to year. For example, in 1991, a very dry year, the SWP delivered about 550,000 acre-feet of water to users; in 2000, a wet year, it delivered about 3,500,000 acre-feet of water to users. Because water users are subject to such variability in SWP and CVP deliveries, they have developed their long-term water management strategies accordingly. Most users of SWP and CVP water do not rely solely on the projects, but have other water sources that can be used when SWP and CVP water is in short supply. Many users of SWP and CVP water have the ability to store water available in wet years in surface reservoirs or groundwater banks for later use in dry years.

SWP and CVP water users are also able to adapt to short-tem changes in water availability. Each fall, the operators of the SWP and CVP make an initial estimate of the amount of water they expect to be available to users in the coming spring and summer, and then periodically update the estimate as hydrological information accumulates. The estimates are based on weather forecasts and the amounts of water in storage in reservoirs in the Central Valley, including Don Pedro Reservoir, and in storage as mountain snow. SWP and CVP water users are able to respond to rapidly developing shortages or surpluses. Agricultural users may increase or decrease their planting of annual crops. Municipal users may impose water rationing or place surplus water in storage. The infrequent changes in SWP and CVP water availability attributable to the WSIP would be accommodated within the water users' existing short-term water management strategies. The minor changes in availability of SWP and CVP water attributable to the WSIP are unlikely to cause SWP and CVP water users to substantially alter either their long-term or short-term water management strategies. Therefore, the environmental impacts of WSIP-caused delivery reductions (should such impacts occur) would be less than significant.

This supplemental analysis supports the Draft PEIR conclusions that WSIP effects on flow, water quality, as well as beneficial uses (i.e., fish/aquatic resources and water supply) would be less than significant. It should also be noted that while the PEIR determines the WSIP effects on the San Joaquin River and Delta to be less than significant and requiring no mitigation, the PEIR does identify a mitigation measure to address the WSIP-induced flow effects in the lower Tuolumne River on fisheries and riparian habitat that would also essentially avoid WSIP-induced effects downstream in the San Joaquin River and the Delta. Mitigation Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water, calls for the SFPUC to secure a water transfer from MID/TID and/or other water agency such that the water acquired is developed through actions that result in a reduction of demand on Don Pedro Reservoir as a result of conservation, improved delivery efficiency, interagency water transfer of conserved water, or use of an alternative supply such as groundwater. Consequently, MID/TID would deliver less water from Don Pedro Reservoir, and the resulting increase in water storage in the reservoir would offset the reduction in reservoir inflow attributable to the WSIP. Thus, the WSIP would not trigger a change in downstream reservoir releases to the lower Tuolumne River. While this measure is not fully in the SFPUC’s control to implement and requires agreements and actions by other entities, the SFPUC intends to adopt and pursue this measure as part of WSIP implementation. This measure would further reduce, if not fully eliminate, the downstream effects of the WSIP on the San Joaquin River and the Delta as well as on the CVP and SWP and their water contractors.

14.9 Master Response on Alameda Creek Fishery Issues

14.9.1 Introduction

This master response addresses comments on the adequacy of the impact analysis and mitigations with respect to the WSIP's effects on the steelhead fishery in Alameda Creek, as well as other comments on Alameda Creek fishery resources, including fish-related stream flows and water quality. Comments concerning fisheries in the context of climate change are addressed in part in this master response, but refer to **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14) for detailed discussion of climate change effects. Comments concerning riparian corridors and related aspects of terrestrial biology are addressed in part in this master response and also in the responses to individual comments (see Vol. 7, Chapter 15) pertaining to terrestrial biology.

Updated Assumptions Used in this Master Response

Since publication of the Draft PEIR, a number of changes have occurred with respect to the Draft PEIR's discussion of the potential for steelhead reestablishment in the upper Alameda Creek watershed. These changes include updated status of fish passage improvement projects, modifications to the descriptions of the Alameda Creek Fishery Enhancement (SV-1) and Calaveras Dam Replacement (SV-2) projects, and updated Alameda Creek flow modeling. This master response incorporates these changes and updated assumptions as part of the comprehensive response to the numerous comments on the Draft PEIR related to steelhead fisheries in Alameda Creek.

Changes in Steelhead Conditions

Although the presence of steelhead in Alameda Creek above the Bay Area Rapid Transit District (BART) weir is not an "existing condition" as defined by CEQA and as described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.4.5-4 to 5.4.5-11), it is a possible future condition that could occur as the result of the cumulative implementation of many planned and proposed projects and actions designed to restore steelhead in Alameda Creek. As a result of information provided by commenters regarding future projects influencing the future habitat conditions for steelhead in the Alameda Creek watershed, the Draft PEIR analysis of cumulative effects (Vol. 3, Chapter 5, pp. 5.7-52 to 5.7-67) has been updated to incorporate a discussion of cumulative impacts of the WSIP on future-occurring steelhead. This master response provides an expanded discussion of the "future cumulative scenario" in which it is assumed that the steelhead fishery has been restored above the BART weir, and then discusses the potential effects of the WSIP on potential future-occurring steelhead. Following this expanded discussion, specific text revisions to the Draft PEIR are identified.

Changes to the Calaveras Dam Replacement and Alameda Creek Fishery Enhancement Projects

Sections 13.2 and 16.2 (Vol. 7, Chapters 13 and 16, respectively) present the revised project descriptions for WSIP components affecting system operations, including changes to the Alameda Creek Fishery Enhancement (SV-1) and Calaveras Dam Replacement (SV-2) projects. Since publication of the Draft PEIR, the SFPUC has incorporated both project revisions and protective measures into these two projects to reduce the WSIP's potential to affect habitat conditions for potential future-occurring steelhead in the upper watershed (SFPUC, 2008). The project revisions would occur regardless of steelhead presence or absence upstream of the BART weir and are as follows:

- The Calaveras Dam Replacement project would include facility modifications at the Alameda Creek Diversion Dam (ACDD) to construct a new bypass structure needed to implement bypass stream flows.
- If a structural alternative involving construction of a recapture facility is selected under the Alameda Creek Fishery Enhancement project, the recapture facility would be located at the downstream end of the reach of Alameda Creek between the lower Sunol Valley and the confluence with Arroyo de la Laguna. As an alternative to the recapture facility, the SFPUC may coordinate with other water agencies to develop and implement other means of recapturing fishery enhancement flows consistent with the 1997 California Department of Fish and Game Memorandum of Understanding (CDFG MOU).

The project description modifications also include protective measures that were designed in the event that man-made barriers in Alameda Creek are removed and steelhead gain access to Alameda Creek above the BART weir. These protective measures would provide both a long-term strategy of working with federal and state agencies, as well as interim protection in the event that: (1) the National Marine Fisheries Service (NMFS) and/or the CDFG have determined steelhead to be present in Alameda Creek above the BART weir; (2) construction of the Calaveras Dam Replacement project is complete; and (3) the Alameda Watershed Habitat Conservation Plan (HCP) has yet to be finalized. The project components designed to provide protective measures for future-occurring steelhead would include the following:

- An operational plan to provide minimum stream flows to support steelhead spawning below the ACDD to the confluence with Calaveras Creek when precipitation naturally generates runoff and flow in the creek, including the site-specific studies needed to determine the specific minimum stream flow requirements to support steelhead spawning in this reach of the creek.
- A detailed monitoring plan to survey and document steelhead spawning, subject to review and comment by the appropriate resource agencies. Monitoring would occur for a minimum of five years and a maximum of 10 years following implementation of the bypass flows for steelhead. At the completion of the monitoring period, the SFPUC would provide a report describing the methods, data collected, and results used to assess the performance of the minimum stream flow in providing suitable habitat for steelhead spawning.
- Interim minimum flows would be implemented if the NMFS and/or CDFG have determined that steelhead are present in Alameda Creek above the BART weir, construction of the Calaveras Dam project is complete, and the Alameda Watershed HCP

has yet to be finalized. The interim bypass flow releases would be consistent with the 1997 CDFG MOU, with the additional requirement that these flows would be achieved through bypass flows at the ACDD at all times when flows are available in upper Alameda Creek, rather than through releases at Calaveras Dam. Any changes in bypass flows provided for in this measure would be limited by the SFPUC's ability to achieve the bypass flow schedule, taking into consideration such factors as natural annual and interannual (i.e., seasonal) variations in flow in Alameda Creek immediately above the ACDD, and the SFPUC's ability to maintain all appropriated water rights in Alameda Creek. If supplemental releases need to be made for 1997 CDFG MOU compliance due to naturally low stream flows in upper Alameda Creek, releases would be made from Calaveras Dam. Based on flow studies conducted by Hagar and Payne (ETJV, 2008), it has been determined that the performance criteria, monitoring requirements, and other specifications included in the 1997 CDFG MOU could be readily adapted to benefit steelhead as well as sensitive amphibians. The MOU flow schedule provides the following instream flows:

  - 5 cubic feet per second (cfs) between November 1 and January 14
  - 20 cfs between January 15 and March 15
  - 7 cfs between March 16 and October 31 (reduced on ramping schedule to avoid settling of fines)

- Until the studies needed to resolve the physical and institutional requirements for future steelhead migration in Alameda Creek have been completed, the following interim measure would be implemented, but only after the following conditions are met: construction of the Calaveras Dam Replacement project (SV-2) is completed; existing barriers to passage are remedied; and the NMFS and/or CDFG have determined that steelhead can migrate above the BART weir of their own volition:

  - The SFPUC would provide seasonal flow bypasses at the ACDD and/or flow releases from Calaveras Dam, either (1) without recapture or (2) with recapture at a point approximately at the downstream end of the reach of Alameda Creek between the lower Sunol Valley and the confluence with Arroyo de la Laguna, below critical riffle locations or lower in the creek, between December 1 and June 30 (combined adult and juvenile migration period) in an amount equivalent to the flow release schedule provided in the 1997 CDFG MOU.

  - As an alternative to the recapture facility, the SFPUC would coordinate with other water agencies to develop and implement other means of recapturing enhancement flows consistent with the 1997 CDFG MOU at a location downstream of the reach of Alameda Creek between the lower Sunol Valley and the confluence with Arroyo de la Laguna.

Draft PEIR Mitigation Measure 5.4.5-3a

In order to reflect the incorporation of the project revisions and additional protective measures into the Calaveras Dam Replacement project (SV-2) component of the WSIP, Draft PEIR Mitigation Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek (Vol. 4, Chapter 6, pp. 6-52 and 6-53), has been modified to be implemented in conjunction with the bypass flows at the diversion dam proposed as part of the Calaveras Dam Replacement project (and described above) to meet the 1997 CDFG MOU flow requirements (see Vol. 7, Chapter 16 for specific text changes).

Updated Flow Modeling

Subsequent to publication of the Draft PEIR, the SFPUC conducted updated model runs with the Hetch Hetchy/Local Simulation Model (HH/LSM)[1] to reflect more recent input assumptions for several model parameters as part of its ongoing system planning and management. Revised model assumptions and data are discussed in Section 13.3 (Vol. 7, Chapter 13), and new model output is shown in Appendix O (Vol. 8) of this PEIR. With respect to Alameda Creek, the updated model runs resulted in generally minor changes in flows and reservoir operations compared to the data presented in the Draft PEIR. The results of the updated model runs are integrated into the responses to comments, updated analyses, and protective measures.

Master Response Organization

This master response is organized by the following subtopics:

14.9.2 Steelhead Fishery – Existing Conditions in Alameda Creek
14.9.3 Impacts on Steelhead in Lower Alameda Creek below the BART Weir
14.9.4 Steelhead – Future Fishery Scenario and Potential Cumulative Effects
14.9.5 Other Fish Species and Aquatic Habitat in Alameda Creek
14.9.6 Climate Change and Cumulative Effects on Future Fish Passage and Fish Habitat

Comments on Alameda Creek fishery issues were received from the following entities:

Federal Agencies

- None

State Agencies

- California Department of Fish and Game – S_CDFG2

Local and Regional Agencies

- Alameda County Flood Control and Water Conservation District – L_ACFCWCD
- Alameda County Water District – L_ACWD
- East Bay Regional Park District – L_EBRPD
- Zone 7 Water Agency – L_Zone7

Groups

- Alameda Creek Alliance – SI_ACA1, SI_ACA2
- California Native Plant Society, East Bay Chapter – SI_CNPS-EB2
- Environmental Defense – SI_EnvDef
- Golden West Women Flyfishers – SI_GWWF2
- Northern California/Nevada Council of the Federation of Fly Fishers Steelhead Committee – SI_NCFFSC

[1] The Draft PEIR (Vol. 3, Chapter 5, pp. 5.1-9 to 5.1-17) analyzed the WSIP's impacts on river and steam flow using a computerized mathematical simulation model developed by the SFPUC. This model, the HH/LSM, simulates the operations of the regional water system using a monthly time-step.

Citizens

- None

PEIR Section Reference

The Draft PEIR evaluates impacts on fisheries and habitat in Alameda Creek, presents mitigation measures to reduce or eliminate impacts, and discusses future fishery habitat enhancement projects in the following locations: Vol. 1, Summary, Table S.6, p. S-53; and Vol. 3, Chapter 5, Section 5.4.1 (stream flow), Section 5.4.3 (water quality), Section 5.4.5 (fisheries), and Section 5.7.3 (cumulative impacts).

The Draft PEIR addresses issues concerning Alameda Creek fisheries-related legal issues and water rights in the following locations: Vol. 1, Chapter 2, Section 2.4.2 (regulatory requirements); Section 2.5.1 (institutional considerations); Table 2.3 (SFPUC water resources policies); Vol. 2, Chapter 4, Section 4.6 (biological resources); Vol. 3, Chapter 5, Section 5.2 (plans and policies) and Section 5.4.5 (fisheries).

14.9.2 Steelhead Fishery – Existing Conditions in Alameda Creek

Introduction

This section of the master response addresses comments concerning the existing conditions in Alameda Creek for steelhead and rainbow trout, including their regulatory status and the SFPUC's current and ongoing stewardship and management efforts towards steelhead restoration. It also discusses flow requirements for steelhead with consideration of other native stream-dependent species. This section is organized by the following subtopics:

- Biological Distinctions and Regulatory Status for Steelhead and Rainbow Trout
- Anadromous Steelhead in Lower Alameda Creek
- Consideration of Fish Passage at the Niles Gaging Station
- SFPUC Environmental Stewardship and Alameda Creek Fishery Restoration Projects
- Consideration of Steelhead at the Alameda Creek Diversion Dam
- Other Native Stream-Dependent Species
- SFPUC's Ongoing Management and Stewardship of the Alameda Watershed

Comment Summary

This section of this master response responds to all or part of the following comments:

L_ACFCWCD-02	L_ACFCWCD-13	SI_ACA1-11
L_ACFCWCD-03	L_ACFCWCD-15	

Summary of Issues Raised by Commenters

- An arbitrary distinction is drawn between steelhead and rainbow trout.

- Clarification is needed regarding the regulatory status of steelhead and rainbow trout in Alameda Creek above the BART weir.
- Issues regarding fish passage above the BART weir, including:
  - The consideration of steelhead currently passing upstream over the BART weir is inadequate.
  - The distinction between naturally migrating fish past the BART weir and fish transported past the weir is arbitrary.
  - The effects of reduced peak winter flows on fish passage over the BART weir and middle inflatable dam are not adequately addressed.
  - Mitigation for effects of reduced peak winter flows on fish passage over the BART weir and middle inflatable dam needs to be included.
- The discussion of Niles gaging station with respect to fish passage is inadequate.
- SFPUC involvement in fishery enhancement projects is inconsistent with the position that steelhead are not present upstream of the BART weir.

Biological Distinctions and Regulatory Status for Steelhead and Rainbow Trout

Comments received on the Draft PEIR requested further validation of the biological distinctions made between anadromous steelhead and resident rainbow trout within the Alameda Creek watershed in determining WSIP-related impacts on steelhead populations. The Draft PEIR addresses the regulatory status, life history, and distinctions between resident and migratory populations, as well as flows needed to support populations, in Section 5.4.5 (Vol. 3, Chapter 5, pp. 5.4.5-4 to 5.4.5-11).

The life-history discussion presented in Section 5.4.5 is summarized here to facilitate an understanding of how the biological distinction was drawn between steelhead and rainbow trout in the Draft PEIR. Steelhead and rainbow trout are both genetically identified as the species *Oncorhynchus mykiss* (*O. mykiss*), but are distinguished by their different regulatory status and life-history strategies, as summarized here. Both steelhead and rainbow trout have a flexible life history and adopt varying life-cycle strategies. All *O. mykiss* hatch in the gravel substrate of coldwater streams (Gunther et al., 2000). During spawning, the female steelhead and rainbow trout clears and cleans a depression in the gravel (redd) where eggs are deposited, fertilized, and incubate until hatching. After the eggs hatch, fry emerge from the gravel and disperse through the stream, typically occupying low-velocity areas along stream margins (Reiser and Bjornn, 1979). Juvenile steelhead and rainbow trout often move to deeper pools and higher velocity areas as they grow, and remain in freshwater for at least one year.

Following this rearing period of at least one year, juveniles (parr) may follow a variety of life-history patterns, which include residents (non-migratory) at one extreme and individuals that migrate to the open ocean (anadromous) at the other extreme. Intermediate life-history patterns include fish that migrate within the stream (potamodromous), fish that migrate only as far as estuarine habitat, and fish that migrate to near-shore ocean areas.

Juveniles that become migratory typically do so after one or two years of rearing, but sometimes longer. Physiological changes (smoltification) in these fish (smolts) ultimately allow them to make a transition from freshwater to seawater. Smolts migrate to the ocean, spend a variable amount of time there (typically one to two years), grow rapidly and return to spawn, generally in the stream where they hatched. This is an anadromous life history, typical of many salmon and trout as well as other fish species, and anadromous *O. mykiss* are commonly known as steelhead. Within a given stream, some *O. mykiss* do not migrate to the sea, and the proportion may vary considerably depending on local circumstances. These resident fish are often known as resident or stream rainbow trout. While resident rainbow trout share many of the same life-history characteristics and environmental requirements as anadromous steelhead, unlike steelhead—which migrate to the ocean for a portion of their life cycle—resident rainbow trout complete their entire life cycle within the freshwater environments of streams and lakes.

In the past, the Alameda Creek watershed supported anadromous steelhead (Gunther et al., 2000). Scientists have determined that resident rainbow trout and anadromous steelhead are genetically the same species that exhibits two different life-history strategies. Specifically, these different life-history strategies do not appear to be genetically distinct, and steelhead and rainbow trout have been observed interbreeding. Tissue samples have been collected from steelhead and rainbow trout in the Alameda Creek watershed and from other streams in the area for genetic analyses (Gunther et al., 2000). These analyses concluded with a high level of confidence that the Alameda Creek samples are not of hatchery origin and are genetically part of the Central California Coast (CCC) Distinct Population Segment (DPS) (formerly Evolutionarily Significant Unit, ESU) (Nielsen, 2003). Trout populations isolated above dams in the Alameda Creek watershed have been observed adopting an adfluvial life history, spending most of their lives in the reservoirs and migrating to tributary streams to spawn.

As described in the Draft PEIR (Vol. 3, Chapter 5, p. 5.4.5-4), while steelhead and resident rainbow trout are genetically identical, a distinction is made for steelhead based on the successful life-history strategy displayed. Although rainbow trout and steelhead are identified in the Draft PEIR as the same species, the two life-history strategies are not used interchangeably when discussing impacts on the listed special-status species of CCC steelhead. Steelhead are distinguished biologically as the anadromous life-history strategy. Anadromous steelhead have the ability to migrate to the sea and return to freshwater spawning areas in natal streams. Resident rainbow trout in upper Alameda Creek can migrate to coastal marine waters, but cannot return to spawning or rearing habitat upstream of the BART weir.

In January 2006, pursuant to the Federal Endangered Species Act (FESA), the NMFS listed as threatened the CCC steelhead DPS, including all naturally spawned anadromous steelhead populations below natural and manmade impassable barriers (71 Federal Register 834). The listing of the Alameda Creek CCC steelhead DPS as threatened applies only to the anadromous form of *O. mykiss* and is therefore limited to populations downstream of the BART weir. Specifically, the final listing determination stated, “Under our final approach of delineating steelhead-only DPSs of *O. mykiss*, the resident populations, including those in upper Alameda Creek and the Livermore-Amador Valley, are not considered part of the listed DPSs” (71 Federal

Register 841). Further discussion of the regulatory status of steelhead in Alameda Creek is presented in the Draft PEIR (Vol. 3, Chapter 5, p. 5.4.5-4).

As discussed in the Draft PEIR, a National Marine Fisheries Service (NMFS) ruling determined that steelhead and rainbow trout inhabiting a river or stream that allows the possibility of successful migration to and from coastal marine waters will, by definition, be classified as steelhead. Thus, the resident rainbow trout that occur in Alameda Creek upstream of the BART weir (a complete barrier to adult migration) are not designated as a listed species due to their inability to complete an entire life cycle involving adult upstream migration to the upper watershed with subsequent spawning. Therefore, a regulatory distinction currently exists that defines *O. mykiss* upstream of the BART weir as resident rainbow trout.

The NMFS has not designated the Alameda Creek watershed as critical habitat for steelhead, and has listed as threatened only those steelhead that currently exist below the lowest impassible barriers in the Alameda Creek watershed (i.e., the BART weir). Thus, the resident rainbow trout that occur in the creek above the BART weir are not designated as a listed species and are not proposed for listing. However, the NMFS has advised that the designation of critical habitat would be open to further evaluation if anadromous steelhead do obtain passage to upper Alameda Creek.

Anadromous Steelhead in Lower Alameda Creek

Many comments were received regarding fish passage in the lower portion of Alameda Creek and past the BART weir. Comments on this issue sought clarification on the extent to which the BART weir currently blocks upstream passage by anadromous CCC steelhead. Section 5.4.5 of the Draft PEIR (Vol. 3, Chapter 5, pp. 5.4.5-4 to 5.4.5-11) discusses steelhead populations in Alameda Creek, current barriers to fish passage, the regulatory status of steelhead in Alameda Creek, and the activities of the SFPUC, other agencies, and workgroups in passage improvement programs. Further discussion of this issue is provided in Section 14.9.3, below.

Alameda Creek historically hosted a steelhead run that spawned in the upper reaches of the watershed. That steelhead run was eliminated by the placement of several obstructions to migration within the Alameda Creek channel over the past century. These obstructions include the Alameda County Flood Control and Water Conservation District’s (ACFCWCD) BART weir, located about 9.5 miles upstream from the creek’s confluence with San Francisco Bay.

In February 2000, the Center for Ecosystem Management and Restoration published a report entitled *An Assessment of the Potential for Restoring a Viable Steelhead Trout Population in the Alameda Creek Watershed* (Gunther et al., 2000). The assessment found that suitable habitat exists in the watershed to support steelhead spawning and rearing, but that upstream adult migration was completely prevented by the presence of several barriers in the lower portion of the watershed. The assessment concluded that the BART weir presents a complete barrier to all migrating anadromous fish species under all flow conditions, with the possible exception of Pacific lamprey. Therefore, steelhead can currently migrate upstream within Alameda Creek only as far as the BART weir. The comment’s assertion that the BART weir barrier is temporal (i.e., flow-dependent) is unsupported by either current literature (Gunther et al., 2000) or regulatory distinction.

Comments received on the Draft PEIR noted that individual steelhead fish have been transported upstream of the BART weir through citizen-group catch-and-release programs coordinated by the Alameda Creek Alliance. Concern was raised regarding impacts on these individual fish due to WSIP implementation. A discussion of steelhead in the Alameda Creek watershed is presented in Draft PEIR Section 5.4.5 (Vol. 3, Chapter 5), and a discussion of cumulative impacts on steelhead is presented in Section 14.9.4, below.

Steelhead that are artificially transported upstream of total passage barriers do not represent a naturally occurring, self-sustaining population, and, as such, impacts on these few individual fish are not evaluated in the Draft PEIR. These individuals are not considered part of the CCC steelhead DPS under FESA because these fish and their offspring, if successful in spawning, cannot return to the watershed upstream of the BART weir to complete a full life cycle. The Alameda Creek Alliance has been involved in transporting adult migrant fish past barriers in lower Alameda Creek. The Alameda Creek Alliance describes this transport operation on its website, which discusses the fact that the transport of a few individuals does not effectively move a sufficient number of fish upstream to create a viable spawning population (Alameda Creek Alliance, 2002).

Consideration of Fish Passage at the Niles Gaging Station

Comments raised concern that the Draft PEIR discussion of the U.S. Geological Survey (USGS) Niles gaging station (located upstream of the BART weir) was inadequate with respect to fish passage. Section 5.4.5 of the Draft PEIR (Vol. 3, Chapter 5, p. 5.4.5-9) discusses the Niles gaging station with respect to fish passage, as well as future habitat and passage improvement projects currently under study and planning. The Niles gaging station has been described as a potential impediment to fish passage (Gunther et al., 2000), although it remains passable during higher flow events. The downstream pool temperatures are characterized by stressful to highly unsuitable conditions in summer months, and improvements are required for both upstream and downstream passage (Hanson, 2008). The Northern California Council Federation of Fly Fishers has developed a preliminary study of fish passage by the Niles gage, and fish passage criteria and studies at the gaging station are ongoing. Because steelhead are unable to migrate upstream of the BART weir under existing conditions, impacts on steelhead passage at the Niles gaging station were not evaluated in the Draft PEIR. However, these impacts are considered in the cumulative impact analysis presented below in Section 14.9.4, which discusses future passage improvements and instream flow strategies as part of the SFPUC's involvement in steelhead population recovery within the Alameda Creek watershed.

SFPUC Environmental Stewardship and Alameda Creek Fishery Restoration Projects

As part of the continuing effort to address steelhead restoration in Alameda Creek, the SFPUC has entered into an agreement with 17 public agencies and organizations as part of the Alameda Creek Fisheries Restoration Workgroup (ACFRW) to provide funding and collaborate on flow studies focused on steelhead restoration. To date, these studies have not developed instream flow recommendations, but an initial workplan—the *Alameda Creek Population Recovery Strategies and Instream Flow Assessment for Steelhead Trout*—has been developed to achieve this goal (McBain and Trush, 2007). Collaborative data collection is scheduled for the near future, and a joint process among the agencies has begun to recommend a range of flows to support steelhead restoration objectives. The referenced report details this effort to establish instream flow targets and outlines specific studies intended to result in a flow strategy for restoring and maintaining native fishes (McBain and Trush, 2007). Due to the many variables involved, these studies need to be completed before it is possible to develop a specific, scientifically based flow schedule for steelhead. Further detailed discussion on specific flow release volumes and schedules is provided in Section 14.9.4, below.

Comments raised concern that the Draft PEIR failed to mitigate or analyze impacts on fish passage within the context of proposed future projects designed to increase habitat quality and connectivity within Alameda Creek for steelhead. A detailed discussion of future cumulative scenario conditions and cumulative impacts associated with WSIP implementation is presented in Section 14.9.4. As previously described, various watershed and habitat studies have established that steelhead do not migrate above the BART weir (Gunther et al., 2000).

Regardless of the timing of the BART weir fish passage project and other planned habitat enhancement/restoration actions, the SFPUC will continue to participate in steelhead restoration efforts. Ongoing studies will recommend flows to support steelhead restoration (as detailed in Section 14.9.4), and the SFPUC will continue to work with the NMFS, CDFG, and other stakeholders on these studies. Section 14.9.4 provides a detailed discussion of the WSIP's potential contribution to cumulative impacts on future-occurring steelhead in Alameda Creek with the consideration of the revisions to the Calaveras Dam Replacement project (SV-2) and Draft PEIR mitigation measures summarized above in Section 14.9.1. The SFPUC plans to incorporate steelhead recovery strategies developed through the ACFRW process into its Alameda Watershed HCP or other regulatory mechanism, which will provide coverage under FESA for regional water system operations at the time steelhead return to the upper Alameda Creek watershed. The SFPUC will comply with FESA requirements for steelhead protection through the Alameda Watershed HCP, or other agreement/authorization acceptable to the permitting agencies, as described in Section 14.9.4.

Consideration of Steelhead at the Alameda Creek Diversion Dam

Comments on the Draft PEIR identified the desire to remove the ACDD as a barrier to fish passage in order to support restoration of the historical range of steelhead within Alameda Creek. The SFPUC has no plans to remove the ACDD, and its removal is not required to mitigate significant impacts of the WSIP. However, to address the potential for steelhead reestablishment in the upper Alameda Creek watershed, the SFPUC proposes to develop and implement an operational plan to provide minimum stream flows below the ACDD that will support steelhead spawning as part of the Calaveras Dam Replacement project (SFPUC, 2008). This operations plan will be developed in coordination with the ACFRW, CDFG, and NMFS. Other SFPUC actions proposed to address potential future-occurring steelhead in the upper watershed are discussed in Section 14.9.1, above. Additionally, as stated in Mitigation Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek, and Mitigation Measure 5.4.5-3b, Alameda Diversion Dam Diversion Restrictions or Fish Screens (Vol. 4, Chapter 6, pp. 6-52 to 6-54), the SFPUC would complete site-specific studies to determine appropriate bypass flows to address impacts on the resident trout fishery in Alameda Creek below the diversion dam. As stated in Measure 5.4.5-3a, providing minimum flows below the dam would support resident trout spawning and egg incubation; it is also expected that this measure would be sufficient to sustain the resident trout population in this reach of the creek, which is limited due to natural drying of the stream channel in alluvial sections during the summer months (Sak, 2007). As stated above and further discussed in Section 14.9.4, the SFPUC is committed to the ongoing management and stewardship of the Alameda Creek watershed, including fishery enhancement projects and measures to provide flows for native stream-dependent species, as detailed in Section 14.9.1, above.

Other Native Stream-Dependent Species

Comments received from the CDFG noted that Mitigation Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek, may not provide adequate protective flows for steelhead and native stream-dependent species. In response to the comment recommending further study to determine whether sufficient water will be available for different life stages of fish and native stream-dependent species, the Draft PEIR mitigation measure incorporates site-specific studies and coordination with the ACFRW to determine the appropriate minimum stream flow. Section 14.9.4 presents a detailed analysis of current habitat conditions for different life stages of steelhead and rainbow trout, the potential impacts of WSIP implementation on these various life stages, and the status of studies on instream flow requirements to protect fishery resources. Please refer to Section 14.9.4, below, as well as **Response S_CDFG2-15** and **Response L_ACWD-22** (Vol. 6, Chapter 15, Sections 15.2 and 15.3, respectively) for more discussion of bypass flows in Alameda Creek.

In response to comments regarding the ACDD bypass flows and reevaluation of Mitigation Measure 5.4.5-3a, the measure has been expanded to address other species and life stages. The following three excerpts from the Draft PEIR are revised as follows:

Vol. 3, Chapter 5, p. 5.4.6-19, third full paragraph:

> Overall, implementation of the proposed WSIP water supply and system operations would result in *potentially significant* impacts on terrestrial biological resources due to a potential reduction in aquatic breeding habitat for key special-status species. Measure 5.4.1-2, Diversion Tunnel Operation, calls for operation of the diversion tunnel in a manner that ensures that flows not required to maintain storage in Calaveras Reservoir are passed down Alameda Creek at the diversion dam. Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek, calls for developing and implementing an operational plan to provide minimum bypass flows below the diversion dam to support habitat for rainbow trout and other native stream-dependent species from December through April. Implementation of these measures would ensure that minimum flows in Alameda Creek are allowed to pass by the diversion dam. Taken together, these measures would reduce adverse impacts on key special-status species to a less-than-significant level.

Vol. 4, Chapter 6, p. 6-52, first paragraph under Fisheries, first sentence:

> **Measure 5.4.5-3a:** The SFPUC shall develop and carry out as part of the implementation of the Calaveras Dam Replacement (SV-2) project, an operational plan to implement minimum ~~stream~~ <u>bypass</u> flows when precipitation generates runoff into the creek below the diversion dam to the Calaveras Creek confluence from December 1 through April 30 to support ~~resident trout~~ spawning and egg incubation <u>for resident trout as well as breeding habitat for other native stream-dependent amphibians</u>.

Vol. 4, Chapter 6, p. 6-53, first paragraph, last sentence:

> The operational plan will allow for adapting minimum flow amounts to support resident trout spawning and egg incubation <u>and other native stream-dependent species</u> based on the monitoring results and best available scientific information.

Section 14.9.4, below, provides a detailed discussion of planned steelhead restoration within the Alameda Creek watershed and assesses potential cumulative effects on steelhead that could result from WSIP implementation. As described in Section 14.9.4, successful implementation of planned and proposed fishery enhancement projects would result in the removal of many barriers to passage for anadromous steelhead within Alameda Creek. As described in Section 14.9.1 above, when steelhead passage is restored to the upper watershed, the SFPUC will work with the CDFG and NMFS to comply with the applicable FESA requirements for steelhead through the Alameda Watershed HCP or other regulatory mechanism. Currently, the SFPUC is developing the Alameda Watershed HCP in compliance with FESA, which will addresses operation (but not construction) of the Calaveras Dam Replacement project (SV-2), and steelhead is a covered species in the HCP. The HCP is a long-term mechanism in which the SFPUC and regulatory agencies are assessing the requirements for steelhead restoration and other native fish and aquatic species in the watershed affected by SFPUC water system operations.

SFPUC's Ongoing Management and Stewardship of the Alameda Watershed

Comments also requested clarification of the SFPUC's position regarding the presence of steelhead in the upper watershed, and the reasons for SFPUC involvement in fishery enhancement projects upstream of the BART weir if the current understanding is that steelhead are not present in the upper watershed. Sections 5.4.5 and 5.7.3 of the Draft PEIR (Vol. 3, Chapter 5) discuss the SFPUC's involvement in habitat improvement programs planned for the Alameda Creek watershed.

The SFPUC manages its Alameda watershed lands to benefit a wide range of species, habitat, and natural resources in addition to specific efforts to restore steelhead to Alameda Creek. The SFPUC's watershed management and stewardship policies are detailed in the *Alameda Watershed Management Plan* (SFPUC, 2001) and the Water Enterprise Environmental Stewardship Policy (SFPUC, 2006). The SFPUC has dedicated much time and funding toward numerous long-term efforts to improve steelhead habitat and passage within the watershed, such as the recent removal of the Sunol and Niles Dams; it is also a major participant in the ACFRW, which is focusing on the restoration of steelhead to Alameda Creek. The SFPUC's work with the ACFRW includes developing a long-term strategy that encompasses a range of watershed management goals.

Additionally, independent of involvement in the ACFRW's fishery enhancement projects, the SFPUC has funded studies to better understand the biological characteristics required for successful steelhead restoration. It is the policy of the SFPUC to operate the SFPUC water system in a manner that protects and restores native fish and wildlife downstream of SFPUC dams and water diversions, within SFPUC reservoirs, and on SFPUC watershed lands.

14.9.3 Impacts on Steelhead in Lower Alameda Creek below the BART Weir

Introduction

This section of the master response addresses comments concerning the analysis of the WSIP's potential effects on steelhead and flows in lower Alameda Creek downstream of the BART weir. This section is organized by the following subtopics:

- Lower Alameda Creek as a Migration Corridor and a Transition Zone for Steelhead Smolts
- Impacts on Stream Flow and Fisheries Downstream of the BART Weir

Comment Summary

This section of this master response responds to all or part of the following comments:

L_ACFCWCD-04	L_ACWD-09	L_ACWD-19
L_ACFCWCD-14	L_ACWD-12	L_Zone7-01
L_ACWD-07	L_ACWD-17	SI_ACA1-02

Summary of Issues Raised by Commenters

- The discussion of lower Alameda Creek as a transition zone for steelhead is inadequate.
- Inadequate discussion of project impacts on steelhead below the middle inflatable dam.
- Lower Alameda Creek flow diversions would affect fisheries and habitat in the flood control channel.
- The WSIP would reduce winter and spring flows by 50 percent in normal years and could adversely affect steelhead passage below the BART weir.
- Flows below the recapture facility should be addressed; flows should be allowed to pass downstream.

Response

Lower Alameda Creek as a Migration Corridor and a Transition Zone for Steelhead Smolts

Comments on the Draft PEIR raised concern that reduced flows below the BART weir resulting from the WSIP would affect the estuarine zone of Alameda Creek and reduce the potential for steelhead smolt development within this possible zone of transition to marine waters.

The flood control channel represents the 12-mile reach of Alameda Creek from the confluence with San Francisco Bay to the mouth of Niles Canyon. It is an artificially managed and modified environment with a heavily sedimented, sandy bottom and riprap sides. The low riparian cover and high summer water temperatures in this creek section (Hanson, 2002a, 2002b) are not suitable for summer rearing by coldwater fish species. Gunther et al. (2000) classify the geographic range of the flood control channel as non-viable habitat for steelhead spawning or rearing.

Tidal influence in the flood control reach of lower Alameda Creek falls short of Alameda County Water District's (ACWD) lowermost inflatable dam (Gunther et al., 2000); unless flows overtop or bypass the inflatable dam, the channel below the inflatable dams can become dry, further reducing the potential under current conditions for the flood control channel to provide viable smolt transition habitat. Under typical operating conditions, ACWD's inflatable dams are raised to facilitate the diversion of flows into off-channel recharge areas, except during peak storm events.

Currently, no summer rearing habitat exists in this reach of lower Alameda Creek that could be considered suitable for either steelhead or rainbow trout. The 12-mile reach of the flood control channel, extending upstream to Niles Canyon, is a simplified system without natural features (such as pool/riffle sequences) and, even after the implementation of future restoration projects, it would primarily offer only migratory habitat (see Section 14.9.4, below). Implementation of the WSIP, as outlined in the Draft PEIR, would not affect smolt development in this section of the creek, as no suitable habitat exists within this reach for smolt development due to the physical characteristics of the engineered flood control channel. Additionally, implementation of the WSIP would not significantly affect the potential for steelhead to continue using this stretch as a migratory corridor. The response presented below addresses the potential impacts on migrating salmonids due to changes in seasonal flow under the WSIP, including the continued use of this creek reach as a migratory corridor.

Impacts on Stream Flow and Fisheries Downstream of the BART Weir

Comments raised concern that increased diversions under the WSIP would adversely affect steelhead passage in the 9.5 miles of channel from San Francisco Bay to the BART weir, and that the Draft PEIR did not contain sufficient analysis of impacts on stream flow and fisheries in the lower section of Alameda Creek.

The Draft PEIR (Vol. 3, Chapter 5, pp. 5.4.1-16 to 5.4.1-43) describes the changes in stream flow and reservoir water levels that would result from the WSIP. Impact 5.4.1-4 (pp. 5.4.1-39 to 5.4.1-43) discusses the analyses conducted on stream flow changes that would occur under the WSIP, and the potential impact of WSIP implementation on flow along Alameda Creek below the confluence with San Antonio Creek. The Draft PEIR analysis concluded that average monthly flows in Alameda Creek below the confluence with San Antonio Creek would be lowered due to the WSIP in winter months of normal or wetter years. It was also determined that changes in flow would be substantially dampened by inflows from other tributaries in the Sunol Valley; therefore, no adverse hydrological effects would result, and no mitigation measures would be required. Additionally, in considering the WSIP-related effects on flow in Alameda Creek, along with fishery flow releases (under the Calaveras Dam Replacement project, SV-2) being recaptured (under the Alameda Creek Fishery Enhancement project, SV-1), the Draft PEIR analysis found there would be no change in average monthly flows in most months of normal and wetter years, and no change in those flows in all months of drier years.

Section 5.4.5 of the Draft PEIR (Vol. 3, Chapter 5) describes fishery resources in Alameda Creek and the potential impacts that would result from the WSIP. Impact 5.4.5-6 (Vol. 3, Chapter 5, pp. 5.4.5-21 and 5.4.5-22) describes the WSIP's effects on fishery resources along Alameda Creek below the confluence with San Antonio Creek. The analysis concluded that potential impacts on fishery resources and habitat along Alameda Creek downstream of the confluence with San Antonio Creek would be less then significant, and no mitigation measures would be required.

In order to address comments regarding the WSIP's impacts on steelhead passage and fishery habitat in lower Alameda Creek downstream of the BART weir (to the confluence with San Francisco Bay), additional stream flow analysis was conducted (see Vol. 8, **Appendix N**); this analytical effort is summarized in the paragraphs that follow.

Downstream of the confluence of Alameda and San Antonio Creeks, Alameda Creek joins with the other major tributary in the Alameda Creek watershed, Arroyo de la Laguna. Below this confluence Alameda Creek enters Niles Canyon and flows for approximately 3.5 miles before exiting the canyon. Lower Alameda Creek, which begins downstream of the Niles Canyon reach, is a low-gradient creek characterized by flood control channels and several instream structures, including the BART weir and ACWD inflatable dams used for water diversion. The ACWD utilizes the lower creek for water supply via diversions and groundwater recharge. Lower Alameda Creek ultimately discharges to San Francisco Bay approximately 12 miles downstream of Niles Canyon.

Recent USGS flow records from three gaging stations on Alameda Creek (upstream of the San Antonio Creek confluence, near the downstream end of Niles Canyon, and from Arroyo de la Laguna) were reviewed to estimate the proportion of flow that upper Alameda Creek and Arroyo de la Laguna contribute to the lower reaches of Alameda Creek. The flow proportions were used to estimate the changes in flow that would occur in lower Alameda Creek as a result of the WSIP for hydrologic years 2000 to 2007.[2] **Figure 14.9-1** presents the locations of the three USGS gaging stations (labeled AC Welch, ADLL, and AC Niles) from which data were analyzed, and the contributing watersheds for each of the gages.

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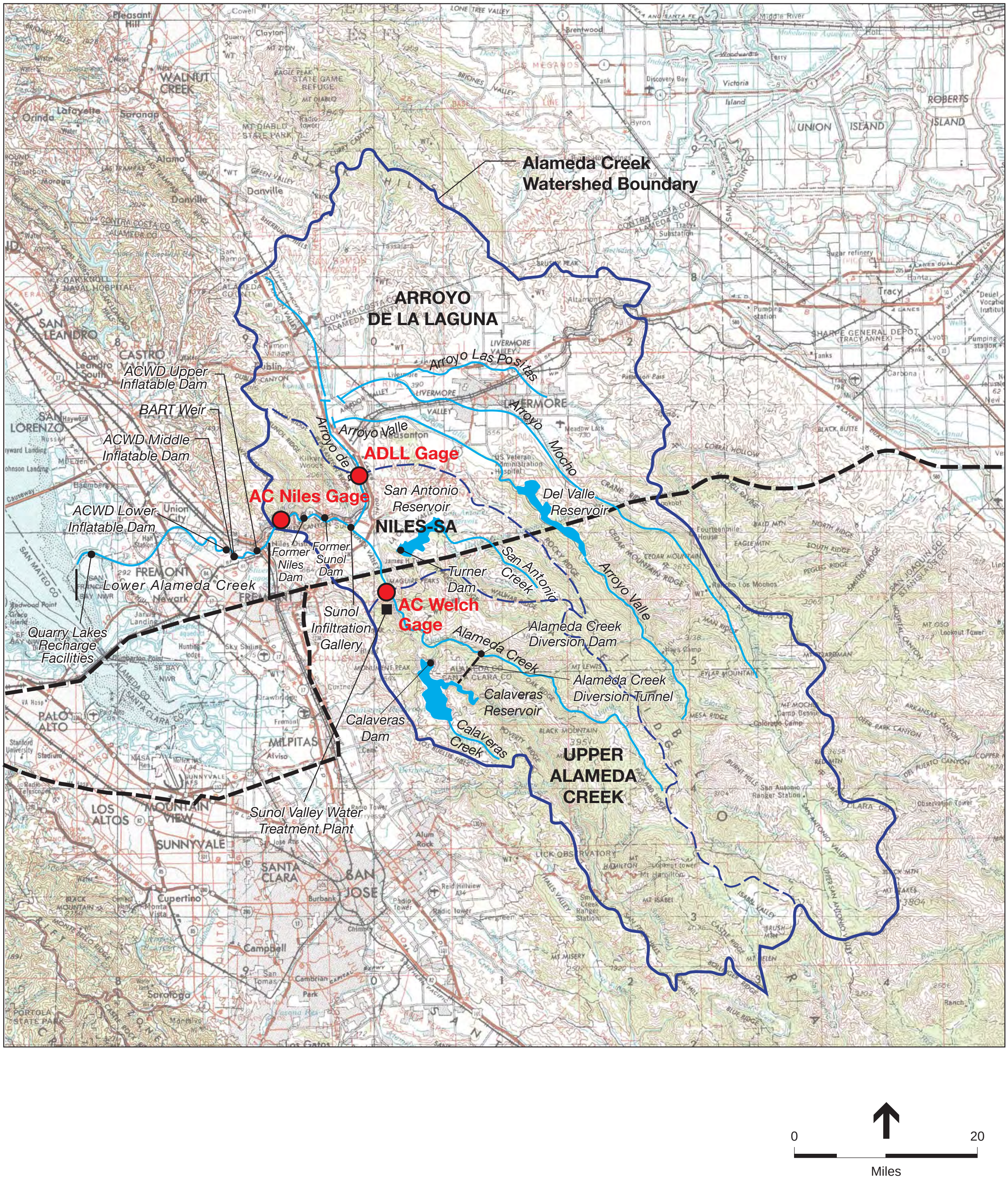
2 This analysis takes into account both the "Calaveras Up" and "Calaveras Down" base-case HH/LSM results because historical gage data were used in the analysis, and the Division of Safety of Dams (DSOD) restriction on Calaveras Dam operations was implemented during the period of analysis (in 2002). Therefore, the analysis uses model data from the Calaveras Up condition (prior to the DSOD restriction) for hydrologic years 2000 to 2001, and model data from the Calaveras Down condition (after the DSOD restriction and the base-case used for the Draft PEIR impact analysis) for the remainder of the years.



SOURCE: ESA + Orion; USGS 1969

SFPUC Water System Improvement Program . 203287

Figure 14.9-1
Location of 3 USGS Gages and
Contributing Watersheds for Lower Alameda Creek

Data from the three USGS gages were reviewed on an average monthly flow basis for overlapping periods of record (hydrologic years 2000 to 2007). Diversions from upper Alameda Creek to Calaveras Reservoir were substantially curtailed starting in 2002 due to the operating restrictions imposed on Calaveras Reservoir by the California Department of Water Resources, Division of Safety of Dams (DSOD). **Figure 14.9-2** presents average monthly flows over the eight-year period for the three gages. Review of the flow data reveals that flow measured at the Arroyo de la Laguna gage (shown as a blue shaded area) generally contributes a higher percentage of the flow measured at the Niles gage (shown as a black line) compared to that measured at the Welch gage (shown as a green shaded area). The discrepancy between the summation of the Arroyo de la Laguna and Welch gage flows and flow at the Niles gage (the white space below the black line) is assumed to be inflow from the watershed between the two upper gages and the Niles gage (labeled "Niles–SA watershed" on Figure 14.9-1).

Included in the Niles–San Antonio Creek watershed are releases made from the State Water Project, flow from San Antonio Creek, and contributions/losses from the watershed that occur downstream of the two upper gages.

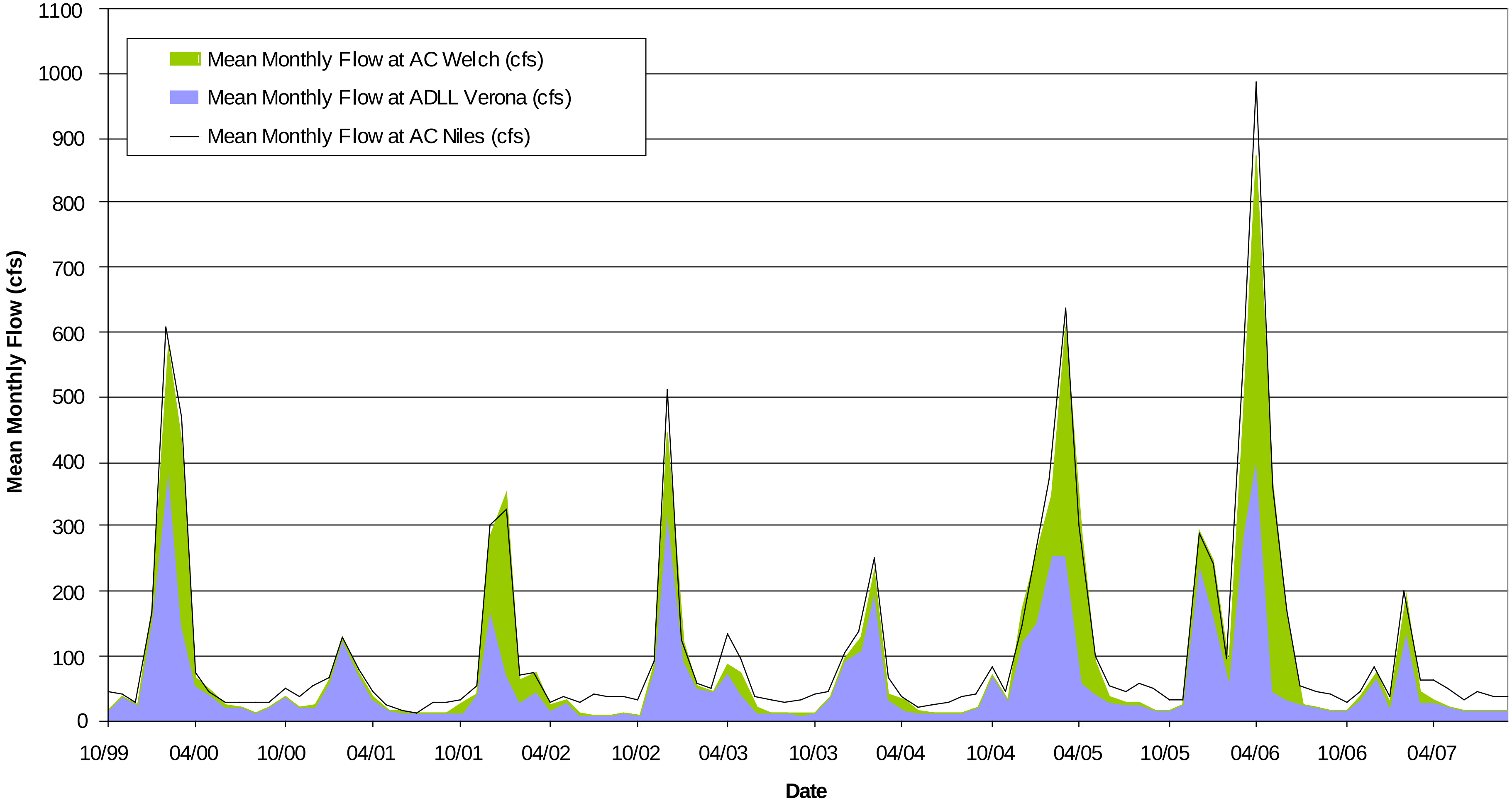
Releases or spills from San Antonio Reservoir rarely occur. Most flows in San Antonio Creek result from groundwater seepage or runoff from the watershed downstream of Turner Dam. The Niles–San Antonio Creek watershed contribution noted in summer months (as a gap between the green and blue areas and the black line) is assumed primarily to be releases from the State Water Project and contribution from groundwater in Niles Canyon. Also notable in the chart are the spikes in flow from upper Alameda Creek in the winter and spring of the hydrologic years 2005 and 2006. These spikes are a result of above-normal runoff in the watershed combined with the restricted Calaveras Reservoir storage and required releases from the reservoir to maintain the DSOD-restricted level.

The data presented in Figure 14.9-2 were analyzed to determine the percentage of flow contributed by each of the watersheds tributary to the Niles gage (identified in Figure 14.9-1). **Tables 14.9-1** and **14.9-2** present the relative contribution of the upstream watersheds to flow at the Niles gage over the past eight hydrologic years, from 2000 to 2007.

TABLE 14.9-1
AVERAGE MONTHLY PERCENTAGE OF WATERSHED CONTRIBUTIONS AT THE NILES GAGE
HYDROLOGIC YEARS 2000–2007

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	WY Total
ADLL	58%	81%	71%	61%	70%	46%	42%	34%	40%	47%	41%	43%	55%
AC Welch	6%	3%	23%	40%	24%	44%	45%	59%	39%	3%	1%	1%	33%
Niles-SA	36%	16%	6%	-1%	5%	10%	13%	7%	20%	50%	58%	57%	13%

SOURCE: Hydroconsult Engineers Inc., 2008 (see Appendix N)



SOURCE: SFPUC Water System Improvement Program

SFPUC Water System Improvement Program . 203287

Figure 14.9-2

Comparison of Mean Monthly Flow Contribution from ADLL and Upper Alameda Creek at Niles, WY 2000-2007

TABLE 14.9-2
SUMMARY OF FLOW CONTRIBUTIONS AT THE NILES GAGE
HYDROLOGIC YEARS 2000–2007

Watershed	Eight-Year Average Contribution	Eight-Year Range of Contribution
Arroyo de la Laguna	55%	43% – 71%
Upper Alameda Creek	33%	5% – 46%
Niles–San Antonio Creek	13%	8% – 27%

SOURCE: Hydroconsult Engineers Inc., 2008 (see Appendix N)

This analysis reveals that on average, approximately one-third of the flow at the Niles gage results from the upper Alameda Creek watershed. Since all SFPUC operations occur within the upper Alameda Creek watershed, implementation of the WSIP would only affect approximately one-third of the upstream flow that contributes to flow at the Niles gage. As such, flow changes in upper Alameda Creek as a result of the WSIP would be dampened in lower Alameda Creek by inflow from the other sub-watersheds. For instance, a flow of 100 cfs for Alameda Creek could hypothetically be reduced by 25 percent in a given month under the WSIP, resulting in a flow of 75 cfs for Alameda Creek. The same hypothetical flow at the Niles gage would be 300 cfs without the WSIP and 275 cfs with the WSIP, corresponding to an 8 percent reduction.

The results from the HH/LSM showing the percentage reductions in monthly flow for Alameda Creek below the San Antonio Creek confluence (see the Draft PEIR, Vol. 3, Chapter 5, Table 5.4.1-11, p. 5.4.1-42) were applied to monthly gage flow data from the Welch gage. Although the Welch gage and the HH/LSM analysis location of Alameda Creek below the San Antonio Creek confluence are not the same, this difference is not considered significant for this analysis. The San Antonio Creek confluence is approximately 2.7 miles downstream of the Welch gage, and the analysis presented in this section applies the percentage change in flow from the HH/LSM analysis, not actual flow data, to the Welch gage. Therefore, any difference in flows at the two locations would not affect this analysis, since the percentage reduction in flow was considered applicable to flow in Alameda Creek in the vicinity of the Welch gage.

Table 14.9-3 presents the flow changes estimated using the HH/LSM. The resulting changes in flow at the Welch and Niles gages are shown in **Tables 14.9-4** and **14.9-5** and **Figure 14.9-3**. Table 14.9-4 presents the results of applying the HH/LSM flow reductions to records from the Welch gage for the hydrologic years 2000–2007. Figure 14.9-3 and Table 14.9-5 detail the predicted changes in flow in Alameda Creek at the Niles gage over the eight-year period (2000–2007) with implementation of the WSIP. The solid blue area in Figure 14.9-3 represents average monthly flow at Niles, and the black line indicates calculated flow with implementation of the WSIP. The discrepancy between the two lines represents a change between gage records and calculated flow under the WSIP.

TABLE 14.9-3
HH/LSM CALCULATED FLOW REDUCTIONS IN ALAMEDA CREEK BELOW THE SAN ANTONIO CREEK CONFLUENCE

Percent Change, Revised Base (Calaveras Down) vs Revised WSIP (Proposed Program)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep
All	0%	0%	-28%	-32%	-21%	-15%	-4%	9%	0%	0%	0%	0%
Wet	0%	0%	-23%	-26%	-9%	-9%	-7%	16%	0%	0%	0%	0%
Above Normal	0%	0%	-38%	-43%	-35%	-21%	17%	1%	0%	0%	0%	0%
Normal	0%	0%	-34%	-47%	-56%	-45%	-12%	0%	0%	0%	0%	0%
Below Normal	0%	0%	0%	0%	-6%	0%	3%	0%	0%	0%	0%	0%
Dry	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Percent Change, Base (Calaveras Up) vs WSIP Proposed Program (Not Revised)

	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep
All	0%	0%	32%	19%	22%	2%	-3%	12%	0%	0%	0%	0%
Wet	0%	0%	49%	14%	13%	-3%	-7%	8%	0%	0%	0%	0%
Above Normal	0%	0%	26%	38%	67%	15%	18%	38%	0%	0%	0%	0%
Normal	0%	0%	5%	14%	17%	18%	16%	0%	0%	0%	0%	0%
Below Normal	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Dry	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Increase of greater than 1%
Decrease of greater than 1%
Decrease of greater than 5%

SOURCE: Hydroconsult Engineers Inc., 2008 (see Appendix N)

TABLE 14.9-4
COMPARISON OF RECORDED AND CALCULATED FLOWS IN ALAMEDA CREEK AT WELCH GAGE

Recorded Flow in Alameda Creek at Welch Gage (cfs, avg. monthly)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Year Type
2000	0	1	2	17	183	287	13	8	3	2	1	1	AN
2001	1	1	1	3	7	8	3	2	1	0	0	0	BN
2002	17	1	112	282	37	28	8	4	2	1	0	0	BN
2003	0	5	117	26	5	3	11	34	5	1	0	0	N
2004	0	0	2	24	26	5	14	1	0	0	0	0	N
2005	0	1	53	106	95	351	227	53	7	3	1	0	AN
2006	0	1	51	84	27	177	466	325	133	2	1	0	AN
2007	1	2	10	5	56	16	4	2	1	0	0	0	D

Calculated Flow at Welch for Revised WSIP Proposed Program (cfs, avg. monthly)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Year Type
2000	0	1	2	23	305	331	16	10	3	2	1	1	AN
2001	1	1	1	3	7	8	3	2	1	0	0	0	BN
2002	17	1	112	282	35	28	8	4	2	1	0	0	BN
2003	0	5	78	14	2	1	10	34	5	1	0	0	N
2004	0	0	1	12	11	3	12	1	0	0	0	0	N
2005	0	1	33	60	62	276	267	53	7	3	1	0	AN
2006	0	1	31	47	18	139	547	328	133	2	1	0	AN
2007	1	2	10	5	56	16	4	2	1	0	0	0	D

Difference Between Recorded and Calculated Flow for Revised WSIP Proposed Program at Welch (cfs, avg. monthly)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Year Type
2000	0 [0%]	0 [0%]	0 [26%]	6 [38%]	122 [67%]	44 [15%]	2 [18%]	3 [38%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	AN
2001	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	BN
2002	0 [0%]	0 [0%]	0 [0%]	0 [0%]	-2 -[6%]	0 [0%]	0 [3%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	BN
2003	0 [0%]	0 [0%]	-40 -[34%]	-12 -[47%]	-3 -[56%]	-1 -[45%]	-1 -[12%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	N
2004	0 [0%]	0 [0%]	-1 -[34%]	-11 -[47%]	-14 -[56%]	-2 -[45%]	-2 -[12%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	N
2005	0 [0%]	0 [0%]	-20 -[38%]	-46 -[43%]	-33 -[35%]	-76 -[21%]	39 [17%]	1 [1%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	AN
2006	0 [0%]	0 [0%]	-19 -[38%]	-36 -[43%]	-9 -[35%]	-38 -[21%]	81 [17%]	4 [1%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	AN
2007	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	0 [0%]	D

Increase of greater than 1%
Decrease of greater than 1%
Decrease of greater than 5%

NOTE: The portion of the table titled "Calculated Flow at Welch for Revised WSIP" represents the future condition with implementation of the WSIP. "Revised" WSIP refers to the 2008 updated modeling results, as discussed in Section 13.3 (Vol. 7).

SOURCE: Hydroconsult Engineers Inc., 2008 (see Appendix N)

TABLE 14.9-5
COMPARISON OF AVERAGE MONTHLY FLOW AT THE NILES GAGE, RECORDED FLOW VERSUS CALCULATED FLOW UNDER THE WSIP

Recorded Flow in Alameda Creek at Niles (cfs, avg. monthly)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Year Type
2000	44	41	28	165	606	469	74	46	26	27	29	29	AN
2001	50	35	55	65	128	79	44	22	14	10	27	27	BN
2002	33	53	302	329	71	76	27	34	30	39	38	36	BN
2003	34	91	513	126	56	50	131	97	35	33	30	33	N
2004	39	45	104	138	251	65	36	21	23	27	35	41	N
2005	83	45	148	262	374	638	300	98	55	46	57	51	AN
2006	30	32	287	242	94	551	986	361	172	53	44	39	AN
2007	28	45	82	38	202	61	61	47	32	43	35	37	D

Calculated Flow at Niles for Revised WSIP Proposed Program (cfs, avg. monthly)

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	Year Type
2000	44	41	28	171	728	513	76	49	26	27	29	29	AN
2001	50	35	55	65	128	79	44	22	14	10	27	27	BN
2002	33	53	302	329	68	76	27	34	30	39	38	36	BN
2003	34	91	474	114	53	48	130	97	35	33	30	33	N
2004	39	45	103	127	237	62	34	21	23	27	35	41	N
2005	83	45	127	216	341	562	340	99	55	46	57	51	AN
2006	30	32	267	205	85	513	1067	365	172	53	44	39	AN
2007	28	45	82	38	202	61	61	47	32	43	35	37	D

Difference Between Recorded and Calculated Flow for Revised WSIP Proposed Program at Niles (cfs, avg. monthly)

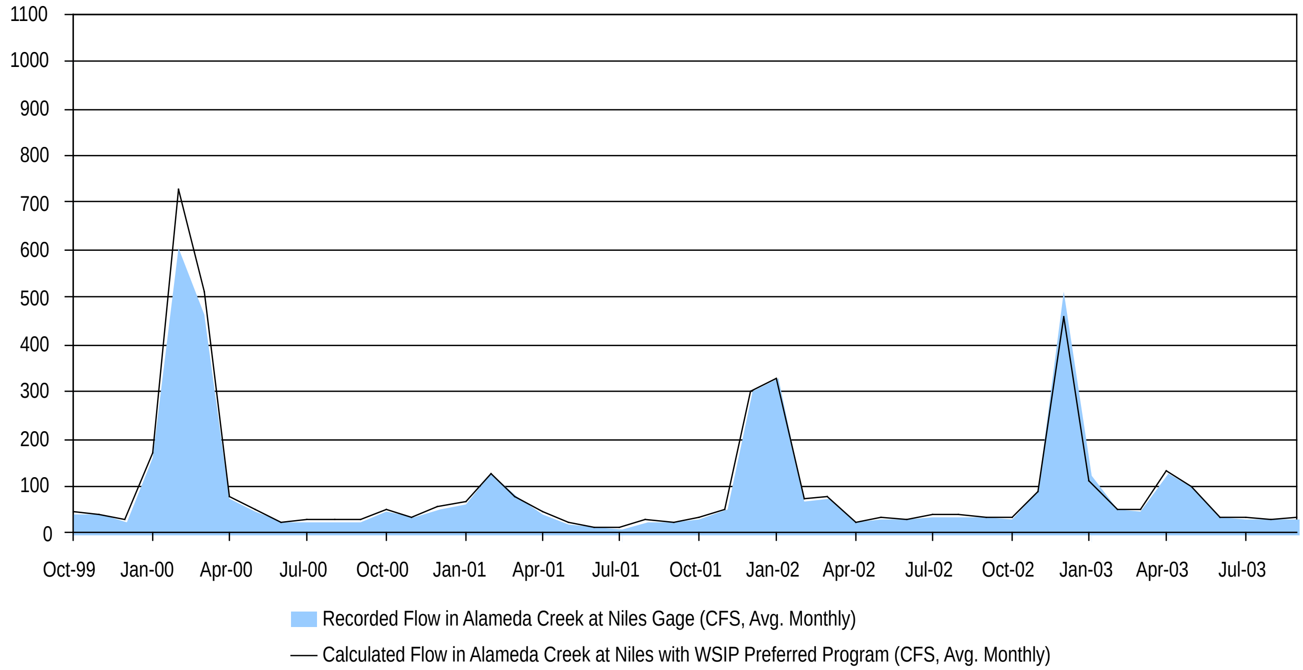
	OCT		NOV		DEC		JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		Year Type
2000	0	[0%]	0	[0%]	0	[1%]	6	[4%]	122	[20%]	44	[9%]	2	[3%]	3	[6%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	AN
2001	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	BN
2002	0	[0%]	0	[0%]	0	[0%]	0	[0%]	-2	-[3%]	0	[0%]	0	[1%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	BN
2003	0	[0%]	0	[0%]	-40	-[8%]	-12	-[10%]	-3	-[5%]	-1	-[2%]	-1	-[1%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	N
2004	0	[0%]	0	[0%]	-1	-[1%]	-11	-[8%]	-14	-[6%]	-2	-[4%]	-2	-[5%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	N
2005	0	[0%]	0	[0%]	-20	-[14%]	-46	-[18%]	-33	-[9%]	-76	-[12%]	39	[13%]	1	[1%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	AN
2006	0	[0%]	0	[0%]	-19	-[7%]	-36	-[15%]	-9	-[10%]	-38	-[7%]	81	[8%]	4	[1%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	AN
2007	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	0	[0%]	D

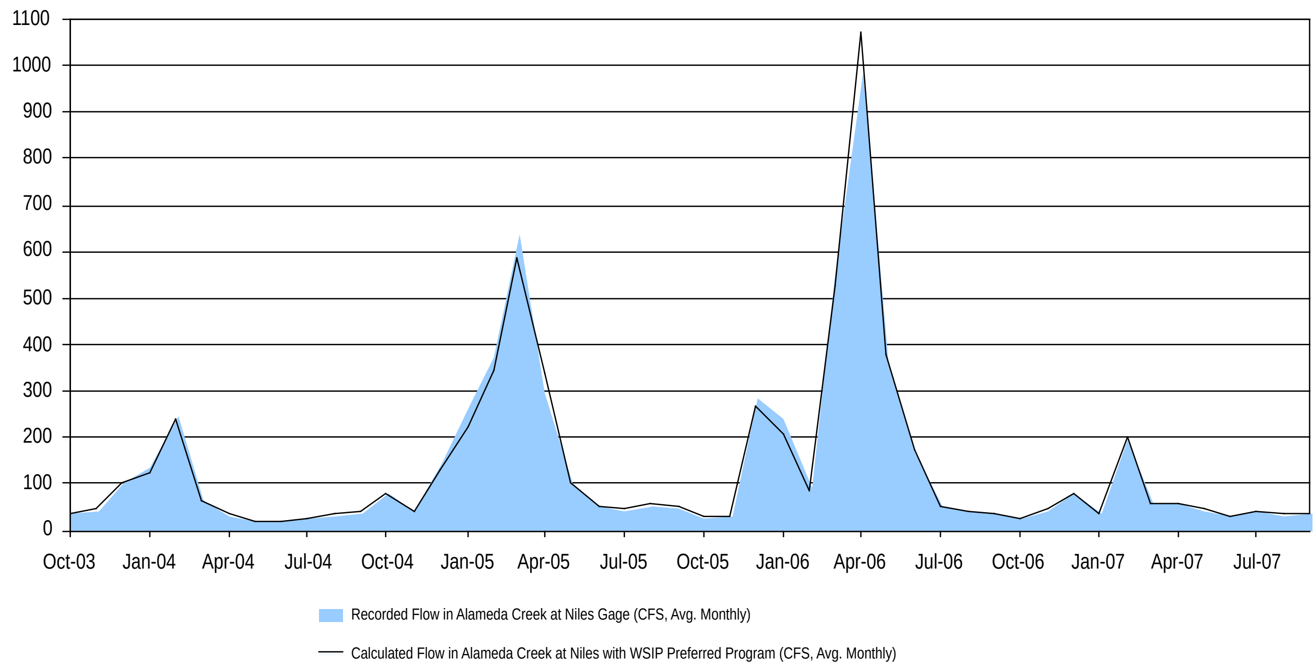
Increase of greater than 1%
Decrease of greater than 1%
Decrease of greater than 5%

NOTE: The portion of the table titled "Calculated Flow at Niles for Revised WSIP" represents the future condition with implementation of the WSIP. "Revised" WSIP refers to the 2008 updated modeling results, as discussed in Section 13.3 (Vol. 7).

SOURCE: Hydroconsult Engineers Inc., 2008 (see Appendix N)

The analysis shows that based on the historical hydrology from 2000 to 2007, reductions in flow in Alameda Creek at Niles Canyon would occasionally occur under the WSIP. Reductions of up to 18 percent in average monthly flow could occur in years similar to the past eight years of record. The maximum flow reduction would occur during January of an above-normal year, but a flow increase of 13 percent would occur in April of that same hydrologic year type. No changes in flow would occur in dry years, and minimal changes (up to 3 percent reductions) would occur in February of below-normal years. It should be noted that in 2000—an above-normal year—there would be an increase in flow of up to 20 percent under the WSIP; this year represents historical operating conditions prior to the DSOD operating restrictions placed on Calaveras Dam. The past eight years include four of the five hydrologic year types (only a wet year is absent). However, as shown in Table 14.9-5, the greatest flow changes under the WSIP would occur during normal and above-normal years, which are represented in the 2000–2007 data and are therefore included in this analysis.





Notes:

- WSIP conditions includes recapture of MOU flows released from Calaveras Dam.
- Years 2000 and 2001analysis includes a comparison of Base with Calaveras Up vs WSIP Proposed Program. DSOD restriction was implemented in
- Analysis for WSIP only, no other cumulative projects analyzed.

SOURCE: SFPUC Water System Improvement Program

Figure 14.9-3
Comparison of Average Monthly Flow at the Niles Gage,
Recorded Flow versus WSIP Proposed Program

The impact conclusion for Impact 5.4.1-4 (Vol. 3, Chapter 5, p. 5.4.1-43) states: “Flow in Alameda Creek below the confluence of San Antonio Creek would be altered as a result of the WSIP in winter months of normal or wetter years; however, the change in flows would be substantially dampened by inflows from other tributaries in the Sunol Valley and would not result in adverse hydrologic effects.” The analysis presented in this section corroborates and provides further supporting detail for this impact conclusion, and also estimates the dampening effect. The largest calculated decrease in flow in lower Alameda Creek would occur during January 2005, with a reduction in average monthly flow of 46 cfs, or 18 percent, of the average monthly flow recorded in January 2005. This corresponds to a reduction in upper Alameda Creek flow of 39 percent. Further review of the data reveals that flow reductions are predicted to occur in December through March of normal to wet years and in April of wet years, and to a small degree in February of below-normal years. In all other months, including winter months of below-normal years (with the exception of a slight decrease in February) and dry years, flow in upper Alameda Creek and at the Niles gage would either remain the same or would increase with implementation of the WSIP.

The calculated flows for lower Alameda Creek under the WSIP are within the range of current flows in this segment of the creek. Further, the flood control infrastructure and water supply facilities in lower Alameda Creek were constructed and operational well before the current DSOD restriction on Calaveras Reservoir required the SFPUC to reduce its diversions at the ACDD. The HH/LSM results indicate that, compared to the flow conditions in existence prior to the DSOD restriction on Calaveras Reservoir, flows in lower Alameda Creek under the WSIP would increase in winter months of normal to wet years (with the exception of slight decreases in March and April of wet years) and would remain the same in all other months of other year types. Therefore, implementation of the WSIP would not affect the operation of flood control infrastructure and water supply facilities in lower Alameda Creek.

The stream flow analysis for the lower 12-mile reach of Alameda Creek from downstream of Niles Canyon to the confluence with San Francisco Bay demonstrates that the WSIP would not affect steelhead passage, fisheries, or fish habitat during any month of a below-normal or drier year (see Table 14.9-5). The analysis also demonstrates that no WSIP-related impacts on steelhead passage, fisheries, or fish habitat would occur between April and November for normal or wetter years (Table 14.9-5). As the table shows, the maximum calculated reduction in flow would occur during the winter months of normal and wetter years (from 262 to 216 cfs), and these flows are within the range of recorded flows typical for this segment of Alameda Creek (from 28 to 638 cfs). The WSIP is therefore unlikely to affect steelhead passage, fisheries, or fish habitat in this reach. Draft PEIR Section 5.4.5.1 (Vol. 5, Chapter 5, pp. 5.4.5-9) discusses steelhead passage improvement projects for the flood control channel of Alameda Creek at the BART weir. Studies conducted on these potential improvement projects estimate that the minimum level of flow needed to ensure adult steelhead passage could range from 10 to 50 cfs for projects that involve total removal of the structure and restoration of a “roughened channel” as well as for projects that involve three ladder and screen options.

Therefore, the impact conclusion for Impact 5.4.5-6 (Draft PEIR, Vol. 3, Chapter 5, pp. 5.4.5-21 and 5.4.5-22) that "impacts on Alameda Creek below the confluence of San Antonio Creek would be less than significant, and no mitigation measures would be required" is supported by the additional analysis performed.

14.9.4 Steelhead – Future Fishery Scenario and Potential Cumulative Effects

Introduction

Several comments expressed concern that the Draft PEIR did not identify potential WSIP impacts under a future scenario in which steelhead have been restored to the reaches of Alameda Creek above the BART weir, as is expected to occur following the implementation of several proposed projects to remove current fish passage barriers. As discussed in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.4.5-1 to 5.4.5-15) and in Section 14.9.2 of this master response, steelhead are precluded from naturally migrating to spawning habitat upstream of the BART weir under existing baseline conditions. In accordance with CEQA Guidelines Section 15125, the Draft PEIR assessed the WSIP's effects with respect to existing conditions in the program area, and therefore did not address potential effects on steelhead (or steelhead habitat) above the BART weir.

The Draft PEIR provides a full discussion of proposed plans to restore anadromous steelhead to Alameda Creek above the BART weir, including the many steps required, parties involved, and agreements in place to accomplish this goal (Vol. 3, Chapter 5, Section 5.4.5.1). The Draft PEIR discusses the planned restoration of steelhead above the BART weir and describes the SFPUC's active participation with other agencies to achieve steelhead restoration; as the PEIR states, once such restoration occurs, the SFPUC will comply with all applicable environmental regulations (FESA foremost among them) to ensure that its water system operations and watershed management practices incorporate conservation measures to protect steelhead. The SFPUC is engaged in consultation with the USFWS, NMFS, and CDFG to prepare a plan for FESA and California Endangered Species Act (CESA) compliance. This plan, called the Alameda Watershed HCP, will address the potential effects of SFPUC water system operations and watershed management activities on several listed species within the SFPUC's Alameda watershed lands, including steelhead. Thus, the SFPUC is actively engaged with the resource agencies in developing appropriate measures to protect this species once steelhead have been restored to this reach of the creek.

Although the presence of steelhead in Alameda Creek above the BART weir is not an "existing condition" as defined by CEQA, it is a possible future condition that could occur through the cumulative implementation of the many proposed projects and actions designed to restore steelhead in Alameda Creek. In response to the comments received on this issue, the Draft PEIR analysis of cumulative effects (Vol. 3, Chapter 5, pp. 5.7-52 to 5.7-67) has been revised to incorporate a discussion of potential WSIP impacts on future-occurring steelhead. This section of this master response provides an expanded discussion of the "future cumulative scenario" (which assumes that the steelhead fishery has been restored above the BART weir) and then discusses the potential effects of the WSIP on potential future-occurring steelhead. Following this expanded discussion, specific text revisions to the Draft PEIR are identified.

The analysis of the WSIP's contribution to potential, cumulative effects (both positive and negative) on future-occurring steelhead is general because many uncertainties remain regarding how and when steelhead will be restored as well as the future environmental conditions that will be present in Alameda Creek at that time. Uncertainties regarding steelhead restoration include, but are not limited to the following: the way in which existing barriers to passage would be remedied in the future; the extent to which natural features act as barriers; and the extent to which the varying water resource operations of the water agencies in the overall Alameda Creek basin influence flows. Protective measures to address and minimize the WSIP's contribution to future cumulative effects on steelhead are included as part of the WSIP program description (incorporated as changes to the project descriptions of the Alameda Creek Fishery Enhancement, SV-1, and Calaveras Dam Replacement, SV-2, projects). As described in Section 14.9.1, above, such protective measures would include: SFPUC reservoir releases and bypass flows to support minimum instream flow requirements, operational modifications (reservoir diversion and release protocols), and monitoring/studying/surveying steelhead habitat below the ACDD. These measures demonstrate the SFPUC's commitment described in the Draft PEIR and the Comments and Responses documents—that the SFPUC would implement the necessary protective measures for steelhead once they are restored, in compliance with applicable environmental regulations including FESA and CESA.

This section of the master response is organized by the following subtopics:

- Future Cumulative Scenario for Steelhead
  - Introduction
  - Regulations, Plans, and Programs Related to Steelhead Recovery in the Watershed
  - Steelhead Life Stages and Habitat Requirements
  - Past and Present Projects Affecting Steelhead
  - Future Projects Influencing Future Habitat Conditions for Steelhead
- Cumulative Impact Assessment for Potential Future-Occurring Steelhead
  - Changes in Habitat Conditions from Future Cumulative Projects
  - Potential Future Cumulative Impacts on Steelhead
    - Migration
    - Spawning
    - Rearing
- PEIR Text Revisions to Include Cumulative Impact on Future-Occurring Steelhead

Comment Summary

This section of this master response responds to all or part of the following comments:

L_ACFCWCD-06	L_ACWD-20	SI_ACA1-12	SI_ACA2-01
L_ACFCWCD-09	SI_ACA1-02	SI_ACA1-13	SI_GWWF2-02
L_ACFCWCD-13	SI_ACA1-03	SI_ACA1-16	SI_NCFFSC-03
L_ACFCWCD-15	SI_ACA1-04	SI_ACA1-19	
L_ACWD-18	SI_ACA1-05	SI_ACA1-20	
L_ACWD-19	SI_ACA1-08	SI_ACA1-25	

Summary of Issues Raised by Commenters

- The effects of the WSIP combined with proposed fish passage improvement projects and steelhead restoration to the upper watershed are not adequately addressed.
- Additional diversions under the WSIP would result in the "take" of listed species through reduced passage and increased temperatures.
- The Draft PEIR contains insufficient information to support the contention that mitigation measures would reduce impacts to a less-than-significant level.
- Specific flow information is required for adequate mitigation of impacts on steelhead passage, spawning, and juvenile rearing.
- Issues related to releases required under two memoranda of understanding: the 1997 CDFG MOU and 2006 ACFRW MOU.
- Relationship of the Draft PEIR assessments to the Calaveras Dam Replacement project-level assessments is unclear.
- The impacts of Calaveras Dam on steelhead/trout in 2010–2012 are not speculative.

Response

Future Cumulative Scenario for Steelhead

Introduction

As described briefly above, it is possible that steelhead could be restored to the Alameda Creek watershed reaches upstream of the BART weir by 2030, the WSIP planning horizon. More specifically, steelhead could be restored during construction or operation of the Calaveras Dam project. In response to this scenario, the SFPUC has modified the project descriptions for components of the proposed program—the Alameda Creek Fishery Enhancement (SV-1) and Calaveras Dam Replacement (SV-2) projects—to recognize this potential for future steelhead restoration, as summarized in Section 14.9.1, above. The modifications to these projects include project revisions that would be implemented regardless of the success of planned and proposed projects to restore steelhead to the upper Alameda Creek watershed, as well as protective measures that would be implemented in the event that the NMFS and/or CDFG have determined steelhead to be present in Alameda Creek above the BART weir, construction of the Calaveras Dam Replacement project is complete, and the Alameda Watershed HCP has yet to be finalized. As summarized in Section 14.9.1, the protective measures have been incorporated into the

Calaveras Dam Replacement project component of the WSIP to address potential effects on steelhead in the event that planned and proposed projects to remove man-made barriers in Alameda Creek are successfully implemented and anadromous steelhead gain access to the upper Alameda Creek watershed. The WSIP's potential contribution to future cumulative effects on steelhead is evaluated here with respect to steelhead life-stage and habitat requirements in the various reaches of Alameda Creek.

The future cumulative scenario for the steelhead fishery in Alameda Creek assumes implementation of all necessary proposed projects and actions to remove the existing fish passage and migration barriers for steelhead, from the BART weir up to spawning and rearing habitats in the upper reaches of Alameda Creek. Under this future cumulative scenario, steelhead are assumed to be present in Alameda Creek above the BART weir. A more detailed discussion of this potential future scenario follows, including: a summary of the regulations, plans, and programs related to steelhead recovery in the Alameda watershed; a review of steelhead life stages and habitat requirements; and the expected future habitat conditions for steelhead following the removal of passage barriers.

This assessment of future conditions does not describe: the specifics of any barrier removal/bypass projects (since no specific adopted designs/plans are available); what flow requirements for reservoir releases, bypass flows at the ACDD, or flows through fish ladders might be adopted; or when (and if) the projects would be undertaken. Thus, this future cumulative scenario is based on a fair degree of speculation, but the information available at this time allows for a general framing of potential future conditions and discussions of the potential WSIP contribution to future cumulative effects.

Regulations, Plans, and Programs Related to Steelhead Recovery in the Watershed

Draft PEIR Section 5.4.5 (Vol. 3, Chapter 5, p. 5.4.5-4) includes a discussion of the regulatory status of steelhead in the Alameda Creek watershed, and Section 5.2 (Vol. 3, Chapter 5, pp. 5.2-1 to 5.2-26) provides an overview of plans and policies relevant to the management of the SFPUC's water supply and system operations, including regulations, policies, plans, and programs related to steelhead recovery in the watershed. Comments on the Draft PEIR expressed concern regarding the take of listed species (defined below under Federal Endangered Species Act) as a result of WSIP implementation. The following information on regulations, plans, and programs related to steelhead recovery augments the information presented in the Draft PEIR.

Federal Endangered Species Act. Pursuant to FESA, the USFWS and NMFS have authority over projects that may result in the take of a federally listed species. Under FESA, "take" means to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." The USFWS has also interpreted the definition of "harm" to include significant habitat loss or modification. If a project could affect a federally listed species, either an incidental take permit under FESA Section 10(a) or a federal interagency consultation under FESA Section 7 is required. The USFWS has regulatory jurisdiction over freshwater and estuarine fishes as well as all terrestrial vegetation and wildlife, while the NMFS has jurisdiction over anadromous and marine species, including steelhead.

The NMFS has not designated the Alameda Creek watershed as critical habitat for steelhead, and has listed as threatened only those steelhead that currently exist below the lowest impassable barriers in the Alameda Creek watershed (i.e., the BART weir). Thus, the resident rainbow trout that occur in the creek above the BART weir are not designated as a listed species and are not proposed for listing. However, the NMFS has advised that the designation of critical habitat would be open to further evaluation if and when anadromous steelhead obtain passage to upper Alameda Creek (as discussed in Section 14.9.2, above). As noted, this cumulative impact assessment is based on the assumption that steelhead will regain access to the Alameda Creek watershed in the future.

Alameda Creek Fisheries Restoration Workgroup. The ACFRW is a multi-agency stakeholder group formed in 1999 to pursue the restoration of steelhead to Alameda Creek. The ACFRW is composed of numerous community and citizens' groups, local water management and flood control agencies, and state and federal resource agencies, including the SFPUC.

With funding from the ACFCWCD and the California Coastal Conservancy, the ACFRW published a report entitled *An Assessment of the Potential for Restoring a Viable Steelhead Trout Population in the Alameda Creek Watershed* (Gunther et al., 2000). The report found that suitable habitat exists in the watershed to support steelhead spawning and rearing, but that several barriers in the lower portion of the watershed completely prevent adult migration upstream. It concluded that making these barriers passable was essential to steelhead restoration in Alameda Creek, and made recommendations to address migration and other steelhead restoration issues in the watershed.

The ACFRW has identified the need to implement passage barrier modification projects, install positive-barrier fish screens at water diversion points, modify instream flows within the four reaches of Alameda Creek, and implement proposed riparian corridor improvements and possibly a steelhead supplementation program. The Draft PEIR discusses the ACFRW's Memorandum of Understanding (2006 ACFRW MOU) to perform steelhead flow studies, the various phases and elements of the studies, and the development of the Alameda Watershed HCP (Vol. 3, Chapter 5, pp. 5.4.5-10 and 5.4.5-11).

SFPUC Alameda Watershed Habitat Conservation Plan. The SFPUC, working with the CDFG, USFWS, and NMFS, is in the process of developing an HCP for its portion of the Alameda Creek watershed in compliance with FESA and CESA. Steelhead is a covered species in the HCP, which is scheduled for public review in 2009. The plan will require preparation of a joint environmental impact report/environmental impact statement (EIR/EIS) before the SFPUC can consider adoption and begin implementation of the HCP conservation strategies. The HCP will be the primary plan in which the SFPUC and regulatory agencies lay out the program and requirements for the restoration of steelhead and other fish species in the watershed affected by SFPUC operations.

SFPUC Water Enterprise Environmental Stewardship Policy. As described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.2-24 and 5.2-25), the Water Enterprise Environmental Stewardship Policy was adopted in June 2006 and established the long-term management direction for the City and County of San Francisco's lands and natural resources affected by operation of the SFPUC regional water system within the Tuolumne River, Alameda Creek, and Peninsula watersheds. The policy includes the following points specifically relevant to the fishery issues in the Alameda Creek watershed:

- It is the policy of the SFPUC to operate the SFPUC water system in a manner that protects and restores native fish and wildlife downstream of SFPUC dams and water diversions, within SFPUC reservoirs, and on SFPUC watershed lands.

- Releases from SFPUC reservoirs will (consistent with the SFPUC mission, existing agreements, and applicable state and federal laws) mimic the variation of the seasonal hydrology (e.g., magnitude, timing, duration, and frequency) of their corresponding watersheds in order to sustain the aquatic and riparian ecosystems upon which these native fish and wildlife species depend (consistent with the SFPUC mission, existing agreements, and applicable state and federal laws).

The Environmental Stewardship Policy calls for specific integration of this policy into the WSIP and individual infrastructure projects.

Steelhead Life Stages and Habitat Requirements

A summary of steelhead life stages (e.g., migration, spawning, rearing) and habitat requirements is provided in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.4.5-4 to 5.4.5-7). The following discussion augments the Draft PEIR discussion and focuses on different steelhead life-stage and habitat requirements in the Alameda Creek watershed. This information was derived from studies/ assessments of steelhead recovery in the Alameda Creek watershed, including the following:

- *Alameda Creek Population Recovery Strategies and Instream Flow Assessment for Steelhead Trout* (McBain and Trush, 2007)

- *An Assessment of the Potential for Restoring a Viable Steelhead Trout Population in the Alameda Creek Watershed* (Gunther et al., 2000)

As previously described, steelhead have a highly flexible and complex life history and may follow a variety of life-history patterns and strategies. Historical (pre-1900s) steelhead life-history strategies in the Alameda Creek watershed likely occurred within two broad categories: (1) fry were born in the upper tributaries and reared for one or two years, then migrated rapidly to San Francisco Bay, and (2) following emergence in the upper tributaries, the fry moved downstream and reared in the mainstem and/or Niles Canyon before entering the estuary and San Francisco Bay (McBain and Trush, 2007). The success of a given strategy likely varied from year to year and depended on several factors (e.g., precipitation, flow, temperature, food availability). Historically, headwater tributaries likely contributed large steelhead smolts to San Francisco Bay, especially during consecutive wet years, but many additional large smolts were likely produced by slower migrating juveniles that grew on their way downstream through the mainstem channels before smolting and entering the Alameda Creek estuary and then San Francisco Bay.

A critical period occurs during juvenile freshwater residency. Juvenile fish may remain in the watershed from less than a year to more than two years. Those residing in freshwater and/or an estuary for less than a full year from the time of egg deposition are called “0+ juveniles.”

Juveniles that spend one complete winter in freshwater and/or an estuary are termed "1+ juveniles," and those remaining for two complete winters in freshwater and/or an estuary are called "2+ juveniles." Prior to entering the Pacific Ocean, all juveniles physiologically transform into ocean salt-tolerant smolts. Smolts mature into adults and may remain in the Pacific Ocean from one to three years (or more) before returning to their natal streams to spawn. In California, most adult steelhead returning to spawn have spent at least one full winter rearing as juveniles (i.e., as 1+ juveniles) in their natal watershed (McBain and Trush, 2007).

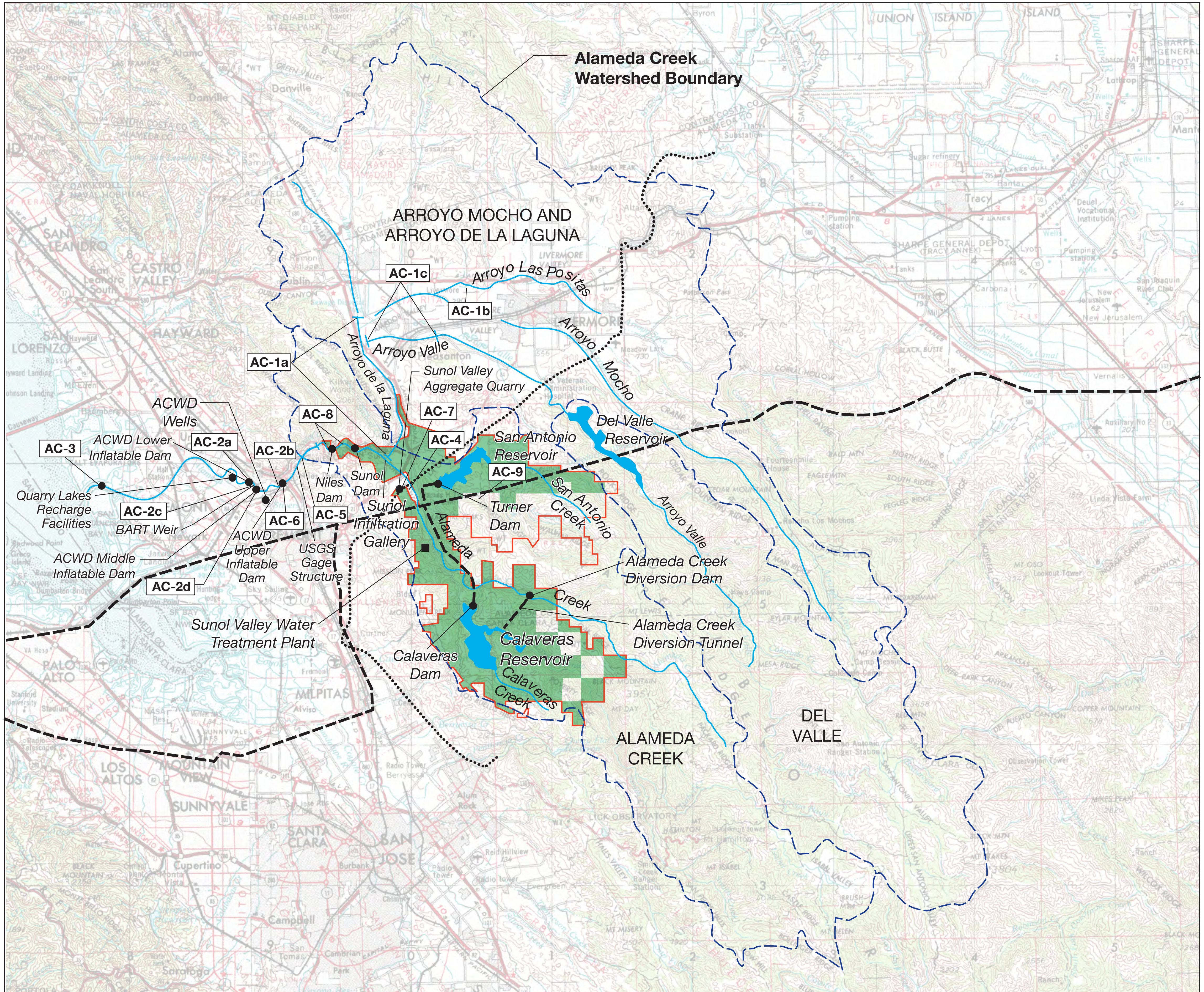
Often, each unique period of juvenile freshwater residency (i.e., staying less than a year, more than one full year, and slightly more than two full years in the watershed) is considered a separate life-history strategy. While these categories are helpful, they do not sufficiently differentiate patterns of watershed use. For example, a juvenile steelhead spending one winter in Alameda Creek (a 1+ juvenile) might reside high in the headwaters then migrate rapidly to San Francisco Bay, or it might move far downstream shortly following emergence to spend the entire winter in Niles Canyon (if suitable conditions exist) before migrating to San Francisco Bay in late spring. Both would enter San Francisco Bay as 1+ smolts, but their strategies for utilizing the watershed would have been fundamentally different (McBain and Trush, 2007).

A key factor in determining steelhead survival and recovery success is the growth of juveniles during freshwater residency and smolt transition. Fish size at smolting is important to steelhead survival, and big smolts are much more likely to return as spawning adults than small smolts (McBain and Trush, 2007). Growth rates during the juvenile rearing period are greatly influenced by both the availability (e.g., access and quantity) and quality (e.g., favorable water temperature and forage availability) of oversummer rearing habitat in the Alameda Creek watershed.

Past and Present Projects Affecting Steelhead

As presented in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.4.5-7 to 5.4.5-10 and pp. 5.7-52 to 5.7-53), a number of existing facilities (i.e., past and present projects) under the jurisdiction of the SFPUC, the ACWD, Zone 7 Water Agency, and the ACFCWCD, among others, affect hydrological and fishery habitat conditions in the Alameda Creek watershed. Many of these structures and facilities have been in existence for well over 80 years and have resulted in substantial changes to the natural conditions that existed prior to the original construction of Calaveras Dam in 1913, when a steelhead run is presumed to have been present throughout the basin. Although built in the past, these facilities (as well as other influences) continue to operate and affect both current habitat conditions and future cumulative scenario conditions for potential future-occurring steelhead in the Alameda Creek watershed. Some of these are direct barriers to fish migration, while others pose various degrees of control/influence over habitat conditions. As shown in Draft PEIR **Figure 5.7-3** (as revised below), the major facilities and other factors affecting fish passage (separated by watershed and/or reach) outlined by Gunther et al. (2000) include:

- *Upper Alameda Creek*:
  - Calaveras Dam and Reservoir
  - Alameda Creek Diversion Dam and Tunnel



- Watershed Boundary
- Existing SFPUC System Corridor
- AP-1 Other SFPUC Project
- AC-1 Non-SFPUC Project
- CCSF Ownership (also project boundary for AP-1, AP-2, AP-3)
- HCP Study Area (also project boundary for AP-1a)
- DWR South Bay Aqueduct

See Draft PEIR Table 5.7-13 for names and descriptions of projects

Cumulative Project No.	Plan/Project Name
OTHER SFPUC PROJECTS (not shown on figure as watershed wide)	
AP-1	Alameda Watershed Management Plan (WMP)
AP-1a	Alameda Watershed Habitat Conservation Plan (sub-project of Alameda WMP)
AP-2	Watershed and Environmental Improvement Program (WSIP-related activity)
AP-3	Habitat Reserve Program (WSIP-related activity)
NON-SFPUC PROJECTS	
AC-1	Zone 7 Stream Management Master Plan (SMMP)
AC-1a	Arroyo de la Laguna Reach 10 Improvements (sub-project of Zone 7 SMMP)
AC-1b	Chain of Lakes (sub-project of Zone 7 SMMP)
AC-1c	Lower Arroyo del Valle Restoration and Enhancement (sub-project of Zone 7 SMMP)
AC-2	Alameda Creek Steelhead Restoration
AC-2a	Rubber Dam 2 Decommissioning and Foundation Modification Project (sub-project of Alameda Creek Steelhead Restoration)
AC-2b	Alameda Creek Pipeline No. 1 Fish Screen (sub-project of Alameda Creek Steelhead Restoration)
AC-2c	BART Weir (sub-project of Alameda Creek Steelhead Restoration Efforts)
AC-2d	Middle Inflatable Dam Modification
AC-3	Alameda Creek – Levee Reconfiguration
AC-4	PG&E Gas Line Crossing
AC-5	Stonybrook Creek Culvert Removal
AC-6	Upper Inflatable Dam Fish Passage Project
AC-7	Sunol Valley Aggregate Quarry – SMP 30
AC-8	Section 1135 Alameda Creek Flood Control Project Fish Passage Modifications
AC-9	Apperson Ridge Quarry

0 — 20 Miles

SOURCE: ESA + Orion

SFPUC Water System Improvement Program . 203287

Figure 5.7-3 (Revised)
Future Projects in the Alameda Creek Watershed Considered in the Cumulative Analysis

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  - Sunol Valley aggregate quarries and the associated relocation and channelization of Alameda Creek
  - PG&E gas line crossing
  - Turner Dam and San Antonio Reservoir
  - Sunol infiltration galleries

- *Niles Canyon*:
  - USGS gage structure

- *Arroyo de la Laguna watershed*:
  - Del Valle Reservoir/South Bay Aqueduct, including State Water Project releases
  - Livermore/Amador Valley/Quarry Lakes recharge facilities
  - Various channelized and culverted stream segments
  - Expansion of urban development of the Tri-Valley Area

- *Lower Alameda Creek*:
  - ACWD's upper, middle, and lower inflatable dams
  - BART weir
  - Alameda Creek levee reconfiguration

All of these facilities, combined with urbanization and other land use activities, have resulted in substantial alteration of habitat conditions for potential future-occurring steelhead in the watershed. In 2006, the SFPUC removed two historic structures—the Niles and Sunol Dams, both located on Alameda Creek below the Sunol quarries. While some influence on the creek channel due to these dams may remain, they have been removed entirely as barriers to fish migration.

Future Projects Influencing Future Habitat Conditions for Steelhead

The reasonably foreseeable future projects that could affect conditions for potential future-occurring steelhead in the Alameda Creek watershed are presented in Draft PEIR Section 5.7.3 and are summarized in Table 5.7-13 and Figure 5.7-3 (Vol. 3, Chapter 5, pp. 5.7-53 to 5.7-60). These projects include removing/modifying dams, weirs, culverts, and pipelines that block fish passage; installing positive-barrier fish screens at water diversions; constructing slurry cutoff walls in quarry pits to reduce losses to groundwater; and restoring and protecting habitat and instream flows. While these identified future projects are considered reasonably foreseeable for the purposes of this analysis, there remains uncertainty regarding their implementation due to unknowns such as funding or permitting issues. Of particular importance to this analysis are proposals to remove or bypass several fish migration barriers in the watershed. The future projects included in this analysis and their planning status are described in Draft PEIR Section 5.7.3. In response to comments, several revisions and updates have been made to the future projects that would influence habitat conditions for steelhead in the Alameda Creek watershed. These revisions to future projects are presented here and were used in establishing the future baseline condition for assessing the effects of the WSIP on future-occurring steelhead upstream of the BART weir.

A comment received on the Draft PEIR regarding future fish passage improvement projects indicated that, subsequent to publication of the Draft PEIR, the ACFCWCD and ACWD entered into an agreement (on July 31, 2007) to design a fish passage facility over the BART weir and the middle inflatable dam in the Alameda County Flood Control Channel. In response to this comment, the Draft PEIR (Vol. 3, Chapter 5, p. 5.4.5-9, first bullet) is amended as follows:

- Alameda County Flood Control and Water Conservation District's BART Weir – several studies have been conducted regarding potential designs to provide passage at this location. The most recent effort is a report (Wood Rogers, 2006) that outlines options ranging from total removal of the structure ("roughened channel") to three ladder and screen alternatives. The range of low flows estimated to allow suitable passage for adult steelhead among these four options is 10–50 cfs. However, other barriers (e.g., ACWD middle and upper rubber dams, PG&E Drop Structure – see below) within Alameda Creek may be impassable at these low flows. ~~There is currently no schedule or budget for this project, and environmental review has yet to begin.~~ On July 31, 2007, the Alameda County Flood Control and Water Conservation District and the Alameda County Water District entered into an agreement to design a fish passage facility over the BART weir and the middle inflatable dam in the Alameda County Flood Control Channel to improve steelhead passage within the Alameda Creek watershed.

Cumulative Impact Assessment for Potential Future-Occurring Steelhead

The following analysis evaluates the WSIP's potential contribution to effects on future-occurring steelhead in combination with past, present, and probable future projects, including other SFPUC and non-SFPUC projects or activities under the jurisdiction of various federal, state, and local agencies that have the potential to affect steelhead recovery in the watershed. The project description changes summarized above include protective measures for future-occurring steelhead in Alameda Creek above the BART weir that are proposed as part of the Calaveras Dam Replacement project, as well as Mitigation Measures 5.4.1-2 and 5.4.5-3a identified in the Draft PEIR. These protective measures and mitigation measures are summarized in Section 14.9.1, above.

Changes in Habitat Conditions from Future Cumulative Projects

A characterization of habitat conditions for steelhead under existing conditions and the projected future cumulative scenario, based on an analysis of past, present, and probable future projects, is provided below. Alameda Creek has historically been divided into three distinct reaches: lower Alameda Creek, Niles Canyon, and upper Alameda Creek. This section provides a description of habitat conditions within each of these three reaches.

Table 14.9-6 presents a summary of existing conditions along Alameda Creek with the current fish passage barriers in place and with Calaveras Reservoir and the ACDD operating under DSOD-restricted conditions, and summarizes the stream and habitat conditions for three different steelhead life stages under two scenarios:

1. A future scenario *without* implementation of the WSIP (i.e., specifically the Calaveras Dam Replacement and Alameda Creek Fishery Enhancement [recapture facility] projects). This scenario assumes that all planned and proposed projects to improve fish passage in the

TABLE 14.9-6
SUMMARY OF ALAMEDA CREEK STEELHEAD HABITAT USE AND CONDITION UNDER FUTURE CUMULATIVE WITHOUT WSIP AND FUTURE CUMULATIVE WITH WSIP SCENARIOS

	Existing Condition	Assumed Future Condition without WSIP[a]				Assumed Future Condition with WSIP and Measures to Address Potential Impacts[b]			
			Life Stage Habitat Use and Condition[b]				Life Stage Habitat Use and Condition[c]		
Alameda Creek Reach (moving upstream)	**Stream Condition (Steelhead do not have access to Alameda Creek above the BART weir under the Existing Condition)**	**Stream Condition**	**Migration**	**Spawning**	**Rearing**	**Stream Condition**	**Migration**	**Spawning**	**Rearing**
Lower Alameda Creek (Flood Control Channel) – from San Francisco Bay to mouth of Niles Canyon	• Concrete-lined flood control channel • BART weir acts as complete barrier to migration; ACWD dams are also major migration obstacles • High summer temperatures • Substrate has high silt component • Intermittent flow in summer • High winter flows with limited diversion in normal/wet and wet years	• Fish passage restored upstream of BART weir and ACWD inflatable dams • No change to habitat conditions in this reach • Possible increased surface flow from upstream improvements at Sunol quarries	PRESENT	ABSENT	ABSENT/ LIMITED	• Fish passage restored upstream of BART weir and ACWD inflatable dams • No change to habitat conditions in this reach • Calaveras Dam Replacement project / WSIP would increase diversions to Calaveras Reservoir, implement releases from ACDD or Calaveras Dam consistent with the 1997 MOU, and recapture releases also consistent with the 1997 MOU. It would result in reduced stream flow in lower Alameda Creek in winter months of normal/wet and wet years (up to 18%); minimal change during below-normal and dry years.	PRESENT	ABSENT	ABSENT/ LIMITED
Niles Canyon – from mouth of Niles Canyon to confluence with Arroyo de la Laguna	• Confined channel with steep canyon walls • Well-developed riparian zone • Low-gradient perennial stream • Large deep pools, connected by run and riffle habitat • High summer temperatures • Serves as conveyance for water supply from South Bay Aqueduct • USGS gage acts as obstacle to migration under moderate to low flow conditions	• Fish passage restored at USGS gage for all flow conditions • Possible increased surface flow from upstream improvements at Sunol quarries • Improved rearing habitat through cool-water thermal buffering	PRESENT	PRESENT/ LIMITED	LIMITED	• Fish passage restored at USGS gage for all flow conditions • Calaveras Dam Replacement project / WSIP would increase diversions to Calaveras Reservoir, implement releases from ACDD or Calaveras Dam consistent with the 1997 MOU, and recapture releases also consistent with the 1997 MOU. It would result in reduced stream flow in lower Alameda Creek in winter months of normal/wet and wet years (up to 18%); minimal change during below-normal and dry years. • Improved rearing habitat through cool-water thermal buffering	PRESENT	PRESENT/ LIMITED	LIMITED
Upper Alameda Creek (General) – from confluence with Arroyo de la Laguna and upstream	• Fish passage limited by Turner Dam, Little Yosemite, Alameda Creek Diversion Dam, Calaveras Dam • Spawning and rearing habitat influenced by SFPUC dam operations and releases	• Downstream passage improvements increase potential for migration to upper reaches • Fish passage limited by Turner Dam, Little Yosemite, Alameda Creek Diversion Dam, Calaveras Dam • Spawning and rearing habitat influenced by SFPUC dam operations and releases	(see reach-by-reach below)	(see reach-by-reach below)	(see reach-by-reach below)	• Downstream passage improvements increase potential for migration to upper reaches • Calaveras Dam Replacement project / WSIP would increase diversions to Calaveras Reservoir and implement fish releases consistent with 1997 MOU. WSIP would include downstream recapture of those releases at downstream end of Reach A-1. • Fish passage limited by Turner Dam, Little Yosemite, Alameda Creek Diversion Dam, Calaveras Dam • Spawning and rearing habitat influenced by SFPUC dam operations and releases	(see reach-by-reach below)	(see reach-by-reach below)	(see reach-by-reach below)
A-1 – from confluence with Arroyo de la Laguna to lower Sunol Valley (near Sunol WTP)	• Wide, low-gradient, alluvial valley • Intermittent flows • Natural channel relocated due to gravel mining operations • “Losing” reach – up to 36% seepage of surface water from Alameda Creek to gravel mining pits, infiltration galleries, etc. • Warmwater fish habitat • Trout likely not present in reach • PG&E pipeline crossing acts as obstacle to migration • Migration impeded at several locations (critical riffles) at low flows	• Downstream passage barriers removed and fish passage restored • Historical channel realigned • Improved stream flow conditions due to reduced surface and groundwater losses with construction of slurry cutoff walls (but would remain a naturally “losing” reach) • Fish passage provided at the PG&E pipeline crossing • Critical riffles present within the segment of Alameda Creek adjacent to the Sunol quarry (SMP 30) would be enhanced through restoration of the stream channel associated with Sunol quarry permit renewal	PRESENT	LIMITED	ABSENT/ LIMITED	• Downstream passage barriers removed and fish passage restored • Historical channel realigned • Improved stream flow and habitat conditions due to reduced surface and groundwater losses with construction of slurry cutoff walls (but would remain “losing” reach) and stream habitat restoration • Intermittent stream flow • Warmwater fish habitat • Calaveras Dam Replacement project / WSIP would increase diversions to Calaveras Reservoir and implement fish releases consistent with 1997 MOU. WSIP would include downstream recapture of those releases at downstream end of Reach A-1. This would result in substantially reduced normal/wet and wet year winter stream flows in this reach (up to 45%), which would adversely affect migration.	PRESENT	LIMITED/ PRESENT	ABSENT/ LIMITED

TABLE 14.9-6 (continued)
SUMMARY OF ALAMEDA CREEK STEELHEAD HABITAT USE AND CONDITION
UNDER FUTURE CUMULATIVE WITHOUT WSIP AND FUTURE CUMULATIVE WITH WSIP SCENARIOS

Alameda Creek Reach (moving upstream)	Existing Condition	Assumed Future Condition without WSIP[a]				Assumed Future Condition with WSIP and Measures to Address Potential Impacts[b]			
	Stream Condition (Steelhead do not have access to Alameda Creek above the BART weir under the Existing Condition)	Stream Condition	Life Stage Habitat Use and Condition[b]			Stream Condition	Life Stage Habitat Use and Condition[c]		
			Migration	Spawning	Rearing		Migration	Spawning	Rearing
A-1 (cont.)		• Intermittent stream flow • Warmwater fish habitat				• Calaveras Dam Replacement project / WSIP would provide for releases to augment flows to support fisheries consistent with the 1997 MOU, and releases would improve habitat conditions upstream of recapture			
A-2 – from lower Sunol Valley to confluence with Calaveras Creek	• Confined stream channel • Well-developed riparian zone • Pool, run, and riffle habitat present • Intermittent stream flow in dry years • High summer temperatures favor warmwater fish • Flows influenced by Calaveras Dam and Alameda Creek Diversion Dam operations under DSOD-restricted conditions • Rearing habitat influenced by operation of Calaveras Dam and Alameda Creek Diversion Dam	• No projects planned in this reach • Downstream passage barriers removed and fish passage restored	PRESENT	PRESENT	ABSENT/ LIMITED	• Downstream passage barriers removed and fish passage restored • Calaveras Dam Replacement project / WSIP implementation would: – Restore historical flow diversions at diversion dam to Calaveras Reservoir and storage in Calaveras Reservoir – Reduce high winter stream flows in normal/wet and wet years (up to 45%); remaining relatively moderate to high flows would enable migration – Provide for releases to augment flows at upstream end of this reach to support fisheries consistent with 1997 MOU – WSIP would include downstream recapture of 1997 MOU releases at downstream end of Reach A-1 – Improve habitat conditions upstream of recapture • Summer coldwater habitat conditions improved in Alameda Creek from the Calaveras Creek confluence to approximately 2 miles downstream	PRESENT	PRESENT (improved due to 1997 MOU releases)	PRESENT (improved due to 1997 MOU releases)
A-3 – from confluence with Calaveras Creek to point upstream of Little Yosemite	• Steep, confined stream channel • Warmwater and coldwater fish habitat present • Steep bedrock/falls/gradient limit fish passage • Passage impeded by steep bedrock falls at Little Yosemite • Diversion dam operations affect winter and spring stream flow, which has substantially increased since DSOD restriction on Calaveras Reservoir	• No projects planned in this reach • Downstream passage barriers removed • Passage impeded by steep bedrock falls at Little Yosemite	LIMITED, only during specific flows (natural barriers)	PRESENT	PRESENT	• No projects planned in this reach • Downstream passage barriers removed • Passage impeded by steep bedrock falls at Little Yosemite • Calaveras Dam Replacement project / WSIP implementation would restore historical flow diversions to Calaveras Reservoir and would reduce magnitude and frequency of flows • PEIR mitigation for bypass flows at diversion dam would provide minimum flows for resident trout	LIMITED, only during specific flows (natural barriers)	PRESENT	PRESENT
A-4 – from Little Yosemite to Alameda Creek Diversion Dam	• Steep gradient channel sections impede passage • Fragmented habitat under low flow conditions • Dry stream sections in summer • Alameda Creek Diversion Dam and Tunnel operations heavily influence flows and habitat conditions	• No projects planned in this reach • Downstream passage barriers removed	LIMITED, only during specific flows (natural barriers)	PRESENT	LIMITED	• No projects planned in this reach • No change to future scenario habitat conditions other than downstream passage barriers removed and WSIP • Calaveras Dam Replacement project / WSIP implementation would restore historical flow diversions to Calaveras Reservoir but mitigation for bypass flows at diversion dam would provide minimum flows for resident trout	LIMITED, only during specific flows (natural barriers)	PRESENT with mitigation for trout minimum flows (PEIR Measure 5.4.5-3a)	LIMITED
A-5 – from Alameda Creek Diversion Dam to Camp Ohlone	• Steep gradient sections impede passage • Fragmented habitat • Dry stream sections in summer • Steelhead access excluded by Alameda Creek Diversion Dam	• No projects planned in this reach • Downstream passage barriers removed • Migration, spawning, and rearing habitat conditions would remain unchanged	N/A (barrier at ACDD would remain)	N/A (barrier at ACDD would remain)	N/A (barrier at ACDD would remain)	• No projects planned in this reach • Migration, spawning, and rearing habitat conditions would remain unchanged • Calaveras Dam Replacement project / WSIP implementation would not affect this reach • Steelhead access still precluded by ACDD	N/A (barrier at ACDD would remain)	N/A (barrier at ACDD would remain)	N/A (barrier at ACDD would remain)

TABLE 14.9-6 (continued)
SUMMARY OF ALAMEDA CREEK STEELHEAD HABITAT USE AND CONDITION
UNDER FUTURE CUMULATIVE WITHOUT WSIP AND FUTURE CUMULATIVE WITH WSIP SCENARIOS

Alameda Creek Reach (moving upstream)	Existing Condition: Stream Condition (Steelhead do not have access to Alameda Creek above the BART weir under the Existing Condition)	Assumed Future Condition without WSIP[a]: Stream Condition	Assumed Future Condition without WSIP[a]: Life Stage Habitat Use and Condition[b]: Migration	Spawning	Rearing	Assumed Future Condition with WSIP and Measures to Address Potential Impacts[b]: Stream Condition	Assumed Future Condition with WSIP and Measures to Address Potential Impacts[b]: Life Stage Habitat Use and Condition[c]: Migration	Spawning	Rearing
C-1 – Calaveras Creek from confluence with Alameda Creek to Calaveras Dam	• Deep pool, run, and riffle habitat present • Stream flow heavily influenced by Calaveras Dam operations • Water temperature influenced by temperatures of reservoir releases • Habitat values marginal for steelhead due to steep topography, isolated pools, altered stream hydrology • Rainbow trout not present	• No projects planned in this reach • No change to future scenario habitat conditions other than WSIP / Calaveras Dam Replacement project	LIMITED (barrier at dam)	LIMITED	LIMITED/ ABSENT	• Calaveras Dam Replacement project / WSIP implementation would restore operations of Calaveras Dam and include fish releases to achieve flow conditions at confluence consistent with 1997 MOU	LIMITED (barrier at replacement dam)	LIMITED	PRESENT
C-2, AH-1 – Calaveras Creek and Arroyo Hondo upstream of Calaveras Reservoir	• Calaveras Creek lacks hydrologic connection with Calaveras Reservoir at lowermost segment of creek • Calaveras Reservoir provides habitat for trout and warmwater fishes • Arroyo Hondo has good habitat/connectivity for 1.8 miles upstream of the reservoir • Steelhead access precluded by Calaveras Dam	• No projects planned in this reach	N/A (barrier at Calaveras Dam would remain)	N/A (barrier at Calaveras Dam would remain)	N/A (barrier at Calaveras Dam would remain)	• Calaveras Dam Replacement project / WSIP would restore historical operating levels and improve coldwater pool in Calaveras Reservoir • Improved connectivity of Arroyo Hondo and Calaveras Creek with Calaveras Reservoir • Steelhead access still precluded by dam	N/A (barrier at replacement dam)	N/A (barrier at replacement dam)	N/A (barrier at replacement dam)

NOTES: See Figure 14.9-4 for the location of reaches.

[a] Future cumulative condition assumes that planned and proposed projects to improve fish passage in the Alameda Creek watershed would be successfully implemented such that anadromous steelhead have access to the upper Alameda Creek watershed, but flow conditions would be the same as under existing conditions (Alameda Creek Diversion Dam and Calaveras Reservoir operations with DSOD restrictions).

[b] Future cumulative condition assumes that planned and proposed projects to improve fish passage in the Alameda Creek watershed would be successfully implemented such that anadromous steelhead have access to the upper Alameda Creek watershed. In addition, it assumes that the proposed WSIP water supply and system operations modifications would be implemented, including construction and operation of the Calaveras Dam Replacement and Alameda Creek Fishery Enhancement projects. Further, it assumes that identified direct impacts of the WSIP would be mitigated and assumes implementation of Draft PEIR Mitigation Measures 5.4.1-2 (Diversion Tunnel Operation) and 5.4.5-3a (Minimum Flows for Resident Trout on Alameda Creek) and 5.4.5-3b (Alameda Creek Diversion Dam Restrictions or Fish Screens).

[c] ABSENT denotes habitat not present in reach to support life stage. LIMITED denotes habitat present to support life stage during periods of the year, but limited by seasonal low flows and/or high summer temperatures; marginally suitable. PRESENT denotes habitat present to support life stage. N/A = Not Applicable, i.e., not affected by Calaveras Dam Replacement project or WSIP because existing barriers (Calaveras Dam and Alameda Creek Diversion Dam) would remain.

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Alameda Creek watershed have been successfully implemented and anadromous steelhead have access to the upper Alameda Creek watershed, and that stream flow conditions attributable to SFPUC water system operations would be the same as under the existing condition.

2. A future scenario *with* implementation of the WSIP, including the Calaveras Dam Replacement and Alameda Creek Fishery Enhancement projects and associated protective measures. This scenario assumes the same conditions as Scenario 1, except it includes full implementation of the WSIP, which would modify stream flow conditions. Under Scenario 2, full implementation of the WSIP would include increasing diversions at the ACDD to restore historical storage levels in Calaveras Reservoir, providing bypass flows at the ACDD as well as releases from Calaveras Reservoir to augment stream flow to support fisheries consistent with the 1997 CDFG MOU, and, if recaptured, recapturing those releases at a downstream location consistent with the 1997 CDFG MOU.

Table 14.9-6 describes the stream and habitat conditions along the various reaches of Alameda Creek that could be affected by the WSIP, including the Calaveras Dam project, beginning at the downstream end of the watershed in lower Alameda Creek and Niles Canyon, and moving upstream to individual reaches in upper Alameda Creek. **Figure 14.9-4** shows the location of the reaches described in Table 14.9-6.

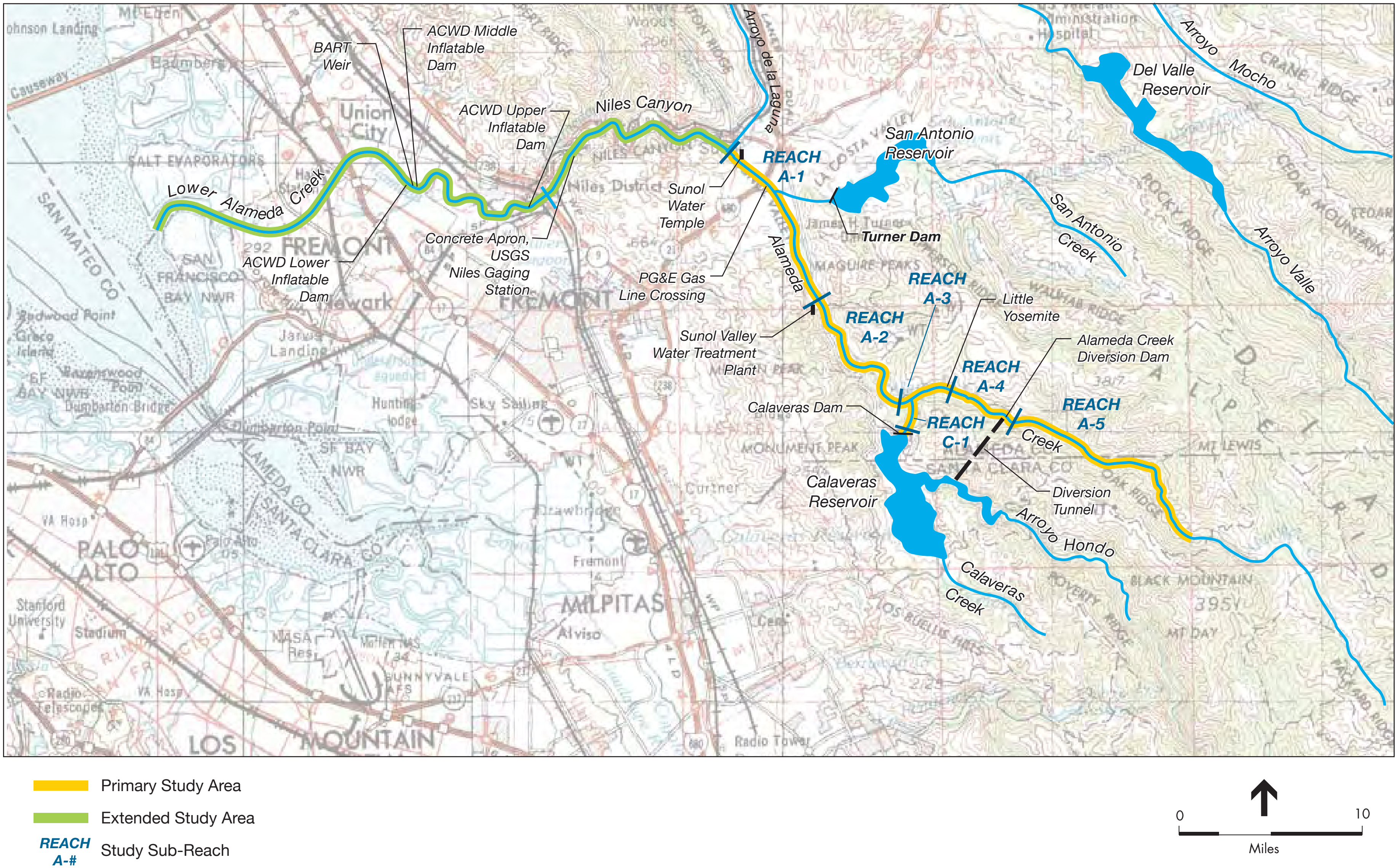
It should be noted that the WSIP's effect on habitat conditions for steelhead in the reaches downstream of Arroyo de la Laguna (i.e., lower Alameda Creek and Niles Canyon) are linked to a number of uncertainties regarding:

- The way in which existing barriers to passage would be remedied in the future (the design of passage facilities and the timing and amount of flow that would be required to achieve suitable passage conditions at those locations) as well as the effectiveness of the proposed slurry cutoff wall on the perimeter of the quarry on the right bank (looking downstream) of Alameda Creek above the San Antonio Creek confluence to reduce seepage losses from Alameda Creek in the Sunol Valley

- The extent to which natural features act as barriers (e.g., wide/braided channel locations, falls, sediment wedges) under various flow regimes and associated water temperature conditions

- The extent to which varying water resource operations of all water agencies in the overall Alameda Creek basin influence flows needed to establish and sustain appropriate flow and temperature conditions for steelhead and the subsequent effects of the WSIP on these downstream conditions (the contributions of flow from Arroyo del Valle and Arroyo de la Laguna complicate the hydrology further and add to uncertainties)

Understanding and resolving the approach to steelhead habitat restoration in the watershed, including addressing uncertainties regarding habitat requirements in Niles Canyon and lower Alameda Creek, requires a comprehensive, coordinated, basinwide effort and is currently being addressed through the ACFRW, of which the SFPUC is a participant.



SOURCE: ESA + Orion; USGS 1969

SFPUC Water System Improvement Program . 203287

Figure 14.9-4
Existing and Future Habitat Conditions for Steelhead on Alameda Creek

Potential Future Cumulative Impacts on Steelhead

The following discussion provides a reach-by-reach analysis of the WSIP's impacts on steelhead in Alameda Creek based on the changes in steelhead life-stage functions: migration (adult and juvenile), spawning, and rearing. The analysis incorporates the project revisions, protective measures, and mitigation measures described in Section 14.9.1, above. The protective measures added to the Calaveras Dam Replacement project description (SFPUC, 2008) include specific operational protocols, seasonal bypass flows at the ACDD and Calaveras Dam, and performance criteria to meet the habitat requirements of steelhead (if present) and other native aquatic species (fish and sensitive amphibians) in upper Alameda Creek in the event that the NMFS and/or CDFG determine that steelhead are present in Alameda Creek above the BART weir, construction of the Calaveras Dam project is complete, and the Alameda Watershed HCP is yet to be finalized. The protective measures also include an interim bypass flow release schedule that would consist of the implementation of flows consistent with the 1997 CDFG MOU, with the additional requirement that these flows be achieved through bypass flows at the ACDD at all times when flows are available, rather than through releases at Calaveras Dam. This interim flow schedule would meet the requirements of the 1997 CDFG MOU point of compliance below the confluence of Alameda and Calaveras Creeks as well as provide additional benefit in the reach between the ACDD and Calaveras Creek. The SFPUC would implement this interim measure until such time that the resource agencies (USFWS, NMFS, and CDFG) develop alternative requirements (i.e., operational protocols, seasonal bypass flows, and performance criteria) through the Alameda Watershed HCP process or other regulatory mechanism to ensure the habitat requirements of steelhead and other native aquatic species are provided at a level that is equal to or better than that provided by this interim measure. Following the development of these protocols, the SFPUC would implement these actions either through the Alameda Watershed HCP or other mechanism developed in consultation with the USFWS, NMFS, and CDFG.

The project revisions and protective measures for steelhead proposed as part of the Calaveras Dam Replacement project (SFPUC, 2008), along with the mitigation measures detailed in the Draft PEIR, have been analyzed by ESA+Orion and EDAW-Turnstone JV (2008) to determine the WSIP's contribution to cumulative effects (both positive and negative) on potential future-occurring steelhead, as discussed below. Implementation of the project revisions, protective measures, and mitigation measures (summarized in the Section 14.9.1, above) would reduce adverse effects of the WSIP on steelhead life stages and habitat in Alameda Creek to a less-than-significant level.

Migration

Upper Alameda Creek (Reaches A-1 through A-5). Implementation of the WSIP would influence stream flow and water temperature in Alameda Creek during steelhead migration periods. Under the WSIP, proposed operation of the ACDD would increase diversions from upper Alameda Creek to Calaveras Reservoir as well as implement protective measures to address steelhead migration downstream of the recapture facility. The protective measures incorporated into the WSIP as part of the Calaveras Dam Replacement and Alameda Fishery Enhancement projects include: (1) in the long term, operational protocols, seasonal bypass flows at the ACDD and Calaveras Dam, and performance criteria to ensure the habitat requirements of steelhead (if present) as implemented through the Alameda Watershed HCP or other regulatory mechanism ensuring compliance with FESA and CESA, and (2) in the short-term until issues associated with the long-term measures are resolved, seasonal flow bypasses at the ACDD and/or Calaveras Dam consistent with the 1997 CDFG MOU but without recapture or with recapture at a point at the downstream end of Reach A-1 below critical riffle locations or lower in the creek. Under this cumulative analysis, it is assumed that Mitigation Measure 5.4.5-3a would be implemented in conjunction with the protective measures

As a result, flows in Alameda Creek downstream of the diversion dam would be substantially reduced from those under existing conditions. Flows passing the diversion dam would include flows above 650 cfs (capacity of the diversion), downstream tributary inflow, and bypass flows when upstream flows are available (from December 1 to April 30) implemented as part of the protective measures and Measure 5.4.5-3a. Natural summer low-flow limitations would not be affected by the bypass flow protective measures, since the bypass flows only address the period from December 1 to April 30, and there is typically no diversion during the summer months.

Because the bypass flows outlined in the 1997 CDFG MOU and Mitigation Measure 5.4.5-3a were developed to meet life-stage habitat suitability requirements for resident rainbow trout, conditions may only be marginally suitable for steelhead migration. As shown in Table 14.9-6, steelhead passage under the existing condition is impeded by natural rock barriers in the steep sections of Alameda Creek within Little Yosemite (Reach A-3, upstream from the Calaveras Creek confluence) under most flow conditions, based on recently completed studies (URS/SWRI, unpublished data). Thus, the effect of the proposed increased diversions on steelhead migration in the reach from the base of the diversion dam to the downstream end of Little Yosemite would only occur during times when flow conditions would have otherwise been adequate for steelhead migration, or if that natural barrier (i.e., falls at Little Yosemite) were to be removed. Removal of the natural Little Yosemite rock barrier is not proposed at this time.

Under the WSIP, flows in the segment of the creek downstream from the confluence of Alameda and Calaveras Creeks would be managed in accordance with the 1997 CDFG MOU through naturally occurring flows, releases from Calaveras Dam, and/or bypass flows at the diversion dam. The resulting stream flows would contribute to potentially suitable migratory conditions at certain times of the year within the reach of Alameda Creek that extends from the Calaveras Creek confluence with Alameda Creek downstream to the water recapture facility. When the bypass flows are released from the diversion dam to meet the terms of the MOU as part of the protective measures incorporated in the Calaveras Dam Replacement project, then the beneficial effects of these flows would also be achieved in Reaches A-3 and A-4, upstream from the Calaveras Creek confluence to the diversion dam.

In the Sunol Valley (Reaches A-1 and A-2), some wide channel areas may limit steelhead passage at lower flows (also known as areas of critical riffles) under existing conditions. In general concept, higher flows would enable upstream migrating adults and downstream migrating adult and juvenile steelhead to pass these areas and the remaining “natural” migration obstacles (following removal of the human-made barriers) in the Sunol Valley and farther downstream.

Stream flow and fish migration assessments conducted in Reach A-1, the stream reach with primary critical riffles adjacent to the Sunol quarry (SMP 30) (ENTRIX, 2006; URS/SWRI, unpublished data), have determined that a total of seven critical riffles are present that could potentially limit fish passage. The assessments determined that a wide range of low to moderate flows would be required to enable fish passage at the individual critical riffle locations. These flow requirements, in order of magnitude, are: 74, 17, 6, 5, 4, 2, and 1 cfs. The flow assessment results indicate that fish passage could be enabled through the provision of minimum flows equal to the highest flow requirement (i.e., 74 cfs) or through physical modification of the creek channel at the critical riffle locations to improve the specific conditions (e.g., wide channel, shallow depths, high velocities, steep gradient, etc.) that impede fish passage, and which, in general, would reduce the flow requirements for suitable fish passage.

While WSIP implementation would result in increased diversions in upper Alameda Creek at the diversion dam, the implementation of releases and/or bypass flows at Calaveras Dam and the ACDD, consistent with the 1997 CDFG MOU (per protective measures incorporated into the Calaveras Dam Replacement project) and Mitigation Measure 5.4.5-3a, would augment migration flows and assure project impacts on fishery habitat as far downstream as the proposed recapture facility are reduced to a less-than-significant level. As part of the project revisions incorporated into the Alameda Fishery Enhancement project, the SFPUC would either not implement recapture until the long-term regulatory mechanism for steelhead protection is resolved, or would locate the recapture facility at a point approximately at the downstream end of Reach A-1 below the areas of critical riffles. Thus, implementation of the 1997 MOU flows would enhance migratory conditions in this area.

Under the assumed future conditions with construction of a slurry cutoff wall and stream habitat restoration at the Sunol quarry pit (i.e., SMP 30 in Reach A-1),[3] downstream losses in stream flow from percolation into these pits in the Sunol area would be reduced; physical conditions at critical riffles is assumed to be improved; and there would be a resulting beneficial effect on steelhead migration in this area. While the remaining stream flow losses due to infiltration and the actual stream flow increase resulting from a future cutoff wall at the Sunol quarry are unknown at this time, it is assumed that increases in stream flows would be achieved and stream habitat restoration would improve physical conditions at critical riffles. Previous assessments of the critical riffles (ENTRIX, 2006; URS/SWRI, unpublished data) determined that passage is enabled at five of the seven critical riffles at relatively low flows (i.e., 1 to 6 cfs). Based on these results, it

3 The SFPUC's Sunol Valley Sand and Aggregate Quarry Operations (SMP 30) includes projects to be undertaken by the quarry operator to correct losses of water into quarry pits and to enhance riparian vegetation. There is limited fish passage and degraded habitat value in this reach due to past mining-related realignment of the creek channel (noted above), which results in mining pit capture of a significant amount of Alameda Creek flows at the head of the realigned creek. The SFPUC proposes to coordinate planning for an Alameda Creek channel restoration project at this location as part of its negotiation with the selected operator of its Sunol quarry and to include aspects of the restoration project as part of the lease conditions. The SFPUC desires the operator to construct a slurry cutoff wall to reduce inflow to the pit as well as provide restoration of riparian habitat on the right bank of Alameda Creek and the left bank of San Antonio Creek (looking downstream). A plan for these actions has not yet been developed. The selected entity will be required to provide funds towards these efforts. CEQA/NEPA environmental review has yet to begin, but will include planning information for fish passage at the PG&E pipeline drop structure.

is assumed that physical conditions (e.g., channel width and form, gradient) would be improved at the critical riffles that require the highest flows (i.e., 74 and 17 cfs) and these improvements would enable fish passage at low flows, similar to the other critical riffle locations (1 to 6 cfs). These actions combined with minimum flow releases/bypasses consistent with the 1997 CDFG MOU (range of flows between 5 and 20 cfs during migration periods) would achieve suitable steelhead migration conditions in the Sunol Valley downstream to the recapture facility.

In summary, under the future conditions with the WSIP, the total combined stream flow from both regulated and unregulated sources, coupled with the assumed stream flow and habitat improvements at the Sunol Quarry, would sustain some winter flows in Alameda Creek that could facilitate fish migration. Location of the recapture facility downstream of critical riffles (Reach A-1) would assure suitable steelhead migration conditions. With the proposed program modifications described above, the WSIP would have a *less-than-significant* impact on steelhead migration in upper Alameda Creek (ESA+Orion and EDAW-Turnstone JV, 2008).

Lower Alameda Creek and Niles Canyon. At present, steelhead have access only to the segment of lower Alameda Creek below the BART weir because the BART weir acts as a complete barrier to steelhead migration under all flow conditions. In combination with other projects that could provide steelhead access through lower Alameda Creek and Niles Canyon to upper Alameda Creek in the future (including the provision of a fish bypass at the BART weir), the WSIP could result in a cumulative effect on steelhead migration.

Additional stream flow analysis was conducted subsequent to publication of the Draft PEIR (summarized above in Section 14.9.3 and included in Vol. 8, **Appendix N**) in order to address comments regarding the WSIP's impacts on steelhead passage and fishery habitat in lower Alameda Creek and Niles Canyon. This analysis determined that, based on the historical hydrology from 2000 to 2007, flows in Alameda Creek in Niles Canyon and downstream, on average, would occasionally be reduced under the WSIP. Reductions of up to 18 percent in average monthly flow could occur in winter months of years similar to the past eight years of record. The maximum flow reduction would occur during January of an above-normal year; however, the average calculated flow during this period remains relatively high (171 to 216 cfs). A flow increase of up to 13 percent would occur in April of that same hydrologic year type. The average monthly reduction that would occur from December through March of these year types is approximately 20 cfs, with a remaining calculated average flow of 313 cfs (range of 28 to 562 cfs). No changes in flow would occur in below-normal and dry years, when naturally low flow conditions would potentially result in the most substantial passage impediments.

Because the WSIP's effect on flows would only occur during above-normal hydrologic year types when flow conditions are predicted to remain relatively high (ESA+Orion and EDAW-Turnstone JV, 2008), operation of the WSIP is expected to have a negligible cumulative effect on future (anticipated) habitat conditions for steelhead migration. Therefore, this impact would be *less than significant*.

Spawning

Upper Alameda Creek (Reaches A-1 through A-5). Studies recently completed by Hagar and Payne (ETJV, 2008) identified suitable habitat for steelhead spawning in the reach of Alameda Creek immediately downstream of the Calaveras Creek confluence (Reach A-2) and between the Calaveras Creek confluence and the ACDD (Reaches A-3 and A-4). Implementation of the Calaveras Dam Replacement project (SV-2) component of the WSIP would alter stream flow in Alameda Creek during steelhead spawning periods. At present, steelhead do not have access to upper Alameda Creek. However, in combination with other projects that would provide steelhead access to upper Alameda Creek in the future, operation of the Calaveras Dam project could affect steelhead spawning.

Upstream of the Calaveras Creek confluence, Alameda Creek flows are predominantly influenced by operation of the diversion dam and tunnel. At present, Alameda Creek between the diversion dam and the confluence with Calaveras Creek provides habitat for spawning resident rainbow trout as well as other native species. As discussed above, passage conditions are extremely limited under most flow conditions at Little Yosemite and likely impede steelhead access to the majority of this reach, and therefore the effects of the Calaveras Dam project on steelhead spawning may only practically be realized in Alameda Creek downstream of Little Yosemite. Implementation of the WSIP would substantially reduce flows in Alameda Creek compared to existing conditions; however, implementation of PEIR Mitigation Measure 5.4.5-3a would address spawning and egg incubation habitat needs for resident rainbow trout as well as breeding habitat for other native stream-dependent amphibian species present in the creek and would require the SFPUC to monitor fish and sensitive amphibian populations and aquatic habitats. With the addition of the protective measures incorporated into the Calaveras Dam Replacement project, the implementation of the 1997 CDFG MOU flow releases from the ACDD when flow is available in upper Alameda Creek would reduce the WSIP’s effect on steelhead spawning in this reach.

While steelhead generally require increased flow (compared to rainbow trout) to meet spawning habitat suitability requirements (e.g., water depth and flow velocity conditions), the bypass flows developed for rainbow trout spawning have been modeled so they would also be adequate for anadromous steelhead spawning. Preliminary studies by Hagar and Payne (ETJV, 2008) to assess flow requirements for steelhead spawning indicate that flows in Alameda Creek between the diversion dam and the Calaveras Creek confluence in the range of 18 to 60 cfs provide the *most* suitable[4] quantity and quality of steelhead spawning habitat. For Alameda Creek downstream of the Calaveras Creek confluence, the studies indicate that flows in the range of 21 to 80 cfs provide the *most* suitable quantity and quality of steelhead spawning habitat. Bypass flows to support spawning in Alameda Creek would be most effective if implemented from approximately January through March, and based on different hydrologic year types and aligned with the timing of precipitation in the upper watershed. It is noted that the 1997 CDFG MOU flows range up to 20 cfs and thus are at or near the lower ranges noted above for the most suitable habitat quantity and quality for steelhead.

[4] 80 percent or greater of maximum usable area based on the relationship between stream flow and spawning habitat requirements (i.e., water depth, flow velocity, and substrate type and size).

Under the WSIP, water releases from Calaveras Dam and/or bypasses from the ACDD consistent with the 1997 CDFG MOU would contribute to enhancing steelhead spawning habitat conditions at certain times (18 to 20 cfs from January to March) within the reach of Alameda Creek that extends from the Calaveras Creek confluence downstream through Reach A-2 (extent of suitable spawning habitat). The MOU was developed to address habitat needs for rainbow trout only, but would also be expected, based on the Hagar and Payne study (ETJV, 2008, Appendix A), to provide spawning habitat functions for steelhead (ESA+Orion and EDAW-Turnstone JV, 2008). Incorporation of the protective measures (steelhead bypass flows) into the WSIP program description, as summarized above, would reduce these impacts to a *less-than-significant* level.

As a separate issue related to spawning, the increased diversion of higher flows (up to about 650 cfs at the diversion dam as part of the Calaveras Dam Replacement project) could provide a benefit in above-normal and wet years by reducing the likelihood that steelhead eggs incubating in redds downstream of Little Yosemite would be vulnerable to scour and erosion. As such, in some years the increased diversions occurring with the WSIP would be expected to contribute to improved reproductive success of any steelhead spawning within the reach, provided that a suitable base level of flow (through bypass flow mitigation) would be available for spawning and egg incubation (ETJV, 2008).

Lower Alameda Creek and Niles Canyon. Steelhead spawning habitat in lower Alameda Creek is either absent or very limited, and there are no proposed spawning habitat restoration projects in this reach of Alameda Creek. Therefore, the WSIP would not affect steelhead spawning in lower Alameda Creek.

Potential spawning habitat is present in Niles Canyon; however, the future production of individuals spawned in this reach would be restricted by several factors related to subsequent rearing requirements and existing and future habitat limitations (see discussion below). As described above under the heading Migration, stream flow modeling indicated that the WSIP could result in reductions of up to 18 percent in average monthly flow in winter months of above-normal/wet years. The maximum flow reduction would occur during January of an above-normal year; however, the average calculated flow during this period remains relatively high (171 to 216 cfs). A flow increase of up to 13 percent would occur in April of that same hydrologic year type. The average monthly reduction that would occur from December through March of these year types is approximately 20 cfs, with a remaining calculated average flow of 313 cfs (range of 28 to 562 cfs). No changes in flow would occur in below-normal and dry years, when naturally low flow conditions would potentially result in the most limited habitat conditions for spawning.

Because the WSIP's effect on potential steelhead spawning habitat would only occur during above-normal hydrologic year types (when remaining flow conditions are predicted to still be relatively high), the WSIP is expected to have a negligible effect on future (anticipated) habitat conditions for steelhead spawning (ESA+Orion and EDAW-Turnstone JV, 2008). Therefore, this impact would be *less than significant*.

Rearing

Upper Alameda Creek (Reaches A-1 through A-5). At present, steelhead do not have access to upper Alameda Creek. However, in combination with planned projects that would provide steelhead access to upper Alameda Creek in the future, operation of the proposed program could affect steelhead rearing. Implementation of the WSIP could influence stream flow and water temperatures in Alameda Creek during steelhead rearing periods.

Although no published studies have been conducted that specifically address flow needs for rearing steelhead in reaches of Alameda Creek downstream of Calaveras Dam or the diversion dam, the 1997 CDFG MOU was developed to provide an increase in the amount of coldwater habitat in lower Alameda Creek for the benefit of resident trout. This is especially important in the summer and fall periods, at which times the MOU releases would provide sufficiently cool water to support fish survival through the hot, dry summer period. Resident trout and juvenile steelhead have essentially the same requirements for rearing habitat (e.g., flow, water temperature, physical habitat components). Therefore, under the WSIP, releases from Calaveras Dam and/or bypasses from the diversion dam that meet flow and temperature objectives consistent with the 1997 CDFG MOU would be expected to provide habitat conditions suitable for rearing steelhead in Alameda Creek from the confluence with Calaveras Creek downstream, and, with bypasses made from the diversion dam under the Calaveras Dam Replacement project, upstream in Alameda Creek as well. Releases consistent with the MOU are proposed as part of the WSIP, including summer releases that do not occur under existing conditions. Thus, the WSIP would have a *beneficial* effect on potential steelhead summer rearing habitat in the approximate two-mile segment of Alameda Creek between the Calaveras Creek confluence and the boundary of the Sunol Regional Park (i.e., the creek segment where sufficiently cool water temperatures could be maintained before warming [CDFG, 1997]) (see Figure 14.9-4).

There is the potential for adverse effects on steelhead rearing habitat during the rainy season (i.e., approximately November through March) in the reach of Alameda Creek between the diversion dam and the Calaveras Creek confluence (Reaches A-3 and A-4). However, proposed bypass releases from the ACDD under Measure Mitigation 5.4.5-3a would reduce the WSIP's contribution to this effect. During the dry season when there is minimal naturally occurring flow in Alameda Creek (i.e., April through November), minimal diversions would be made under the WSIP, similar to the existing condition. Furthermore, Draft PEIR Mitigation Measure 5.4.1-2 (Vol. 4, Chapter 6, pp. 6-51 and 6-52) would formalize a commitment for the SFPUC operators to close the gates to the diversion tunnel once reservoir storage levels are met to provide the maximum possible days of winter and spring flows in Alameda Creek below the diversion dam.

Downstream of the bridge at the Sunol Valley Water Treatment Plant (Reach A-1), habitat conditions in the Sunol Valley do not appear to be suitable for steelhead rearing. Annual fish monitoring from 1998 to present (conducted by the SFPUC and summarized in ETJV, 2008) resulted in no rainbow trout being sampled or observed at locations immediately above this reach. With construction of a slurry cutoff wall at the Sunol quarry pit (SMP 30), downstream losses in stream flow resulting from the percolation of groundwater may be substantially reduced, resulting in a beneficial effect. However, remaining losses in stream flow and the capture efficiency of a future cutoff wall at the Sunol quarry (SMP 30) are unknown. Therefore, while the future viability of reestablished steelhead rearing habitat in the Sunol Valley is still uncertain, releases/bypasses included under the WSIP as part of the 1997 CDFG MOU requirements or as part of the PEIR mitigation requirements for resident trout could result in the limited seasonal enhancement of rearing habitat conditions for steelhead (i.e., late spring and late fall, when water temperatures remain sufficiently cool) compared to the existing condition (ESA+Orion and EDAW-Turnstone JV, 2008). Therefore, the WSIP is unlikely to have an adverse effect on steelhead rearing habitat in Reach A-1. In summary, implementation of the WSIP, including project description changes that provide protective measures, in conjunction with the mitigation measures, would result in a *less-than-significant impact* on steelhead rearing.

Lower Alameda Creek and Niles Canyon. There are several key uncertainties regarding the availability and quality of rearing habitat in lower Alameda Creek and Niles Canyon (McBain and Trush, 2007). The Niles Canyon reach may have historically provided important rearing habitat for juvenile steelhead. Currently, rearing habitat in this reach for steelhead is limited by altered flows and warm water temperatures (ETJV, 2008; McBain and Trush, 2007; Hanson, 2002b). As previously noted, the proposed slurry cutoff wall at the Sunol quarry pits could improve the contributions to stream flow and underflow of shallow groundwater into Niles Canyon.

As described above under the heading Migration, additional stream flow analysis indicated that the WSIP could result in reductions of up to 18 percent in average monthly flow in winter months of above-normal/wet years. The maximum flow reduction would occur during January of an above-normal year; however, the average calculated flow during this period remains relatively high (171 to 216 cfs). A flow increase of up to 13 percent would occur in April of that same hydrologic year type. The average monthly reduction that would occur from December through March of these year types is approximately 20 cfs, with a remaining calculated average flow of 313 cfs (range of 28 to 562 cfs). No changes in flow would occur in below-normal and dry years, when naturally low flow conditions would potentially result in the most limited habitat conditions for rearing.

Because habitat functions for rearing have been greatly diminished in lower Alameda Creek and the WSIP's predicted effect on rearing habitat would only occur during above-normal year types (when remaining flow conditions are predicted to still be relatively high), the WSIP is expected to have a negligible effect on future (anticipated) habitat conditions for steelhead rearing (ESA+Orion and EDAW-Turnstone JV, 2008). Therefore, this impact would be *less than significant.*

PEIR Text Revisions to Include Cumulative Impact on Future-Occurring Steelhead

Based on the analysis of the WSIP's contribution to future cumulative effects on potential future-occurring steelhead presented above, the assessment presented in the Draft PEIR of the WSIP's cumulative impacts in the Alameda Creek watershed has been revised. The Draft PEIR text is revised as follows (Vol. 3, Chapter 5, p. 5.4.5-11, fifth full paragraph):

Potential Steelhead Restoration

For the purposes of full disclosure, the PEIR provides this discussion of steelhead in lower Alameda Creek, and the potential for steelhead to be restored to the upper reaches of Alameda Creek (above the BART weir). However, because this steelhead access does not currently exist and there is no current steelhead migration above the BART weir, ~~there would be no~~ the potential impact on steelhead migration, spawning, or juvenile rearing upstream of the BART weir as a result of WSIP implementation is not analyzed in this section, which addresses WSIP impacts relative to existing conditions, but instead is analyzed as a future, cumulative impact in Section 5.7.3. ~~Further, as described in the preceding discussion, since a number of steps are required before steelhead migration further upstream can occur, it is speculative to assess the specific impacts that system operation under the WSIP might have on the potential future restoration of steelhead. Thus, no impact analysis or conclusion is developed in this PEIR. If and when steelhead are restored, the SFPUC will be required to conform its system operations to comply with the applicable Endangered Species Act requirements.~~

In addition, the Draft PEIR text is revised as follows (Vol. 3, Chapter 5, p. 5.7-65, second paragraph):

Cumulative Effects and WSIP Contribution

Table 5.7-15 summarizes the effects of past and present projects, the impacts of the WSIP, the effects of probable future projects, and the combined impacts of the WSIP plus probable future projects on the Alameda Creek watershed. Past and present projects have substantially altered the hydrology, geomorphology, surface water quality, groundwater, fisheries, and terrestrial biology of this portion of the Alameda Creek watershed compared to pre-Euro-American settlement conditions. Visual and recreational resources have been moderately altered. The existing condition, which serves as the baseline for the analysis of the WSIP, reflects the substantial environmental changes that have occurred as a result of the past projects. Because past and present actions have drastically altered ~~this portion of~~ the Alameda Creek watershed, some of the environmental resources are more sensitive to small adverse changes than they would be if the ~~reach~~ watershed had remained relatively unaltered from pre-Euro-American settlement conditions.

In addition, the Draft PEIR text is revised as follows (Vol. 3, Chapter 5, p. 5.7-66, third paragraph):

Implementation of the WSIP would substantially reduce flows in the reach of Alameda Creek from the diversion dam to below its confluence with Calaveras Creek compared to existing conditions (Impact 5.4.1-2). This impact was determined to be significant and unavoidable, even with implementation of Measure 5.4.1-2 (Diversion Tunnel Operation) and bypass flows included as part of the protective measures in the Calaveras Dam Replacement project (SV-2). However, no other past, present, or future projects were identified that would further reduce the stream flow in this reach of Alameda Creek, and some of the projects listed in Table 5.7-13 could enhance the flow. Thus, there would be no adverse cumulative impact on hydrology associated with past, present, and future projects, and the WSIP's contribution to the cumulative impact on hydrology is not applicable.

Due to agreements and ongoing actions regarding the implementation of fish passage improvement projects in lower Alameda Creek (as described in Section 5.4.5 of the Draft

PEIR), it is possible that steelhead will be restored to the Alameda Creek watershed reaches upstream of the BART weir by 2030. More specifically, steelhead may be restored during construction or operation of the Calaveras Dam Replacement project (SV-2) under the WSIP. In response to this scenario, the SFPUC has modified the WSIP program description—mainly that of the Alameda Creek Fishery Enhancement (SV-1) and Calaveras Dam Replacement (SV-2) projects—to incorporate protective measures for steelhead in the event that man-made barriers in Alameda Creek have been successfully removed and that steelhead migration, spawning, and rearing have been restored in Alameda Creek above the BART weir. The protective measures incorporated into the operations of the Calaveras Dam Replacement project would address future-occurring steelhead and would provide for a range of minimum bypass flows and releases at the Alameda Creek Diversion Dam and Calaveras Dam to support steelhead migration, spawning, and rearing. The program as revised, and with implementation of mitigation measures identified in the Draft PEIR, which together include minimum bypass flows to support the various life stages and habitat requirements for steelhead, would have a less-than-significant contribution to cumulative impacts on fishery resources in the Alameda Creek watershed. Please refer to Chapter 14, Section 14.9, of the Final PEIR for further discussion.

14.9.5 Other Fish Species and Aquatic Habitat in Alameda Creek

Introduction

This section of the master response addresses comments concerning the impact analysis and mitigation for the WSIP's potential effects on fishery resources in Alameda Creek upstream of the BART weir. This section of the master response is organized by the following subtopics:

- Analysis of Chinook Salmon, Coho Salmon, and Pacific Lamprey
- Warmwater Fish Species and their Habitats in Alameda Creek

Comment Summary

This section of this master response responds to all or part of the following comments:

L_ACFCWCD-14	SI_ACA1-08	SI_ACA1-19
L_ACWD-19	SI_ACA1-09	SI_ACA1-20
SI_ACA1-05	SI_ACA1-10	SI_GWWF2-02

Summary of Issues Raised by Commenters

- Need to acknowledge the historical range of Chinook salmon, coho salmon, and Pacific lamprey.
- Need to perform analyses to determine mitigation for impacts of flow diversions on Chinook salmon and Pacific lamprey.
- The mitigation measures target rainbow trout and may not mitigate impacts on steelhead, Pacific lamprey, and Chinook salmon.

- Inadequate discussion of warmwater and coldwater fish species and their habitats in the lower Alameda Creek reach.
- Lower Alameda Creek flow diversions would affect fisheries and habitat in the flood control channel.

Chinook Salmon, Coho Salmon, and Pacific Lamprey

Chinook Salmon

Chinook salmon are addressed in the Draft PEIR as part of the environmental setting for Alameda Creek fisheries (Vol. 3, Chapter 5, pp. 5.4.5-11 and 5.4.5-12). While small runs of Chinook salmon may have historically occurred within Alameda Creek, in recent years only a small number of individual Chinook salmon adults have been recovered in the flood control channel downstream of the BART weir. As presented in the Draft PEIR, it is believed that hatchery-produced salmon have strayed into streams that did not traditionally (and do not currently) support them (Gunther et al., 2000).

Although Chinook salmon are occasionally observed and documented below the BART weir, these few individuals are not currently able to migrate upstream of this barrier. If the migration barriers were absent, as discussed above in Section 14.9.3, seasonal high temperatures and low stream flow conditions during both the adult and juvenile migration and rearing periods would likely limit successful Chinook salmon production in most years.

As described above, the discussion of existing conditions presented in the Draft PEIR does not include Chinook salmon as a species of concern in the program area upstream of the BART weir. Impacts on Chinook salmon due to reduced flows below the BART weir have not been determined to be significant based on hydrological modeling of flow changes in the lower portion of Alameda Creek. Further discussion of WSIP-related flow impacts in the flood control channel is provided above in Section 14.9.3, under the heading Impacts on Stream Flow and Fisheries Downstream of the BART Weir. It should be noted, however, that Chinook salmon will be included in the SFPUC's Alameda Watershed HCP.

Coho Salmon

The geographic range for the CCC coho salmon DPS extends from Punta Gorda in northern California south to and including the San Lorenzo River in central California (NMFS, 2006). Evidence presented by Leidy (2007) shows the Alameda Creek watershed historically supported a run of coho salmon. Although there is evidence to support the historical presence of coho salmon in tributaries and coastal streams in and around San Francisco Bay, current findings on the geographic distribution of coho salmon conclude the species is absent from San Francisco Bay and its tributaries and is limited locally to a small number of tributaries in Marin County (NMFS, 2005).

A report by the NMFS (2005) on the status of federally listed DPS of west coast salmon and steelhead summarized a range of surveys and reports on the occurrence of coho salmon in tributaries and coastal streams in and around San Francisco Bay. In assessing historical data and discussing decreasing population numbers for coho salmon in this region, the report identified extremely low contemporary abundance compared to historical abundance, widespread local extinctions, clear downward trends in abundance, extensive habitat degradation, and associated decreases in the carrying capacity of Alameda Creek. The NMFS (2005) presented findings that salmon stocks in small coastal streams north of San Francisco were at moderate risk of extinction, and those in coastal streams south of San Francisco Bay were at high risk of extinction. The report indicated that coho salmon were not present in San Francisco Bay and its tributaries. The results of presence-absence analyses for the CCC coho salmon ESU as a whole estimated that coho salmon were present in only 42 percent of streams historically known to contain coho salmon (NMFS, 2005). Data presented as part of these analyses (CDFG findings, as presented in NMFS, 2005) estimated occupancy was highest in Mendocino County (62 percent), followed by Marin County (40 percent), Sonoma County (4 percent), and San Francisco Bay tributaries (0 percent).

In summary, there is no documentation indicating the presence of coho salmon within Alameda Creek. Therefore, the Draft PEIR does not include an analysis of impacts on coho salmon as a species of concern in the program area.

Pacific Lamprey

Pacific lamprey is addressed in the Draft PEIR as part of the environmental setting for Alameda Creek fisheries (Vol. 3, Chapter 5, p. 5.4.5-12). Additionally, Leidy (2007) presents records for the upper Alameda Creek watershed suggesting that lamprey are able to ascend some formidable migration barriers to reach spawning habitat in the upper Sunol Valley, including the BART weir and the PG&E gas line crossing, as well as more transitory obstacles such as the ACWD inflatable dams in the Alameda Creek flood control channel downstream of Niles Canyon.

Moyle (2002) suggests the possibility that some upstream populations of Pacific lamprey may contain individuals that remain resident, rather than migrating to sea (much like rainbow trout), and it is therefore possible that the sampled population in the program area is resident. There are no known observations of either Pacific lamprey or river lamprey spawning in Alameda Creek, and no recorded observations of lamprey attached to other fish or of scars on fish from lamprey attacks. If adult Pacific lamprey can ascend barriers in the lower creek and reach Sunol Park, it is unclear how often they are successful at doing so.

The Draft PEIR identified sensitive habitat and listed species in the program area. The PEIR description of existing conditions does not include anadromous Pacific lamprey as a species of concern in the program area due to the lack of conclusive data indicating that this form of Pacific lamprey occurs within the upper Alameda Creek watershed. Impacts on Pacific lamprey due to reduced flows below the BART weir (where individual lamprey have recently been netted in the flood control channel section) have not been determined to be significant based on hydrological modeling of flow changes in the lower portion of Alameda Creek. Further discussion of WSIP-related flow impacts in the flood control channel is provided above in Section 14.9.3 under the heading “Impacts on Stream Flow and Fisheries Downstream of the BART Weir.” It should be noted, however, that Pacific lamprey will be included in the SFPUC’s Alameda Watershed HCP.

Warmwater Fish Species and their Habitats in Alameda Creek

Comments on the Draft PEIR requested consideration of warmwater fish habitat in the lower portion of Alameda Creek. A discussion of species present within Alameda Creek, including warmwater species, is presented in Section 5.4.5 of the Draft PEIR (Vol. 3, Chapter 5, p. 5.4.5-12) and summarized in Table 5.4.5-1 (Vol. 3, Chapter 5, pp. 5.4.5-13 to 5.4.5-15).

The CDFG has outlined recreational fishing resources in the San Francisco Bay Area and classifies Alameda Creek as habitat for federally listed steelhead as well as for many native non-game warmwater fish and native and introduced game fish species (CDFG, 2008). According to Skinner (1962), while Alameda Creek may not be a typical warmwater stream, it does support a number of warmwater fish species, including largemouth bass, small-mouth black bass, crappie, catfish, panfish, and roughfish.

The impacts of the WSIP on all fishery resources, including the warmwater species discussed in Table 5.4.5-1, are presented in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.4.5-16 to 5.4.5-22). These impacts were determined to be either beneficial or less than significant in all cases (except for Impact 5.4.5-3, which would be potentially significant, but could be mitigated to a less-than-significant level with implementation of Mitigation Measures 5.4.5-3a and 5.4.5-3b).

14.9.6 Climate Change and Cumulative Effects on Future Fish Passage and Fish Habitat

Introduction

This section of the master response addresses comments concerning the WSIP’s potential effects on fish passage and fishery resources in the Alameda Creek watershed when the effects of climate change are taken into consideration.

Comment Summary

This section of this master response responds to all or part of the following comments:

L_ACFCWCD-05

Summary of Issues Raised by Commenters

- The combined effects of the WSIP and climate change on flows and fish passage over the BART weir and middle inflatable dam are not adequately addressed.

Response

Comments received on the Draft EIR included concern regarding climate change effects on flows as they relate to fish passage over the BART weir. A number of habitat studies identify the BART weir as a total barrier to anadromous fish passage (Gunther et al., 2000). As described above in Section 14.9.4, passage improvement projects in Alameda Creek must be successfully completed for fish passage to be possible at the BART weir, and other barriers to passage will need to be removed as well for steelhead to become restored to the upper watershed. For this reason, impacts related to fish passage at the BART weir within the context of climate change were not analyzed in the Draft PEIR. Potential cumulative impacts on fish passage are discussed in Section 14.9.4, which describes the impacts of the WSIP on potential future-occurring anadromous fish under the future cumulative scenario, which assumes the implementation of passage improvement projects and minimum flow releases for the protection of listed species. Impacts on anadromous salmonid migration and fishery habitat in lower Alameda Creek below the recapture facility due to implementation of the WSIP are presented above in Section 14.9.3.

Additional concern was raised that climate change could affect flows in the upper watershed and thus affect future fish passage and habitat connectivity. Potential impacts of climate change on the regional water system, precipitation patterns, and local hydrology are discussed in **Section 14.11, Master Response on Climate Change** (Vol. 7, Chapter 14, Section 14.11.4); this master response provides a qualitative assessment of WSIP impacts in the Alameda Creek watershed with consideration of climate change effects, and therefore addresses effects of climate change on Alameda Creek flows.

Potential impacts on habitat and habitat connectivity from climate-change-induced temperature effects are discussed here. The results of temperature monitoring in Alameda Creek conducted as part of habitat survey work (Hanson, 2002a, 2002b; McBain and Trush, 2007) demonstrate that current habitat conditions in Alameda Creek are on the threshold for steelhead suitability. Temperatures in mid-April already exceeded the smoltification success threshold, and by mid-June had exceeded the assumed juvenile growth threshold in Niles Canyon and farther downstream. Summer water temperatures within the lower reaches of the tributaries and mainstem Alameda Creek were characterized as stressful and/or unsuitable for juvenile steelhead rearing under the environmental conditions monitored during 2001 and 2002 (Hanson, 2002a, 2002b).

Under future climate change scenarios, increased summer temperatures could cause Alameda Creek to exceed the range for viable steelhead summer rearing habitat, particularly in the middle and lower reaches of the creek. Cooler waters are also more likely to favor high juvenile growth rates. Instream flow releases can generate physical juvenile rearing habitat, but abundant habitat that is too warm is not viable for steelhead. However, greater stream flow generally produces cooler water temperatures, especially instream flows released from the hypolimnion[5] of reservoirs (McBain and Trush, 2007). Instream flow releases will be an important management tool for extending favorable water temperatures into spring and summer. In addition, as discussed above in Section 14.9.4, under the future cumulative scenario, the proposed improvements at the Sunol quarry pits could improve the contributions to stream flow and underflow of shallow groundwater into Niles Canyon, improving rearing habitat through cool-water thermal buffering.

[5] The bottom portion of a thermally stratified lake or reservoir; water in the hypolimnion is generally cool and has a low oxygen concentration.

Under proposed WSIP operations, peak winter flows of up to 650 cfs would be diverted from Alameda Creek to Calaveras Reservoir through the diversion tunnel. These proposed diversions would not adversely affect summer temperatures or rearing habitat, as no diversions occur during the summer (dry) months. The project revisions described in Section 14.9.1, above, provide detailed discussion of the various strategies for instream flow releases, designed as protective measures for fishery and native stream-dependent biological resources in Alameda Creek. The protective measures include ongoing monitoring and adaptive management of bypass flows such that the SFPUC would modify and adjust flows as needed to address steelhead habitat and life-stage requirements. The ongoing monitoring and adaptation would include operational and flow modifications to address possible climate change effects.

14.10 Master Response on Modified WSIP Alternative

14.10.1 Introduction

Overview

This master response addresses the issues commenters raised on the Modified WSIP Alternative, which was identified in the Draft PEIR as the environmentally superior alternative. Several commenters requested that the Final PEIR further describe and analyze the Draft PEIR's Modified WSIP Alternative. Commenters expressed support for the Modified WSIP Alternative because it would result in fewer impacts on natural resources than the proposed program. This master response is organized by the following subtopics:

14.10.2 Modified WSIP Alternative – Additional Details
14.10.3 Additional Water Conservation/Recycling and the Modified WSIP Alternative
14.10.4 Modified WSIP Alternative – Additional Information on Environmental Impacts

It was apparent from the comments that the Modified WSIP Alternative concept needed clarification. This alternative was devised to avoid the significant adverse impacts on fisheries and terrestrial biological resources in the reach of the Tuolumne River below La Grange Dam that were identified to occur with the WSIP. It incorporates some, but not all, of the mitigation measures that were designed to lessen or eliminate the significant impacts of the WSIP (see Draft PEIR, Vol. 4, Chapter 6). If the Modified WSIP Alternative were to be implemented, mitigation measures would still be needed to avoid significant adverse impacts, as described below in Section 14.10.4.

Commenters

Commenters that addressed this topic include:

Federal Agencies

- None

State Agencies

- California Department of Fish and Game – S_CDFG2
- California State Assembly – S_CSA

Local and Regional Agencies

- Alameda County Water District – L_ACWD
- Bay Area Water Supply and Conservation Agency – L_BAWSCA1, L_BAWSCA2, L_BAWSCA6
- City of Daly City – L_DalyCty
- City of Hillsborough – L_Hillsb
- City of Millbrae – L_Millbr
- City of Palo Alto – L_PaloAlto
- City of Sunnyvale – L_Snnyvl
- Stanford University (BAWSCA member) – L_Stanford

- Tuolumne Utilities District – L_TUD1
- Tuolumne County Board of Supervisors – L_Tuol1
- Alameda County Flood Control and Water Conservation District, Zone 7 – L_Zone7

Groups

- Citizens Advisory Committee to PUC – SI_CAC2
- California Native Plant Society, East Bay Chapter – SI_CNPS-EB1
- Environmental Defense – SI_EnvDef
- Pacific Institute – SI_PacInst
- Restore Hetch Hetchy – SI_RHH1
- San Francisco Planning and Urban Research Association – SI_SPUR
- State Water Contractors – SI_SWC
- Tuolumne River Trust – SI_TRT3

Citizens

- Okuzumi, Margaret – C_Okuzu

PEIR Section Reference

The Draft PEIR addresses this topic area in the following locations: Vol. 1, Summary, Section S.7, pp. S-75, S-77, and S-78; and Vol. 4, Chapter 9, Section 9.2.8, pp. 9-78 to 9-84.

14.10.2 Modified WSIP Alternative – Additional Details

Comment Summary

This section of this master response responds to all or part of the following comments:

S_CDFG2-06	L_BAWSCA6-03	L_Zone7-02
S_CDFG2-07	L_DalyCty-22	SI_EnvDef-03
S_CSA-02	L_Hillsb-04	SI_EnvDef-17
S_CSA-04	L_Millbr-03	SI_PacInst-22
L_BAWSCA1-46	L_PaloAlto-05	SI_PacInst-83
L_BAWSCA1-47	L_Snnyvl-10	SI_SPUR-03
L_BAWSCA1-49	L_Stanford-01	
L_BAWSCA6-02	L_TUD1-04	

Summary of Issues Raised by Commenters

- The PEIR should provide a more detailed description of the Modified WSIP Alternative.

Response

As described in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-78 to 9-82), the Modified WSIP Alternative incorporates changes into the proposed WSIP primarily to modify the proposed water supply and system operations so as to minimize environmental effects on resources in the

Tuolumne River, Alameda Creek, San Mateo Creek, and Pilarcitos Creek watersheds. This alternative incorporates many (but not all) of the mitigation measures identified in the Draft PEIR to reduce potentially significant or significant impacts. It consists of the same facility improvement projects and water supply sources as the WSIP, but would also include additional conservation, water recycling, and local groundwater development and certain system operation modifications that would reduce environmental impacts. The Modified WSIP Alternative would meet 2030 customer purchase requests and achieve all of the WSIP goals and level of service objectives, and its performance would be essentially identical to that of the WSIP based on the drought-year shortages and the amount of rationing that would be required during the design drought (see Table 14.10-3, below).

The Modified WSIP Alternative is similar to the proposed WSIP and would consist of the following elements:

- Water supply sources during all years (nondrought and drought periods):
  - Local supplies from the Peninsula and Alameda Creek watersheds (similar to the WSIP)
  - Tuolumne River (similar to existing conditions)
  - Transfer of water conserved in the TID and MID service areas and/or in the service area of another water agency (not part of the WSIP)
  - Recycled water/groundwater/increased conservation in San Francisco (same as the WSIP)
  - Increased recycled water/conservation/local groundwater in the regional wholesale customer service area (not part of the WSIP)

- Supplemental dry-year water supply sources:
  - Westside Groundwater Basin conjunctive use (same as the WSIP)
  - Dry-year water transfer of conserved water from TID and MID (similar to the WSIP, but with transfer made from conserved water)

- System operations under the Modified WSIP Alternative would be the same as with the WSIP, except for the following additional measures designed to minimize environmental effects:
  - Alameda Creek bypass flows between the Alameda Creek Diversion Dam and the confluence with Calaveras Creek to provide minimum flows for resident trout
  - Modified operations of Pilarcitos facilities to reduce effects on water quality, biological resources, and fisheries
  - Modified operations of Crystal Springs Reservoir to reduce effects on biological resources

Table 14.10-1 presents a comparison of the Modified WSIP Alternative and the proposed program, and updates information on the Modified WSIP Alternative shown in Table 9.5 of the Draft PEIR (Vol. 4, Chapter 9, p. 9-11). As shown in the table, the Modified WSIP Alternative would have essentially the same water supply sources as the proposed program, with the notable

TABLE 14.10-1
(SIMILAR TO DRAFT PEIR TABLE 9.4)
COMPARISON OF PROPOSED PROGRAM AND MODIFIED WSIP ALTERNATIVE

Program Element	Existing Condition	Proposed Program	Modified WSIP Alternative
Planning Year	2005	2030	2030
Target Delivery Level (annual average)	265 mgd	300 mgd	300 mgd
Water Supply Sources (during nondrought and drought periods)	▪ Local watersheds (with Calaveras and Lower Crystal Springs Reservoirs operating at reduced levels based on Division of Safety of Dams restrictions) ▪ Tuolumne River	▪ Local watersheds (with Calaveras and Lower Crystal Springs Reservoirs restored) ▪ Tuolumne River, with increased average annual diversions ▪ Recycled water/groundwater/additional conservation in San Francisco, 10 mgd	▪ Local watersheds (with Calaveras and Lower Crystal Springs Reservoirs restored, but with reduced maximum operating levels for Crystal Springs Reservoir) ▪ Tuolumne River, with increased average annual diversions between Hetch Hetchy and Don Pedro Reservoirs but with no increase in diversions below La Grange Dam ▪ Recycled water/groundwater/additional conservation in San Francisco, 10 mgd ▪ Regional recycled water/groundwater/additional conservation in wholesale service area, 10 mgd ▪ Transfer of conserved water in the TID and MID service area and/or in the service area of another water agency
Supplemental Dry-Year Water Supply Sources (for implementation during drought periods only)	None	▪ Additional Tuolumne River diversions from Turlock and Modesto Irrigation District (TID and MID) transfers of 25 mgd (average over design drought) ▪ Westside Basin conjunctive use, 6 mgd (average over design drought)	▪ Transfer of conserved water from TID and MID (17.5 mgd average over design drought) ▪ Westside Basin conjunctive use, (6 mgd average over design drought)
Maximum Drought Rationing Policy	No defined limit, but assumed incidental rationing of up to 25%	20%	20%
System Firm Yield	219 mgd	256 mgd	248 mgd
WSIP PEIR Facility Improvement Projects	None	All projects	All projects
Other Facility Improvements	None	None	▪ Low-head pumping station and permanent aeration system at Pilarcitos Reservoir ▪ Facilities associated with water conservation project(s) in TID, MID, and/or other water agency service area ▪ Facilities associated with additional water conservation, recycling, and groundwater projects in the wholesale service area
Delivery, Operations, and Maintenance	As described in Chapter 2, Section 2.3 (Vol. 1)	Improved to meet WSIP goals and objectives (as described in Vol. 1, Chapter 3, Section 3.8)	Similar to proposed program but with: bypass flows for resident trout at Alameda Creek Diversion Dam; revised operations at Pilarcitos Reservoir; reduced maximum operating levels in Crystal Springs Reservoir; habitat monitoring and compensation at Pilarcitos Reservoir; and establishing flow criteria, monitoring, and augmenting flows below Stone Dam

TABLE 14.10-1 (Continued)
COMPARISON OF PROPOSED PROGRAM AND MODIFIED WSIP ALTERNATIVE

Program Element	Existing Condition	Proposed Program	Modified WSIP Alternative
Permits, Approvals, and other Decisions/Actions	As described in Chapter 2, Sections 2.4 and 2.5 (Vol. 1)	▪ San Francisco Planning Commission certifies Final PEIR ▪ SFPUC adopts CEQA findings/mitigation monitoring and reporting program and approves and adopts the WSIP ▪ Water transfer agreements with TID and MID ▪ Operating agreements with Daly City, San Bruno, and California Water Service Company for Westside Basin conjunctive-use program ▪ Water sales agreements with retail and wholesale customers (see Vol. 1, Chapter 3, Section 3.13)	Same as proposed program except: ▪ Transfer agreements with TID and MID and/or other water agency for conserved water ▪ Agreements for participation in regional recycled water/ conservation/local groundwater projects that could offset SFPUC supply
Mitigation Measures needed to reduce significant and potentially significant impacts	N/A	▪ All programmatic mitigation measures identified for impacts associated with facility improvement projects (Measures 4.3-2 to 4.17-8) ▪ All mitigation measures identified for water supply and system operations impacts (Measures 5.3.6-4 to 5.6-5)	▪ All programmatic mitigation measures for facility improvement projects (Measures 4.3-2 to 4.17-8) ▪ All mitigation measures identified for water supply and system operations impacts (Measures 5.3.6-4 to 5.6-5), except for the following, which would be incorporated into this alternative: - Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water - Measure 5.3.6-4b, Fishery Habitat Enhancement - Measure 5.3.7-6, Lower Tuolumne River Riparian Habitat Enhancement - Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek - Measure 5.4.5-3b, Alameda Diversion Dam Diversion Restrictions or Fish Screens - Measure 5.5.3-2a, Low-Head Pumping Station at Pilarcitos Reservoir - Measure 5.5.3-2b, Aeration System at Pilarcitos Reservoir - Measure 5.5.3-2c, Habitat Monitoring and Compensation at Pilarcitos Reservoir - Measure 5.5.5-5, Establish Flow Criteria, Monitor and Augment Flow below Stone Dam

difference that the alternative would implement increased levels of conservation and water recycling. Section 14.10.3, below, presents a detailed description of the water conservation and recycling proposed under the Modified WSIP Alternative to supplement water supply sources, including agricultural conservation in the San Joaquin Valley and increased conservation/water recycling/local groundwater projects in the wholesale service area. The additional water conservation and recycling efforts incorporated into the Modified WSIP Alternative would enable the SFPUC to reduce diversions from the Tuolumne River compared to the levels proposed under the WSIP while still achieving all of the WSIP's level of service objectives, including serving customer purchase requests to 2030. As indicated in the table, the Modified WSIP Alternative would incorporate some, but not all, of the mitigation measures identified for the WSIP in the Draft PEIR. This alternative is designed to reduce the water-supply-related impacts of the WSIP, but would still require implementation of many of the same mitigation measures as the proposed program to reduce other identified impacts to a less-than-significant level. As described below in Section 14.10.4, the Modified WSIP Alternative was determined to be the environmentally superior alternative.

The Draft PEIR (Vol. 1, Chapter 3) provides detailed descriptions of the proposed facility improvement projects (pp. 3-48 to 3-72) that would be implemented under both the WSIP and the Modified WSIP Alternative. However, since publication of the Draft PEIR in June 2007, the SFPUC has conducted additional studies that would result in slight modifications to the facility improvement projects and system operations under the Modified WSIP Alternative. These changes would affect Alameda Creek bypass flows, Pilarcitos facilities operations, and Crystal Springs Reservoir operations, as described below.

Facility Improvement Project Updates and Alameda Creek Fishery Releases

As described in Section 13.2, Program Description Changes Affecting System Operations (Vol. 7, Chapter 13), as well as in **Section 14.9, Master Response on Alameda Creek Fishery Issues** (Vol. 7, Chapter 14), the SFPUC modified the project descriptions of the Alameda Creek Fishery Enhancement (SV-1) and Calaveras Dam Replacement (SV-2) projects after publication of the Draft PEIR. These modifications would reduce the environmental impacts on fishery, recreational, and visual resources in the Alameda Creek watershed and would also affect regional system operations. The modifications to the Calaveras Dam project include construction of a new bypass structure at the Alameda Creek Diversion Dam and implementation of releases from this structure to meet the requirements of the 1997 California Department of Fish and Game Memorandum of Understanding when flow is available in Alameda Creek. This proposed measure to implement flow releases at the Alameda Creek Diversion Dam would reduce the effects of the WSIP on resident trout between the diversion dam and the confluence with Calaveras Creek and on recreational and visual resources in the Sunol Regional Wilderness. It would also serve as an interim measure to reduce potential impacts on future-occurring steelhead in Alameda Creek to a less-than-significant level, until such time that the Alameda Watershed Habitat Conservation Plan is completed.

Under both the WSIP and the Modified WSIP Alternative, the SFPUC would incorporate these modifications and implement them as part of the Calaveras Dam Replacement project (SV-2).

The Modified WSIP Alternative would also incorporate the specific requirements included in Mitigation Measure 5.4.5-3a (see Vol. 7, Chapter 16, Section 16.2, Measure 5.4.5-3a, as revised), which call for the SFPUC to conduct the necessary site-specific studies to determine the minimum flow requirements needed to support resident trout spawning and egg incubation, and to implement an operations plan that provides for adaptation of the minimum flows based on the monitoring results and best available scientific information.

Modified Pilarcitos Facilities Operations and Related Measures

As described in the Draft PEIR (Vol. 4, Chapter 9, p. 9-79), the Modified WSIP Alternative incorporates Mitigation Measure 5.5.3-2, Revised Operations Plan for Pilarcitos Watershed Facilities, to avoid impacts on multiple Pilarcitos watershed resources, including water quality, terrestrial biological resources, and fisheries. However, as described in Section 13.3 (Vol. 7, Chapter 13), the SFPUC conducted further analysis and modeling of Pilarcitos facilities subsequent to Draft PEIR publication and determined that this proposed mitigation measure would be technically challenging and that other more practical solutions are available. As a result, multiple substitute mitigation measures have been developed to replace Measure 5.5.3-2 that would reduce the impacts of the WSIP on all resources in the Pilarcitos Creek watershed to a less-than-significant level. The replacement measures are described in Section 13.3 (Vol. 7, Chapter 13) and are presented as revised text in Section 16.2 (Vol. 7, Chapter 16). The replacement/substitute measures for the Pilarcitos watershed consist of the following: Measure 5.5.3-2a, Low-Head Pumping Station at Pilarcitos Reservoir; Measure 5.5.3-2b, Aeration System at Pilarcitos Reservoir; Measure 5.5.3-2c, Habitat Monitoring and Compensation; and Measure 5.5.5-5, Establish Flow Criteria, Monitor and Augment Flow.

Therefore, the Modified WSIP Alternative as currently proposed incorporates these replacement mitigation measures. Under the Modified WSIP Alternative, the SFPUC would:

- Install a permanent low-head pumping station at Pilarcitos Reservoir, which would enable the SFPUC to augment flow in Pilarcitos Creek with water from the reservoir when the WSIP would cause releases from Pilarcitos Reservoir to Pilarcitos Creek to be reduced to reservoir inflow earlier in the summer than would occur under the existing condition—about 25 percent of years in the hydrologic record (see Measure 5.5.3-2a)

- Install a permanent aeration system at Pilarcitos Reservoir, which the SFPUC would operate as necessary to avoid anoxic conditions and maintain good water quality conditions at the reservoir (see Measure 5.5.3-2b)

- Develop and implement an adaptive management plan for managing and maintaining freshwater marsh and other wetlands around the periphery of Pilarcitos Reservoir, and compensate for the reduced productivity and diversity of San Francisco garter snake and California red-legged frog wetland habitat that could occur as a result of the greater variability, extent, and duration of drawdowns at Pilarcitos Reservoir associated with operation of the proposed low-head pumping station (see Measure 5.5.3-2c)

- Develop and implement a monitoring and operations plan for Stone Dam to ensure WSIP-related flow reductions downstream of Stone Dam do not impair steelhead passage and spawning during the winter months of normal and wetter hydrologic years and, if needed, release bypass flows from Stone Dam when flow is available to meet the minimum stream flow for steelhead passage in Pilarcitos Creek in the reach between Stone Dam and Albert Canyon (see Measure 5.5.5-5)

Modified Crystal Springs Reservoir Operations

Since publication of the Draft PEIR, the SFPUC has completed studies on Crystal Springs Reservoir as part of the development of the Lower Crystal Springs Dam Improvements project (PN-4). These studies included topographic LiDAR surveys, detailed review of historical water surface elevations and operating procedures, mapping of existing habitat, and analysis of future conditions under the WSIP and the Modified WSIP Alternative using the Hetch Hetchy/Local Simulation Model (HH/LSM) (SFPUC, 2008; Entrix, 2008). The studies identified the maximum operating water surface elevation and corresponding maximum storage capacity in Crystal Springs Reservoir under various conditions, as shown in **Table 14.10-2**, below:

TABLE 14.10-2
CRYSTAL SPRINGS RESERVOIR WATER SURFACE ELEVATION AND STORAGE CAPACITY

Condition	Maximum Water Surface Elevation (feet, NGVD)	Maximum Storage Capacity (billion gallons)
Existing Condition, with DSOD restrictions imposed since 1982	283.8	18.5
WSIP, proposed program analyzed in the Draft PEIR	291.8	22.2
Modified WSIP Alternative	287.8	20.3

NGVD = National Geodetic Vertical Datum of 1929; DSOD = California Department of Water Resources, Division of Safety of Dams.

SOURCE: SFPUC, 2008.

In determining the maximum operating water surface elevation and corresponding storage capacity under the Modified WSIP Alternative, the SFPUC considered numerous factors that would reduce impacts on biological resources, including existing vegetation, the potential for areas to revegetate with other vegetation/habitat if operating water elevations are raised, and the estimated frequency and duration of various inundation conditions, among others. This revised definition of operating parameters for Crystal Springs Reservoir under the Modified WSIP Alternative would set a maximum water surface elevation for most of the year, below the maximum capacity of the future reservoir, to reduce impacts on various habitats and related biological resources while still allowing the SFPUC to achieve the WSIP level of service objectives. It assumes that proposed system operations would not affect the daily rates of change in water surface elevation (which are based on storms and customer demand) or minimum elevations during drought periods (which are based on supply limitations). The major change in operating assumptions under the WSIP and the Modified WSIP Alternative compared to the existing condition is that Crystal Springs Reservoir would be fuller longer, subject to the maximum water surface elevation and corresponding storage level specified above.

The above assumptions constitute a refinement and improvement of the proposed Crystal Springs Reservoir operations under the Modified WSIP Alternative described in the Draft PEIR, which suggested that the SFPUC could regulate seasonal fluctuations within the maximum reservoir capacity rather than restricting the maximum storage level (Vol. 4, Chapter 9, p. 9-9). The refined operating assumptions for the Modified WSIP Alternative would reduce the magnitude of impacts on biological resources compared to the WSIP, but would not eliminate the impacts, which would remain potentially significant under the Modified WSIP Alternative. Therefore, implementation of the following mitigation measures would still be required to reduce impacts to a less-than-significant level: Measure 5.5.6-1a, Adaptive Management of Freshwater Marsh and Wetlands; Measure 5.5.6-1b, Compensation for Impacts on Terrestrial Biological Resources; and Measure 5.5.6-1c, Compensation for Serpentine Seep-Related Special-Status Plants (Vol. 4, Chapter 6, pp. 6-57 and 6-58). However, these impacts and mitigation measures will be reevaluated in detail at a project level and refined as part of the environmental review of the Lower Crystal Springs Dam Improvements project (PN-4).

14.10.3 Additional Water Conservation/Recycling and the Modified WSIP Alternative

Comment Summary

This section of this master response responds to all or part of the following comments:

S_CDFG2-06
S_CDFG2-07
S_CSA-02
S_CSA-04
L_ACWD-03
L_BAWSCA1-46
L_BAWSCA1-47
L_BAWSCA1-49
L_BAWSCA2-04
L_BAWSCA6-02
L_BAWSCA6-03
L_DalyCty-22
L_Hillsb-04
L_Millbr-03
L_PaloAlto-05
L_Snnyvl-10
L_Stanford-01
L_TUD1-04
L_Tuol1-01
L_Zone7-02
SI_CAC2-03
SI_CNPS-EB1-15
SI_EnvDef-07
SI_EnvDef-10
SI_EnvDef-16
SI_EnvDef-17
SI_PacInst-22
SI_PacInst-83
SI_RHH1-03
SI_SPUR-03
SI_SWC-02
SI_TRT3-04
SI_TRT10-02
C_Okuzu-03

Summary of Issues Raised by Commenters

- The PEIR should provide a more detailed description of how the proposed conserved water transfer from the Turlock Irrigation District (TID) and the Modesto Irrigation District (MID) (i.e., reduction in demand for water from Don Pedro Reservoir) is to be achieved.

- The PEIR should explore the feasibility of increasing agricultural conservation beyond that proposed to develop the conserved water dry-year water transfer element of the WSIP, with the goal of no net decrease in flows released to the lower Tuolumne River or even an increase; this could result in *more* water (a net increase) remaining in Don Pedro Reservoir (and released to the lower Tuolumne) than is currently the case, even after taking the proposed increased diversions for the SFPUC regional system into account. Possible mechanisms to increase agricultural water conservation to be explored include: Bay Area water agencies provide economic incentives and/or financial support to encourage and fund agricultural conservation.

- The PEIR should provide more detail on future water recycling efforts by the wholesale customers.
- The preferred alternative identified in the Draft PEIR (the proposed program) does not maximize water conservation and recycling in lieu of additional water diversions from the Tuolumne River.
- The SFPUC and Bay Area Water Supply and Conservation Agency (BAWSCA) should work together to establish more effective regional conservation and recycling programs.

Response

Proposed Transfer of Conserved Water Included in Modified WSIP Alternative

Under the WSIP, the SFPUC would increase the amount of water it would divert from the Tuolumne River at Hetch Hetchy Reservoir. The increased diversion of water at Hetch Hetchy Reservoir needed to serve increased purchase requests by 2030 would be partially facilitated by a proposed dry-year water transfer from TID and MID to the SFPUC. The dry-year water transfer is included in the WSIP in order to avoid water rationing of more than 20 percent systemwide during a prolonged drought. For more information on the proposed dry-year water transfer, see **Section 14.3, Master Response on Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14).

Because more water would be diverted at Hetch Hetchy Reservoir with the WSIP (including the dry-year transfer), less water would flow down the river between O'Shaughnessy Dam and Don Pedro Reservoir, and inflow to Don Pedro Reservoir would be reduced. Decreased inflow would reduce storage in Don Pedro Reservoir compared to the existing condition. Because storage in Don Pedro Reservoir with the WSIP would be reduced, more of the late spring/early summer snowmelt runoff would be needed to refill the reservoir. As a result, less water would be released to the Tuolumne River below La Grange Dam than is released under the existing condition. Releases would still be in compliance with the Federal Energy Regulatory Commission's minimum required releases, but the HH/LSM results indicate that minimum releases would be made in 734 months of the 984-month hydrologic record with the WSIP compared to 717 months under the existing condition. The reduction in late spring/early summer releases attributable to the WSIP would have significant adverse impacts on fisheries and terrestrial biological resources in the reach of the river below La Grange Dam, as described in the Draft PEIR (Vol. 3, Chapter 5, Sections 5.3.6 and 5.3.7).

Draft PEIR Mitigation Measure 5.3.6-4a describes a "conserved water transfer" (Vol. 4, Chapter 6, p. 6-48) to reduce the impacts of the WSIP on fisheries and terrestrial biological resources in the Tuolumne River below La Grange Dam to a less-than-significant level. Measure 5.3.6-4a would involve a water transfer from TID/MID and/or another water agency to the SFPUC, in a manner similar to the dry-year water transfer that is already part of the WSIP. The water for Measure 5.3.6-4a would be developed through conservation in the service areas of TID, MID, and/or another water agency. In this context, conservation could include water savings achieved through altered irrigation methods or planting of less water-intensive crops; improved delivery efficiency; an interagency transfer of conserved water; or use of an alternative supply such as groundwater. Measure 5.3.6-4a was incorporated into the Modified WSIP Alternative, as described in Chapter 9 of the Draft PEIR (Vol. 4, pp. 9-78 to 9-81), but with the condition that the water for the mitigation measure would be developed through conservation only. Unlike Measure 5.3.6-4a, this alternative would not include as an option the use of alternative water sources.

As described in the Draft PEIR (Vol. 1, Chapter 3, pp. 3-36 to 3-39), and expanded upon in **Section 14.3, Master Response on Proposed Dry-Year Water Transfer** (Vol. 7, Chapter 14), the dry-year transfer would be made between TID/MID and the SFPUC. The conserved water transfer included in Measure 5.3.6-4a and the Modified WSIP Alternative differs from the dry-year transfer in that it could be made between TID/MID and the SFPUC or between another water agency and the SFPUC. From a practical standpoint, only a water agency in reasonable proximity to the TID and MID service areas could serve as the source of the conserved water transfer to the SFPUC. The Modified WSIP Alternative, incorporating Measure 5.3.6-4a with water developed through conservation only, would result in less-than-significant adverse impacts on fisheries and terrestrial biological resources in the Tuolumne River below La Grange Dam because it would have little effect on storage in Don Pedro Reservoir compared to the existing condition. Storage in Don Pedro Reservoir with the Modified WSIP Alternative would be similar to storage under the existing condition, and, consequently, releases to the river from La Grange Dam with the Modified WSIP Alternative would be similar to those under the existing condition. Under the Modified WSIP Alternative, the WSIP-caused reduction in inflow to Don Pedro Reservoir would be offset by a reduction in Don Pedro Reservoir outflow, thus maintaining storage in the reservoir at close to the existing condition. Outflow from the reservoir (i.e., water diverted to the Modesto and Turlock Canals) would be reduced through conservation in the TID and MID service areas, or in the service areas of neighboring irrigation districts. The conserved water would be transferred to the SFPUC.

If the source of the conserved water transfer were to be TID and MID, those agencies would conserve water in their service areas and transfer the conserved water directly to the SFPUC. If the source of the conserved water transfer were to be an agency other than TID and MID, the transfer would still involve TID and MID and would occur as follows. The transferring agency would reduce water use in its service area by implementing conservation measures and would transfer the conserved water to TID and MID. TID and MID would use the conserved water in their service areas, thereby reducing the need to divert water from the Tuolumne River. The reduction in diversions of Tuolumne River water by TID and MID, and the consequent reduction in outflow from Don Pedro Reservoir, would offset the reduction in inflow to the reservoir produced by the SFPUC's increased diversions from the Tuolumne River at Hetch Hetchy Reservoir. As noted in the Draft PEIR, the details of the proposed water transfers have not been developed, and no agreements have been made with MID/TID or another water agency with respect to the transfers. The proposed water transfers could themselves have environmental impacts and may need additional environmental review, as described in the Draft PEIR (Vol. 4, Chapter 6, p. 6-63) and Section 14.10.4 of this master response, once the details of such transfers are known.

A commenter on the Draft PEIR, BAWSCA, supports the conserved water transfer concept but notes that decisions regarding crop choice and irrigation water pricing are the responsibility of the irrigation districts and their members. Furthermore, BAWSCA states that it does not support the fallowing of land as a means of water conservation. The San Francisco Planning Department acknowledges the views expressed by BAWSCA. The SFPUC intends to work with TID, MID, and/or other water agencies to develop a transfer of conserved water that is acceptable to all parties to the transfer. Any conserved water transfer agreement is likely to involve the implementation of water conservation measures selected and implemented by the transferring agency and paid for by the SFPUC and the wholesale customers. BAWSCA has expressed its willingness to contribute to the cost of agricultural water conservation measures that reduce environmental impacts on the Tuolumne River.

Many experts believe that water could be used more efficiently in California's cities and agricultural areas, and that it would be if appropriate financial incentives were provided. (See the comment letter from BAWSCA dated February 21, 2008 and the attached materials authored by Professor Brent Haddad, Director of the Center for Integrated Water Research at the University of California, and Peter Gleick, President of the Pacific Institute [Vol. 8, **Appendix M**].) Even without financial incentives, farmers in California are slowly but consistently moving toward more efficient irrigation methods. For example, data from surveys conducted by the California Department of Water Resources indicate that the percentage of land in California irrigated by the more efficient methods—sprinkler and drip/micro irrigation—increased from about 20 percent in the early 1970s to 50 percent in 2000.

The adoption of more efficient irrigation methods could be accelerated through the provision of appropriate financial incentives. Currently, TID and MID divert an average of 867,000 acre-feet of water annually from the Tuolumne River at La Grange Dam. If the SFPUC and TID/MID agreed to a conserved water transfer, TID and MID would only have to increase their water use efficiency slightly to offset the effects of the Modified WSIP Alternative. With appropriate financial incentives, it is assumed that additional agricultural water conservation and improvements in water use efficiency on this scale in the service areas of TID, MID, and/or other water agencies would be feasible.

It should be noted that the Modified WSIP Alternative would lessen but not entirely eliminate the impacts of the WSIP on flow, fisheries, and terrestrial biological resources in the Tuolumne River below La Grange Dam. With the conserved water transfer, average annual releases to the river below La Grange Dam would increase slightly with the Modified WSIP Alternative compared to the existing condition, which would be marginally beneficial for fisheries and terrestrial biological resources. With the Modified WSIP Alternative, there would still be occasional delays in the late spring/early summer releases from La Grange Dam (those releases in excess of minimum requirements), but the magnitude and frequency of the delays would be much less than with the WSIP. The delays would not be completely eliminated under the Modified WSIP Alternative because the timing of changes in Don Pedro Reservoir inflow attributable to increased water demand could not be perfectly matched with the timing of changes in reservoir outflow attributable to the conserved water transfer. Nevertheless, the impacts of the occasional delays in spring releases on fisheries and terrestrial biological resources that would occur under the

Modified WSIP Alternative would be reduced to a less-than-significant level with implementation of the conserved water transfer.

The conserved water transfer that is a part of the Modified WSIP Alternative could have an indirect effect on surface and groundwater resources in the lower Tuolumne River watershed and neighboring watersheds, as noted in the Draft PEIR (Vol. 4, Chapter 6, p. 6-64). Conservation measures and measures to improve the efficiency of agricultural water use could reduce groundwater recharge and the volume of irrigation tailwater discharges to surface streams. The environmental effects of the measures would depend on their nature and location, but would be expected to be relatively minor because any reductions in groundwater recharge or tailwater discharge would be small compared to total groundwater storage capacity or river flow.

Water Conservation in Agricultural Areas Beyond that Included in the Modified WSIP Alternative

BAWSCA and some of its member agencies have proposed the implementation of additional agricultural water conservation beyond that included in the Modified WSIP Alternative. According to these proposals, the water saved would accumulate in Don Pedro Reservoir and could be used to increase flows in the Tuolumne River below La Grange Dam or could be conveyed to water users in the Bay Area via a water exchange agreement with TID and MID. The SFPUC regards any project intended to increase agricultural water conservation beyond the level needed to reduce the impacts of the WSIP to a less-than-significant level to be separate from the WSIP. If the Modified WSIP Alternative is selected as the preferred course of action, the SFPUC would work with TID, MID, or another water agency to develop the transfer of conserved water that is included in the Modified WSIP Alternative. BAWSCA could choose to pursue a separate agricultural water conservation project to augment this transfer, but if the SFPUC were to participate in the project, it would be considered a distinct action from the WSIP or any alternative/variant of the WSIP.

Increased Conservation, Water Recycling, and Local Groundwater Use by Wholesale Customers Included in the Modified WSIP Alternative

The WSIP would increase the average annual diversion of water from the Tuolumne River by 24 million gallons per day (mgd) compared to the existing condition, based on updated HH/LSM results (see **Table 14.10-3**). The Modified WSIP Alternative includes features that would both increase and decrease average annual diversions of water from the Tuolumne River compared to the WSIP, but would result in a net reduced level of Tuolumne River diversions compared to the proposed program. The components of the Modified WSIP Alternative that would increase average annual diversions include the measures to lessen the impacts of the WSIP on natural resources in the Alameda Creek and Peninsula watersheds. They include the release of water from the diversion dam on Alameda Creek to support resident trout, modified operations in the Pilarcitos Creek watershed, and restrictions on the use of storage in Crystal Springs Reservoir. Implementation of these measures would reduce the amount of water available to the regional system from the Alameda Creek and Peninsula watersheds by an annual average of 1 mgd. In order to meet its level of service goals under the Modified WSIP Alternative, the SFPUC would have to increase diversions from the Tuolumne River by an annual average of about 1 mgd compared to the WSIP to compensate for the loss of water from the local watersheds.

TABLE 14.10-3
(SIMILAR TO DRAFT PEIR TABLE 9.5)
AVERAGE ANNUAL TUOLUMNE RIVER DIVERSIONS AND DROUGHT-YEAR SHORTAGES FOR THE MODIFIED WSIP ALTERNATIVE[a]

Scenario	Estimated Tuolumne River Diversions Over the 82-Year Period of Hydrologic Record[b]		Drought-Year Shortages Based on 82-Year Period of Hydrologic Record				Drought-Year Shortages During Design Drought (8.5 years)		
	Average Annual Increase by the SFPUC (mgd)	Average Annual Diversions by the SFPUC (mgd)	Years of Shortages (10% Shortage)	Years of Shortages (20% Shortage)	Years of Shortages >20% Shortage)	No. of Years Drought-Year Supplies Triggered	Years of Shortages (10% Shortage)	Years of Shortages (20% Shortage)	Years of Shortages (25% to 30% Shortage)
Existing Conditions	N/A	221	6 out of 82 (1 in 14 years)	8 out of 82 (1 in 10 years)	None	N/A	1	5	1.5
Proposed Program (WSIP)	24	245	6 out of 82 (1 in 14 years)	2 out of 82 (1 in 41 years)	None	24	3	3.5	None
Modified WSIP Alternative, between Hetch Hetchy and Don Pedro Reservoirs	15	236	6 out of 82 (1 in 14 years)	2 out of 82 (1 in 41 years)	None	23	3	3.5	None
Modified WSIP Alternative, below La Grange Dam	0	221[c]	6 out of 82 (1 in 14 years)	2 out of 82 (1 in 41 years)	None	23	3	3.5	None

[a] Results from the 2008 HH/LSM analysis using updated and refined model input assumptions. The numbers are not directly comparable to those in Draft PEIR Table 9.5, which are based on the 2007 HH/LSM analysis.
[b] Diversion levels represent the average annual amount modeled over the 82-year historical hydrology, but do not represent year-to-year variation in diversions. Thus, even with a zero average annual increase in diversions, there would still be year-to-year variations in diversions compared to the existing condition, due primarily to modified system operations for maintenance and implementation of the conjunctive-use program.
[c] This represents the net effect of SFPUC diversions below La Grange Dam with conserved water transfers implemented.

The components of the Modified WSIP Alternative that would decrease average annual diversions include increased local water conservation, recycling, and groundwater use within the wholesale customer service area of 5 to 10 mgd compared to the WSIP (see Draft PEIR, Vol. 4, Chapter 9, p. 9-80). Studies completed by BAWSCA and the SFPUC indicate that opportunities exist to develop more water conservation, recycling, and groundwater projects within the wholesale customers' service areas than were reflected in the purchase request estimates for the WSIP (Vol. 4, Chapter 9, pp. 9-47 to 9-59). These projects alone would not meet the full projected wholesale customer need for additional water delivery in 2030, but they could meet more of the demand than was assumed in the Draft PEIR.

Increasing local conservation, water recycling, and groundwater use within the wholesale customer service area by 5 to 10 mgd under the Modified WSIP Alternative would decrease the SFPUC's diversion of water from the Tuolumne River by an annual average of 5 to 10 mgd compared to the WSIP. As noted above, the mitigation measures in the Alameda and Peninsula watersheds that are part of the Modified WSIP Alternative would increase the SFPUC's diversion of water from the Tuolumne River by an annual average of 1 mgd compared to the WSIP. Thus, the reduction in diversions associated with additional local conservation, water recycling, and groundwater use would more than offset the increase in diversions attributable to the mitigation measures in the Alameda and Peninsula watersheds.

Modeling performed for the Modified WSIP Alternative—assuming an additional 10 mgd of regional water conservation, recycling, and groundwater use—indicates that the SFPUC's diversion of water from the Tuolumne River at Hetch Hetchy Reservoir would be reduced by an annual average of 9 mgd compared to the WSIP. As shown in Table 14.10-3, the SFPUC's annual average diversion of water from the Tuolumne River at Hetch Hetchy Reservoir under the existing condition is 221 mgd. Annual diversions would average 245 mgd with the WSIP and 236 mgd with the Modified WSIP Alternative. Flow in the Tuolumne River below O'Shaughnessy Dam would be reduced under the Modified WSIP Alternative, but to a lesser extent than under the WSIP.

As described above, the Modified WSIP Alternative includes a transfer of conserved water, which on balance would offset the effects of the SFPUC's increased diversion of water from the Tuolumne River at Hetch Hetchy Reservoir in the reach of the river below La Grange Dam. With the Modified WSIP Alternative, annual average releases from La Grange Dam would be greater than under the WSIP and similar to those made under the existing condition. The environmental effects of the Modified WSIP Alternative on fisheries and terrestrial biological resources in the reach of the river below La Grange Dam would be much less than those of the WSIP.

BAWSCA supports additional conservation, water recycling, and groundwater use within the wholesale customer service area as part of the Modified WSIP Alternative (see Comment L_BAWSCA1-51, Vol. 6, Chapter 12, Section 12.3). In March 2008, the BAWSCA Board of Directors authorized a study of additional water conservation, recycling, and groundwater use opportunities within its service area, and in July 2008, BAWSCA released a Request for Proposals for preparation of a water conservation/recycling implementation plan. Building on the work presented in the *Investigation of Regional Water Supply Option No. 4 Technical*

Memorandum (SFPUC, 2007, Appendix D), this current effort is expected to provide more detailed information about specific near-term projects that BAWSCA and its member agencies can pursue to develop additional local supplies and/or offset demand with conservation and/or water recycling.

14.10.4 Modified WSIP Alternative – Additional Information on Environmental Impacts

Comment Summary

This section of this master response responds to all or part of the following comments:

S_CDFG2-06	L_BAWSCA6-02	L_Stanford-01
S_CDFG2-07	L_BAWSCA6-03	L_TUD1-04
S_CSA-02	L_DalyCty-22	L_Zone7-02
S_CSA-04	L_Hillsb-04	SI_EnvDef-17
L_BAWSCA1-46	L_Millbr-03	SI_PacInst-22
L_BAWSCA1-47	L_PaloAlto-05	SI_PacInst-83
L_BAWSCA1-49	L_Snnyvl-10	SI_SPUR-03

Summary of Issues Raised by Commenters

- The PEIR should further analyze the Modified WSIP Alternative.
- The PEIR should more fully explore the environmentally superior alternative.

Response

The Draft PEIR includes a qualitative/comparative assessment of the environmental impacts of the Modified WSIP Alternative compared to those of the WSIP (Vol. 4, Chapter 9, pp. 9-82 to 9-84). Since publication of the Draft PEIR, the SFPUC has conducted a review of the Modified WSIP Alternative and has refined the assumptions for measures included in it, as described above in Sections 14.10.2 and 14.10.3. This section provides further discussion and analysis of the environmental impacts of the Modified WSIP Alternative, including the results of additional HH/LSM modeling. The impacts of this alternative on resources in the Tuolumne River, Alameda Creek, and Peninsula watersheds are summarized in **Tables 14.10-4**, **14.10-5,** and **14.10-6**; the tables include only those impacts that were determined to be significant or potentially significant under the WSIP, and present a comparison of those impacts between the WSIP and the Modified WSIP Alternative. The impacts of the Modified WSIP Alternative are discussed below under three categories: facility impacts, supply and system operations impacts, and growth-inducement impacts.

Facility Impacts

The environmental impacts of the facility improvement projects proposed under the Modified WSIP Alternative would be the same as those of the WSIP, as described in the Draft PEIR (Vol. 2, Chapter 4), and the same mitigation measures identified for the WSIP's impacts would also apply

TABLE 14.10-4
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP AND MODIFIED WSIP ALTERNATIVE
TUOLUMNE RIVER WATERSHED

Impact	Impact Description	Proposed Program	Modified WSIP Alternative
Section 5.3.6, Fisheries			
Impact 5.3.6-4: Effects on fishery resources along the Tuolumne River below La Grange Dam.			
	In wet or above-normal years when Don Pedro Reservoir is being filled, changes in the timing and duration of releases from the reservoir would decrease average monthly flows along the lower Tuolumne River beneath La Grange Dam. The greatest average flow reductions would occur during June and could result in elevated water temperatures. Changes in stream flow and water temperature would result in a reduction in the linear extent of suitable habitat for rearing Chinook salmon and oversummering steelhead/rainbow trout, potentially causing adverse affects on these fish populations in the lower Tuolumne River.	PSM	Similar to but much less than proposed program (LS) due to conserved water transfer
Section 5.3.7, Terrestrial Biological Resources			
Impact 5.3.7-2: Impacts on meadow/alluvial features along the Tuolumne River below O'Shaughnessy Dam.			
▪ Sensitive habitats	Delayed snowmelt releases, reductions in flow, and the resulting reduction in groundwater recharge would result in an incremental reduction in the extent and diversity of wetland and riparian habitats, including sensitive wetland and riparian habitats in the Poopenaut Valley.	PSM	Similar to but slightly less than proposed program (PSM)
▪ Key special-status species	A reduction in wetland and riparian habitat would reduce suitable breeding habitat for key special-status species potentially occurring along this reach (e.g., foothill yellow-legged frog, California red-legged frog, and willow flycatcher), the populations of which are already critically reduced in the Sierra Nevada.	PSM	Similar to but slightly less than proposed program (PSM)
▪ Other species of concern	A reduction in the extent and diversity of wetland and riparian habitats would reduce habitat quality and extent for animal and plant species of concern.	PSM	Similar to but slightly less than proposed program (PSM)
▪ Common habitats and species	All habitats affected by the WSIP are considered sensitive. The WSIP could affect a large number of common animal species that depend on sensitive meadows and larger riparian areas for food and cover.	PSM	Similar to but slightly less than proposed program (PSM)
Impact 5.3.7-6: Impacts on biological resources along the Tuolumne River below La Grange Dam.			
▪ Sensitive habitats	Delayed spring releases and reductions in average and total flow (particularly during and following an extended drought) below La Grange Dam would reduce or eliminate suitable conditions for the recruitment of some riparian species along the river.	PSM	Similar to but much less than proposed program (LS) due to conserved water transfer

TABLE 14.10-4 (Continued)
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP AND MODIFIED WSIP ALTERNATIVE
TUOLUMNE RIVER WATERSHED

Impact	Impact Description	Proposed Program	Modified WSIP Alternative
Section 5.3.7, Terrestrial Biological Resources (cont.)			
▪ Key special-status species	Because of the known presence of key special-status species and the very limited amount of remaining suitable habitat along this reach of the Tuolumne River, this incremental impact would be potentially significant.	PSM	Similar to but much less than proposed program (LS) due to conserved water transfer
▪ Other species of concern	Species of concern that would be adversely affected by changes in the extent and quality of suitable riparian habitat include western pond turtle, several bat species, and a wide variety of riparian- and marsh-associated bird species.	PSM	Similar to but much less than proposed program (LS) due to conserved water transfer
▪ Common habitats and species	The populations of common species that depend on riparian habitat could be adversely affected by the alteration of habitat.	PSM	Similar to but much less than proposed program (LS) due to conserved water transfer

LS = Less than Significant, no mitigation required
SM or PSM = Significant or Potentially Significant, can be Mitigated to less than significant
SU or PSU = Significant Unavoidable or Potentially Significant Unavoidable, cannot be mitigated to less than significant

TABLE 14.10-5
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP AND MODIFIED WSIP ALTERNATIVE
ALAMEDA CREEK WATERSHED

Impact	Impact Description	WSIP	Modified WSIP Alternative
Section 5.4.1, Stream Flow and Reservoir Water Levels			
Impact 5.4.1-2: Effects on flow along Alameda Creek below the diversion dam.			
	In all year types, system operations under the WSIP would increase diversions from Alameda Creek to Calaveras Reservoir between the months of December and May, nearly eliminating low and moderate (1 to 650 cubic feet per second) flows in Alameda Creek downstream of the diversion dam and substantially reducing many higher (greater than 650 cubic feet per second) flows that have occurred since 2002. The resultant reduction in stream flows and alteration of the stream hydrograph is considered an adverse effect.	SU	Similar to proposed program (SU)
Section 5.4.5, Fisheries			
Impact 5.4.5-3: Effects on fishery resources.			
	Following implementation of the Calaveras Dam Replacement project (SV-2), operation of Calaveras Reservoir and the Alameda Creek Diversion Dam would be restored to pre-2002 conditions. A substantial increase in diversions from Alameda Creek to Calaveras Reservoir would reduce flows in this stretch of the creek, despite proposed bypass flows at the diversion dam. Diversion of most or all flows during late winter and spring months would reduce the ability of resident rainbow trout to spawn and for eggs to incubate; additional monitoring would be needed to determine the effectiveness of proposed bypass flows. In addition, the increased diversion of flows to the reservoir would divert fish from Alameda Creek to the reservoir, prevent fish passage to downstream reaches of the creek, and increase the potential for fish entrainment since there are currently no screens on the diversion.	PSM	Much less than proposed program (LS) due to bypass flows for resident trout from Alameda Creek Diversion Dam
Section 5.4.6, Terrestrial Biological Resources			
Impact 5.4.6-1: Impacts on riparian habitat and related biological resources in Calaveras Reservoir.			
▪ Sensitive habitats	Increased reservoir storage elevations would result in inundation and permanent loss of seasonal wetlands, seeps, perennial freshwater marsh, and riparian habitat that have established since 2002.	PSM	Same as proposed program (PSM)
▪ Key special-status species	Since 2002, foothill yellow-legged frogs have occupied approximately 10,000 linear feet of stream channel along Arroyo Hondo between the maximum reservoir elevation mandated by the Division of Safety of Dams and the spillway elevation. Higher maintained reservoir levels would reduce the length of this high-quality habitat along the creek and adversely affect existing populations of foothill yellow-legged frog.	PSM	Same as proposed program (PSM)
Impact 5.4.6-2: Effects on riparian habitat and related biological resources along Alameda Creek from below the diversion dam to the confluence with Calaveras Creek.			
▪ Key special-status species	A reduction in the frequency, duration, and magnitude of flows below the diversion dam would reduce the total available aquatic breeding habitat and food sources for California red-legged frog and foothill yellow-legged frog populations that currently occupy this reach of Alameda Creek.	PSM	Much less than proposed program (LS) due to bypass flows for resident trout from Alameda Creek Diversion Dam

TABLE 14.10-5 (Continued)
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP AND MODIFIED WSIP ALTERNATIVE
ALAMEDA CREEK WATERSHED

Impact	Impact Description	WSIP	Modified WSIP Alternative
Section 5.4.6, Terrestrial Biological Resources (cont.)			
Impact 5.4.6-3: Effects on riparian habitat and related biological resources along Calaveras Creek from Calaveras Reservoir to the confluence with Alameda Creek.			
▪ Key special-status species	Future outlet works at Calaveras Dam would have the capacity to make higher volume releases than under existing conditions. Depending on the timing and volume of operational releases, they could adversely affect the reproductive success of special-status amphibian species along this reach (e.g., California red-legged frog and foothill yellow-legged frog).	PSM	Similar to proposed program (PSM)
Impact 5.4.6-4: Effects on riparian habitat and related biological resources along Alameda Creek from Calaveras Creek to San Antonio Creek.			
▪ Key special-status species	Depending on annual rainfall and localized site conditions along this creek segment, changes in winter and summer flows along this reach could result in both beneficial and adverse impacts on habitat for California red-legged frog and foothill yellow-legged frog populations.	PSM	Similar to proposed program (PSM)
Section 5.4.7, Recreational and Visual Resources			
Impact 5.4.7-1: Effects on recreation.			
	Operations under the WSIP would substantially reduce flows along Alameda Creek in the Sunol Regional Wilderness during winter and early spring months and adversely affect the recreational experience for hikers. *(Note: The Draft PEIR determined this impact to be PSM, but due to the change in the project description of the Calaveras Dam Replacement project (SV-2), this impact determination is revised to LS.)*	LS	Same as proposed program (LS)
Impact 5.4.7-2: Visual effects.			
	WSIP-induced reductions in stream flows along Alameda Creek would substantially change the quality of visual resources in the Sunol Regional Wilderness. *(Note: The Draft PEIR determined this impact to be PSM, but due to the change in the project description of the Calaveras Dam Replacement project (SV-2), this impact determination is revised to LS.)*	LS	Same as proposed program (LS)

LS = Less than Significant, no mitigation required
SM or PSM = Significant or Potentially Significant, can be Mitigated to less than significant
SU or PSU = Significant Unavoidable or Potentially Significant Unavoidable, cannot be mitigated to less than significant

TABLE 14.10-6
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP AND MODIFIED WSIP ALTERNATIVE
PENINSULA WATERSHED

Impact	Impact Description	WSIP	Modified WSIP Alternative
Section 5.5.3, Surface Water Quality			
Impact 5.5.3-2: Water quality in Pilarcitos Reservoir and along Pilarcitos Creek.			
	Proposed operations would generally be within the same range as existing conditions, although replacement Measure 5.5.3-2a would cause Pilarcitos Reservoir to be drawn down earlier in the summer compared to existing conditions. Water temperature could increase and dissolved oxygen could be reduced. *(Note: The Draft PEIR determined this impact to be PSM, and with the refined impact analysis for the Pilarcitos Creek watershed, implementation of a replacement mitigation measure would result in this impact determination remaining PSM.)*	PSM	Effects offset by aeration system (LS)
	During dry years, summertime releases from Pilarcitos Reservoir to Pilarcitos Creek would be reduced to reservoir inflow at an earlier date than they are under the existing condition. This would increase the temperature of instream flows between Pilarcitos Creek and Stone Dam and reduce the creek's ability to support designated cold freshwater habitat along this reach.	PSM	Similar to existing condition (LS) due to releases from low-head pump station
	During wet and above-normal years, the volume of spills over Stone Dam would be reduced compared to the existing condition.	LS	Similar to proposed program (LS)
Section 5.5.5, Fisheries			
Impact 5.5.5-1: Effects on fishery resources in Crystal Springs Reservoir.			
	Elevated water levels in Crystal Springs Reservoir would inundate approximately 1,500 linear feet of trout spawning habitat upstream of the reservoir along Laguna and San Mateo Creeks.	PSU	Similar to but less than proposed program (PSU)
Impact 5.5.5-4: Effects on fisheries resources in Pilarcitos Reservoir.			
	Proposed operations would be within the same range as existing conditions, although replacement Measure 5.5.3-2a would cause Pilarcitos Reservoir to be drawn down earlier in the summer compared to existing conditions. This would reduce the volume and quality of coldwater habitat available for resident fish species. *(Note: The Draft PEIR determined this impact to be PSM, and with the refined impact analysis for the Pilarcitos Creek watershed, implementation of a replacement mitigation measure would result in this impact determination remaining PSM.)*	PSM	Effects offset by aeration system (LS)
Impact 5.5.5-5: Effects on fisheries resources along Pilarcitos Creek below Pilarcitos Reservoir.			
	Under the WSIP, the extended period of no or very little flow in Pilarcitos Creek below Pilarcitos Reservoir during summer months of dry years would result in significant impacts on resident trout, other resident fish species and aquatic resources, and habitat quality and availability for anadromous steelhead. Increased drawdown of Pilarcitos Reservoir would increase the temperature of releases in summer and fall and reduce the quality and availability of habitat for coldwater fish species.	PSM	Similar to existing condition (LS) due to releases from low-head pump station
	A reduction in the frequency and magnitude of spills over Stone Dam would reduce flows along the lower reach. Reduced instream flows during winter months would adversely affect migratory fish habitat.	PSM	Similar to proposed program (PSM)

TABLE 14.10-6 (Continued)
SUMMARY OF SIGNIFICANT WATER SUPPLY AND SYSTEM OPERATIONS IMPACTS FOR THE WSIP AND MODIFIED WSIP ALTERNATIVE PENINSULA WATERSHED

Impact	Impact Description	WSIP	Modified WSIP Alternative
Section 5.5.6, Terrestrial Biological Resources			
Impact 5.5.6-1: Impacts on biological resources in Upper and Lower Crystal Springs Reservoirs.			
▪ Sensitive Habitats	Implementation of the Lower Crystal Springs Dam Improvements project (PN-4) would raise average monthly water levels in Crystal Springs Reservoir and result in a short-term reduction in the overall extent of freshwater marsh as the reservoir fills. Proposed changes in operations would maintain maximum reservoir levels during summer for longer periods than under existing conditions, which could affect the composition and structure of riparian habitats. In addition, sensitive upland habitats that are unable to tolerate these longer periods of inundation would be lost.	PSM	Similar to but less than proposed program (PSM)
▪ Key special-status species	Elevated reservoir levels would inundate existing populations of special-status plant species, including serpentine-associated fountain thistle and Marin western flax, and their habitat could be permanently lost. The extent of available habitat for San Francisco garter snake and California red-legged frog would be temporarily reduced during reservoir refill, but wetland habitat that would establish at higher elevations could be more extensive. Raised reservoir levels would provide greater opportunities for largemouth bass and other predators to access frogs and snakes. Periodic drawdown during planned maintenance could adversely affect San Francisco garter snake foraging habitat.	PSM	Similar to but less than proposed program (PSM)
▪ Other species of concern	Changes in wetland habitat due to reservoir refill and proposed operations would adversely affect reptile and bird species of concern, particularly if permanent changes in the composition of wetland vegetation occur. Permanent loss of upland habitat, including upland trees, grassland, and coastal scrub, would result in significant impacts on several bird and mammal species of concern. Serpentine- and grassland-associated plant species unable to tolerate extended periods of inundation would be lost.	PSM	Similar to but less than proposed program (PSM)
▪ Common Habitats and species	Due to the extent of area involved, impacts on common habitats and species would be significant.	PSM	Similar to but less than proposed program (PSM)
Impact 5.5.6-4: Impacts on biological resources in Pilarcitos Reservoir.			
▪ Key special-status species	Proposed operations would be within the same range as existing conditions, although replacement Measure 5.5.3-2a would cause Pilarcitos Reservoir to be drawn down earlier in the summer compared to existing conditions. This would affect the extent of suitable habitat for California red-legged frog and San Francisco garter snake. Special-status species that utilize adjacent upland vegetation would not be affected. *(Note: The Draft PEIR determined this impact to be PSM, and with the refined impact analysis for the Pilarcitos Creek watershed, implementation of a replacement mitigation measure would result in this impact determination remaining PSM.)*	PSM	Effects offset by monitoring and compensation program (LS)
Impact 5.5.6-5: Impacts on biological resources along Pilarcitos Creek.			
▪ Sensitive habitats	In summer months of dry years, an extended period of no or little flow in Pilarcitos Creek between Pilarcitos Reservoir and Stone Dam could stress riparian vegetation, but existing vegetation appears to be adapted to periods of dryness. *(Note: The Draft PEIR determined this impact to be PSM, but due to the refined impact analysis for the Pilarcitos Creek watershed, this impact determination is revised to LS.)*	LS	Similar to existing condition (LS)

LS = Less than Significant, no mitigation required
SM or PSM = Significant or Potentially Significant, can be Mitigated to less than significant
SU or PSU = Significant Unavoidable or Potentially Significant Unavoidable, cannot be mitigated to less than significant

to the Modified WSIP Alternative. However, the Modified WSIP Alternative would include some additional facilities that could have environmental impacts in addition to those identified for the WSIP, as shown in Table 14.10-1, above. New or modified water management facilities in the service areas of TID, MID, or another water agency would likely be needed to enable the conserved water transfer that is part of the Modified WSIP Alternative. New or modified facilities might include sprinkler and drip irrigation systems, tailwater recycling systems, and lined canals. Under the Modified WSIP Alternative, the increased conservation, water recycling, and groundwater use in the wholesale customer service area could require the construction of new facilities such as wastewater reclamation plants and groundwater wells and associated pipelines and transmission facilities (Vol. 4, Chapter 9, pp. 9-35 and 9-93). These facilities would be subject to separate CEQA review; however, in general, it is expected that these facilities would be constructed in previously disturbed areas (within either agricultural or urban lands) and that all construction and operational impacts could be mitigated to a less-than-significant level.

Supply and System Operations Impacts

After publication of the Draft PEIR, the SFPUC conducted updated and refined water supply modeling using the HH/LSM, and quantitative data became available to allow a more detailed analysis of the potential impacts of the Modified WSIP Alternative than the qualitative assessment presented in the Draft PEIR. As described in Section 13.3 (Vol. 7, Chapter 13), the updated HH/LSM results included refinements in the input assumptions, so data from the updated analyses are not always directly comparable to the HH/LSM results presented in the Draft PEIR. However, the updated model results enable a direct comparison of the effects of the WSIP and the Modified WSIP Alternative to those under the existing condition. **Appendix O** (Vol. 8) provides supporting information on the updated HH/LSM assumptions and results for the WSIP and Modified WSIP Alternative.

Tuolumne Watershed Impacts

As shown in Table 14.10-3, diversions from the Tuolumne River at Hetch Hetchy Reservoir under the Modified WSIP Alternative would increase by an annual average of 15 mgd compared to the existing condition. This amount is 9 mgd less than would occur with the WSIP. The reduction in flow in the upper Tuolumne River below Hetch Hetchy Reservoir as a result of increased diversions by the SFPUC would manifest itself as a delay in the spring releases from Hetch Hetchy Reservoir. As described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.7-21 and 5.3.7-22), the delay in the spring releases from Hetch Hetchy Reservoir attributable to the WSIP would have a significant adverse impact on terrestrial biological resources in the streamside meadows and riparian corridor downstream of O'Shaughnessy Dam. Although the delay would be less with the Modified WSIP Alternative than with the WSIP, it would still have a potentially significant adverse effect on terrestrial biological resources in the Poopenaut Valley downstream of the dam; the same mitigation measure, Measure 5.3.7-2, Controlled Releases to Recharge Groundwater in Streamside Meadows, would reduce this impact to a less-than-significant level.

As described in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.3.1-21 to 5.3.1-37), the SFPUC's increased diversions of water from the Tuolumne River would result in a decrease in flow in the river below

La Grange Dam. Again, the decrease would manifest itself as a delay in the late spring/early summer releases from La Grange Dam, together with a reduction in episodic releases from the dam in the fall and winter. As described in Sections 5.3.3, 5.3.6, and 5.3.7 of the Draft PEIR (Vol. 3, Chapter 5), increased water temperature, the delay in late spring/early summer releases, and the reduction in average flow attributable to the WSIP would have a significant adverse impact on fisheries and terrestrial biological resources in the Tuolumne River downstream of La Grange Dam. However, the Modified WSIP Alternative includes a transfer of conserved water from TID, MID, or another water agency (as described in Section 14.10.2, above) that would offset the effects of the SFPUC's increased diversions of water from the Tuolumne River. As a result, the Modified WSIP Alternative would have a less-than-significant impact on fisheries and terrestrial biological resources in the Tuolumne River below La Grange Dam.

The conserved water transfer that is a part of the Modified WSIP Alternative could result in impacts on local groundwater or surface water resources, but conservation projects typically have minor environmental impacts with some tradeoffs in environmental effects. However, those impacts cannot be fully assessed until the characteristics of the projects needed to enable the conserved water transfer are defined. If an agreement for the conserved water transfer were to be made between TID/MID and the SFPUC, additional project-level CEQA review may not be required. The transferring agencies, TID and MID, would serve as the responsible agencies for CEQA compliance and could use the PEIR to make their own findings, as required by CEQA Guidelines Section 15096. If it became apparent that the projects needed to enable the conserved water transfer could have environmental impacts that were not described and analyzed in the Draft PEIR, then additional CEQA review would likely be required. TID and/or MID would be the lead agency for the subsequent, project-specific CEQA review.

If the agreement for a conserved water transfer were to be made between another water agency and the SFPUC, it is expected that the impacts on the Tuolumne River would be less than those described in the Draft PEIR, although impacts could occur in neighboring watersheds. In this case, either the SFPUC or the transferring agency would serve as lead agency for CEQA compliance, and impacts on neighboring watersheds would be evaluated in a project-level CEQA document prior to any discretionary action required for the transfer. Whether the PEIR could be used to provide general background information would be determined at that time and in light of contemporaneous facts and circumstances.

Alameda Watershed Impacts

With the exception of the reach of Alameda Creek between the diversion dam and the confluence with Calavaras Creek, the impacts of the Modified WSIP Alternative in the Alameda Creek watershed would be essentially the same as those of the WSIP, as described in the Draft PEIR (Vol. 3, Chapter 5, Section 5.4). Under the Modified WSIP Alternative, the only difference in system operations in the Alameda Creek watershed would be the incorporation of Mitigation Measure 5.4.5-3a, Minimum Flows for Resident Trout on Alameda Creek (as revised due to changes in the project description of the Calaveras Dam Replacement project [SV-2], Vol. 7, Chapter 13, Section 13.2); this measure requires a monitoring program and site-specific studies to determine if proposed bypass flows would be adequate to support trout spawning and egg incubation, as well as an operations plan that would ensure the bypass flows are adapted as needed based on monitoring results and best available scientific information. For both the WSIP and the Modified WSIP Alternative, incorporation of this measure would reduce potentially significant impacts on fishery and biological resources (key special-status species) along Alameda Creek below the diversion dam (Impacts 5.4.5-3 and 5.4.6-2, respectively, Vol. 3, Chapter 5, pp. 5.4.5-18 to 5.4.5-20 and 5.4.6-18 to 5.4.6-19) to a less-than-significant level.

The impact on flow along Alameda Creek below the diversion would be similar for the Modified WSIP Alternative and the WSIP, and for both would be significant and unavoidable. Other potentially significant impacts on biological resources identified in the Draft PEIR for the WSIP (Impacts 5.4.6-1, 5.4.6-3, and 5.4.6-4 [Vol. 3, Chapter 5, pp. 5.4.6-14 to 5.4.6-23] related to biological resources in Calaveras Reservoir, Calaveras Creek, and Alameda Creek between Calaveras and San Antonio Creeks, respectively) would be the same for the Modified WSIP Alternative, and implementation of Draft PEIR Measure 5.4.6-1, Compensation for Impacts on Terrestrial Biological Resources, and Measure 5.4.6-3, Operational Procedures for Calaveras Dam Releases (Vol. 4, Chapter 6, pp. 6-54 and 6-55) would reduce these impacts to a less-than-significant level.

Peninsula Watershed Impacts

Crystal Springs Reservoir. As described above in Section 14.10.2, the Modified WSIP Alternative would alter the proposed operations of Crystal Springs Reservoir compared to the proposed operations under the WSIP. The Modified WSIP Alternative would impose a maximum water surface elevation for most of the year that is 4 feet lower than the maximum elevation under the WSIP, thus reducing the area of inundation and reducing the magnitude of impacts on habitat and related biological resources around the periphery of the reservoir. However, the operating assumptions for the Modified WSIP Alternative would not eliminate the impacts on biological resources, and the potentially significant impact identified in the Draft PEIR (Impact 5.5.6-1, Vol. 3, Chapter 5, pp. 5.5.6-14 to 5.5.6-17) would also be potentially significant under the Modified WSIP Alternative. Implementation of Measure 5.5.6-1a, Adaptive Management of Freshwater Marsh and Wetlands at Upper and Lower Crystal Springs Reservoir, and Measure 5.5.6-1b, Compensation for Impacts on Terrestrial Biological Resources, would still be required, though to lesser degree, to reduce this impact to a less-than-significant level.

Similarly, the Draft PEIR identified a potentially significant, unavoidable impact on fishery resources in Crystal Springs Reservoir (Impact 5.5.5-1, Vol. 3, Chapter 5, pp. 5.5.5-6 and 5.5.5-7) due to elevated water levels, which would inundate trout spawning habitat upstream of the reservoir along Laguna and San Mateo Creeks. While the Modified WSIP Alternative would reduce the maximum water surface elevation in the reservoir and reduce the magnitude of the impact compared to the WSIP, this impact would remain potentially significant and unavoidable.

These impacts will be evaluated in detail at a project-level as part of the environmental review of the Lower Crystal Springs Dam Improvements project (PN-4).

Pilarcitos Watershed. The WSIP would result in significant adverse effects on water quality, fisheries, and terrestrial biological resources in the Pilarcitos Creek watershed, as described in

Sections 5.5.3, 5.5.5, and 5.5.6 of the Draft PEIR (Vol. 3, Chapter 5), and recommended mitigation measures would reduce all impacts to a less-than-significant level. As described above in Section 14.10.3, the Modified WSIP Alternative would incorporate Measure 5.5.3-2a, Low-Head Pumping Station at Pilarcitos Reservoir; Measure 5.5.3-2b, Aeration System at Pilarcitos Reservoir; Measure 5.5.3-2c, Habitat Monitoring and Compensation; and Measure 5.5.5-5, Establish Flow Criteria, Monitor and Augment Flow. Thus, the impacts of the Modified WSIP Alternative in the Pilarcitos Creek watershed would be the same as those of the WSIP after the inclusion of the mitigation measures.

Growth-Inducement Impacts

The growth-inducement impacts of the Modified WSIP Alternative would be the same as those of the WSIP.

Environmentally Superior Alternative

As described in the Draft PEIR (Vol. 4, Chapter 9, pp. 9-95 and 9-96), the Modified WSIP Alternative is considered the environmentally superior alternative. This conclusion is further supported by the detailed analysis presented above. The Modified WSIP Alternative would reduce key impacts of the WSIP on natural resources along the lower Tuolumne River, along Alameda Creek below the diversion dam, at Pilarcitos Reservoir and along Pilarcitos Creek, and in Crystal Springs Reservoir. Importantly, it would also achieve the WSIP's goals and level of service objectives.

As stated above, compared to the proposed program, the Modified WSIP Alternative could result in additional facilities-related impacts associated with increased conservation, water recycling, and local groundwater projects, including conservation projects within agricultural areas. However, while the construction of new facilities would cause temporary disruption and related environmental impacts, the long-term implementation of these conservation, water recycling, and local groundwater projects would substantially reduce long-term impacts on the Tuolumne River. The impacts associated with these projects would occur in previously disturbed areas in either agricultural or urban use, and could likely be mitigated with standard mitigation measures.

Depending on the extent to which increased conservation, water recycling, and local groundwater projects could be implemented in the wholesale customers' service areas, the SFPUC's need to divert water from the Tuolumne River would be reduced. The Modified WSIP Alternative includes 5 to 10 mgd of regional conservation, water recycling, and local groundwater projects in the wholesale customers' service areas. Assuming that projects resulting in 10 mgd are implemented by 2030, the SFPUC's diversion of water from the Tuolumne River at Hetch Hetchy Reservoir would be reduced by an annual average of 9 mgd compared to the WSIP. In addition, by implementing a transfer of conserved water under the Modified WSIP Alternative, the SFPUC would be able to offset the WSIP's increased diversions from the upper reaches of Tuolumne River such that the average annual releases below La Grange Dam would be similar to those under existing conditions.

14.11 Master Response on Climate Change

14.11.1 Introduction

Overview

This master response addresses issues raised by commenters concerning the discussion on climate change and global warming presented in the Draft PEIR. Commenters primarily raised questions about how the PEIR addresses the effects of climate change on the SFPUC's water supply sources and how those effects would combine with WSIP-related impacts; some commenters also referred to the WSIP's potential to increase greenhouse gas emissions and contribute to global climate change. This master response is organized by the following subtopics:

- 14.11.2 Update of Climate Change Studies on Water Resources in California and Climate Change Regulatory Framework
- 14.11.3 Review of Water Agencies' Water Supply Management Approach to Climate Change
- 14.11.4 Climate Change and the SFPUC Regional Water System
- 14.11.5 SFPUC's Actions to Address Climate Change

Commenters

Comments on climate change/global warming were received from the following entities:

Federal Agencies

- National Park Service, Yosemite National Park – F_NPS-YOS

State Agencies

- Regional Water Quality Control Board, San Francisco Bay Region – S_RWQCBSF

Local/Regional Agencies

- Alameda County Flood Control and Water Conservation District – L_ACFCWD
- Modesto Irrigation District and Turlock Irrigation District – L_MID-TID
- Tuolumne County – L_Tuol1

Groups

- Acterra – SI_ACT
- Citizens Advisory Committee to PUC – SI_CAC1, SI_CAC2
- California Native Plant Society, East Bay Chapter – SI_CNPS-EB1
- Center for Resource Solutions – SI_CRS
- Clean Water Action – SI_CWA2
- Greenpeace – SI_GreenP
- Pacific Institute – SI_PacInst

- Sierra Club – SI_SierraC2, SI_SierraC3, SI_SierraC7
- San Francisco Planning and Urban Research Association – SI_SPUR
- Tuolumne River Trust – SI_TRT7, SI_TRT8
- Tuolumne River Trust/Clean Water Action/Sierra Club, San Francisco Bay Chapter – SI_TRT-CWA-SierraC

Citizens

- Bail, Christopher – C_Bail
- Chodeu, Bernie – C_Chode
- Clark, Ann – C_Clark1, C_Clark2
- Collin, Robert – C_Colli
- Garbarino, Caroline – C_Garba
- Gelman, Robert – C_Gelma
- Genovese, Marylyn – C_Genov-02
- Greene, David – C_GreenD
- Hasson, Tomer – C_Hasso
- Kaliner-MacKellen, Gwynn – C_Kalin
- Lee, Aldora – C_Lee
- Martin, Michael – C_MartiM-01
- Materman, Len – C_Mater
- Mijac, Ivo – C_Mijac
- Owen, Ellie – C_Owen
- Raffaeli, Paul – C_Raffa
- Steinhart, Peter – C_Stein
- Sugars, Marc – C_Sugar
- Tubman, Marianna – C_Tubma
- Walker, Patricia – C_Walke
- Williams, Doris – C_Willi

PEIR Section Reference

The Draft PEIR (Vol. 2, Chapter 4, Section 4.9, pp. 4.9-14 to 4.9-20 and pp. 4.9-42 to 4.9-47) addresses the potential impacts of the WSIP facility improvement projects relative to greenhouse gas (GHG) emissions and presents a program-level analysis of GHG emissions. This information is also discussed in the following sections: Vol. 1, Summary, Section S.3, pp. S-28 and S-63; and Vol. 1, Chapter 3, Section 3.10, p. 3-82. The analysis concluded that construction and operation of the facility improvement projects would not conflict with the state's goal of reducing GHG emissions to 1990 levels by 2020 because WSIP-related GHG emissions would not result in a substantial contribution to a global climate change. This determination was based on the ongoing implementation of GHG reduction actions by the City and County of San Francisco (CCSF) and the SFPUC and additional GHG reduction actions that the SFPUC would implement as part of the WSIP (see the Draft PEIR, Vol. 1, Chapter 3, p. 3-82). Furthermore, implementation of mitigation measures related to exhaust controls, criteria pollutant emissions, waste reduction, and energy efficiency would further reduce GHG emissions associated with construction and operation of the facility improvement projects.

The Draft PEIR (Vol. 4, Chapter 7, pp. 7-60, 7-61, and 7-76) addresses the potential impacts of the WSIP-related growth inducement, which could indirectly result in increases in GHG emissions. No comments were received regarding the adequacy of the GHG emissions analysis in Draft PEIR Chapters 4 and 7, and commenters did not identify any other significant issues related to GHG emissions associated with facility construction and operations. Therefore, this master response does not provide any further discussion of WSIP-generated GHG emissions beyond that provided in Chapters 4 and 7.

The Draft PEIR addresses the potential effects of global climate change on the SFPUC's water resources in the following location: Vol. 3, Chapter 5, Section 5.7.6, pp. 5.7-92 to 5.7-96.

Comments received on the Draft PEIR related to climate change were focused almost exclusively on issues addressed in Chapter 5 of the Draft PEIR; therefore, this master response provides further discussion to update and augment the analysis of climate change issues presented in Chapter 5.

14.11.2 Update of Climate Change Studies on Water Resources in California and Climate Change Regulatory Framework

Comment Summary

This section of this master response responds to all or part of the following comments:

F_NPS-YOS-01	SI_PacInst-18	SI_TRTCWA-SierraC-78
S_RWQCBSF-16	SI_SierraC2-03	SI_TRTCWA-SierraC-130
L_ACFCWCD-05	SI_SierraC3-03	SI_TRTCWA-SierraC-133
L_MID-TID1-11	SI_SierraC7-06	SI_TRTCWA-SierraC-135
L_MID-TID1-26	SI_SPUR-04	SI_TRTCWA-SierraC-159
SI_ACT-04	SI_SPUR-05	SI_TRTCWA-SierraC-168
SI_ACT-05	SI_TRT8-06	C_Gelma-02
SI_CAC2-04	SI_TRTCWA-SierraC-20	C_Hasso-04
SI_CNPS-EB1-06	SI_TRTCWA-SierraC-22	C_Lee-04
SI_CRS-04	SI_TRTCWA-SierraC-34	C_Mater-01
SI_CWA-01	SI_TRTCWA-SierraC-70	C_Owen-01
SI_GreenP-04	SI_TRTCWA-SierraC-77	C_Unreadable1-01

Summary of Issues Raised by Commenters

- The PEIR lacks up-to-date research.
- The California Department of Water Resources (DWR) has made predictions related to climate change effects on state water resources that should be included in the impact analysis.
- Projections by the Intergovernmental Panel on Climate Change (IPCC) should be addressed.
- The PEIR only addresses one of many possible patterns of global climate change.
- The PEIR does not consider climate science in the impact analysis.
- The PEIR impact analysis does not consider that studies indicate global warming will reduce the Sierra snowpack by 5 percent by 2030 and 33 percent by 2060.

Response

Climate Change Literature Review

The following review of climate change literature relevant to the WSIP and the Draft PEIR was prepared by CH2M HILL (2007) and the SFPUC (2008) to augment and update the annotated bibliography presented in the Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-93 and 5.7-94). The literature review focuses on information related to climate change effects on California water supplies and water management, including many of the references cited in comments received on the Draft PEIR. The key findings of this literature review are briefly summarized below, followed by an annotated review of relevant climate change science and policy/guidance literature in Tables 14.11-1 and 14.11-2. The findings from this literature review are then used in Section 14.11.4, below, to assess the effects of climate change on the impact analysis of water resources presented in the Draft PEIR.

Summary of Literature Review

In California and throughout the West the signs of climate change are evident. During the last 50 years, trends have shown a slight increase in winter and spring temperatures, snow levels in the Sierra Nevada mountains have moved to a higher average elevation, and snowmelt has been occurring earlier in the season. Observed temperature increases in California are higher than the global average. The causes of these recent climate changes are complex and are in part due to the levels of GHG emissions throughout the globe. Climate scientists are studying possible future conditions under a range of future GHG emissions. Under all future emission scenarios, the level of warming is expected to increase and would significantly accelerate under higher emission scenarios. Temperature increases in the range of 1.7 to 5.8 degrees Celsius (°C) are possible by 2100 with a mid-range estimate of 3.1 to 4.3 °C. However, despite the general consensus on future warming for California (and the globe), the scientific studies show no clearly discernible trend in precipitation changes in California over the next century. There is a wide range of differences in model projections for precipitation changes due to global warming, with some models projecting increases in precipitation and others predicting no increase or decreases over the century; still other studies indicate that even with no change in annual precipitation, the number of days with precipitation could decline, resulting in more intense precipitation on those fewer days with precipitation.

A number of analyses have been performed over the past 5 to 10 years to assess the hydrologic impacts of climate change on California's water resources. Some of the more robust findings among the studies listed in Table 14.11-1 are presented below:

- The Sierra Nevada spring snowpack is expected to continue to decrease due to an increase in the elevation of the freezing line, more precipitation falling as rain rather than snow, and an earlier snowmelt (DWR, 2006; California Climate Change Center, 2006; Mote et al., 2005; Roos, 2005).

- Rivers and streams fed by mountain watersheds are expected to exhibit an increase in stream flow in winter and early spring and a decrease in late spring and summer (Hamlet et al., 2005; Maurer and Duffey, 2005; Hayhoe et al., 2004).

- Greater conflicts among water supply, hydropower, and flood control in reservoir operations are anticipated (DWR, 2006).

- Warmer temperatures are expected to reduce some reservoir coldwater pools, which could affect the temperature of reservoir releases and increase stream temperatures, potentially disrupting aquatic species (DWR, 2006).

- Warmer temperatures could cause increases in water demand in both agricultural and municipal regions (DWR, 2006; Kiparsky and Gleick, 2003).
- Sea level rise will affect coastal areas and estuaries and could threaten levees (IPCC, 2007; DWR, 2006).

These six major findings are further discussed below in Section 14.11.4 (see Table 14.11-3) with respect to how climate change may be expected to affect the SFPUC regional water system and how climate change considerations would affect the WSIP impacts presented in the Draft PEIR.

In summary, the literature review (Table 14.11-1) indicated that quantitative assessments of potential climate change effects have been developed for the major watersheds in the Central Valley, and these studies have provided information useful to the SFPUC regional water system. These studies indicate a potential loss in Sierra spring snowpack of 12 to 50 percent by mid-century, depending on the degree of warming. The DWR's most recent climate change study (DWR, 2006) evaluated a range of future climate conditions on water resources in the Central Valley using output from two climate models and four climate change scenarios selected from the IPCC studies; DWR found that under three of the four climate change scenarios (those assuming a modest decline in total precipitation), water deliveries to State Water Project (SWP) and Central Valley Project (CVP) contractors would significantly decrease by 2050. The water resources in lower to mid-elevation basins, such as the upper Sacramento River and Feather River basins, would be substantially affected due to a reduction in snowpack and changes in runoff. Higher elevation basins, such as those providing inflow to Hetch Hetchy Reservoir, would be less sensitive to warming and would not lose as much winter-season snowpack as those with average elevations near the freezing line. The DWR reported that when these climate change scenarios are applied to Don Pedro Reservoir, there would be a reduction in Tuolumne River annual inflow to the reservoir as well as a shift in the timing of inflow by 2050. No focused studies of the upper Tuolumne River basin were identified in this literature review (outside of the initial modeling efforts performed by the SFPUC of the Hetch Hetchy system, as summarized in the Draft PEIR and described further below), although many researchers have analyzed the broad effects of climate change on the Sierra drainages, including the Tuolumne River watershed.

Various researchers and agencies have used different approaches and applied different climate change scenarios to assess the impacts and vulnerabilities of water resource systems to future climate change. One approach used by the DWR and the California Climate Change Center applies a range of future emission scenarios coupled with two general circulation models to quantify possible impacts. The quantitative assessments performed using this approach have utilized results from the research community as inputs to existing operational models. The applications of this approach vary from the use of specific scenarios to multi-model ensemble scenarios to perform the assessments. Another approach recently used by the U.S. Bureau of Reclamation in the Colorado River basin relies on paleoclimatological (tree ring) data over several centuries to characterize hydrologic variability and to predict future climate trends. A third approach used by several entities including the East Bay Municipal Utility District (EBMUD) evaluates system vulnerability to climate change and rates future management options based on flexibility to adapt to a changed climate. The approach being used by the SFPUC to address climate change is described in Sections 14.11.4 and 14.11.5 of this master response.

Tables 14.11-1 and **14.11-2** summarize the recent literature on climate change science and policy relevant to California water supplies and water management that was reviewed for this PEIR.

Regulatory Framework – Climate Change

This section summarizes recent California statues and executive orders that specifically pertain to global climate change, and augments the regulatory framework included in the Draft PEIR (Vol. 2, Chapter 4, pp. 4.9-14 and 4.9-15). The additional regulatory framework information provides a more comprehensive basis for evaluating climate change policy issues related to the SFPUC regional water system, but does not change the analysis in the Draft PEIR. It should be noted that all regulatory policy and guidance related to climate change pertain to GHG emissions.

Assembly Bill 1493

Approved in 2002, Assembly Bill 1493 addresses GHG emissions from motor vehicles. It requires that the California Air Resources Board (CARB) develop and adopt, by January 1, 2005, regulations that achieve "the maximum feasible reduction of GHGs emitted by passenger vehicles and light-duty truck and other vehicles determined by the CARB to be vehicles whose primary use is noncommercial personal transportation in the state."

Executive Order S-3-05

Approved on June 1, 2005 by Governor Schwarzenegger, Executive Order S-3-05 formally recognizes California's vulnerability to the impacts of climate change, including the fact that increased temperatures threaten to reduce snowpack in the Sierra Nevada, which serves as one of the state's primary sources of water. Additionally, the order notes that climate change could influence human health, coastal habitats, microclimates, and agricultural yield. To address these potential impacts, the order mandates the following GHG emission reduction targets: by 2010, reduce GHG emissions to 2000 levels; by 2020, reduce GHG emissions to 1990 levels, and by 2050, reduce GHG emissions to 80 percent below 1990 levels. In addition, the order requires biannual reports starting in January 2006 describing: progress made toward meeting GHG emission targets; global warming impacts in California on water supply, public health, agriculture, the coastline, and forestry; and mitigation and adaptation plans to combat these impacts.

Assembly Bill 32 – California Global Warming Solutions Act

Approved in 2006, the California Global Warming Solutions Act (Assembly Bill 32) establishes a timetable for the CARB to adopt emission limits, rules, and regulations designed to achieve, among other objectives, a statewide GHG emissions cap for 2020 that is equivalent to the 1990 emissions levels. The act requires the CARB to adopt regulations to require the reporting and verification of statewide GHG emissions as well as regulations to achieve the maximum technologically feasible and cost-effective reductions in GHGs. Refer to the Draft PEIR (Vol. 2, Chapter 4, pp. 4.9-14 and 4.9-15) for further description of this act.

TABLE 14.11-1
CLIMATE CHANGE SCIENCE REFERENCES

Reference	Summary
Barnett, T.P., D.W. Pierce, H.G. Hidalgo, C. Bonfils, B.D. Santer, T. Das, G. Bala, A.W. Wood, T. Nozawa, A.A. Mirin, D.R. Cayan, and M.D. Dettinger, Human-Induced Changes in the Hydrology of the Western United States, in: *Science* 319:1080-1082, 2008.	This study provides statistical validation that observed changes in the hydrological cycle in the western United States from 1950 to 1999 are due to human-caused climate changes related to GHGs and aerosols. The authors conducted a regional, multivariable climate change detection and attribution study using a high-resolution hydrologic model combined with global climate models and sophisticated data analysis. The results show that up to 60 percent of the climate-related trends of river flow, winter air temperature, and snow-pack between 1950 and 1999 are human-induced.
Intergovernmental Panel on Climate Change (IPCC), *Climate Change 2007: The Physical Science Basis, Summary for Policymakers,* 2007.	This brief report provides a summary of the IPPC Working Group I findings in its Fourth Assessment Report (AR4). The report summarizes the most current scientific consensus-based findings regarding recent observations of climate change, a paleoclimate perspective, and projections of future climate change.
Christensen, J.H., B. Hewitson, A. Busuioc, A. Chen, X. Gao, I. Held, R. Jones, R.K. Kolli, W.T. Kwon, R. Laprise, V. Magaña Rueda, L. Mearns, C.G. Menéndez, J. Räisänen, A. Rinke, A. Sarr, and P. Whetton, *Regional Climate Projections*, in: *Climate Change 2007: The Physical Science Basis, Contribution of Working Group I to the Fourth Assessment Report of the Intergovern-mental Panel on Climate Change,* 2007.	This chapter of the IPCC Assessment Report 4 provides a summary of the most recent regional climate projections and attempts to synthesize the most overarching issues. North America is considered as one region, although some greater geographical detail is provided. An assessment is provided regarding the general skill (capability of simulating observed climate) of the current suite of AOGCMs. General conclusions regarding temperature increases, precipitation changes, extreme events, atmospheric circulation, and snowpack-snowmelt-runoff are provided. In addition to the findings reported elsewhere of temperature increases and precipitation uncertainty, the report indicates greater climate variability during the 21st century. It indicates both a greater frequency in extreme temperature events and diurnal range, as well as greater frequency of extreme precipitation events (both wet and dry).
California Department of Water Resources (DWR), *Progress on Incorporating Climate Change into Planning and Management of California's Water Resources,* Technical Memorandum Report, July 2006.	This report is DWR's response to the governor's 2005 order establishing targets for GHG emissions and requiring biennial reporting by state agencies. This report describes the progress made to incorporate climate change into water resources planning and management. The report describes potential changes in precipitation and runoff, sea level, water demand, and fisheries. Based on research by Knowles and Cayan (2002) and the 2001 IPCC findings, the report projects the following loss of April snowpack averaged across the entire Sierra in snow-water-equivalent. Snow-water-equivalent is a measure of the volume of water that would be produced by melting snow and is used to translate snowpack to water volume. • 0.6 °C rise, ~5 percent loss • 1.6 °C rise, ~33 percent loss • 2.1 °C rise, ~50 percent loss These three levels of average temperature rise were projected by Knowles and Cayan to occur by 2030, 2060, and 2090, respectively. The water supply analyses included in this report utilized the results from four climate change scenarios described below in CalEPA (2006): PCM A2, GFDL A2, PCM B1, and GFDL B1. All four of these scenarios show a warming trend by the end of the 21st century; three of the four scenarios show a modest drying trend in precipitation with the fourth scenario showing a weak precipitation increase. There was no consistent trend for precipitation. Due to the coarse scale of the AOGCMs, the results from these climate change scenarios were "downscaled," a process of translating AOGCM output to a smaller regional or watershed scale (such as the major watersheds of the Central Valley) using the statistical methods described by Wood et al (2002, 2004) and Maurer et al. (2007). After downscaling, hydrological analyses were performed using the macro-scale Variable Infiltration Capacity model for each major watershed. The effects on runoff were analyzed for a historical period centered around 1976 (1961–1990) and for a climate change future period centered around 2050 (2035–2064). The fractional changes in runoff from historical gage measurements and future scenarios were then applied as monthly perturbation ratios to adjust the inflows to the CALSIM II Hydrology and Operations model to reflect

TABLE 14.11-1 (Continued)
CLIMATE CHANGE SCIENCE REFERENCES

Reference	Summary
	the climate change future. The perturbation ratios are simply multipliers applied to historical inflows to reflect the effects of climate change. For example, the historical inflow to Oroville Reservoir for July 1985 was approximately 2,189 cubic feet per second (cfs), and the perturbation ratio for July under the GFDL A2 scenario is 0.68. The inflow to Oroville for this simulated month under the GFDL A2 climate change scenario would then be 1,489 cfs (2,189 cfs multiplied by 0.68). For the major watersheds contributing stream flow to the Central Valley (including Tuolumne River inflow to Don Pedro Reservoir), the DWR found there was generally an increase in runoff from December through April and a decrease in May through November due to: more precipitation falling as rain rather than snow and, a reduced snowpack in the warmer climate. This shift occurred regardless of whether the climate change scenario was considered wetter or drier than historical records due to the temperature effect on the snowpack. The long-term average annual inflows to Shasta, Oroville, and Folsom Reservoirs were found to be decreased in three of the four scenarios (those assuming a decline in total precipitation). Only the PCM B1 scenario, the less-sensitive AOGCM combined with the lower emissions, produced increased annual inflows to these reservoirs. The DWR performed model simulations to analyze the long-term potential impacts on State Water Project (SWP) and Central Valley Project (CVP) delivery capability and found that total project impacts ranged from virtually no change to up to 10 percent, depending on the climate change scenario. The DWR also reported potential changes in monthly patterns of Tuolumne River inflow to Don Pedro Reservoir. The shift in the *fraction* of monthly inflows ranged from an increase of 6 to 25 percent for the December through April period and a decrease of 4 to 29 percent for the May through November period. Note that these percentages are an average of the fractional changes and are not equivalent to volumetric shifts in inflow. Volumetric changes in inflow were not documented in the DWR report. However, using the perturbation factors presented in this report and historical inflows to Don Pedro Reservoir, average annual inflow would also decrease for three of the four climate change scenarios (those assuming a decline in total precipitation). Only the wetter PCM B1 scenario produces increased average annual inflow. The report, however, did not specifically analyze climate change effects on the Hetch Hetchy system.
California Environmental Protection Agency (CalEPA), *Climate Action Team Report to Governor Schwarzenegger and the Legislature,* March 2006.	This report provides a general overview of climate processes and summarizes a broad range of climate change impacts on various resources in California. Strategies for controlling GHG emissions and potential adaptation measures are provided. Importantly, the report summarizes climate change scenarios used in the analysis of each of the resource areas. The report uses the results from three emission scenarios developed by the IPCC: a higher emission scenario (A1Fi), a medium-high emission scenario (A2), and a lower emission scenario (B1). To capture the range of uncertainty among climate models, the report relies on projections of the climate changes under these emission scenarios from three atmosphere-ocean general circulation models (AOGCM): the low-sensitivity Parallel Climate Model (PCM) from the National Center for Atmospheric Research (NCAR) and Department of Energy (DOE), the medium-sensitivity Geophysical Fluids Dynamic Laboratory (GFDL) CM2.1 model from the National Oceanic and Atmospheric Administration (NOAA), and the slightly higher-sensitivity Hadley Centre Climate Model, Version 2 (HadCM3) from the U.K. Met Office Hadley Center. The range of scenarios considered in this report exhibits projected temperature increases for the period of 2000 to 2100 of 1.7 to 3.0 °C for the lower range, 3.1 to 4.3 °C in the medium range, and 4.4 to 5.8 °C in the higher range. Despite the consensus among scenarios in projecting warming for California (and the globe), there is no clear trend for overall precipitation results for California over the next century. Only one scenario (PCM B1) projected an increase in precipitation, while all others indicated no change or a decrease.
California Climate Change Center, *Scenarios of Climate Change in California: An Overview,* February 2006.	This white paper was largely incorporated into the March 2006 CalEPA report to Governor Schwarzenegger. It describes the basis of climate change scenarios and gives an overview of the potential impacts on various resources in California. The impacts on water resources are briefly summarized. Hydrologic modeling performed for California was used to estimate changes in snowpack throughout the century. These studies projected reductions in Sierra snowpack with increased temperature and showed large snowpack losses associated with the higher ranges of temperature increases. The paper indicates that in the Sierra Nevada, by the 2035–2064 period, snowpack could be reduced by 12 to 47 percent from historical levels under the lower range of warming and 26 to 40 percent under the higher range of warming. By the end of the century, snowpack may be reduced by as much as 90 percent at the higher end of warming.

TABLE 14.11-1 (Continued)
CLIMATE CHANGE SCIENCE REFERENCES

Reference	Summary
	Two modeling approaches were applied to evaluate the effects on water supply in the Central Valley. The first approach is that described in DWR (2006) using the CALSIM model with climate change “perturbed” inflows. The second approach uses the Water Evaluation and Planning (WEAP) model with direct temperature and precipitation inputs. Both methods indicate a likely decrease in stream flows by mid-century, with more dramatic changes by the end of the century. In addition, the analyses indicate a greater propensity for “critically dry” year classification (using unadjusted indices) than the historical hydrology. Analyses using the CALSIM model indicated that by the end of the century deliveries to the SWP and CVP could be reduced by 15 to 30 percent under the lower warming scenarios and by as much as 40 to 50 percent under the medium and higher warming scenarios. These studies did not include the effects of increased agricultural or outdoor urban demands, but suggested that these could increase by 2 to 13 percent by the end of the century.
California Climate Change Center, *Our Changing Climate, Assessing the Risks to California*, A Summary Report from the California Climate Change Center, 2006.	This brief report is a summary of the “Climate Scenarios” project, which analyzed a range of impacts that would likely result with rising temperatures in California. It is largely a summary of other work. In summarizing the potential effects on the Sierra snowpack, the reports states that “if heat-trapping emissions continue unabated, more precipitation will fall as rain instead of snow, and the snow that does fall will melt earlier, reducing the Sierra Nevada spring snowpack by as much as 70 to 90 percent.” The report also indicates there is continued uncertainty regarding the future changes in precipitation, which would affect the magnitude of the snowpack loss. It indicates that if emissions are significantly curbed and temperatures remain in the lower range of projections, the loss of snowpack will likely be half that expected if temperatures reach the higher range of projections.
Sansone, Amy and Pascal Storck, *The Implications of Climate Change on a Snow Melt Dominated Watershed in Western Washington,* 3TIER Environmental Forecast Group Inc., HydroVision, 2006.	The goal of this paper was to evaluate the effect of global warming by 2025 and 2045 on the snowpack in the watershed that supplies a portion of the city of Seattle’s water supply. The results from eight global climate simulations were evaluated, and the analysis showed a 1.5 °C change over a 30-year period from 1995 to 2025. The study also showed a shift in runoff from the months of April, May, and June to the months of January, February, and March.
Maurer, E., *Uncertainty in Hydrologic Impacts of Climate Change in the Sierra Nevada Mountains, California under Two Emissions Scenarios,* April 2005.	This manuscript reports on an evaluation of hydrologic impacts in the Sierra Nevada with climate projected by 11 different AOGCMs under two emission scenarios. The intent of the study was to identify the projected hydrologic changes that have high statistical confidence for the period of 2071–2100. High statistical confidence was found under the projections for increasing winter stream flow and decreasing late spring and summer flow. Less snow at the end of winter and earlier arrival of the annual flow volume were identified as confident projections. The two emission pathways investigated, SRES A2 and B1, showed differing impacts with high confidence, leading to the author’s conclusion that future emission scenarios play a significant role in the degree of impacts on water resources in California.
Dettinger, Michael D., *From Climate-Change Spaghetti to Climate-Change Distributions for 21st Century California,* San Francisco Estuary and Watershed Science, U.S. Geological Survey, March 2005.	The goal of this paper was to derive a statistically based conclusion from the variable results from runs of many differing Global Circulation Models (GCMs). The paper uses the same figure (temperature change over time from a variety of GCMs) that is used in the Cayan 2004 Ground Water Conference presentation, but it explores a statistical resampling technique to construct projection distribution functions to reduce the variance in the results. When North American GCM results are emphasized in the resampling process, an increase of 3 °C by 2050 and 6 °C by 2100 temperature change is found.
Mote, P.W., A.F. Hamlet, M.P. Clark, and D.P. Lettenmaier, *Declining Mountain Snowpack in Western North America*. Bulletin of the American Meteorological Society, January 2005.	This article presented the results of research utilizing 824 snow stations from the Natural Resources Conservation Service, DWR, and Ministry of Sustainable Resource Management for British Columbia. The authors found decreases in April 1 snow water equivalent between 1950 and 1977 at the majority of the sites, with the largest decreases found in western Oregon and Washington and northern California. Some upward trends in snow water equivalent were found for the Southwest, including the southern Sierra. Some of the increasing trend was attributed to long-term climatic signals such as the Pacific Decadal Oscillation and the El Niño Southern Oscillation.

TABLE 14.11-1 (Continued)
CLIMATE CHANGE SCIENCE REFERENCES

Reference	Summary
Maurer, E and P.B. Duffy, *Uncertainty in Projections of Streamflow Changes due to Climate Change in California,* Geophysical Research Letters, Vol. 32, L03704, 2005.	This paper examines the effects of stream flow under a range of climate projections with the goal of analyzing uncertainty between models and confidence in hydrologic impacts. The effects of climate change on stream flow at three northern Sacramento Valley rivers (Sacramento River at Shasta Dam, Feather River at Oroville, American River at Folsom) and four San Joaquin Valley rivers (Stanislaus River at New Melones, Tuolumne River at New Don Pedro, and Merced River at Lake McClure) were examined under a range of carbon dioxide increase scenarios. The AOGCMs applied were those available for the Coupled Model Intercomparison Project, but are not comparable to those used by Maurer to support the DWR (2006) analyses. This paper confirmed the robust result of increases in stream flow in December through March and decreases in June through October. In addition, the authors found that the March–April flows in the higher elevation south basins were more highly influenced by projected temperature changes than in the lower elevation north basins. This appears to contradict findings by Hamlet et al. (2005), who found that trends in snow water equivalent at high-elevation basins were less affected by warming than lower basins; however, Hamlet's study covered the entire western United States, whereas this study focuses on California. The perturbed climate scenarios utilized in this study indicated a shift in stream flow timing for the Tuolumne River at New Don Pedro, but also indicated an increase in overall annual runoff due to increased precipitation projections.
Roos, M., *Accounting for Climate Change,* California Water Plan Update 2005, Vol. 4, 2005.	This report by Maurice Roos, State Hydrologist for California, examines the broad implications of climate change on California water resources. It provides a good narrative of historical trends in temperature, sea level rise, and water resource systems. The report states that the "most important parameter in determining runoff and therefore water supply is precipitation" and that "regional precipitation predictions in the huge general circulation models of the atmosphere have not been reliable, and vary greatly among the different models." Roos states that on a global scale, warming would increase evaporation, and thus increase overall precipitation, but highlights that "where and when the precipitation falls is all-important." The report discusses initial efforts by the DWR that indicated a much greater trend for warming impacts on northern Sierra snowpack and runoff decreases compared to southern Sierra snowpack and runoff, due to the elevation of these watersheds. Roos reports that with recent models it is possible to project increases in southern Sierra snowmelt runoff under wetter climate scenarios (although from less area), while this phenomenon is not shown for the northern Sierra. Roos also discusses implications for water resources in the state and concludes that not all basins would be equally affected. The report references the differences in the ratio of storage to average annual inflow in watersheds as an indicator of the level of impact. Due to a greater capacity to store runoff, the Stanislaus River with a ratio of 2.5 (storage to inflow) would be expected to have a smaller impact than the American River, where the ratio is about 0.64. Roos also analyzed the past hydrologic record for the Sacramento River and identified declining trends in April–July runoff. The trend was found to exist for most major drainages to the Central Valley, with smaller declines in the southern Sierra. This report also mentions work by researchers that has shown an increased risk for large storms and flood events for several AOGCM scenarios. An increase in flood control space would conflict with operations for water supply, power, and recreation for many of the reservoirs in California. Roos suggests that if increased winter flood control capacity were required, then one would expect greater difficulty in filling reservoirs in the spring. Finally, Roos discusses potential changes (increases) in agricultural water use with increasing temperature and difficulties in managing cold–water pools for anadromous fish. Cold-water pools in reservoirs, and within the watershed, would be expected to decrease, and river water temperatures could warm beyond the tolerable limits for salmon and steelhead in the summer. Roos suggests that multi-level outlets in reservoirs should be considered for more effective cold-water release management.
Hamlet, A., P.W. Mote, M.P. Clark, and D.P. Lettenmaier, *Effects of Temperature and Precipitation Variability on Snowpack Trends in the Western United States,* Journal of Climate, 2005.	This paper summarizes hydrologic simulation studies that were used to examine trends in snow water equivalent for the western U.S. The authors found that widespread warming occurred during 1916–2003, resulting in downward trends in April 1 snow water equivalent for large areas of the western U.S. However, as in previous work, the authors indicate upward trends in snow water equivalent in the Southwest and southern Sierra. Importantly, the paper finds that almost all upward trends in snow water equivalent are due to modest upward trends in precipitation, while all downward trends are associated with widespread warming. Decadal variability (such as the Pacific Decadal Oscillation) is reported to account for the winter trends of precipitation. Trends for stations at high elevations are less affected by warming than those at lower elevations.

TABLE 14.11-1 (Continued)
CLIMATE CHANGE SCIENCE REFERENCES

Reference	Summary
Hayhoe, K., D. Cayan, C.B. Field, P.C. Frumhoff, E.P. Maurer, N.L. Miller, S.C. Moser, S.H. Schneider, K.N. Cahill, E.E. Cleland, L. Dale, R. Drapek, R.M. Hanemann, L.S. Kalkstein, J. Lenihan, C.K. Lunch, R.P. Neilson, S.C. Sheridan, and J.H. Verville, *Emissions Pathways, Climate Change, and Impacts on California*, 2004.	This study represents one of the earlier versions of the "scenarios" project for California, in which a broad range of climate impacts were analyzed under various emission pathways. The study found that California temperature increases nearly double from the lower to the higher emission scenarios and three of four simulations showed greater summer increases than winter increases. By the end of the century, Sierra snowpack was projected to decrease by 30 to 70 percent under the lower emission scenario and up to 90 percent under the higher emission scenario. The study found that the main differences between scenarios were apparent in the second half of the century, but were strongly dependent on emissions from the preceding decades.
Cayan, Dan, *Climate Change: A Challenge Looming for California*, 2004.	This reference is for a presentation given at the Ground Water Conference, Sacramento, California on October 26, 2004 by Dan Cayan, Scripps Institution of Oceanography, Climate Research Division and the U.S. Geological Survey with input from Mike Dettinger, Iris Stewart, and Noah Knowles, sponsored by the NOAA OGP RISA element, California Energy Commission PIER program. The presentation showed modeled temperature changes for Northern California that range from 1.5 to 4.5 °C by 2050 and from 2 to 10 °C by 2100. A midpoint in these ranges was selected for each date: 3 °C by 2050 and 6 °C by 2100. The presentation concluded that: • Humans have altered the atmospheric composition and thus are altering the earth's climate; greenhouse gases have long lifetimes, so choices made now and in the future will determine future climate. Warming is already underway and coming fast. • California temperature projections are broadly in consensus (increases from 2 to 6 °C by 2100). • Warming would produce more rain, less snow, earlier flows, more floods, higher sea level, and drier summers. • California precipitation projections are scattered, with most projections showing small changes. • "Shoulders" of watershed elevations at 6,000–8,000 feet would generate more immediate runoff. • Better monitoring and modeling is crucially needed.
Kiparsky, M. and P.H. Gleick, *Climate Change and California Water Resources: A Survey and Summary of Literature*, California Water Plan, Vol. 4, Reference Guide, 2003.	This report summarizes the research and studies (as of 2003) of climate change effects on various California resources. It also highlights areas of greater uncertainty and provides recommendations for further research. The report concludes with suggested strategies for adapting to potential climate change impacts. This report provides a good summary of research, but is somewhat outdated with the rapid advance of climate change analyses in recent years.
Miller, N.L. and K.E. Bashford, *Climate Change Sensitivity Study of California Hydrology: A Report to the California Energy Commission*, Lawrence Berkeley National Labs Technical Report No. 49110, 2001.	This report describes the methodology and results of a study to analyze the effects of climate change on the major drainages of the Central Valley. The study utilized two AOGCM projections from the IPCC Third Assessment Report to analyze temperature and precipitation changes, and eventually snowpack, snowmelt, and runoff. Of particular note in this study, the authors utilized a range of temperature shifts and precipitation ratios to the Sacramento Soil Moisture Accounting Model and Anderson Snow Model in order to determine hydrologic sensitivities. Climate temperature shifts and precipitation ratios were utilized to constrain the changes from the historical climate in order to use existing operational models and "increase credibility and public acceptance" of hydrologic response. Such an approach was deemed valid, although it removed the variance in the time-series that may indicate extreme events. Results indicated that a larger proportion of the streamflow volume will occur earlier in the year and that the amount and timing is dependent on the characteristics of each basin, particularly the elevation of the freezing line. In general, higher elevation basins are less sensitive and do not lose as much winter season snowpack as those with centroid elevations near the freezing line. The paper also reported that there would likely be an increase in high flow days under the scenarios analyzed.

SOURCES: CH2M HILL, 2007; SFPUC, 2008.

TABLE 14.11-2
SELECTED CLIMATE CHANGE POLICY AND GUIDANCE REFERENCES

Reference	Summary
Natural Resources Defense Council (NRDC), *In Hot Water: Water Management Strategies to Weather the Effects of Global Warming,* 2007.	This recent report highlights the potential effects of climate change on water resources and ecosystems and suggests approaches for future water management. Potential impacts on water supply, flood management, aquatic ecosystems, water quality, and hydropower are summarized largely through reference to other studies. The foundation of the report, however, is in identifying approaches for incorporating climate change into water planning and management. The report suggests the following strategies for water managers: (1) evaluate the vulnerability of water systems to global warming impacts, (2) develop response strategies to reduce future impacts of global warming, (3) prevent future impacts by reducing greenhouse gas emissions, and (4) increase awareness of global warming and water impacts. The report also provides an assessment of the performance of various water management strategies after considering global warming effects. This report is included here as it was referenced by a commenter on the Draft PEIR.
California Department of Water Resources (DWR), *State Water Project Delivery Reliability Report-2005,* April 2006.	The 2005 State Water Project (SWP) Delivery Reliability Report addressed the need to incorporate some of the uncertainties of global warming with regard to planning and operation of the SWP. "Until the impacts of climate change on precipitation and runoff patterns in California are better quantified, future weather patterns are usually assumed to be similar to those of the past, especially where there is a significant historical rainfall record. The State Water Project analyses contained in this report are based upon 73 years of historical records (1922 to1994) for rainfall and runoff that have been adjusted to reflect the current and future levels of development in the source areas by analyzing land use patterns and projecting future land and water use. These series of data are then used to forecast the amount of water available to the SWP under current and future conditions. The assumption that past rainfall-runoff patterns will be repeated in the future has an inherent uncertainty, especially given the evolving information on the potential effects of global climate change." Note: This report has been updated in 2007 to incorporate recent interim changes in fishery protection actions required by court decisions. The report also presents SWP reliability information with consideration given to the climate change scenarios described in DWR July 2006 above.
Gleick, P.H., H. Cooley, and D. Groves, *California Water 2030: An Efficient Future*. Pacific Institute, September 2005.	This report is not specifically on climate change, but investigates the water "scenarios" approach to decision-making as applied to the California Water Plan. The report argues that the scenarios approach allows for robust decision-making without explicitly quantifying all ranges of uncertainty. This report is included here as it was referenced by a commenter on the Draft PEIR.

SOURCE: CH2M HILL, 2007.

Senate Bill 1368

Approved in 2006 as the companion bill of Assembly Bill 32, Senate Bill 1368 requires the California Energy Commission, in consultation with the California Public Utilities Commission and the CARB, to establish and adopt by June 2007 a GHG emission performance standard and implementing regulations for all long-term baseload generation commitments made by electric utilities. The legislation requires the California Energy Commission to reevaluate and continue, modify, or replace the GHG emission performance standard when an enforceable GHG emissions limit is established and in operation.

Executive Order S-1-07

Executive Order S-1-07, the Low Carbon Fuel Standard, was issued on January 18, 2007 and calls for a reduction of at least 10 percent in the carbon intensity of California's transportation fuels by 2020. The order instructs the California Environmental Protection Agency to coordinate activities among the University of California, the California Energy Commission, and other state agencies to develop and propose a draft compliance schedule to meet the 2020 target. Furthermore, the order directs the CARB to consider initiating regulatory proceedings to establish and implement the Low Carbon Fuel Standard. In response, the CARB identified the Low Carbon Fuel Standard as an early action item with a regulation to be adopted and implemented by 2010.

Senate Bill 97

Senate Bill 97 was signed into law in August 2007. This bill requires the Office of Planning and Research to prepare, develop, and transmit to the State of California Resources Agency guidelines for the feasible mitigation of GHG emissions or the effects of GHG emissions by July 1, 2009. The Resources Agency would be required to certify and adopt those guidelines by January 10, 2010. The Office of Planning and Research is required to periodically update the guidelines to incorporate new information or criteria established by the CARB pursuant to the California Global Warming Solutions Act of 2006 (described above). The Office of Planning and Research recently released a technical advisory on CEQA and climate change. The technical advisory offers "informal guidance regarding the steps lead agencies should take to address climate change in their CEQA documents" (OPR, 2008).

14.11.3 Review of Water Agencies' Water Supply Management Approach to Climate Change

Comment Summary

This section of this master response responds to all or part of the following comments, which reference actions by other water agencies to address climate change:

F_NPS-YOS-01
S_RWQCBSF-16
L_ACFCWCD-05
L_MID-TID1-11
L_MID-TID1-26
SI_ACT-04
SI_ACT-05
SI_CAC2-04
SI_CNPS-EB1-06
SI_CRS-04
SI_CWA-01
SI_GreenP-04
SI_SPUR-04
SI_SPUR-05
SI_TRT8-06
SI_TRTCWA-SierraC-20
SI_TRTCWA-SierraC-22
SI_TRTCWA-SierraC-34
SI_TRTCWA-SierraC-70
SI_TRTCWA-SierraC-77
SI_TRTCWA-SierraC-78
SI_TRTCWA-SierraC-130
SI_TRTCWA-SierraC-133
SI_TRTCWA-SierraC-135
SI_TRTCWA-SierraC-159
SI_TRTCWA-SierraC-168
C_Gelma-02
C_Hasso-04
C_Lee-04
C_Mater-02
C_Owen-01
C_Unreadable1-01

Summary of Issues Raised by Commenters

- The PEIR should follow an approach to climate change similar to that used by EBMUD, which has quantified possible climate change impacts and developed operation models.

- Turlock Irrigation District (TID) staff conducted preliminary modeling of global warming effects on the Tuolumne River and the PEIR needs to address the impacts of global warming on this river system.

Response

East Bay Municipal Utility District

EBMUD has been actively monitoring the progress of climate change research to understand and predict potential future impacts on its water supply and operations and has used the results from climate change studies to analyze these impacts (Sykes, 2006). In general, the results have indicated only a modest impact on the utility's water supply reliability. EBMUD used its water supply model to simulate the 80-year historical hydrologic record under a changed climate scenario to analyze the potential effects on water supply reliability at a 2020 level of development. These simulations assumed no change in total annual precipitation, but assumed that a warmer climate (3 °C increase in temperature) would cause 28 percent of the historical runoff to occur earlier in the year. The results of the study indicated that an earlier runoff would have little impact on EBMUD's water deliveries for four main reasons: the large percentage of spring runoff in the system's water supply watershed, the steepness of the area-elevation curve (see Figure 14.11-2), the timing and amount of demands, and the reservoir storage-to-runoff ratio. The climate change scenario used in their model resulted in fewer flood control releases due to decreased spring runoff and no significant effect on carryover storage. In addition, the amount of demand under this scenario is less than the average annual runoff, and the storage volume is greater than the average annual runoff. Nonetheless, EBMUD has taken actions to prepare for climate change, including diversifying its water supply portfolio to reduce vulnerability to geographical variation in precipitation and reinforcing its system to prepare for the effects of a 3-foot sea level rise on its Delta facilities. It is also promoting water conservation and water reclamation and a reduction in emissions of GHGs.

EBMUD has embarked on an evaluation of water supply management options through the year 2040. The focus of EBMUD's initial climate change plan is on the vulnerability of its system to climate change. As part of this effort, the district will conduct sensitivity analyses to evaluate and score the flexibility of each water supply portfolio considered in the Water Supply Management Plan 2040 to respond to climate change. The district will also consider secondary (or backup) elements for use under the predicted worsening climate conditions. This proposed approach represents a "bottom-up" methodology that would initially be limited to climate change scenarios and would not rely on the results of the "downscaled" atmosphere-ocean general circulation models (AOGCM) being used by the DWR (see the description in Table 14.11-1, above, under DWR's *Progress on Incorporating Climate Change into Planning and Management of California's Water Resources*, 2006).

As described in more detail below, many of EBMUD's strategies to address climate change are similar to those being implemented by the SFPUC. The SFPUC used one of the same key assumptions as EBMUD in its near-term planning for climate change (i.e., no change in the total annual precipitation but a shift in runoff patterns to earlier in the year that would be expected to result from warmer climate). However, unique aspects of the EBMUD and SFPUC systems necessitated some differences in the analyses of climate change effects on the systems' water resources and deliveries as well as in the long-term planning approaches. For example, the SFPUC conducted preliminary modeling of near-term climate change effects (to 2030) using temperature projections that were consistent with those of the IPCC, while EBMUD's period of analysis was to 2020 and used different temperature figures. As described below in Section 14.11.4, the SFPUC analysis used a potential mean annual temperature increase of 1.5 °C by 2025–2030, based on climate change studies that forecast a mean annual temperature increase of 3 °C by 2050 (Dettinger, 2005; Sansone and Storck, 2006). EBMUD's use of a 3 °C temperature increase by 2020 accelerates the projected temperature increase compared to the findings of current climate change studies and thus represents a very conservative assumption. The SFPUC's long-term water supply planning to prepare for the effects of climate change (as described in Section 14.11.5, below) has some of the same elements as EBMUD's program, including diversifying its water supply portfolio.

Turlock Irrigation District

TID has conducted some preliminary analyses of the possible impacts of global warming on Tuolumne River watershed runoff. The ongoing study, performed in collaboration with the SFPUC, uses a physical process model—the Hydrologic Forecasting Analysis Model—calibrated to the Tuolumne River basin for the period 1931 to 2000. The model is designed to explicitly analyze evapotranspiration,[1] snowpack, precipitation as rain or snow, and heat budget to determine effects on runoff timing and volume. This initial work compares the existing temperature (base case) with increasing temperature inputs of 0.6 and 1.7 °C (1 and 3 °F). The SFPUC is currently working with TID in reviewing the model assumptions and preliminary results. However, the work is still in progress, and no conclusions have been reached to date. As described in Section 14.11.5 below, the SFPUC is working with TID to further develop this model for use in long-term planning for climate change effects.

California Department of Water Resources

The DWR's climate change planning efforts are described above in Table 14.11-1. The SFPUC is using information provided by the DWR as general guidance in addressing climate change effects on its water system, although the results of specific DWR modeling do not address the Hetch Hetchy system and therefore are not directly applicable. (Please refer to Table 14.11-1 for descriptions of DWR's climate change planning documents.)

Sacramento Municipal Utility District

Because the Sacramento Municipal Utility District (SMUD) system includes reservoirs in the Sierra Nevada at elevations similar to those in the Hetch Hetchy system, the SFPUC contacted SMUD regarding its ongoing actions related to climate change. SMUD is following the scientific literature and DWR's analyses on climate change, particularly with respect to potential effects on the runoff patterns and quantities that could affect its system. Although SMUD does not provide water supply services, it operates and maintains hydroelectric facilities that are dependent on

[1] The return of water from the soil and from plants to the atmosphere by evaporation and transpiration.

runoff patterns that could be altered by climate change. SMUD's hydroelectric project in the upper American River watershed includes three major reservoirs, at elevations of approximately 4,500, 5,500, and 6,300 feet. Because the drainage basin includes areas at 9,000-foot elevations, climate change effects associated with rising snowlines would not be expected to affect SMUD's system in the near future. SMUD has not conducted modeling or other analyses to determine any special issues for its reservoirs and watershed (McFadden, 2008).

14.11.4 Climate Change and the SFPUC Regional Water System

Comment Summary

This section of this master response responds to all or part of the following comments:

F_NPS-YOS-01
S_RWQCBSF-16
L_ACFCWCD-05
L_MID-TID1-11
L_MID-TID1-26
SI_ACT-04
SI_ACT-05
SI_CAC2-04
SI_CNPS-EB1-06
SI_CRS-04
SI_CWA-01
SI_GreenP-04
SI_PacInst-18
SI_SierraC2-03
SI_SierraC3-03
SI_SierraC7-06
SI_SPUR-04
SI_SPUR-05
SI_TRT7-09
SI_TRT8-06
SI_TRT-CWA-SierraC-20
SI_TRT-CWA-SierraC-22
SI_TRT-CWA-SierraC-34
SI_TRT-CWA-SierraC-70
SI_TRT-CWA-SierraC-77
SI_TRT-CWA-SierraC-78
SI_TRT-CWA-SierraC-130
SI_TRT-CWA-SierraC-133
SI_TRT-CWA-SierraC-135
SI_TRT-CWA-SierraC-159
SI_TRT-CWA-SierraC-168
SI_TRT7-09
SI_TRT8-06
SI_TRT-CWA-SierraC-20
SI_TRT-CWA-SierraC-22
C_Chode-01
C_Clark1-04
C_Clark1-07
C_Clark1-08
C_Clark1-12
C_Clark2-03
C_Colli-02
C_Garba-03
C_Gelma-02
C_Genov-02
C_Colli-02
C_Garba-03
C_Genov-02
C_GreenD-03
C_GreenD-03
C_Hasso-04
C_Kallin-01
C_Lee-04
C_MartiM-04
C_Mater-02
C_Mijac-01
C_Owen-01
C_Raffa-06
C_Stein-03
C_Stein-04
C_Sugar-02
C_Tubma-02
C_Unreadable1-01
C_Walke-02

Summary of Issues Raised by Commenters

- The PEIR should analyze the effects of increased diversions coupled with the effects stemming from climate change and global warming, including impacts on biological resources.
- The PEIR should analyze the effects on the Tuolumne River watershed, including the SFPUC's Tuolumne River system firm yield, due to climate change and associated effects on the SFPUC's system operations and water yield.
- The PEIR should analyze the effects of climate change on demand, water use patterns, and the frequency of future rationing.

- Use of historical hydrology in the impact analysis overestimates water availability and underestimates the impacts of removing water from the Tuolumne River. Changes within the historical range are not the same as no impact, and modeling shown in the PEIR does not capture the range of impacts.
- The analysis should be expanded to include the effects resulting from changes in the frequency and duration of extreme climatic events.
- The water system needs to be robust enough to withstand any future climate scenario.

Response

Chapter 5 of the Draft PEIR (Vol.3, pp. 5.7-92 to 5.7-96) describes the SFPUC's initial modeling of potential climate change effects, which indicated that warming of 1.5 °C would effectively raise the snowline by 500 feet and transfer a portion of each year's runoff from spring/summer to fall/winter. This initial modeling of the SFPUC's regional water system indicates that, by 2025, about 7 percent of the current runoff to Hetch Hetchy Reservoir would occur earlier in the year. The Draft PEIR indicates that this degree of change is within the interannual variation in runoff, and that the potential impacts of global warming on the SFPUC's regional system would not affect the proposed WSIP operations through 2030. Consistent with the approach presented in the Draft PEIR, the analysis presented in this master response relies on the best available scientific information to provide further discussion and assessment of potential climate change effects on water resources and the SFPUC regional water system in the context of the environmental impacts of the WSIP.

SFPUC's Current Studies of Climate Change Effects

Background

The SFPUC manages three reservoirs in the Sierra Nevada mountains and five local reservoirs in the Bay Area to provide water supplies for customers in the Bay Area. The mountain watersheds typically have substantial snowmelt runoff from about March through June, filling the three Sierra reservoirs by late in the spring season. The supply from the Sierra reservoirs supplements the water supply provided by the local reservoirs, and in most years it is adequate to meet customer demand through the summer as well as to provide longer term reservoir storage in case subsequent years are dry.

The historical variability of hydrologic year types includes a broad range of annual runoff volumes in the mountain watersheds, ranging from at least 40 to 200 percent of the average annual runoff, and each winter's pattern of storms is different. The SFPUC operates the Hetch Hetchy system based on the "water first" protocol (see the Draft PEIR, Vol. 1, Chapter 2, p. 2-18), and discretionary drafts of the reservoir do not occur until forecasting tools confirm that snowmelt runoff will fill the reservoirs. This policy is designed to protect against water supply shortages in the foreseeable future.

The Hetch Hetchy basin above O'Shaughnessy Dam covers 459 square miles. About 87 percent of the area is above 6,000 feet in elevation, and about 76 percent is above 7,000 feet. The Cherry

Creek drainage basin above Lake Lloyd is 116 square miles; about 76 percent is above 6,000 feet, and about 52 percent is above 7,000 feet. The Eleanor Creek drainage basin above Lake Eleanor is 79 square miles, and about 60 percent is above 6,000 feet and 26 percent is above 7,000 feet.

Based on preliminary modeling of global warming effects, the SFPUC has estimated that the elevation of the snowline in the Sierra watersheds will increase from 6,000 to about 6,500 feet by 2025 (see the Draft PEIR, Vol. 3, Chapter 5, p. 5.7-94). This change means that in the future with climate change more of the precipitation in the SFPUC's Sierra watersheds will fall as rain than as snow due to the increased occurrence of warmer storms compared to historical conditions. It also means that the snowpack, on average, will contain less water and produce less snowmelt runoff. While the total runoff volume is likely to stay about the same, the pattern of the runoff will change. The November-through-March fraction of the runoff is expected to increase, and the April-through-July fraction of the runoff is expected to decrease.

Preliminary Modeling of Near-Term Climate Change Effects

The Draft PEIR (Vol. 3, Chapter 5, pp. 5.7-94 to 5.7-96) summarizes the SFPUC's initial evaluation of climate change effects on the regional system, and a more detailed description of that study is presented in this master response. The SFPUC conducted a preliminary analysis of global warming effects using the Water Supply Forecast Model (WSFM), a statistical model based on a 48-year record of daily temperature and precipitation (Hannaford, 1997). The SFPUC currently uses the WSFM as a tool to assist in the planning and operation of the Hetch Hetchy system to predict unimpaired stream flow conditions, and adapted this model to estimate stream flow effects of near-term temperature increases in the Tuolumne River watershed that appear likely in the next few decades based on the climate change literature. However, because the WSFM is a statistical model based on historical data, the SFPUC is working with TID to develop a different model—a physical process model—for studying long-term climate change effects (see Section 14.11.5, below).

The WSFM makes forecasts using prior precipitation and runoff, the water stored as snowpack in the basin, and future precipitation. The basin's snowpack is quantified by 35 snow courses (snow measuring stations) located throughout the Merced, Tuolumne, and Stanislaus River basins. Historical precipitation is used to estimate the likely range of future precipitation, and historical temperature is used to estimate future snow melt quantity and timing. An advanced statistical procedure is employed to develop equations that are then used, together with current conditions and 48 years of historical temperature and precipitation data, to make monthly forecasts of future runoff volumes.[2]

The database used in the model includes public data collected by state, federal, and cooperating organizations and individuals. Snow course data are coordinated by the California Cooperative Snow Survey Program based in Sacramento. Precipitation and temperature data originate from a variety of sources, including the Snow Survey, the National Weather Service and their

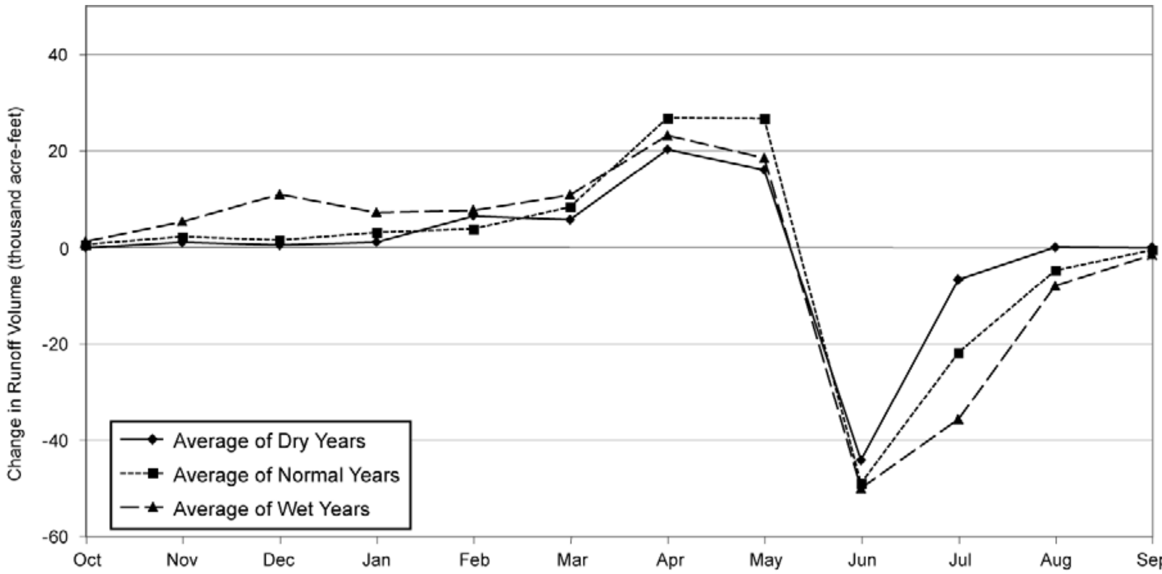
2 Based on standard errors, the accuracy of the WSFM in predicting total annual runoff is within approximately 5 percent.

cooperators, and irrigation and water supply districts. Runoff data for the model originate from sources such as the U.S. Geological Survey, TID, and MID.

Climate change studies indicate that there will be an increase of 3 °C mean annual temperature from 2000 to 2050 (Dettinger, 2005; Sansone and Storck, 2006). Because the PEIR period of analysis is through 2030, a projected temperature increase of 1.5 °C (about 3 °F) by 2025 was selected for analysis, which is assumed to approximate the 2030 condition. Thus, a 1.5 °C warming factor was added to historical temperatures, and the SFPUC calculated runoff volumes by month for the 1948–1995 period using the WSFM to depict a climate change scenario. Differences in the monthly volumes between the historical and climate change scenarios were analyzed for the entire analysis period, and the years were also sorted into wet, normal, and dry categories to determine if differences were evident for the various wetness regimes. This analysis assumed that no changes in annual precipitation would occur, even though the scientific literature has reported a range of differences in various model projections for precipitation changes due to global warming. Since the scientific literature indicates no clear trend for precipitation changes in California over the next century (see the description in Table 14.11-1, above, under CalEPA's *Climate Action Team Report to Governor Schwarznegger and the Legislature*, 2006), it was determined that no change in annual precipitation from historical/existing conditions was a reasonable assumption for the purposes of this near-term analysis (i.e., use of this assumption would be sufficient to characterize the general nature of effects that may be expected through 2030 due to climate change). The analysis is not intended to provide the full range of possible outcomes that could occur under the various climate change scenarios, but rather to encompass a reasonable range of effects. In the absence of scientific consensus on a quantifiable change in precipitation, the assumption of no change avoids speculation as to whether precipitation would decrease, increase, or occur at the same level, or whether it would occur on fewer days but at more intense levels.

Preliminary results from the WSFM confirmed that a shift in the timing of runoff from late winter months to early winter months could occur between 2000 and 2025, and inflow to all three of the SFPUC's Sierra reservoirs shows an average shift in runoff of about 7 percent. For the 48-year period, about 7 percent of the runoff shifted from the April–July period to the November–March period. In dry years, the runoff volume is smaller, and 8.5 percent shifted, corresponding to a volume of about 35,000 acre-feet out of 410,000 acre-feet as an average runoff volume for that year type. For normal years, 7 percent shifted, corresponding to a volume of about 50,000 acre-feet out of 677,000 acre-feet as an average runoff volume. For wet years, 6 percent shifted, corresponding to a volume of about 70,000 acre-feet out of 1,410,000 acre-feet. **Figure 14.11-1** graphically depicts the shift in the volume and timing of runoff that would be expected to occur by 2025 compared to historical conditions based on a 1.5 °C increase in temperature.

The capacity of Hetch Hetchy Reservoir is 360,000 acre-feet, and in normal and wet years over 700,000 acre-feet of water flows into the reservoir, resulting in large spills/releases to the Tuolumne River. Modest amounts of spill occur even in dry years. The WSFM results indicate that a shift in the timing of runoff volumes ranging from 35,000 to 70,000 acre-feet could occur by 2025 due to global warming. These predicted changes are well within the range of current and



Note: Zero represents average historical conditions from 1948 to 1995.

SFPUC Water System Improvement Program ▪ 203287

SOURCE: SFPUC, 2008.

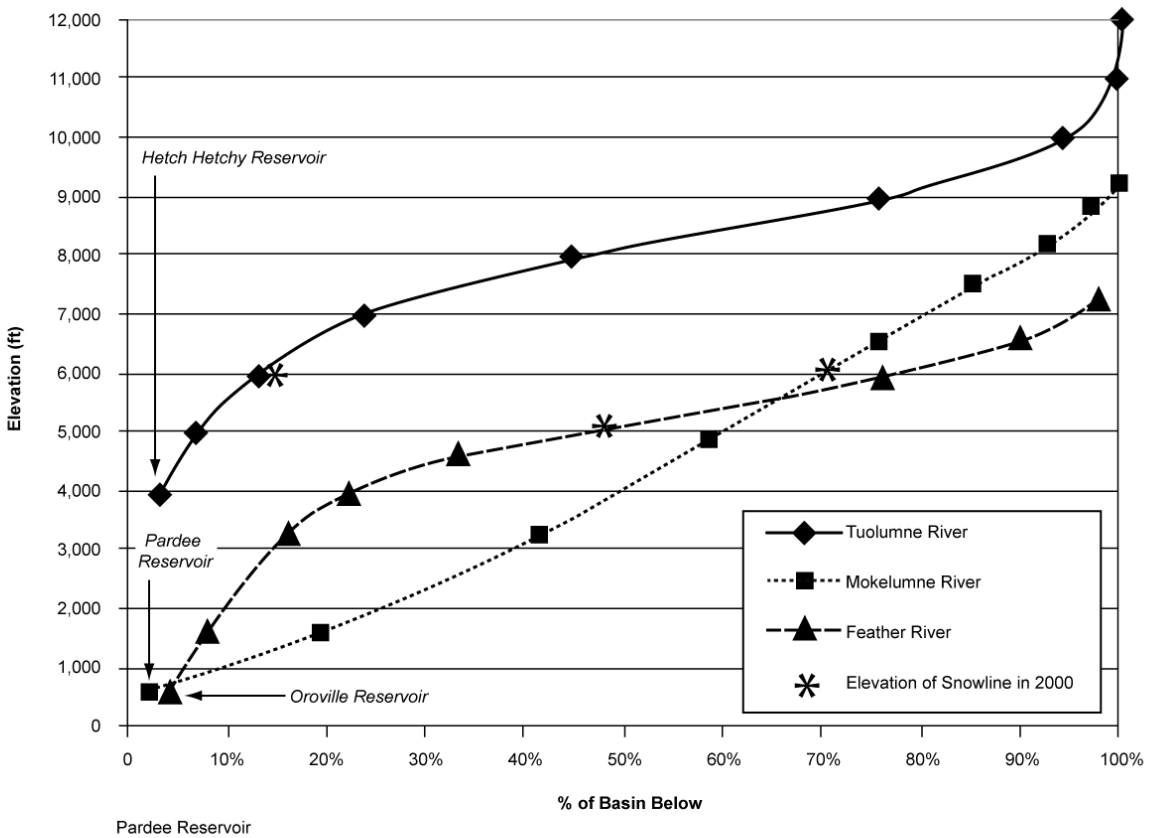
Figure 14.11-1
Modeled Shift in Runoff to Hetch Hetchy Reservoir
Comparing Historical Patterns with a Global Warming Scenario
of 1.5 °C Increase in Temperature

historical variability in annual runoff patterns. Year-to-year historical variability has shown much larger shifts between early and late winter runoff than the 2025–2030 global warming effect projected by the WSFM. Therefore, while global warming is projected to result in changes in runoff patterns in the Hetch Hetchy watershed, the SFPUC operators have determined that the magnitude of the predicted near-term changes is within the range of current/historical runoff patterns, and therefore it is not expected that substantial changes in SFPUC management practices or operations would be required through 2030. In dry years, if runoff ends earlier than in normal or wet years, the SFPUC has established operational procedures to minimize spills or discretionary power releases. A shift in the timing of runoff volumes (ranging from 35,000 to 70,000 acre-feet) to earlier in the season could cause releases/spills from the reservoir to cease a few days earlier each year. For current Hetch Hetchy Reservoir operations, the period when spills cease typically ranges from June 1 to August 15 depending on the hydrologic conditions of any given year. Under global warming conditions in the 2025–2030 timeframe, any change in the timing of when spills from Hetch Hetchy Reservoir cease would be minor compared to current/historical year-to-year variability. For these reasons, the SFPUC operators have determined that the change in runoff timing due to near-term global warming is not expected to cause substantial operational changes in the SFPUC's water supply system or its reliability.

The critical factor behind the relatively small shift in runoff timing and volume due to the predicted 1.5 °C warming at Hetch Hetchy Reservoir is the high elevation of the Hetch Hetchy watershed. The higher the elevation of a snow-covered basin, the greater the warming needed to change a large fraction of the snow-covered area and alter runoff patterns significantly.

Figure 5.7-5 in the Draft PEIR (Vol. 3, Chapter 5, p. 5.7-95) depicts the estimated decrease in snowpack in the Hetch Hetchy watershed due to predicted temperature increases by 2030 associated with global climate change.

Thus, the expected near-term climate change effects on the SFPUC regional system are different from those predicted for other California water supply and hydroelectric systems with reservoirs at much lower elevations. For example, EBMUD's Mokelumne River watershed and the SWP's Feather River watershed contain much lower proportions of their overall drainage basin as high-elevation snowpack compared to the Tuolumne River watershed. As shown in **Figure 14.11-2**, the overall basin elevation and the shape (steepness) of the area-elevation curve are indicative of a system's sensitivity to temperature change. The Feather River basin, for example, is sensitive to temperature change because its area-elevation curve is very flat, and for modest temperature changes, large areas of the basin could shift from snow-covered to rain-influenced lands.



SFPUC Water System Improvement Program ▪ 203287

SOURCE: SFPUC, 2008.

Figure 14.11-2
Relationship between Area and Elevation for the Tuolumne, Mokelumne, and Feather River Basins

Reservoirs at higher elevations, such as Hetch Hetchy, are less likely to be affected by increased air temperatures from global warming in the next 25 to 30 years than those at lower elevations in terms of reservoir water temperatures and stream flow releases. A shift in the timing of runoff would not likely cause a substantial change in the magnitude or schedule of the minimum stream flow releases from reservoirs at higher elevations, since these releases are routinely made from the bottom of the reservoir (i.e., below the upper layer of water in the reservoir that is affected by air temperature). If summer air temperatures become significantly higher with global warming, streams may warm more rapidly than under historical conditions; however, air temperature is dynamic and highly variable, and thermal refuges such as cool, deep pools exist in most stream reaches.

In conclusion, the preliminary WSFM results indicate that the near-term effects of climate change through 2030 are not expected to affect the current water supply planning or operations of the SFPUC regional water system.

Since the planning horizon for the WSIP is 2030, the results of the preliminary WSFM modeling are adequate for the purposes of the PEIR environmental analysis. A description of the SFPUC's long-term planning with respect to climate change is provided in Section 14.11.5, below, for informational purposes. Further detail on the effects of climate change as they relate to the proposed WSIP is presented below using the results of the WSFM modeling.

It should be noted that the current state of atmospheric science and global circulation models is not yet advanced enough to provide specific information on phenomena such as changes in total precipitation, seasonal precipitation allocation, or the more frequent or more intense droughts or larger storm events that some scientists believe may occur. Thus, at this time, it would be speculative to predict the magnitude and characteristics such events and attempt to analyze them with operational planning models. The SFPUC now uses a design drought in its operational planning models that is longer and more intense than any drought on record, and is thereby planning for the more intense droughts predicted to occur under some climate change scenarios using prudent judgment and the best available scientific information.

Qualitative Assessment of WSIP Impacts with Consideration of Climate Change Effects

In response to the numerous comments on the Draft PEIR related to climate change, this master response presents a qualitative assessment of potential WSIP impacts in the context of potential climate change effects in order to confirm the impact analysis of proposed WSIP water supply and system operations presented in the Draft PEIR (Vol. 3, Chapter 5).

In the 2005 *State Water Project Delivery Reliability Report*, the DWR stated:

> Until the impacts of climate change on precipitation and runoff patterns in California are better quantified, future weather patterns are usually assumed to be similar to those of the past, especially where there is a significant historical rainfall record.

Consistent with this statement, the impact analysis of the WSIP water supply and system operations presented in Chapter 5 of the Draft PEIR is largely based on results obtained from the Hetch Hetchy/Local Simulation Model (HH/LSM), which simulates system operations over an 82-year period of historical hydrology (from 1920 to 2002). Although there is inherent uncertainty regarding whether historical hydrology will be repeated in the future—especially given the evolving information on the potential effects of global climate change—the use of historical data over 82 years provides a wide enough range of inter-annual variation to address the climate change effects expected by 2030. The HH/LSM represents the best available tool for depicting overall regional system operations and predicting potential future effects on resources downstream of SFPUC water system facilities. The validity of this methodology to account for the future effects of climate change through 2030 was corroborated by the results of the WSFM modeling described above, which indicated that, independent of WSIP implementation, the existing SFPUC system operations and management practices provide adequate flexibility to accommodate the projected effects of climate change through the WSIP planning year of 2030.

Nevertheless, in response to comments received on the Draft PEIR, a qualitative analysis was conducted to determine how climate change might affect the environmental impacts of the WSIP identified in the Draft PEIR. The qualitative assessment was conducted by first reviewing the key findings from the scientific literature (summarized in Section 14.11.2, above) and assessing the applicability of each finding to the SFPUC regional water system. The qualitative analysis then reexamined the impacts of the WSIP assuming that a certain climate change scenario would occur between now and 2030 using the findings from the WSFM modeling described above. The qualitative analysis was based on an understanding of regional system operations and operating constraints combined with an understanding of the changes in system operations that would result from WSIP implementation as identified through the HH/LSM.

Table 14.11-3 lists the key findings from the literature review on climate change variables and describes how each variable relates to the HH/LSM assumptions and how those assumptions could be adjusted to account for climate change. The table indicates that, with the exception of the shift in the seasonal timing of runoff to the Hetch Hetchy system reservoirs and Don Pedro Reservoir, no other adjustments to the assumptions used in the HH/LSM or the Draft PEIR impact analysis would be required, either because any revised assumption would be too speculative at this time or because the existing operational protocols and planning process include adequate flexibility to account for expected climate change effects through 2030.

Methods and Assumptions for Qualitative Assessment

This qualitative analysis was based on a reasonable prediction of climate change effects in the next few decades as they pertain to the SFPUC regional water system. Although it does not encompass the wide range of climate change projections and variability described in the scientific literature, this approach provides a reasonable basis for the purposes of the PEIR for estimating the nature and magnitude of the environmental impacts of the WSIP while accounting for climate change through 2030. This qualitative assessment assumed global climate change would increase air temperatures in California by an average of 1.5 °C by 2030, but that no change in average annual precipitation would occur. These assumptions are generally consistent with the results of

TABLE 14.11-3
CLIMATE CHANGE VARIABLES AND THE SFPUC REGIONAL WATER SYSTEM

Climate Change Variable	Existing HH/LSM Modeling Assumptions That Could Be Affected	Adjusted Assumptions to Account for Climate Change Variable for the Qualitative Assessment
1. Sierra snowpack will likely decrease due to an increase in snowline elevation, resulting in increased amount of precipitation falling as rain rather than snow and an earlier snowmelt. Since there is no clear trend for precipitation changes in California, this variable assumes no change in total average annual precipitation.	• Unimpaired runoff to Hetch Hetchy system reservoirs and to Don Pedro Reservoir • Tuolumne River entitlements among CCSF, TID, and MID • Forecasted runoff procedures and operation protocols	Shift in monthly distribution of inflow within a year: • Increased inflow to reservoirs in fall, winter, and spring (approximately October to May) • Decreased inflow to reservoirs in late spring and summer (approximately June to September)
2. Rivers and streams fed by mountain watersheds are expected to exhibit an increase in stream flow in fall, winter, and spring, and a decrease in late spring and summer.	Instream flow requirements are based on hydrology and fishery needs that establish releases from: • Lake Lloyd (Cherry Reservoir) • Lake Eleanor • Hetch Hetchy Reservoir • Don Pedro Reservoir	No change in current mandated minimum releases for fisheries from affected reservoirs. At this time, it would be speculative to assume that future resource objectives and flow requirements would be different from the existing condition.
3. Warmer air temperatures are expected to increase water temperature in reservoirs, potentially increasing temperature of releases to streams; instream water temperatures may increase.	Instream flow requirements are based on hydrology and fishery needs that establish releases from: • Lake Lloyd (Cherry Reservoir) • Lake Eleanor • Hetch Hetchy Reservoir • Don Pedro Reservoir	No change in current mandated minimum releases for fisheries from affected reservoirs (see above). There would be negligible changes in SFPUC reservoirs during all but the most extreme droughts due to the size of the coldwater pool in the reservoirs and minimal changes in reservoir operations.
4. Conflicts among water supply, hydropower, and flood control in reservoir operations are expected.	Reservoir operations	No change in protocols for SFPUC reservoir operations. Protocols would continue to prioritize water supply. No change in protocols for Don Pedro Reservoir operations by TID and MID.
5. Warmer temperatures could cause increases in water demand in both agricultural and municipal regions.	• 300 mgd, 2030 purchase request • Availability of water in Don Pedro Reservoir	No change in delivery assumptions for the SFPUC. While demand of SFPUC customers may increase, delivery is limited to the contractual amount. Agricultural demand of TID and MID may evolve, since warmer conditions could lead to increased demand for irrigation. However, other factors such as land use conversion and agricultural market forces may have a larger effect on demand for irrigation than climate change, making alternative demands too speculative to predict.
6. Sea level rise will affect coastal areas and estuaries.	Not applicable	Not applicable
7. Increased risk for more extreme weather and climate events (i.e., more intense precipitation and drought events) is likely.	• Historical and design drought sequences included in the HH/LSM to establish system firm yield and rationing needs • Flood control studies have been performed for regulatory requirements	No change in existing SFPUC operation protocols, which were developed to address a wide range of conditions, including extreme weather events. The SFPUC planning process already incorporates a more extreme drought scenario than any from historical hydrology (i.e., the design drought). No change in SFPUC operations related to flooding because the SFPUC facilities have no flood control functions. Assume no change for TID and MID flood control operations for Don Pedro Reservoir.

the literature review presented above in Section 14.11.2, with the understanding that an increase of 1.5 °C by 2030 may be on the high side (and is therefore a conservative assumption with respect to determining potential impacts). The following analysis considers the effects of this temperature increase on hydrology within the SFPUC regional water system based on the WSFM results, and compares the environmental effects that would stem from this hydrologic change with the impact analysis presented in the Draft PEIR.

The WSFM, described above, was used to estimate inflow into reservoirs on the Tuolumne River under this climate change scenario (an average of 1.5 °C warming by 2030). As noted earlier, the primary effect of the climate-change-induced temperature rise would be to increase precipitation falling as rain, decrease precipitation falling as snow, and cause snowmelt to occur earlier in the season. Using the numerical reservoir inflow estimates provided by the WSFM, the qualitative analysis was performed by tracking the movement of water through the SFPUC regional water system, noting where reservoir storage and releases to rivers would increase or decrease due to climate change effects compared to the analysis presented in Chapter 5 of the Draft PEIR. The general scale of increases and decreases was also noted. However, due to the broad assumptions used in the analysis regarding climate change effects, no numerical values for increases or decreases of reservoir storage and releases are presented, since they would give a misleading impression of the precision of this assessment.

The following assessment is organized by watersheds and reflects a three-step process. First, it summarizes the environmental impacts of the WSIP compared to existing conditions as presented in Chapter 5 of the Draft PEIR. It then describes how climate change could affect reservoir storage and releases by 2030. Finally, the impacts of the WSIP presented in the Draft PEIR are discussed in light of possible climate change effects.

Upper Tuolumne River Watershed

Under the existing condition, only the required minimum stream flow releases are made to the Tuolumne River from Hetch Hetchy Reservoir for most months of the year. In the late spring, snowmelt runoff fills the reservoir and releases in excess of the minimum required are made to the river (typically in May and June). With the WSIP in 2030, the SFPUC would draw down Hetch Hetchy Reservoir farther prior to the snowmelt period than it does under the existing condition in order to serve the increased purchase requests, thus lowering the water level in the reservoir. As a result, a greater proportion of the snowmelt runoff would be needed to refill the reservoir, and spring stream flow releases in excess of the minimum required would be delayed by a few to several days, and the total volume of releases over that time period would be reduced. Terrestrial biological resources in the Poopenaut Valley would be adversely affected by the delay and reduced volume of the spring release (see Draft PEIR, Impact 5.3.7-2, Vol. 3, Chapter 5, pp. 5.3.7-21 and 5.3.7-22).

With climate change effects in 2030, snowmelt is expected to occur earlier in the year. Assuming no change in annual precipitation, the total volume of the spring release would not be altered but its seasonal timing would be. Hetch Hetchy Reservoir would have lower water levels due to serving the increased purchase requests under the WSIP, and it would fill with snowmelt runoff earlier in the year due to climate change; thus, releases to the river in excess of the minimum would begin earlier. Thus, it is possible that the delay in spring releases to the river (by a few to several days) that was identified as a consequence of the WSIP might not occur when the combined effects of climate change and the WSIP are considered together. If this were to happen, terrestrial biological resources in the Poopenaut Valley would not be subjected to a delay in spring releases, and the Poopenaut Valley would probably experience the greatest release several weeks earlier than under the existing condition. When climate change is considered, the effect on biological resources in the Poopenaut Valley would be the same as, or possibly less than, that described in Draft PEIR Impact 5.3.7-2.

The WSIP and climate change combined could still adversely affect terrestrial biological resources if peak flows were reduced compared to the existing condition and opportunities for groundwater recharge in the Poopenaut Valley were reduced. However, as identified in the Draft PEIR for the impacts of the WSIP, the combined effects of the WSIP and climate change on these resources could be reduced through the operational strategies described in Mitigation Measure 5.3.7-2 (Vol. 4, Chapter 6, pp. 6-49 and 6-50). These strategies involve shaping the releases from Hetch Hetchy Reservoir to maximize opportunities for inundation of the valley in an effort to achieve the necessary groundwater recharge, and, as specified in the measure, can be modified as needed to achieve the mitigating effect of sustaining the existing meadow communities.

The Draft PEIR determined that the WSIP would have a less-than-significant effect on whitewater river recreation in the upper Tuolumne River watershed (Impact 5.3.8-2, Vol. 3, Chapter 5, pp. 5.3.8-27 to 5.3.8-32). With the WSIP in 2030, the delay in spring releases could slightly reduce the number of days when flow in the river is suitable for rafting in some years; however, when climate change effects are also considered, the earlier snowmelt could cause releases to the river to begin earlier, possibly offsetting the effects of the WSIP. When climate change is considered, the effect on whitewater river recreation would be the same as, or possibly less than, that described in Draft PEIR Impact 5.3.8-2.

Lower Tuolumne River Watershed

Under the existing condition, only the minimum required stream flow releases are made to the Tuolumne River from La Grange Dam in most months. During the summer and fall, Don Pedro Reservoir is drawn down to meet water supply needs. One of the goals of dam operators is to fill the reservoir in the following winter and spring with rainfall and snowmelt runoff by the end of the snowmelt period. The operators' ability to meet this goal is constrained by the requirement that space must be retained in Don Pedro Reservoir to accommodate flood flows and reduce the risk of downstream flooding. Water in excess of the minimum required is typically released from La Grange Dam to the Tuolumne River in a number of pulses. During large winter storms, operators may have to release water to maintain the flood reservation in the reservoir, creating a pulse release of a few days to a few weeks. The need to maintain the flood reservation declines in the late spring, and the operators use snowmelt runoff to fill Don Pedro Reservoir. If more water is available than is needed to fill the reservoir, releases in excess of the minimum required are made to the Tuolumne River below La Grange Dam. In many years, the release from the reservoir during the snowmelt period is the largest of the pulse releases.

With the WSIP in 2030, increased purchase requests in the SFPUC service area would cause Don Pedro Reservoir to be drawn down farther prior to the snowmelt period than it is under the existing condition. As a result, a greater proportion of reservoir inflow from winter rainfall and snowmelt runoff would be needed to fill the reservoir. Because the reservoir would be drawn down farther than under the existing condition, runoff from winter storms could be more easily contained in the reservoir without encroaching on the flood reservation. As a result, some of the wintertime pulse releases to the Tuolumne River from La Grange Dam that occur under the existing condition would be eliminated or reduced in volume with the WSIP. The increased reservoir drawdown with the WSIP would also delay (by several days or weeks) the larger pulse release in the snowmelt period and reduce its total volume. The delay and reduction in the spring pulse release would have adverse effects on anadromous fish in the Tuolumne River and biological resources along the river below La Grange Dam (see Draft PEIR, Impacts 5.3.6-4 and 5.3.7-6, Vol. 3, Chapter 5, pp. 5.3.6-28 to 5.3.6-32 and pp. 5.3.7-25 to 5.3.7-26).

With climate change effects in 2030, rainfall and snowmelt runoff would enter Don Pedro Reservoir earlier in the season than it does under the existing condition. As the dam operators would be unable to accommodate the earlier wintertime runoff in the reservoir because of the flood control reservation, they would have to release water in excess of the minimum required to the Tuolumne River. The earlier runoff could offset the effects of the WSIP on reservoir water levels. When the effects of WSIP and climate change are considered together, the wintertime pulse releases could occur much as they do under the existing condition.

Based on the assumptions and results from the WSFM analysis, climate change is not expected to have much effect on the total average annual volume of water released from La Grange Dam by 2030.[3] As noted above, the WSIP would delay the spring pulse release by several days or weeks compared to the existing condition. The WSIP and climate change together would delay the spring release and also reduce its volume because a higher proportion of inflow to the reservoir would be in the winter and be released to the stream at that time.

The adverse effects of the WSIP on anadromous fish would be attributable to the delay and reduction in volume of the spring release from La Grange Dam and would not be much affected by the WSIP-caused reductions in wintertime pulse releases. When the WSIP and climate change are considered together, the reduction in spring release would be greater than with the WSIP alone, and therefore the effects on anadromous fish could be greater. If increases in spring water temperatures due to climate change are also considered, the effects on anadromous fish could be even more severe. Implementation of Mitigation Measure 5.3.6-4a, Avoidance of Flow Changes by Reducing Demand for Don Pedro Reservoir Water, or Mitigation Measure 5.3.6-4b, Fishery Habitat Enhancement (Vol. 4, Chapter 6, pp. 6-48 and 6-49), would avoid the impacts attributable

3 As described in Section 14.11.2, above, the DWR reported that when some climate change scenarios are applied to Don Pedro Reservoir, there would be a reduction in Tuolumne River annual inflow to the reservoir as well as a shift in the timing of the inflow by 2050. The results of this qualitative assessment corroborate the DWR prediction that climate change will cause a shift in the timing of runoff; however, unlike the DWR results, due to differences in the assumptions used in the climate change scenarios, this qualitative assessment assumes the total annual inflow to Don Pedro Reservoir would remain the same.

to the WSIP. Since implementation of this measure would fully mitigate the adverse effects of the WSIP, the effects of climate change on anadromous fish would be independent of the WSIP.

The identified adverse effects of the WSIP on terrestrial biological resources along the Tuolumne River below La Grange Dam are primarily attributable to the reduction in average peak flows and total flows in the river. Thus, the effects on biological resources due to the WSIP and climate change combined could be essentially the same as those due to the WSIP alone (as described in Draft PEIR Impact 5.3.7-6), since climate change effects are not expected to result in much change in the total volume of winter and spring releases from La Grange Dam based on the assumptions used in the WSFM. Implementation of Mitigation Measure 5.3.6-4a (Vol. 4, Chapter 6, p. 6-48) would avoid the impacts attributable to the WSIP.

The shift in the timing of snowmelt and runoff in the Tuolumne River watershed due to climate change is not expected to affect SFPUC system deliveries to the San Joaquin Pipelines and Bay Area customers.

Alameda Creek Watershed

Climate change effects by 2030 are not expected to change the total volume of water the SFPUC diverts from the Tuolumne River. Since this analysis assumed no change in total annual precipitation, and since the Alameda Creek watershed is at a much lower elevation than the Sierra watersheds and is not affected by snowmelt, there would be no change in local hydrology and runoff patterns due to increasing snowline elevations. While some studies indicate that climate change could result in more extreme weather or climate events, there are insufficient data to make any assumptions regarding how these extreme weather events might affect a specific watershed or operation of local SFPUC facilities. None of the SFPUC reservoirs in the Alameda Creek watershed currently provide or are proposed to provide flood control functions under the WSIP, so any operational changes attributable to extreme flooding events due to climate change would occur independent of the WSIP. Similarly, SFPUC operational practices during drought events would remain the same, regardless of whether the WSIP is implemented, and the SFPUC would continue to meet all legal requirements for the protection of fish and other wildlife habitat. Consequently, the 2030 operations of water supply facilities in the Alameda Creek watershed with the WSIP and with the WSIP and climate change considered together would likely be the same. Therefore, the environmental effects of SFPUC water system operations in the Alameda Creek watershed with the WSIP and with the WSIP and climate change combined would also likely be the same, as described in the Draft PEIR (Vol. 3, Chapter 5, Section 5.4).

Peninsula Watershed

As stated above, climate change would not affect the total volume of water the SFPUC would divert from the Tuolumne River by 2030. Since this analysis assumed no change in total annual precipitation, and since the San Mateo Creek and Pilarcitos Creek watersheds are at much lower elevations than the Sierra watersheds and are not affected by snowmelt, there would be no change in local hydrology and runoff patterns due to increasing snowline elevations. While some studies indicate that climate change could result in more extreme weather or climate events, there are insufficient data to make any assumptions regarding how these extreme weather events might affect a specific watershed or operation of local SFPUC facilities. None of the SFPUC reservoirs in the Peninsula watershed currently provide or are proposed to provide flood control functions under the WSIP,[4] so any operational changes attributable to extreme flooding events due to climate change would occur independent of the WSIP. Similarly, SFPUC operational practices during drought events would remain the same, regardless of whether the WSIP is implemented, and the SFPUC would continue to meet all legal requirements for the protection of fish and other wildlife habitat. Consequently, the 2030 operations of water supply facilities in the Peninsula watershed with the WSIP and with the WSIP and climate change considered together would likely be the same. Therefore, the environmental effects of SFPUC water system operations in the Peninsula watershed with the WSIP and with the WSIP and climate change combined would also likely be the same, as described in the Draft PEIR (Vol. 3, Chapter 5, Section 5.5).

Summary of Qualitative Assessment of WSIP Impacts and Climate Change

The assessment demonstrates that, in all cases, the impacts of the WSIP through 2030 on resources in the Tuolumne River, Alameda Creek, and Peninsula watersheds identified in the Draft PEIR remain valid when climate change effects are also considered. In most cases, when WSIP effects are considered in combination with a climate change scenario, the resulting impacts are either comparable to those described in the Draft PEIR or possibly less severe due to an offsetting effect of the timing of snowmelt compared to the WSIP-induced changes in reservoir storage or releases. In all cases, mitigation measures identified in the Draft PEIR would apply whether or not climate change is considered. Thus, the impact analysis of WSIP water supply and system operations presented in Chapter 5 of the Draft PEIR provides a reasonable, and sometimes conservative, assessment of environmental effects that accounts for potential climate change through the SFPUC planning horizon of 2030.

14.11.5 SFPUC's Actions to Address Climate Change

Comment Summary

This section of this master response responds to all or part of the following comments:

F_NPS-YOS-01	SI_SPUR-04	C_Chode-01
S_RWQCBSF-16	SI_SPUR-05	C_Clark1-04
L_ACFCWCD-05	SI_SPUR-07	C_Clark1-07
L_MID-TID1-11	SI_TRT7-09	C_Clark1-08
L_MID-TID1-26	SI_TRT8-06	C_Clark2-03
L_Tuol1-07	SI_TRT-CWA-SierraC-20	C_Gelma-02
SI_ACT-04	SI_TRT-CWA-SierraC-22	C_Hasso-04
SI_ACT-05	SI_TRT-CWA-SierraC-34	C_Lee-04
SI_CAC2-04	SI_TRT-CWA-SierraC-70	C_MartiM-04
SI_CNPS-EB1-06	SI_TRT-CWA-SierraC-77	C_Mater-01
SI_CRS-04	SI_TRT-CWA-SierraC-78	C_Mijac-01

[4] The Lower Crystal Springs Dam Improvements project (PN-4) would include improvements to protect downstream areas from the probable maximum flood; however, the Lower Crystal Springs Dam is generally not operated as a flood control facility. Crystal Springs Reservoir reduces peak flow in San Mateo Creek most of the time, and the SFPUC operates the reservoir to allow space for floodwaters when major storms are expected.

SI_CWA-01	SI_TRT-CWA-SierraC-130	C_Owen-01
SI_GreenP-04	SI_TRT-CWA-SierraC-133	C_Raffa-08
SI_PacInst-18	SI_TRT-CWA-SierraC-135	C_Unreadable1-01
SI_SierraC2-03	SI_TRT-CWA-SierraC-159	C_Willi-04
SI_SierraC3-03	SI_TRT-CWA-SierraC-168	
SI_SierraC7-06	C_Bail-02	

Summary of Issues Raised by Commenters

- Proactive climate change management strategies should be the first priority.

Response

SFPUC Water Supply Management Approach to Climate Change

As part of its ongoing operations and management of the regional water system, the SFPUC is addressing climate change with respect to both the near-term and long-term implications for the system. While some short-term trends over the next 20 to 25 years are discernible to a degree, the uncertainty associated with the range of climate conditions that could develop late in the 21st century from the continued accumulation of greenhouse gases in the atmosphere presents a greater challenge to water supply management.

The SFPUC is now taking steps to evaluate its water supply planning with respect to climate change effects. In addition, the SFPUC is working at a broader level to organize the utility community around climate change issues, to advocate for improved climate science, and to help develop better decision support tools that can address uncertainties related to long-term climate change effects.

Planning for Long-Term Climate Change Effects

The SFPUC is investigating the effects of global warming on the Tuolumne River basin water supply at time scales that extend well beyond the planning horizon for the WSIP and the PEIR. At these longer time scales (such as by 2100), a potential 6 °C change would have a range of effects that are more significant than the effects estimated to occur by 2025 or 2030. Physical processes subject to long-term climate change effects, such as evapotranspiration (ET), the lack of permanent snow cover, and midwinter melting, could change runoff timing in a significant way and even alter runoff volumes due to increased ET losses.

The SFPUC has begun collaborative research with TID (as described above in Section 14.11.3) and plans to assess the longer time-scale changes with a physical process model that TID has had calibrated to the Tuolumne River basin. The TID model is an explicit physics-based simulation model that incorporates the physical processes that occur during the accumulation and ablation (loss) of a watershed's snowpack and that produce runoff, and is thus better suited to examining the large changes in temperature and other variables that could occur between 2025 and 2100. The TID model analyzes ET and snowpack accumulation by allocating precipitation (as rain or snow) on 800 sub-watersheds based on elevation and other factors, and then performs heat budget calculations for the snowpack. It is expected that the model will depict representative effects of long-term climate change on runoff timing and volume. The TID model output can then be used as the input to an operations or planning model to investigate changes in operations, firm yield, and other issues of interest for the period from 2050 to 2100 and beyond. Operations models using these new inflow time series can be changed to assess ways of adapting current project operations to compensate for the expected larger changes in runoff timing and volume in this longer timeframe. As regional downscaling of global circulation models begins to provide better projections of climate change effects in the Tuolumne River basin, the TID model will be used to refine the analysis of changes in temperature and precipitation on runoff timing and quantity.

SFPUC Climate Change Activities

In August 2006, the SFPUC Commission held a special public hearing to begin outlining the local and regional steps needed to prepare the utility and its customers for the expected impacts of global climate change on the SFPUC's water, wastewater, and power services. In January and February 2007, the SFPUC convened the Water Utility Climate Change Summit, which was attended by managers and board members from 30 water utilities from eight states; representatives from 17 regional, state, and federal agencies; leaders from non-governmental organizations and business communities; and members of the public. The summit was designed for the utility community with a focus on adaptation to climate change ("adaptation" is the term used to describe efforts to respond to the effects of climate change rather than to address the causes). For two days, top experts from around the country discussed the implications of climate change with respect to water supply, operations, and sea level rise, as well as the state of climate science in determining the nature of climate change impacts. The second day was focused on brainstorming action items, such as enhancing technical tools to help better predict climate change impacts, increasing funding for data gathering related to snowpack, streamflow, and related issues, and developing a collective voice for the water utility community.

Eight of the attending utilities have since formed a coalition, called the Water Utility Climate Alliance, to build on the recommendations that emerged from the summit. Chaired by the SFPUC, the alliance also includes Seattle Public Utilities, Metropolitan Water District of Southern California, New York City Department of Environmental Protection, San Diego County Water Authority, Southern Nevada Water Authority, Portland Water Bureau, and Denver Water. Combined, these utilities deliver water to over 36 million Americans. Thus far, the focus has been on addressing adaptation concerns while also enhancing mitigation programs. The group has identified the following two priorities: (1) lobbying for more funding for climate research, and greater focus on regional climate forecasting, in order to improve the ability to predict the effects of climate change on water supply and infrastructure; and (2) adapting decision support tools that might assist utilities in developing frameworks for long-term planning in the face of the extensive uncertainties regarding the scope of climate change effects. Utilities in the alliance are also learning from one another in developing adaptation programs, gathering information on federal initiatives such as the Climate Change Science Program (and commenting in an integrated fashion on that program), educating each other about efforts to downscale global circulation models to improve forecasting at a regional level, and tracking federal legislation. Guest speakers representing the Western Water Assessment in Colorado, National Center for Atmospheric Research, Association of Metropolitan Water Agencies, American Water Works Association

Research Foundation, and U.S. Environmental Protection Agency have participated in the activities of the Water Utility Climate Alliance.

In addition to these efforts, the SFPUC participated in the American Water Works Association Research Foundation (AwwaRF) Climate Change Research Needs Workshop on January 8 and 9, 2008. The SFPUC's water quality manager, Andrew DeGraca, served as chair of the workshop and is chairing a new strategic initiative at AwwaRF focused on improving climate change research to assist water utility planning efforts.

Other activities at the SFPUC include: (1) in May 2007, SFPUC General Manager Susan Leal represented Mayor Gavin Newsom at the international C40 Large Cities Climate Summit hosted by Mayor Michael Bloomberg in New York; and (2) during 2007, SFPUC staff presented their climate change-related work on panels at the Association of Metropolitan Water Agencies fall conference, the Colorado Water Congress annual meeting, the annual California Water Policy Conference of Public Officials for Water and Environmental Reform (POWER), and at a workshop on Climate Change, Urban Drainage, and Adaptation sponsored by Seattle Public Utilities.

Reducing the SFPUC's Carbon Footprint

In addition to the steps the CCSF and the SFPUC are taking to reduce GHG emissions described in the Draft PEIR (Vol. 2, Chapter 4, pp. 4.9-16 to 4.9-20), the SFPUC is taking other actions as well. The SFPUC is developing a comprehensive Sustainability Plan, which will incorporate consideration of the agency's carbon footprint and adaptation of system operations to adjust for climate change effects.

As a clean power generator whose water supply is largely gravity fed, the SFPUC currently has a small carbon footprint compared to that of most utility districts. Nonetheless, the SFPUC Power Enterprise manages a number of programs that develop renewable energy facilities and energy efficiency programs for the CCSF.

Two key programs managed by the Power Enterprise—renewable energy generation and energy efficiency—are helping the SFPUC contribute to San Francisco's effort to reduce its carbon footprint. By the end of 2007, a total of 2 megawatts of peak solar capacity had been installed on city facilities (including Moscone Center, San Francisco International Airport, the SFPUC's City Distribution Division, and other locations), generating an estimated 2.5 million kilowatt-hours of electricity per year, or approximately 1,000 tons of carbon-dioxide-equivalent[5] per year.

On the energy efficiency front, the SFPUC has an aggressive program in several city departments; projects include lighting and HVAC (heating, ventilation, and air conditioning) upgrades at San Francisco General Hospital, and conversion of the city's traffic signals to LED technology. The resulting energy savings of these projects is an estimated 24 million kilowatt-

5 Carbon dioxide equivalency is a quantity that describes, for a given mixture and amount of greenhouse gas, the amount of carbon dioxide that would have the same global warming potential when measured over a specified timescale (generally 100 years).

hours of electricity and 300,000 therms of natural gas per year, a GHG emissions reduction of approximately 11,000 tons of carbon-dioxide-equivalent per year.

The SFPUC recycles a substantial amount of potential GHG at its wastewater treatment plants. Methane gas produced in the anaerobic digesters at both wastewater treatment plants (Southeast and Oceanside) is used to fuel the engine generators and boilers, which in turn produce the energy used in plant operations. The engine generators produce electrical power, and the engine generators and boilers both produce hot water to heat the digesters and run the plant's HVAC system. Without this system, this methane gas—a more damaging GHG than carbon dioxide—would be released into the atmosphere.

The CCSF's newly adopted Green Building Ordinance (Chapter 7 of the Environment Code) requires city construction projects over 5,000 square feet in size to be built to Leadership in Energy and Environmental Design (LEED) Silver standards and to be certified by the U.S. Green Building Council. The San Francisco Municipal Green Building Program is mandatory for most aboveground buildings, including those proposed under the WSIP, regardless of whether or not they are used to house facilities or people. The San Francisco Department of the Environment has also been working with the SFPUC and other CCSF departments on certain municipal projects that are not required to obtain LEED Silver Certification (such as pipelines) to try to ensure these projects are constructed with recycled, environmentally friendly building materials that are sourced locally to minimize transportation fuel. City officials estimate this ordinance could reduce carbon dioxide emissions in the city by 60,000 tons and save 220,000 megawatt-hours of power by 2012.

Finally, the CCSF is a member of the California Climate Action Registry and became the first city to certify its emissions with the Registry in 2006. The SFPUC's emissions were certified as part of the overall city/county certification process using the Registry's Power Utility Protocol.

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