Chapter 25
Public Health

This chapter focuses on issues related to human health and safety that could potentially be affected by implementation of the action alternatives, particularly with respect to water quality, the potential to cause or worsen water borne illness, the potential to create habitat for vectors that may carry diseases; and to address potential health related concerns from additional electric transmission lines needed under most of the alternatives. Although some potential health-related impacts of the alternatives are discussed in other chapters of this EIR/EIS (please see Chapter 8, *Water Quality*, Chapter 9, *Geology and Seismicity*, Chapter 10, *Soils*, Chapter 11, *Fish and Aquatic Resources*, Chapter 12, *Terrestrial Biological Resources*, Chapter 14, *Agricultural Resources*, Chapter 22, *Air Quality and Greenhouse Gas Emissions*, Chapter 23, *Noise*, Chapter 24, *Hazards and Hazardous Materials*, and Chapter 28, *Environmental Justice*), the primary focus of those other chapters is not on public health. The specific topics addressed in this chapter are listed below.

- Drinking water quality as related specifically to humans.
- Bioaccumulation of toxicants in fish and aquatic organisms that are consumed by humans.
- Pathogens in recreational waters.
- Vectors—specifically, disease carrying mosquitoes.
- Electromagnetic fields from transmission lines that may be required by an alternative and that could affect the public.

This chapter does not duplicate the information provided in other sections of the EIR/EIS, but rather focuses the discussion on potential impacts on human health of implementing the action alternatives. As indicated above, this chapter also includes a discussion of the potential effects of implementing the action alternatives on human health related to pathogens in recreational waters and disease-carrying vectors, topics not addressed in any other chapter of the EIR/EIS.

The reader is referred to Chapter 6, *Surface Water*, Chapter 22, *Air Quality and Greenhouse Gas Emissions*, and Chapter 24, *Hazards and Hazardous Materials*, for a discussion of potential public health and safety effects related to potential levee failure and flooding, air quality, and release of hazardous materials, respectively, as a result of project implementation. Chapter 20, *Public Services and Utilities*, discusses the ability of existing public services in the Plan Area to provide fire protection, emergency response, and hospital and medical services facilities.

25.0 Summary Comparison of Alternatives

A summary comparison of important public health impacts is provided in Figure 25-0. This figure provides information on the magnitude of the most pertinent and quantifiable public health impacts that are expected to result from all alternatives. Important impacts to consider include the increase in surface water that could result in an increase in vector-borne diseases as a result of the construction and operation of the water conveyance facilities or as a result of an increase in habitat from the implementation of conservation actions.

As depicted in Figure 25-0, increases in surface water because of construction and operation of the water conveyance facilities could result in an increase in vector-borne disease in the Plan Area. Alternative 2D would result in the greatest number of water bodies that could host disease vectors, 26. No such water bodies would be created under the No Action Alternative or Alternative 9. Alternatives 4 and 4A would fall near the top of this range, at 24 water bodies.

Each alternative, with the exception of the No Action Alternative, would provide restored habitat that could be a breeding ground for disease vectors. Of the BDCP alternatives, almost all would include the greatest amount of restoration, 83,839 acres. The non-HCP alternatives would provide far less habitat restoration. Alternative 5A would restore the least amount of habitat, 15,516 acres. Alternative 4A would restore 15,836 acres of habitat, and Alternative 2D would restore 18,097 acres of habitat.

Table ES-8 in the Executive Summary provides a summary of all impacts disclosed in this chapter.

25.1 Environmental Setting/Affected Environment

This section summarizes existing conditions related to drinking water, the bioaccumulation of toxicants in aquatic resources, pathogens in recreational waters, disease-carrying vectors, and electromagnetic fields from proposed project transmission lines within the study area.

The discussion of drinking water covers various nutrients, metals, chemicals, and the physical conditions that affect the quality of water resources as related to human health. Bioaccumulation concerns the uptake of toxicants into the tissues of fish and shellfish, and has the potential to affect the health of those who consume fish and shellfish on a regular basis. Pathogens (disease-causing micro-organisms) in water can create adverse health effects in people who use the Delta for recreational activities. The discussion of vectors concerns the spread of disease through mosquitoes. While the California Public Utilities Commission (CPUC) does not recognize the potential adverse health impacts related to electromagnetic field (EMF) exposure generated by transmission power lines, this chapter discusses the potential for adverse health effects associated with EMF exposure in relation to new transmission lines in the study area and extending immediately outside of the study area. Proposed transmission lines for each alternative are depicted in detail in Mapbook Figures M3-1, M3-2, M3-3, M3-4, and M3-5 in Chapter 3, *Description of Alternatives*.

Federal, state, and local agencies responsible for water quality regulations and standards for drinking water under which bioaccumulation of toxicants and waterborne pathogens are managed, are discussed in Section 25.2, *Regulatory Setting*.

25.1.1 Potential Environmental Effects Area

For the purposes of this analysis, the study area (the area in which impacts may occur) for public health is defined as the Plan Area (the area covered by the action alternatives) and Areas of Additional Analysis. As defined in Chapter 1, *Introduction*, the Plan Area encompasses the aquatic and terrestrial ecosystems, the natural communities and adjacent riparian and floodplain natural communities within the statutory Delta (as defined in Water Code Section 12220), as well as the Suisun Marsh and Yolo Bypass (see Figure 1-9 in Chapter 1). The statutory Delta includes parts of Yolo, Solano, Contra Costa, San Joaquin, and Sacramento Counties. The Areas of Additional Analysis are two areas outside the defined Plan Area that encompass power transmission corridors. One area

Chapter 25 – Public Health	Alternative																			
	Existing Condition	No Action	1A	1B	1C	2A	2B	2C	3	4	5	6A	6B	6C	7	8	9	4A	2D	5A
PH-1: Increase in surface water in Plan Area that could result in increase in vector-borne diseases as a result of construction and operation of the water conveyance facilities (Number of lagoons/basins/forebays/ inundation areas)	n/a	0	28	26	26	23	21	26	11	24	7	23	26	26	15	18	0	24	26	22
	n/a	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA
PH-5: Increase in surface water in Plan Area that could result in increase in vector-borne diseases as a result of implementing CM2-CM7, CM10 and CM11 (Acres of restoration)	n/a	0	83,839	83,839	83,839	83,839	83,839	83,839	83,839	83,839	43,839	83,839	83,839	83,839	93,839	83,839	83,839	15836	18,097	15,516
	n/a	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA	LTS/NA

Key

Level of significance or effect **before** mitigation (Quantity of impact: number of sites, structures, acres, etc. affected)

Increasing level of significance

n/a not applicable
> greater than
< less than
≈ about equal to

Level of significance or effect **after** mitigation (CEQA Finding / NEPA Finding)

CEQA Finding

NI No Impact
LTS Less than significant
S Significant
SU Significant and unavoidable

NEPA Finding

B Beneficial
NE No Effect
NA Not Adverse
A Adverse

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Figure 25-0
Comparison of Impacts on Public Health

lies west of the Plan Area and is considered in analysis of proposed action alternatives that include the western alignment (Alternatives 1C, 2C, and 6C); the other area lies east of the Plan Area and represents the transmission line alignment analyzed for Alternative 4) (see Mapbook Figures M3-1, M3-2, M3-3, M3-4, and M3-5 in Chapter 3, *Description of Alternatives*).

Potential public health impacts occurring as a result of the action alternatives primarily would be localized. Given downstream flows, potential health effects from water quality-related impacts would not be transported upstream, and therefore this chapter does not discuss public water related health effects in the Upstream of the Delta Region. Potential drinking water impacts would occur first and most prominently in the study area because, after water is exported to other areas of the state, it is treated and distributed by water purveyors and districts; thus, this chapter discusses the State Water Project (SWP)/Central Valley Project (CVP) Export Service Areas only as necessary. Potential spread of disease through mosquitoes is expected to occur only within the study area because of the life cycle of mosquitoes and the distance they travel. It is not expected that there would be significant impacts from vectors outside of the study area. Additionally, potential effects on public health from EMF exposure would be limited to the areas surrounding the new transmission lines, which would be confined within the Plan Area and in the Areas of Additional Analysis. If an alternative that includes one of these corridors is selected, the extension will be incorporated into the Plan Area.

25.1.1.1 Drinking Water

Water conveyed through the Delta and water from the Delta provides drinking water for two-thirds of California's population (CALFED Bay-Delta Program 2000). Surface water and groundwater resources are both used to provide drinking water resources for populations in the study area, as well as throughout California.

Constituents of Concern

Constituents that are of concern in Delta waters are those that, at elevated concentrations, have the potential to directly or indirectly adversely affect or impair one or more of the Delta's beneficial uses related to drinking water, species habitat, or recreational facilities. Table 25-1 lists the regulatory standards and goals for each of the constituents of direct concern to public health in the Delta. At high enough concentrations, these constituents can be directly harmful to human health if consumed. Further discussion of constituent regulations can be found in Section 25.2, *Regulatory Setting*. Constituents of concern are discussed in detail in Chapter 8, *Water Quality*, Section 8.1.1. The constituents of concern with regard to drinking water quality that are discussed in this impact analysis include disinfection byproducts, non-bioaccumulative pesticides, and trace metals, and are described below.

Table 25-1. Constituents of Concern for Drinking Water Quality

	Maximum Contaminant Level (mg/L)	
Contaminant	EPA	California
Trace Metals (Inorganics)		
Aluminum	0.05–0.2	1 to 0.2[b]
Arsenic	0.010	0.010
Cadmium	0.005	0.005
Copper[a]	1.3	1.3
Lead[a]	0.015	0.015
Mercury	0.002	0.002
Nickel	Remanded	0.1
Synthetic Organic Chemicals		
Benzo(a)Pyrene	0.0002	0.0002
2,3,7,8-TCDD (Dioxin)	$3x10^{-8}$	$3x10^{-8}$
Disinfection Byproducts		
Bromate	0.01	0.01
Chlorite	0.1	1
Total Trihalomethanes	–	0.08

Source: California Department of Public Health 2008.

mg/L = milligrams per liter; EPA = U.S. Environmental Protection Agency.

[a] The listed contaminant is regulated by a regulatory action level (RAL) rather than a maximum contaminant level (MCL). If contaminant levels exceed the listed RAL, additional actions, such as educating the public about the effects lead in drinking water and ways to reduce their exposure, are required (U.S. Environmental Protection Agency 2012b).

[b] Secondary MCL.

Disinfection Byproducts

Trihalomethanes (THMs) and haloacetic acids (HAA5) are chemicals that are formed along with other disinfection byproducts (DBP) when chlorine or other disinfectants used to control microbial contaminants in drinking water react with naturally occurring organic and inorganic matter in water. THMs are chloroform, bromodichloromethane (BDCM), dibromochloromethane (DBCM), and bromoform. HAA5 chemicals include monochloroacetic acid, dichloroacetic acid, trichloroacetic acid, monobromoacetic acid, and dibromoacetic acid. The disinfection process for drinking water includes adding chlorine to drinking water sources prior to release into public drinking water distribution systems. The chlorine reacts with the organic carbon (total [TOC] and dissolved [DOC]) and bromide that are in water sources and forms DBPs. Generally, if organic carbon is not chlorinated, or bromide is not present, the risk of DBP formation at drinking water plants is greatly reduced. The U.S. Environmental Protection Agency (EPA) indicates that ingestion of water containing DBPs over many years could lead to liver, kidney, or central nervous system problems, and an increased risk of cancer (U.S. Environmental Protection Agency 2012a). Table 8-21 (Chapter 8, *Water Quality*) presents DOC concentrations at selected north- and south-of-Delta stations for water years 2001–2006; total organic carbon concentrations at Delta intakes and major tributaries are provided in Table 8-20. Bromide concentrations at various locations in the Plan Area are identified in Chapter 8, Section 8.1.3.3.

Trace Metals

Trace metals occur naturally in the environment, and can be toxic to human and aquatic life in high concentrations. Trace metals include aluminum, arsenic, cadmium, copper, iron, lead, nickel, silver, and zinc. The beneficial uses of Delta waters most affected by trace metal concentrations include aquatic life uses (cold freshwater habitat, warm freshwater habitat, and estuarine habitat), harvesting activities that depend on aquatic life (shellfish harvesting, commercial and sport fishing), and drinking water supplies (municipal and domestic supply) (See Table 8-1 in Chapter 8, *Water Quality*).

Pesticides

Pesticides may be described in two general categories: current use pesticides and legacy pesticides. Current use pesticides include carbamates (e.g., carbofuran), organophosphates (e.g., chlorpyrifos, diazinon, diuron, malathion), thiocarbamates (e.g., molinate, thiobencarb), and more recently, pyrethroids (e.g., permethrin, cypermethrin), a class of synthetic insecticides applied in urban and agricultural areas. These chemicals have toxic effects on the nervous systems of terrestrial and aquatic life, and some are toxic to the human nervous system. EPA has begun to phase out certain uses of organophosphates because of their potential toxicity in humans, which has led to the gradual replacement of organophosphates by pyrethroids (Werner et al. 2008).

Legacy pesticides include primarily organochlorine pesticides, such as dichlorodiphenyltrichloroethane (DDT) and “Group A Pesticides” (aldrin, dieldrin, chlordane, endrin, heptachlor, heptachlor epoxide, hexachlorocyclohexane [including lindane], endosulfan, and toxaphene). These chemicals are highly persistent in the environment and can bioaccumulate (discussed in Section 25.1.1.2); organophosphates and pyrethroids generally are not considered persistent bioaccumulative compounds. Please see Chapter 8, *Water Quality*, Section 8.1.3.13, *Pesticides and Herbicides*, for a detailed discussion on the prior use of legacy pesticides in the Plan Area.

25.1.1.2 Bioaccumulating Constituents

As discussed in Chapter 8, *Water Quality*, Section 8.1.3, toxins are present in the existing aquatic environment of the Delta and may be mobilized into the food chain. The toxins that biomagnify through the food chain, such as methylmercury, organochlorine and other legacy pesticides, and PCBs, resulting in higher concentrations in predator fish such as striped bass, commonly consumed by humans, are of particular concern for public health.

Bioavailability is a measure of the ability of a toxin to cross the cellular membrane of an organism, to become incorporated in that organism, and to enter the food chain (Semple et al. 2004). Not all toxins are in a form that can be taken up by an organism. Bioavailability is not only chemical-specific, but it also can be specific to the chemical form that a constituent takes. For instance, mercury in an organic complex as methylmercury is much more bioavailable and toxic than elemental mercury or mercury complexed with an inorganic compound.

In addition to the availability of the chemical to be taken up by biota, some chemicals are magnified more through the food chain. *Bioaccumulation* often is loosely used interchangeably with the term *biomagnification.* Strictly speaking, bioaccumulation occurs at any one trophic level or in any one species (and age-class) as a pollutant is ingested inside of food items or absorbed from the environment and thereby *accumulates* to some concentration in tissues of organisms at that particular trophic level or in that particular species (and age-class). In contrast, *biomagnification* more properly refers to increases in tissue concentrations of a pollutant as it passes upward through the food chain, from prey to predator, to the topmost, mature predators. In these top predators tissue concentrations may be harmful both to the animal (especially to offspring) and to those that consume it. In summary, bioaccumulation happens within a specific trophic level; biomagnification occurs over multiple trophic levels.

Bioaccumulation is a function of the chemical's specific characteristics and the way the organism metabolizes the chemical—such as whether it is metabolized and excreted, or stored in fat. Toxins that are bioavailable and lipophilic (tend to accumulate in fatty tissue of an organism and are not very water soluble) typically bioaccumulate at higher rates. If stored, these chemicals can biomagnify in the food chain, as do mercury and some pesticides, such as organochlorine pesticides (e.g., lindane), which are most likely to biomagnify.

In the Delta, the toxins of primary concern to human health are mercury, pesticides and polychlorinated biphenyls (PCBs). Selenium can also biomagnify through the food chain under certain conditions, but selenium is a metal required in human diets and does not pose a high level of risk to humans at low concentrations. PCBs are currently present at various levels in Delta fish. As explained in Appendix 8C, *Screening Analysis,* are not anticipated to change under implementation of any of the action alternatives.

For evaluation of risks to human health, analyses of fish fillets are most common because of the limited information that is generally available. If additional information is available and appropriate, fish consumption effects could be analyzed in the form that people may eat (California Office of Environmental Health Hazard Assessment 2008). Please see Chapter 28, *Environmental Justice*, Section 28.2.1.7, for a discussion of fish consumption patterns among ethnic groups in the Delta.

Study Area

Mercury

Various regulatory criteria exist for mercury and methylmercury, and the applicable water quality criteria for judging the degree of contamination and effects of future changes in concentrations are summarized below.

- The national recommended water quality criterion for total mercury is 770 nanograms per liter (ng/L)[1] to protect freshwater aquatic life chronic exposure, and 940 ng/L for marine life (U.S. Environmental Protection Agency 2006).
- The Delta methylmercury total maximum daily load (TMDL) recommended water column concentration of methylmercury, to protect fish from bioaccumulation, is 0.06 ng/L (Central Valley Regional Water Quality Control Board 2008a).
- The San Francisco Bay mercury TMDL recommended water column concentration of total mercury is 25 ng/L (4-day average).
- The Delta TMDL recommendation for small, whole-fish mercury content for protection of fish and wildlife is 0.03 milligram per kilogram (mg/kg) wet weight (Central Valley Regional Water Quality Control Board 2008a).

[1] Approximately equal to parts per trillion (U.S. Geological Survey 1995).

- The Central Valley Water Board has recommended fish tissue goals (fillet concentrations, wet weight mercury) of 0.24 milligrams of mercury (Hg) per kilogram (mg Hg/kg) wet weight in trophic level 4 fish (adult, top predatory sport fish, such as largemouth bass) (Central Valley Regional Water Quality Control Board 2008b).
- EPA recommends a water quality criterion for fish tissue of 0.3 mg Hg/kg wet weight for protection of human health and wildlife (U.S. Environmental Protection Agency 2001).

Further discussion on water quality standards can be found in Chapter 8, *Water Quality*, Section 8.1.1.

The Sacramento River is the primary transport route of methylmercury to the study area and contributes about 80% of riverborne mercury inputs (Stephenson et al. 2007; Wood et al. 2010). Chapter 8, Section 8.1.3.9, *Mercury*, provides a detailed description of mercury and methylmercury presence in the Delta. Table 8-14 provides surface water concentrations of mercury and methylmercury at tributary inputs and the Delta's major outputs. In the Sacramento River watershed, the highest concentrations of mercury are found in Cache Creek and the Yolo Bypass where Cache Creek terminates. Cache Creek is the largest contributor of mercury to the Delta. The creek drains 2% of the area in the Central Valley and contributes 54% of the Delta's mercury (Foe et al. 2008). Methylmercury concentrations decrease significantly (by 30%–60%) downstream of Rio Vista, where concentrations were at or below 0.05 ng/L (Foe 2003; Wood et al. 2010).

Relative to the Sacramento River, the San Joaquin River is a minor contributor of methylmercury to the Delta. In the San Joaquin watershed, the Mokelumne-Cosumnes River is the greatest contributor of mercury, accounting for 2.1% of the total methylmercury in the Delta, with an average concentration of 0.17 ng/L (Wood at al. 2010). Marsh Creek, which drains the Mt. Diablo mining area, contributes a small percentage (0.04%) because of its size, but it does have relatively high average concentrations of methylmercury, estimated at 0.25 ng/L (Wood et al. 2010). Bear Creek and Mosher Creek, which drain a former mining area, are also high in mercury, with concentrations reported at 0.31 ng/L (Wood at al. 2010). These creeks are also small and contribute a relatively small percentage to the overall mercury budget in the Delta.

To resolve the mercury impairment in the Delta, the Central Valley Water Board has developed a water quality attainment strategy that contains two components: (1) a methylmercury TMDL for the Delta; and (2) an amendment of the Basin Plan for the Sacramento and San Joaquin River Basins (Basin Plan) to implement the TMDL program. The Delta methylmercury TMDL was approved by the Central Valley Water Board in 2010. The San Francisco Bay Mercury TMDL has been adopted and is currently being implemented (State Water Resources Control Board 2008).

The Delta and Suisun Marsh are both listed as impaired water bodies on the Clean Water Act (CWA) Section 303(d) list for mercury in fish tissue (State Water Resources Control Board 2007). Mercury concentrations in Delta and San Francisco Bay fish tissues exceed human health criteria. For example, the Delta TMDL recommendation for small, whole-fish mercury content for protection of fish and wildlife is 0.03 mg/kg wet weight (Central Valley Regional Water Quality Control Board 2008b). Most of these small fish from the Delta and Suisun Marsh exceed the recommended Delta TMDL small fish guideline concentrations for mercury. Monitoring during 2005–2006 found Mississippi silversides' whole-body mercury concentrations at 0.03–0.06 mg Hg/kg wet weight in the Central Delta, 0.17 mg Hg/kg wet weight in the Yolo Bypass, and up to 0.20 mg Hg/kg wet weight at a Cosumnes River site (Slotton et al. 2007). Results from a study of mercury in sportfish from the study area found the median largemouth bass mercury concentration to be 0.53 mg/kg wet weight (Davis et al. 2008).

PCBs

Historically, PCBs were associated with urban discharge, and these contaminants have been detected in fish tissues in San Francisco Bay, although there is little research on PCB levels in the study area. Fish tissue samples taken during 2005 indicate that while high concentrations of PCBs can be found in older, fattier fish in specific regions of the Delta (north Delta, Sacramento, and Stockton), Delta PCB concentrations are generally below California Office of Environmental Health Hazard Assessment (OEHHA) screening values (deVlaming 2008). The 2005 results indicate that the north Delta may be eligible for Section 303(d) de-listing, and the 2008 TMDL for PCBs in San Francisco Bay states that PCBs in the Delta are expected to attenuate naturally, thus eliminating the need for implementing actions to reduce PCBs in the study area waters (San Francisco Bay Regional Water Quality Control Board 2008). Table 8-10 (Chapter 8, *Water Quality*) presents the sum concentrations of all PCBs at the mouths of the Sacramento and San Joaquin Rivers for water years 2001–2006.

Legacy Pesticides

As discussed in Chapter 8, *Water Quality*, Section 8.1.3.13, legacy pesticides include primarily organochlorine pesticides, such as DDT and "Group A Pesticides" (aldrin, dieldrin, chlordane, endrin, heptachlor, heptachlor epoxide, hexachlorocyclohexane [including lindane], endosulfan, and toxaphene). These chemicals are highly persistent in the environment. Although they were banned in the 1970s because of their health and environmental effects, the compounds and their byproducts are still found throughout the Delta at elevated concentrations (CALFED Bay-Delta Program 2008). Organochlorines are prone to accumulation in sediments, and typically enter the Delta via rivers and streams during high stream flow events. Organochlorines can still be found in terrestrial soils and riverine sediments throughout the Central Valley, where they enter through surface water runoff and erosion of terrestrial soils and through resuspension of riverine bottom sediments (Central Valley Regional Water Quality Control Board 2010a).

There was a large monitoring effort from 1988 to 1993 to assess pesticides in the Delta for DDT compounds (DDT, DDE, and DDD), the Group A Pesticides, and chlorpyrifos, diazinon, atrazine, and thiobencarb (Bay Delta and Tributaries Project 2009). Analysis of monitoring data for the San Joaquin River at Buckley Cove, Sacramento River at Hood (actually collected at Greene's Landing Sacramento River above Point Sacramento, San Joaquin River at Antioch Ship Channel, Old River at Rancho Del Rio, Suisun Bay at Bulls Head Point near Martinez, and Franks Tract indicated that most pesticides were near or below laboratory detection limits).

Bioaccumulation in Fish and Shellfish

Bioaccumulation in fish and shellfish results when fish and shellfish absorb a toxic substance in the water or from food at a rate greater than that at which the substance is lost. The organisms then concentrate these chemicals at levels higher than is found in the water. Most health advisories are issued because of high levels of mercury in fish. In a few cases, fish are contaminated with PCBs or other chemicals such as DDT.

OEHHA gives two sets of guidelines for fish with mercury. Because human babies and children are most sensitive to possible health effects from mercury, OEHHA recommends that women ages 18 to

45 years (pregnant, nursing or who may be pregnant) and children 1 to 17 years eat fish less frequently than men older than 17 and women older than 45 (California Office of Environmental Health Hazard Assessment 2007).

In March 2004, the U.S. Food and Drug Administration (FDA) issued recommendations for the consumption of fish or shellfish for women who might become pregnant, women who are pregnant or nursing, and young children (no other sensitive receptors were identified). While FDA states fish and shellfish are an important part of a healthy diet, nearly all fish and shellfish contain trace amounts of mercury (U.S. Food and Drug Administration 2011). However, some species contain higher amounts of the toxicant, and thus it is not recommended that women who might become pregnant, women who are pregnant or nursing, or young children eat shark, swordfish, king mackerel, or tilefish. None of these species are commonly found in the Delta. Further, local advisories should be checked for the safety of locally caught fish and if these advisories are unavailable, the weekly consumption of fish or shellfish species should be limited.

Waterways within the Delta have been found to have different levels of contaminants; thus, each waterway has a different advisory for fish or shellfish caught in it. To protect public health, fish consumption advisories have been issued for the Delta. These advisories are issued by OEHHA and provide guidance on the specific types and amount of Delta fish that can be eaten safely.

Table 25-2 outlines the OEHHA recommended serving amounts for fish within the Delta waterways.

Table 25-2. Advisories for Consumption of Fish and Invertebrate Species/Guilds for Each Waterway

	Receptors*				
Species	Children (age 1–17)	Men (age 17+)	Women (age 18–45)	Women (age 45+)	Suggested Servings
Lower American River					
American Shad	X		X		4 Servings a Week
		X		X	7 Servings a Week
Redear and other Sunfish			X		1 Serving a Week
		X		X	2 Servings a Week
Sucker	X		X		1 Serving a Week
		X		X	2 Servings a Week
White Catfish	X		X		1 Serving a Week
		X		X	2 Servings a Week
All Bass	X		X		Do Not Eat
		X		X	1 Serving a Week
Pikeminnow	X		X		Do Not Eat
		X		X	1 Serving a Week
Sacramento River and Northern Delta					
American Shad	X		X		3 Servings a Week
		X		X	7 Servings a Week
Clams	X		X		3 Servings a Week
		X		X	7 Servings a Week
Salmon	X		X		3 Servings a Week
		X		X	7 Servings a Week

Species	Children (age 1–17)	Men (age 17+)	Women (age 18–45)	Women (age 45+)	Suggested Servings
	Receptors*				
Trout	X		X		3 Servings a Week
		X		X	7 Servings a Week
Bluegill and other Sunfish	X		X		1 Serving a Week
		X		X	3 Servings a Week
Catfish	X		X		1 Serving a Week
		X		X	3 Servings a Week
Carp and Goldfish	X		X		1 Serving a Week
		X		X	3 Servings a Week
Crayfish	X		X		1 Serving a Week
		X		X	3 Servings a Week
Crappie	X		X		1 Serving a Week
		X		X	3 Servings a Week
Hardhead	X		X		1 Serving a Week
		X		X	3 Servings a Week
Hitch	X		X		1 Serving a Week
		X		X	3 Servings a Week
Suckerfish	X		X		1 Serving a Week
		X		X	3 Servings a Week
Largemouth and other Black Bass (not including Striped Bass)	X		X		Do Not Eat
		X		X	1 Serving a Week
Pikeminnow	X		X		Do Not Eat
		X		X	1 Serving a Week
Sturgeon	X		X		1 Meal Per Month
		X		X	2 Meals Per Month
Striped Bass	X		X		1 Meal Per Month
		X		X	2 Meals Per Month
Striped Bass over 27 Inches	X	X	X	X	Do Not Eat
Striped Bass over 35 Inches	X	X	X	X	Do Not Eat
San Francisco Bay and Delta Region					
Sturgeon	X		X		1 Meal Per Month
		X		X	2 Meals Per Month
Striped Bass	X		X		1 Meal Per Month
		X		X	2 Meals Per Month
Striped Bass over 27 Inches	X	X	X	X	Do Not Eat
Striped Bass over 35 Inches	X	X	X	X	Do Not Eat
Shark	X	X	X	X	Do Not Eat
San Francisco Bay Sport Fish	X		X		1 Meal Per Month
		X		X	2 Meals Per Month

Species	Receptors* Children (age 1–17)	Men (age 17+)	Women (age 18–45)	Women (age 45+)	Suggested Servings
Central and South Delta					
Bluegill	X		X		2 Servings a Week
		X		X	5 Servings a Week
Catfish	X		X		2 Servings a Week
		X		X	5 Servings a Week
Clams	X		X		2 Servings a Week
		X		X	5 Servings a Week
Crayfish	X		X		2 Servings a Week
		X		X	5 Servings a Week
Bass	X		X		1 Serving a Week
		X		X	2–3 Servings a Week
Carp	X		X		1 Serving a Week
		X		X	2–3 Servings a Week
Crappie	X		X		1 Serving a Week
		X		X	2–3 Servings a Week
Sucker	X		X		1 Serving a Week
		X		X	2–3 Servings a Week
Lower Cosumnes River					
Clams	X		X		5 Servings a Week
		X		X	7 Servings a Week
Carp	X		X		1 Serving a Week
		X		X	2 Servings a Week
Crayfish	X		X		1 Serving a Week
		X		X	2 Servings a Week
Redear and other Sunfish	X		X		1 Serving a Week
		X		X	2 Servings a Week
Sucker	X		X		1 Serving a Week
		X		X	2 Servings a Week
Bass	X		X		Do Not Eat
		X		X	1 Serving a Week
Catfish	X		X		Do Not Eat
		X		X	1 Serving a Week
Crappie	X	X	X	X	Do Not Eat
Lower Mokelumne River					
Clams	X		X		7 Servings a Week
		X		X	7 Servings a Week
Bluegill	X		X		1 Serving a Week
		X		X	2 Servings a Week
Crayfish	X		X		1 Serving a Week
		X		X	2 Servings a Week
Catfish	X		X		1 Serving a Week
		X		X	2 Servings a Week

Species	Receptors*				Suggested Servings
	Children (age 1–17)	Men (age 17+)	Women (age 18–45)	Women (age 45+)	
Bass	X		X		Do Not Eat
		X		X	1 Serving a Week
Pikeminnow	X	X	X	X	Do Not Eat
San Joaquin River between the Friant Dam and the Port of Stockton					
Bluegill	X		X		2 Servings a Week
		X		X	5 Servings a Week
Carp	X		X		1 Serving a Week
		X		X	2 Servings a Week
Catfish	X		X		1 Serving a Week
		X		X	2 Servings a Week
Sucker	X		X		1 Serving a Week
		X		X	2 Servings a Week
Bass (not including Striped Bass)	X		X		Do Not Eat
		X		X	1 Serving a Week
Port of Stockton					
Any Fish	X	X	X	X	Do Not Eat
Any Shellfish	X	X	X	X	Do Not Eat

Source: California Office of Environmental Health Hazard Assessment 2007.

* The placement of an "X" underneath a receptor indicates the suggested serving associated with that particular receptor and species.

The Delta Mercury Exposure Reduction Program is a collaborative effort of the Sacramento-San Joaquin Delta Conservancy, the California Department of Public Health, and the Central Valley Regional Water Quality Control Board to reduce human exposure from eating contaminated fish. Program activities include convening a stakeholder advisory group, implementing outreach and education projects, developing signs in the Delta and developing multilingual educational materials.

25.1.1.3 Pathogens

The Delta is commonly used for various recreational activities such as boating, swimming, and fishing. Because the waterways within the Delta have the potential to contain common pathogens (disease-causing micro-organisms), direct contact or ingestion can affect human health. Pathogens of concern include bacteria, such as *Escherichia coli* (*E. coli*) and *Campylobacter*; viruses, such as hepatitis and rotavirus; and protozoa, such as *Giardia* and *Cryptosporidium*. Sampling for bacterial and viral pathogens involves collection of data for fecal indicators, such as total coliform or fecal coliform.

Overview

Sources of pathogens include wild and domestic animals, aquatic species, urban stormwater runoff, discharge from wastewater treatment plants, and agricultural point and nonpoint sources such as confined feeding lots. Pathogens that have animal hosts can be transported from the watershed to source waters from grazed lands and cattle operations; aquatic species such as waterfowl also contribute pathogens directly to water bodies. Stormwater runoff from urban or rural areas can contain pathogens carried in waste from domestic pets, birds, or rodents, as well as sewage spills. Although some pathogens have the ability to colonize within sediments, current research has not addressed this behavior in the Central Valley (Tetra Tech 2007), so information regarding effects of colonization within sediments is limited. Furthermore, sediment disturbance would be limited to localized areas under the alternatives because, based on the pathogen conceptual model (discussed in Section 25.3.1.2, *Pathogens and Water Quality*), some types of pathogens experience a rapid die-off the farther they travel from their source; thus, this issue is not discussed further.

Pathogen transport into Delta waterways can be expected to be higher during initial wet weather events, since they are carried by stormwater and agricultural runoff into the study area (as was observed with fecal coliform indicators by Tetra Tech 2007). Other sources of pathogens include wetland and inundated restoration areas due to increased biological activity associated with these habitats (e.g., birds and fish species). Some pathogens rapidly die off once excreted by their host. Once in the environment, die-off rates vary according to ambient water temperature and salinity, sunlight exposure, and the nature of the pathogen (Tetra Tech 2007).Humans can be exposed to and infected by certain pathogens (e.g., *E. coli*) in contaminated rivers, lakes, and coastal waters while participating in recreational activities including swimming, water skiing, surfing, and boating. Waterborne pathogenic microbes are capable of causing illness in people in a dose-dependent way and depending on the physical condition of the individual(s) exposed. Exposure to waterborne pathogens does not always result in infection, and infection with a pathogen does not always result in clinical illness (Pond 2005).

Although there are many potential pathogens that enter Delta waterways, the presence of pathogens identified in Table 25-3 is tested by wastewater treatment service districts, public drinking water service districts, and other public agencies as needed (e.g., Department of Public Health).

Table 25-3. Pathogens

Pathogen	Description and Source	Method of Transmittal	Public Health Concern
Escherichia coli	Anaerobic bacterium that lives in the gastrointestinal tract of warm-blooded animals	Fecal contamination by human waste, wastewater, or animal wastes	Generates toxicants that can result in diarrhea, inflammation, fever, and bacillary dysentery. Certain strains of *E. coli* can be severely toxic to some patients, particularly children, causing destruction of red blood cells and occasional kidney failure (Tetra Tech 2007)
Campylobacter	Present in the gastrointestinal tract of cattle, pigs, and poultry	Natural waters	Causes bacterial gastroenteritis. In rare cases, Campylobacter infection may be followed by Guillain-Barre Syndrome, a form of neuromuscular paralysis
Hepatitis	Viruses such as Hepatitis A and E	Fecal-oral route and via contaminated food and water	Causes liver inflammation
Rotavirus	Virus	Fecal-oral route and via contaminated food and water	Causes diarrhea

Pathogen	Description and Source	Method of Transmittal	Public Health Concern
Giardia	Parasite found in the intestinal linings of a wide range of animals and their feces, and in contaminated water	Wastewater	Causes diarrhea and abdominal pain
Cryptosporidium	Single-celled, intestinal parasites that infect humans and a variety of animals	Wastewater	Diarrhea, stomach cramps, upset stomach, and slight fever; more serious symptoms can result in weakened immune systems (U.S. Environmental Protection Agency 1999). Major cause of gastrointestinal illness

Water Treatment

EPA's Surface Water Treatment Rule (SWTR [discussed in detail in Section 25.2.2.5]) requires that public water systems using surface water or groundwater under the direct influence of surface water (1) disinfect water to destroy pathogens, and (2) either meet criteria for avoiding filtration or filter water to remove pathogens so that the contaminants are controlled at the following levels (U.S. Environmental Protection Agency 2013).

- Total Coliform: No more than 5.0% of samples for total coliform are positive in a month (for water systems that collect fewer than 40 routine samples per month, no more than one sample can be total coliform-positive per month). Every sample that is positive for total coliform must be analyzed for either fecal coliform or *E. coli*. If two consecutive total coliform-positive samples occur, and one is also positive for *E. coli*/fecal coliform, the system is deemed as having an acute maximum contaminant level (MCL) violation.
- Viruses: 99.99% removal/inactivation.
- *Giardia lamblia*: 99.9% removal/inactivation.
- *Cryptosporidium*: 99% removal.

Water treatment processes that are focused on the removal of particulates, such as filtration and bio-membranes, are generally effective at removing pathogens. Disinfection of bacteria pathogens can be achieved effectively through either chemical oxidation using chlorine or ozone, or through exposure to ultraviolet light. Viruses can also be removed effectively through chlorine or ozone oxidation. The treatment of protozoa is more challenging, as cysts and oocysts of protozoa cannot be fully removed by sand filtration and are resistant to chemical disinfection; however, disinfection using ultraviolet light and ozonation has been found to be effective (Tetra Tech 2007).

Study Area

There are numerous potential sources of pathogens in the study area, including urban runoff, wastewater treatment discharges, agricultural discharges, and wetlands (Tetra Tech 2007). Specifically, tidal wetlands are known to be sources of coliforms originating from aquatic, terrestrial, and avian wildlife that inhabit these areas (Desmarais et al. 2001; Grant et al. 2001; Evanson and Ambrose 2006; Tetra Tech 2007).

Although this chapter represents an effort to fully disclose existing conditions of pathogens in the study area and the variable nature of pathogen and indicator concentrations in surface waters, and the rapid die-off of many of these organisms in the ambient environment, makes it very difficult to quantify the importance of different sources on a scale as large as the Central Valley, especially for coliforms that are widely present in water under a variety of conditions. A single source in proximity to the sampling location can dominate the coliform concentrations observed at a location downstream of several thousand square miles of watershed.

Of the known sources that deposit coliforms into the waters of the Central Valley, it was found that wastewater total coliform concentrations for most plants were low (less than 1,000 most probable number [MPN]/100 milliliters [ml]), whereas the highest total coliform concentrations in water (greater than 10,000 MPN/100 ml) were observed near samples influenced by urban areas (Tetra Tech 2007). In the San Joaquin Valley, comparably high concentrations of *E. coli* were observed for waters affected by urban areas and intensive agriculture (Tetra Tech 2007). Fecal indicator data showed minimal relationships with flow rates, although most of the high concentrations were observed during the wet months of the years, possibly indicating the contribution of stormwater runoff (Tetra Tech 2007).

Data for *Cryptosporidium* and *Giardia* along the Sacramento River showed that these parameters were often not detected, and when detected the concentrations were generally low, typically less than one organism per liter (Tetra Tech 2007). There may be natural or artificial barriers that limit transport of *Cryptosporidium* to water. Significant die-off of oocysts that do reach the water may contribute to the low frequency of detection *Cryptosporidium* oocysts in natural waters (Tetra Tech 2007).

There was limited pathogen data at the locations examined, as indicated by Tetra Tech (2007). Where data were collected, these parameters were often not detected. However, when they were detected, the concentrations were typically less than one organism per liter. Pathogen concentrations are highly variable in time and space; monitoring programs that adequately address these constraints are very limited.

Pathogens are listed on the Section 303(d) list for the Stockton Deep Water Ship Channel (SDWSC), with sources including recreational and tourism activities (non-boating) and urban runoff/storm sewers. The Basin Plan addresses this on the basis of water contact recreation such that fecal coliform (minimum 5 samples in any 30-day period) shall not exceed a geometric mean of 200 organisms/100 ml, nor shall more than 10% of the total number of samples taken during any 30-day period exceed 400 organisms/100 ml. These criteria have been exceeded at several of the water quality sampling locations in the Delta (Tetra Tech 2007). The Basin Plan water quality objectives for pathogens are detailed in Appendix 8A, *Water Quality Criteria and Objectives*.

25.1.1.4 *Microcystis*

Microcystis aeruginosa (*Microcystis*) is a species of cyanobacteria or blue-green algae that produces the cyanotoxin microcystin. Microcystin is a liver toxin and is the most widespread of the cyanotoxins. *Microcystis* is a photosynthetic bacterium which is naturally occurring in lakes, streams, ponds, and other surface waters. Because *Microcystis* is commonly found in surface water, microcystin is of relevance to drinking water supplies and recreational waters, and therefore to public health. In addition to producing surface scums that interfere with recreation and cause aesthetic problems, microcystin also produces taste and odor compounds.

Overview

There are at least 80 known microcystins, including microcystin-LR, which is generally considered one of the most toxic (U.S. Environmental Protection Agency 2012c). Microcystin-LR is the most widely studied congener of the known microcystins, and it has been associated with most incidents of toxicity involving microcystins. *Microcystis* blooms can cause toxicity to phytoplankton, zooplankton, and fish, and also can affect feeding success or food quality for zooplankton and fish. Although cyanotoxins break down slowly over time in full sunlight, they are very stable and can withstand boiling, indicating that cooking is not sufficient to destroy the toxins (California Environmental Protection Agency 2009). There are many reports of a variety of health effects in addition to liver damage(e.g., diarrhea, vomiting, blistering at the mouth, headache) following human exposure to blue-green algae toxins (cyanobacteria) in drinking water or from swimming in water in which are present. Such effects can occur within minutes to days following exposure to cyanotoxins (World Health Organization 2003). However, there are no reported cases of human deaths occurring from microcystin ingestion (California Environmental Protection Agency 2009).

Water treatment can effectively remove cyanotoxins in drinking water supplies. However, some treatment options are effective for some cyanotoxins, but not for others (U.S. Environmental Protection Agency 2012c). Thus, operators of drinking water treatment systems must remain informed about the growth patterns and species of blue-green algae blooming in their surface water supplies to determine appropriate treatment or actions, and monitor treated water for cyanotoxins.

Blooms of *Microcystis* require high levels of nutrients and low turbidity, but also require sufficiently high water temperature (i.e., above 19°C) and long hydraulic residence time (low flow), since the species is fairly slow growing (Lehman et al. 2008; Lehman et al. 2013). In addition, low vertical mixing associated with long hydraulic residence time allows *Microcystis* colonies to float to the surface of the water column, where they out compete other species for light.

The World Health Organization released a provisional drinking water guideline for microcystin-LR in 1998. The guideline value for drinking water for microcystin-LR is 1.0 micrograms per liter (μg/L), which is an advisory value developed to protect against adverse liver effects associated with human consumption of this toxin. For recreational waters, the World Health Organization has issued multiple guidance values for the relative probability of acute health effects due to recreational exposure to cyanobacteria and microcystins because of the variety of possible exposures routes via recreational activities (e.g., direct contact, ingestion, and inhalation) (Table 25-4). No federal regulatory guidelines for cyanobacteria or their toxins in recreational waters exist at this time in the United States. In 2015, EPA issued a 10-day health advisory value for microcystins of 0.3 μg/L for bottle-fed infants and preschool-age children and 1.6 μg/L for school-age children and adults (U.S. Environmental Protection Agency 2015). Guidance values for microcystin and other cyanotoxins in drinking water have been adopted by three states (Minnesota, Ohio, and Oregon) and guidance values for recreational water have been adopted by 20 states, including California (U.S. Environmental Protection Agency 2014). The advisory value for microcystin for recreational waters in California is 0.8 μg/L.

Table 25-4. World Health Organization Guidance Values for the Relative Probability of Acute Health Effects during Recreational Exposure to Cyanobacteria and Microcystins

Relative Probability of Acute Health Effects	Cyanobacteria (cells/ml)	Microcystin-LR (μg/L)
Low	< 20,000	< 10
Moderate	20,000–100,000	10–20
High	100,000–10,000,000	20–2,000
Very High	> 10,000,000	> 2,000

Source: U.S. Environmental Protection Agency 2014.
cells/ml = cells per milliliter; μg/L = micrograms per liter.

Study Area

Like other types of algae, under favorable conditions *Microcystis* can multiply rapidly in surface water and cause algal "blooms" (U.S. Environmental Protection Agency 2012c). As described in Chapter 8, *Water* Quality, water temperatures greater than 19°C, low water velocities, and high water clarity are conditions necessary for *Microcystis* levels to reach bloom-forming scale (Paerl 1988; Lehman et al. 2008; Lehman et al. 2013). Water temperature is considered the primary factor that restricts bloom development to the months of June through September (Lehman et al. 2013).

Sufficiently high water temperature (i.e., 19°C), low flow and thus sufficiently long hydraulic residence time, and increased clarity enable bloom formation, which occurs in the San Joaquin River, Old River, and Middle River earlier than other areas of the Delta. Blooms of *Microcystis* have been observed from June to November throughout the freshwater Delta since 1999 (Lehman et al. 2005, 2008), with peaks in abundance in September (Acuña et al. 2012). Lehman and coauthors (2010) found abundance greatest in the western and central Delta, with the highest densities near Old River at Rancho Del Rio and the San Joaquin River at Antioch. The Delta's shallow, submerged islands sustain high levels of *Microcystis* during the growing season because the physical drivers of bloom formation are amplified in these areas due to low flushing rates (Lehman et al. 2008). Although elevated pH is tolerated by *Microcystis*, pH is not currently thought to be a primary driver of seasonal and interannual variation in bloom formation (Lehman et al. 2013). Similarly, nutrient concentrations/ratios for constituents such as nitrogen and phosphorus do not appear to control seasonal or interannual variation in bloom formation.

As discussed in Chapter 8, *Water* Quality, issues related to *Microcystis* blooms upstream of the Delta have only occurred in highly eutrophic lakes, such as Clear Lake, because most upstream reservoirs have relatively low nutrient levels. Hydrodynamic conditions of upstream rivers and watersheds are not conducive to *Microcystis* bloom formation. Problematic *Microcystis* blooms have not occurred in the Export Service Areas, but microcystins produced in waters of the Delta have been exported from Banks and Jones pumping plants to the SWP and CVP (Archibald Consulting et al. 2012).

25.1.1.5 Vectors

A vector is an insect or any living carrier that transmits an infectious agent from one host to another. Vectors that can be found in the study area include mosquitoes and small mammals, such as mice and rats. Diseases carried by warm blooded animals, such as hantavirus[2] and plague[3], are not of concern in the study area, as their occurrence is extremely rare in the nation, state, and the Delta (Sutter-Yuba Mosquito Vector Control District 2012a, 2012b). Given the low rate of infection for both hantavirus and plague in California, these diseases are not further discussed. Rabies is another vector-borne disease that occurs in California. This disease is a viral infection that is carried by infected animals, and is spread through the bite of an infected animal (Sutter-Yuba Mosquito Vector Control District 2012c). While rabies cases do occur in the Delta, this disease is not discussed in further detail, because the action alternatives would not increase the public's vulnerability or exposure to this disease, as it is not anticipated to increase rabies sources.

The vector of most concern in the study area is the mosquito because it is considered a nuisance to the public through irritating bites and can transmit various diseases, including the West Nile virus (WNV), to birds and humans. Recently, two invasive species of mosquitoes that can potentially transmit dengue[4] and chikungunya[5] viruses have been detected in Madera, Fresno, San Diego, San Mateo, Kern, and Tulare counties (*Aedes aegypti*), and in Los Angeles County (*Aedes albopictus* and *Aedes aegypti*) (California Department of Public Health 2014c). *Aedes albopictus* (Asian tiger mosquito) and *Aedes aegypti* (yellow fever mosquito). Currently, the risk of local dengue or chikungunya transmission is low, and there have been no reported cases of either of these diseases that have been acquired in California. Therefore, these mosquito species and diseases are not discussed further.

The focus of this section is on public nuisances associated with mosquito-borne diseases transmitted to humans. This section provides a description of the habitat and life history of mosquito species that exist in the study area.

Overview

Different cropping and land use patterns create differing amounts of suitable mosquito breeding habitat, which affect mosquito prevalence in the study area. Currently, the Delta consists primarily of agricultural lands and tidal, riparian and other water-related habitat that can provide suitable habitat for mosquitoes to breed and multiply. Deep, open-water habitats are poor mosquito breeding areas because the wave action generated over water bodies disrupts the ability of larvae to penetrate the water surface, and because vegetation necessary for egg laying and larvae survival is

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[2] Hantavirus is a pulmonary disease that is carried by deer mice, white-footed mice, and rice rats, and is spread through inhalation or ingestion of contaminated particles of urine, saliva, or excrement. In the last 11 years, there have only been 35 cases of hantavirus in California.

[3] Plague is a bacterial infection that is carried by fleas on small mammals, and is spread through the bite of infected fleas. Since the mid-1920s, there have been approximately 10 reported cases of the plague in the U.S. annually (Sutter-Yuba Mosquito Vector Control District 2012b).

[4] Dengue is a mosquito-borne infection transmitted principally by the yellow fever mosquito and secondarily by the Asian tiger mosquito. With the exception of parts of Mexico, Puerto Rico, and small areas in southern Texas and southern Florida, dengue transmission does not occur in North America. Dengue virus cannot be transmitted from person to person (California Department of Public Health 2014a).

[5] Chikungunya is a viral disease transmitted by the yellow fever mosquito and the Asian tiger mosquito. In California, chikungunya infections have been documented only in people who acquired the virus while travelling outside the United States; Chikungunya is not a contagious disease (California Department of Public Health 2014b).

lacking (U.S. Fish and Wildlife Service 1992). Tidally influenced marshes that lack sufficient tidal flow can provide suitable breeding habitat for mosquitoes (Kramer et al. 1992, 1995). The optimal conditions for mosquitoes to carry out their complete growth and reproduction cycles can be found in areas of standing water with non-stagnant pond surface water, such as ponds subject to daily tide flushes or wind-driven wave action. The majority of mosquitoes lay eggs on the surface of fresh or stagnant water. The water may be in various stagnant water locations, such as tin cans, barrels, horse troughs, ornamental ponds, swimming pools, puddles, creeks, ditches, catch basins, or marshy areas. The breeding habitat varies depending on the species of mosquito. The majority of mosquito species prefer water sheltered from the wind by grass and weeds.

The availability of preferable mosquito breeding habitat varies by season, and is reduced during dry periods of the year. Available open water habitat can be expected to increase during the wet season; however, changes in flow volume in the Delta would result in increased flow velocities, limiting preferable mosquito breeding habitat.

Suitable mosquito breeding habitat is in close proximity to urban areas along the Sacramento River and the south Delta; therefore, the current urban population is already exposed to vector-borne diseases (See *Potential Mosquito-Borne Diseases in Delta* below for additional information).

The islands and tracts within the Delta presently have mosquitoes and require varying degrees of mosquito control by existing mosquito and vector control districts (MVCDs). Mosquito control techniques employed by different MVCDs generally emphasize minimization and disruption of suitable habitat and control of larvae through chemical and biological means (Kwansy et al. 2004). Control techniques most often include source reduction and source prevention (e.g., drainage of water bodies that produce mosquitoes), application of larvicides, use of chemical larvicides, use of biological agents such as mosquitofish as larval predators, and monitoring of mosquito populations and vector-borne diseases (Kwansy et al. 2004). Furthermore, to address public health concerns about mosquito production in existing managed wetlands and tidal areas, MVCDs have developed guides and habitat management strategies to reduce mosquito production. MVCDs encourage Integrated Pest Management (IPM), which incorporates multiple strategies to achieve effective control of mosquitoes and includes the following.

- Source reduction – designing wetlands and agricultural operations to be inhospitable to mosquitoes.
- Monitoring – implementing monitoring and sampling programs to detect early signs of mosquito population problems.
- Biological control – use of biological agents such as mosquitofish (*Gambusia affinis*) to limit larval mosquito populations.
- Chemical control – use of larvicides and adulticides.
- Cultural control – changing the behavior of people so their actions prevent the development of mosquitoes or the transmission of vector-borne disease.

Specifically, the following guidelines are incorporated for habitat management plans in different MVCDs in the study area.

- *Technical Guide to Best Management Practices for Mosquito Control in Managed Wetlands,* 2004.
- *Best Management Practices for Mosquito Control on California State Properties, California Department of Public Health*, June 2008.
- *Mosquito Reduction Best Management Practices, Sacramento-Yolo County Mosquito and Vector Control District*, 2008.

Study Area

The islands and tracts within the Delta presently have mosquitoes and require varying degrees of mosquito control by MVCDs. The change in mosquito prevalence in the study area is attributable to changes in cropping and land use patterns. Different cropping and land use patterns create differing amounts of suitable mosquito breeding habitat. Currently, the Delta consists primarily of agricultural lands and tidal, riparian and other water-related habitat that can provide suitable habitat for mosquitoes to breed and multiply.

Tidally influenced marshes that lack sufficient tidal flow can provide suitable breeding habitat for mosquitoes (Kramer et al. 1992 and 1995). However, functional tidal marshes do not provide high-quality habitat for many mosquito species, such as *Aedes dorsalis* (Meigen) and *Aedes squamiger* (Coquillett), and maintenance and restoration of natural tidal flushing in marshes is effective at limiting mosquito populations (Kramer et al. 1995; Williams and Faber 2004). Problems can occur in seasonally ponded wetlands, in densely vegetated tidal areas that pond water between tides, or where tidal drainage has been interrupted (Williams and Faber 2004). Therefore, tidal wetland restoration can reduce mosquito populations as tidal fluctuations keep water moving so that mosquitoes do not have standing water in which to breed (Williams and Faber 2004; Kramer et al. 1995). Semi-permanent and permanent non-tidal wetlands can produce *An. freeborni* and *Cx. tarsalis*; however, because of their limited acreage, stable water levels, and abundance of mosquito predators (fish, dragonflies, and other predatory invertebrates) such wetlands are not typically considered mosquito production areas (Kwansy et al. 2004).

Existing land uses in the Delta are currently located in relatively close proximity to urban areas along the Sacramento River and the south Delta; therefore, the current urban population is already exposed to mosquitoes and the vector-borne diseases that mosquitoes carry.

Common Mosquito Species

There are multiple species of mosquito known to occur in the study area. Factors that affect the productivity and breeding of mosquitoes include water circulation, organic content, vegetation, temperature, humidity, and irrigation and flooding practices.

The habitat for the breeding of mosquitoes varies depending on the combination of habitat conditions. The following discussion presents an overview of mosquito species and their habitat, as well as mosquito-borne diseases, in the study area. Table 25-5 identifies the seasonal presence of mosquitoes.

Table 25-5. Seasonal Presence of Mosquito

General Water Source/Preferred Habitat	Most Active Season			
	Winter	Spring	Summer	Fall
Standing Water (e.g., permanent wetlands or foul standing water sources; brackish or freshwater)	• Cool weather mosquito (*Culiseta incidens*)[2] • California salt marsh mosquito (*Ochlerotatus squamiger*)[3] • Winter salt marsh mosquito (*Aedes squamiger*)	• California salt marsh mosquito (*Ochlerotatus squamiger*)[3]	• Encephalitis mosquito (*Culex tarsalis*) • Northern house mosquito (*Culex pipiens*) • Western malaria mosquito (*Anopheles freeborni*)	• Encephalitis mosquito (*Culex tarsalis*) • Northern house mosquito (*Culex pipiens*) • Western malaria mosquito (*Anopheles freeborni*) • Cool Weather Mosquito (*Culiseta incidens*) [2]
Flood waters (e.g., seasonal/semi-permanent wetlands, including pastures and rice fields)		• Wetlands mosquito (*Aedes melanimon*) • Inland floodwater mosquito (*Aedes vexans*) • Pale marsh mosquito (*Ochlerotatus doralis*)[1]	• Inland floodwater mosquito (*Aedes vexans*) • Western malaria mosquito (*Anopheles freeborni*)[5]	• Wetlands mosquito (*Aedes melanimon*) • Inland floodwater mosquito (*Aedes vexans*)
Tule and Grasses		Tule mosquito (*Culex erythrothorax*)[4]	Tule mosquito (*Culex erythrothorax*)[4]	
Containers (e.g., holes in oak woodlands, containers of standing water, sumps)	Western treehole mosquito (*Aedes sierrensis*)	Western treehole mosquito (*Aedes sierrensis*)	Northern house mosquito (*Culex pipiens*)	Northern house mosquito (*Culex pipiens*)
Wooded areas, seasonal creeks and year-round rivers	Woodland malaria mosquito (*Anopheles punctipennis*)*			

Sources: Unless otherwise noted, sources in this table are from Sacramento-Yolo Mosquito and Vector Control District 2008.

[1] Solano County Mosquito Abatement District 2005a; Napa County Mosquito Abatement District 2006.

[2] Alameda County Mosquito Abatement District 2011.

[3] Solano County Mosquito Abatement District 2005ba.

[4] Santa Cruz County Government Environmental Health Services 2011.

[5] Marin/Sonoma Mosquito and Vector Control District 2009; Solano County Mosquito Abatement District 2005a.

* Unknown what season the woodland malaria mosquito is most active.

Potential Mosquito-Borne Diseases in the Delta

Mosquitoes in the study area are known to carry six major diseases: malaria, cerebral encephalitis (CE), WNV, St. Louis encephalitis (SLE), dog heartworms, and Western equine encephalitis (WEE). Table 25-6 summarizes the types of mosquitoes known to occur in the study area and the types of diseases they commonly carry.

Table 25-6. Mosquitoes Known to Occur in the Delta and the Diseases They Commonly Carry

Mosquito	Distance Travels from Breeding Ground	Diseases
Pale marsh mosquito (*Ochlerotatus doralis*)[a]	20 miles	Cerebral Encephalitis (CE) virus; Dog heartworms
Cool weather mosquito (*Culiseta incidens*)[b]	5 miles	Western Equine Encephalitis (WEE) virus*
Western encephalitis mosquito (*Culex tarsalis*)[c, d]	Up to 16 miles	WEE virus; St. Louis Encephalitis (SLE) West Nile Virus (WNV)
California salt marsh mosquito (*Ochlerotatus squamiger)*[d]	Up to 20 miles or more	CE virus WNV in a limited number of this species in 2004
Western treehole mosquito (*Aedes sierrensis*)[e]	Limited	Dog heartworms
Wetlands mosquito (*Aedes melanimon*)[d]	10 or more miles	Secondary vector of the WEE virus Primary carrier of the CE virus Recently linked as a potential vector of the WNV
House mosquito (*Culex pipiens*)[d, f]	3 – 5 miles	Major vector of the SLE virus and the WNV**
Inland floodwater mosquito (*Aedes vexans*)[e]	10 or more miles	WEE virus; CE virus; and secondary vector for dog heartworms
Tule mosquito (*Culex erythrothorax*)[g]	Unavailable	SLE virus WEE virus
Salt marsh mosquito (*Ochlerotatus squamiger*)[h]	30 miles	Secondary vector of SLE virus Secondary vector of WEE virus
Winter salt marsh mosquito (*Aedes squamiger*)[i]	20 miles	Seasonal nuisance not considered a disease or virus vector
Western malaria mosquito (*Anopheles freeborni*)[j]	5 miles	Malaria
Woodland malaria mosquito (*Anopheles punctipennis)* [k]	Less than 1 mile	Malaria

[a] Marin/Sonoma Mosquito and Vector Control District 2009; Solano County Mosquito Abatement District 2005a.
[b] Napa County Mosquito Abatement District 2006; Solano County Mosquito Abatement District 2005a.
[c] Marin/Sonoma Mosquito and Vector Control District 2009; Napa County Mosquito Abatement District 2006; Alameda County Mosquito Abatement District 2011; Reisen 1993.
[d] Solano County Mosquito Abatement District 2005b.
[e] Sacramento-Yolo Mosquito and Vector Control District 2009.
[f] Marin/Sonoma Mosquito and Vector Control District 2009.
[g] Marin/Sonoma Mosquito and Vector Control District 2009.
[h] Solano County Mosquito Abatement District 2005a and Napa County Mosquito Abatement District 2006
[i] Napa County Mosquito Abatement District 2006.
[j] Marin/Sonoma Mosquito and Vector Control District 2009, Solano County Mosquito Abatement District 2005a, and Marin/Sonoma Mosquito and Vector Control District 2009.
[k] Napa County Mosquito Abatement District 2006.
* Recently identified under laboratory conditions as a vector for WEE, but has not yet been found in wild populations.
** Not considered a strong virus vector for humans in northern California but identified in southern California and the Gulf Coast as human virus vector.

Malaria

Malaria is a mosquito-borne disease caused by a single-celled parasite, *Plasmodium* (Reiter 2001). This parasite infects and destroys the red blood cells of its host. The disease is usually transmitted through the bite of an infected mosquito; a mosquito becomes infected from feeding on people carrying malaria in the blood (Zucker 1996). Malaria occurs in tropical and subtropical areas with high humidity and temperatures, including Africa and Central and South America. Although no longer considered an endemic disease in California, malaria cases continue to be reported in the United States (CalSurv 2012). In the United States there are approximately 1,200 diagnosed cases each year (Marin/Sonoma Mosquito and Vector Control District 2009). In California, the primary vectors of this disease are female western malaria mosquitoes.

Encephalitis

Encephalitis is a virus with symptoms characterized by swelling or inflammation of the brain and spinal cord. Mosquito-borne encephalitis is directly transmitted to humans by mosquitoes and maintained through the contact between virus-carrying birds and mosquitoes. It is most commonly found in California as a consequence of the WNV, SLE virus, and WEE virus. Horses and birds are usually the most important carriers and also the most vulnerable and susceptible to these viruses (California Department of Public Health 2010a, 2010b).

West Nile Virus

WNV is a mosquito-borne virus introduced to North America in 1999 (San Joaquin County Mosquito and Vector Control District 2009). The *Culex* mosquito genus has been identified as the primary transmitting vector of the virus (Goodard et al. 2002). The majority of victims of this virus develop very few or no symptoms. Some of the common symptoms identified are fever, nausea, body aches, headache, and mild skin rash. A very small proportion (less than 1%) of victims may also develop brain inflammation (encephalitis), which could lead to partial paralysis and death (Marin/Sonoma Mosquito and Vector Control District 2009).

St. Louis Encephalitis

SLE is distributed throughout California and generally affects non-human mammals, principally horses. The western encephalitis and house mosquitoes are the main transmitting vectors (CalSurv 2012). The main sources of infection for mosquitoes are birds; once infected, the mosquito can transmit the virus to other animals and, on few occasions, humans. Symptoms tend to be very mild and usually include fever, headache, and dizziness. However, the disease may also lead to convulsions and death, and carries a fatality rate that ranges from 3–30% (Contra Costa Mosquito and Vector Control District 2011; CalSurv 2012). From 1964 through 2009, an average of 102 cases were reported annually in the United States. From 1964 through 2010, 123 cases of SLE were reported in California (Centers for Disease Control and Prevention 2011)

Western Equine Encephalitis

Seasonal viral activity is at its highest for WEE from late spring to early summer, especially in areas with highly irrigated agriculture and stream drainages. The disease has a fatality rate of 33% and affects young children most severely (Marin/Sonoma Mosquito and Vector Control District 2009). The western encephalitis mosquitoes are generally identified as primary transmitters. In California, the pale marsh mosquito is also a major vector. Symptoms range from mild flu-like illness to encephalitis, which could lead victims into a coma and death (Napa County Mosquito Abatement District 2006). Between 1964 and 2005, 639 cases of WEE were reported in the United States (Centers for Disease Control 2005).

Mosquito-Borne Disease Incidence

Each county, following public health and safety code regulations, designs its individual Mosquito and Vector Control District Programs to control mosquito-borne disease incidence in its individual district. The most common mosquito-borne diseases each district is expected to control include WNV, WEE virus, SLE virus, heartworm disease, and malaria. Based on mosquito-borne disease surveillance and activity data, yearly reports show that WNV has the highest incidence reported within the Delta counties. This virus is commonly identified in small animals, such as squirrels and birds, and can also affect large mammals, including horses and humans. The ratio of dead birds infected with WNV to reported human cases within the statutory Delta counties is approximately 10:1 (Table 25-8). The number of documented human cases of WNV in Delta counties is relatively low compared with the population of the counties, and the number of documented WNV-positive dead birds in Delta counties was less than 250 in 2015 (Table 25-8). Therefore, while WNV is a growing concern and a potential threat to the population within the study area and California, the documented human occurrences within the study area have been relatively limited.

Table 25-7. Confirmed West Nile Virus Cases in California 2011–2015

Cases	2011	2012	2013	2014	2015
Number of Counties	35	41	44	40	41
Human Cases	158	479	379	801	783
Horses	15	22	13	NA	NA
Dead Birds	688	1,644	1,251	2,442	1,349
Mosquito Samples	2,087	2,849	2,528	3,340	3,329
Sentinel Chickens	391	540	485	443	449
Squirrels	24	23	NA	NA	NA

Sources: California Department of Public Health et al. 2011, 2012, 2013, 2014, 2015, and 2016.
NA = not applicable because species is no longer monitored.

Table 25-8. West Nile Virus Activity by County in Study Area, 2011–2015

	2011				2012				2013				2014				2015			
County	Human Cases	Horses[a]	Dead Birds	Mosquito Samples	Human Cases	Horses[a]	Dead Birds	Mosquito Samples	Human Cases	Horses[a]	Dead Birds	Mosquito Samples	Human Cases	Horses[a]	Dead Birds	Mosquito Samples	Human Cases	Horses[a]	Dead Birds	Mosquito Samples
Alameda	–	–	–	–	2	–	15	–	–	–	22	–	1	–	96	16	–	–	19	16
Contra Costa	3	–	38	7	4	–	66	19	5	–	68	13	5	–	44	25	1	–	11	8
Sacramento	4	–	134	381	30	–	466	487	10	–	179	384	10	–	294	487	4	–	103	164
San Joaquin	5	–	27	51	13	–	58	169	8	–	34	163	9	–	53	239	2	–	18	208
Solano	–	–	1	–	2	–	28	3	1	–	15	1	5	–	33	11	1	–	10	6
Sutter	–	–	2	26	8	–	29	19	10	–	16	61	8	–	19	52	2	–	16	54
Yolo	–	–	9	7	10	–	98	154	6	–	106	146	15	–	71	221	8	–	61	173

Sources: California Department of Public Health et al. 2011, 2012, 2013, 2014, 2015, and 2016.

– = no record.

[a] Species is no longer monitored.

25.1.1.6 Electromagnetic Fields

An EMF is an invisible line of force that is produced by an electrically charged object. It affects the behavior of other charged objects in the vicinity of the field. The EMF extends indefinitely throughout space and can be viewed as the combination of an electric field and a magnetic field. Electric fields are produced by voltage and increase in strength as the voltage increases. The electric field strength is measured in units of volts per meter. Magnetic fields result from the flow of current through wires or electrical devices and increase in strength as the current increases. Magnetic fields are measured in units of gauss or tesla. Most electrical equipment has to be turned on (i.e., current must be flowing) for a magnetic field to be produced. If current does flow, the strength of the magnetic field will vary with power consumption. Electric fields, on the other hand, are present and constant even when the equipment is switched off, as long as the equipment remains connected to the source of electric power (World Health Organization 2012.)

Electric fields are shielded or weakened by materials that conduct electricity (including trees, buildings, and human skin). Magnetic fields, on the other hand, pass through most materials and are therefore more difficult to shield. Both electric and magnetic fields decrease as the distance from the source increases (California Public Utility Commission 2007).

Electromagnetic fields are present everywhere in our environment but are invisible to the human eye. Besides natural sources, such as thunderstorms, the electromagnetic spectrum includes fields generated by human-made sources, such as X-rays. The electricity that comes out of every power socket has associated low-frequency electromagnetic fields, and various kinds of higher frequency radio waves are used to transmit information (World Health Organization 2012).

Electric fields and magnetic fields can be characterized by their wavelength, frequency, and amplitude or strength. The frequency of the field, measured in hertz (Hz), describes the number of cycles that occur in one second. Electricity in North America alternates through 60 cycles per second, or 60 Hz. The time-varying electromagnetic fields produced by electrical appliances are an example of extremely low-frequency (ELF) fields. ELF fields generally have frequencies up to 300 Hz. Other technologies produce intermediate-frequency (IF) fields with frequencies from 300 Hz to 10 megahertz (MHz) and radiofrequency (RF) fields with frequencies of 10 MHz to 300 gigahertz (GHz). The effects of electromagnetic fields on the human body depend not only on their field level but on their frequency and energy. Our electricity power supply and all appliances using electricity are the main sources of ELF fields; computer screens, anti-theft devices, and security systems are the main sources of IF fields; radio, television, radar, cellular telephone antennas, and microwave ovens are the main sources of RF fields (World Health Organization 2012). Electromagnetic fields are commonly measured in units of gauss; a milligauss (mG) is 1,000 times smaller than a gauss. High voltage transmission line EMF levels range from 30–90 mG underneath the wires, based on the voltage, height, and placement of the lines. Most household appliances' EMF levels range from 3 mG–1,600 mG.

Potential Health Concerns

There has been extensive research done over the past 20 years on the relationship of EMF exposure and human health risks. To date, the potential health risk caused by EMF exposure remains unknown and inconclusive. Two national research organizations (the National Research Council and the National Institute of Health) have concluded that there is no strong evidence showing that EMF exposures pose a health risk. However, some studies have shown an association between household

EMF exposure and a small increased risk of childhood leukemia at average exposures greater than 3 mG (Greenland et al. 2000). For cancers other than childhood leukemia, there is less evidence for an effect. For example, workers that repair power lines and railway workers can be exposed to much higher EMF levels than the general public. The results of cancer studies in these workers are mixed. Some studies have suggested a link between EMF exposure in electrical workers and leukemia and brain cancer while other similar studies have not found such associations (Ahlbom et al. 2001). There is also some evidence that utility workers exposed to high levels of EMF may be at increased risk of developing amyotrophic lateral sclerosis (ALS, or Lou Gehrig's disease). The current scientific evidence provides no definitive answers as to whether EMF exposure can increase health risks (California Public Utilities Commission 2007).

Proximity to Power Lines

Residences and other sensitive receptors located 300 feet or more from power lines with kilovolts (kV) of 230 kV or less are not considered to be at risk of high EMF exposure (National Institute of Environmental Health Sciences and National Institutes of Health 2002). At this distance, EMF exposure from power lines is no different than from typical levels around the home. Furthermore, recognizing that transmission lines carry different voltages, the California Department of Education created regulations that require schools to be set back from transmission line right-of-ways based on the voltage of the lines. Schools must be placed 100 feet or greater from 50–133 kV lines; 150 feet or greater from 220–230 kV lines; and 350 feet or greater from 500–550 kV lines. Similar to the National Institute of Health's 300-foot setback for sensitive receptors, these distances were based on the fact that the electrical fields from the transmission lines decrease to background levels at the corresponding distances (California Department of Public Health 1999).

There are currently approximately 621 miles of transmission lines in the study area. Sensitive receptors to EMFs include schools, hospitals, parks and fire stations. Parks and schools provide a location for people to congregate, and fire stations and hospitals could have sensitive communications and health equipment that could be affected by EMF interference. The following list summarizes the types of existing transmission lines and sensitive receptors within the study area or immediately adjacent to the study area.

- No hospitals are located within 300 feet of existing 230 kV or 69 kV lines.
- No schools are located within 300 feet of existing 230 kV or 69 kV lines.
- One fire station (Station 52 of Sacramento Metro District at 9780 Elder Creek Road, Sacramento) is within 300 feet of existing 230 kV lines located just outside the study area.
- Three sections of Cosumnes River Ecological Reserve and the Woods (Jones) park (part of Cosumnes River Admin Area) are within 300 feet of existing 230 kV lines (lines run through parks).

25.2 Regulatory Setting

Numerous acts, plans, policies, and programs define the framework for regulating water quality, safety from vectors, and EMF in California. The following discussion focuses on requirements that are applicable to drinking water (including pathogens and bioaccumulation), vectors, and EMF within the study area. Additional water quality regulations can be found in Chapter 8, *Water Quality,* Section 8.2.

25.2.1 Federal and State Agencies Responsible for Regulating Water Quality

EPA provides guidance and oversight to California in regulating water quality, as it does for other states and tribes. EPA delegates authorities for establishing water standards and regulating controllable factors affecting water quality in the state. In California, this authority is delegated to the State Water Resources Control Board (State Water Board). The State Water Board, in turn, delegates authority to its nine Regional Water Quality Control Boards to implement the state's water quality management responsibilities in the nine geographic regions. The two regional boards that regulate the Delta region are the Central Valley Regional Water Quality Control Board and the San Francisco Bay Regional Water Quality Control Board. Although the state generally takes the lead on developing and adopting water quality standards for California, EPA must approve new or modified standards. Thus, EPA, the State Water Board, and the two Regional Water Boards have worked together to establish existing water quality criteria/objectives and beneficial uses for the Delta. Applicable regulations and standards are listed below and additional regulations and standards are discussed in Chapter 8, *Water Quality*, Section 8.1.1.6.

25.2.1.1 Bureau of Reclamation

The Bureau of Reclamation (Reclamation) owns and manages several dams and distribution canals upstream of and within the Delta for water supply. Reclamation consults with the state and provides technical assistance related to reservoir reoperation studies (California Department of Water Resources 2008). Reservoir operations are covered in Chapter 5, *Water Supply*.

25.2.1.2 Other Federal Agencies

Other federal agencies have programs related to floodplain management. These include the U.S. Geological Survey (USGS) and the Natural Resources Conservation Service (NRCS) (California Department of Water Resources 2009). USGS, in cooperation with the California Department of Water Resources (DWR), is responsible for collecting surface water data, which becomes the essential database used to develop the hydrology required for defining hydraulic studies. NRCS is involved in watershed planning, and has programs that can provide assistance to local governments and the state in constructing flood relief facilities and preventing flood damage.

25.2.2 Federal Plans, Policies, and Regulations

25.2.2.1 Clean Water Act

The CWA (33 U.S.C. Section 1251 et seq.) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and gives EPA the authority to implement pollution control programs. The CWA sets water quality standards for all contaminants in surface waters. In California, such responsibility has been delegated to the State, which administers the CWA through the Porter-Cologne [Water Quality Control] Act (California Water Code, Section 13000 et seq.). Under the Porter-Cologne Act, the State Water Board oversees nine Regional Water Quality Control Boards that regulate the quality of waters within their regions.

25.2.2.2 Clean Water Act Section 303(d)

If the CWA's permit program fails to clean up a river or river segment, states are required to identify such waters and list them in order of priority. Thus, under CWA Section 303(d), states, territories, and authorized tribes are required to develop a ranked list of water quality-limited segments of rivers and other water bodies under their jurisdiction. Listed waters are those that do not meet water quality standards, even after point sources of pollution have had the minimum required levels of pollution control technology incorporated. The law requires that action plans or TMDLs (Total Maximum Daily Load) be developed to monitor and improve water quality.

25.2.2.3 National Toxics Rule

In 1992, pursuant to the CWA, EPA promulgated the National Toxics Rule (NTR) to establish water quality criteria for 12 states and two territories, including California, that had not complied fully with Section 303(c)(2)(B) of the CWA (57 Federal Register 60848). As described in the preamble to the final NTR, when a state adopts, and EPA approves, water quality criteria that meet the requirements of CWA Section 303(c)(2)(B), EPA will issue a rule amending the NTR to withdraw the federal criteria for that state. If the state's criteria are no less stringent than the promulgated federal criteria, EPA will withdraw its criteria without formal rulemaking because additional comment on the criteria would be unnecessary (65 Federal Register 19659). However, if a state adopts criteria that are less stringent than the federally promulgated criteria, but in EPA's judgment fully meet CWA requirements, EPA will provide an opportunity for public comment before withdrawing the federally promulgated criteria (57 Federal Register 60860, December 22, 1992).

25.2.2.4 Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) was established to protect the public health and quality of drinking water in the United States, whether from aboveground or underground sources. The SDWA directed EPA to set national standards for drinking water quality. It required EPA to set MCLs for a wide variety of potential drinking water pollutants (see Appendix 8A, *Water Quality Criteria and Objectives*). The owners or operators of public water systems are required to comply with federal primary (health-related) MCLs and encouraged to comply with federal secondary (nuisance- or aesthetics-related) MCLs. SDWA drinking water standards apply to treated water as it is served to consumers. See Section 25.2.3.2, *California Safe Drinking Water Act*, for applicable state drinking water regulations.

25.2.2.5 Surface Water Treatment Rule

The federal SWTR is implemented by the California SWTR, which satisfies three specific requirements of the SDWA by: (1) establishing criteria for determining when filtration is required for surface waters; (2) defining minimum levels of disinfection for surface waters; and (3) addressing *Cryptosporidium* spp., *Giardia lamblia*, *Legionella* spp., *E. coli*, viruses, turbidity, and heterotrophic plate count (procedure used to estimate the number of live heterotrophic bacteria that are present in a water sample) by prescribing a treatment technique. A treatment technique is prescribed in lieu of an MCL for a contaminant when it is not technologically or economically feasible to measure that contaminant. The California SWTR applies to all drinking water supply activities in California and its implementation is overseen by the California Department of Public Health (CDPH).

25.2.3 State Plans, Policies, and Regulations

25.2.3.1 California Toxics Rule

In 1992, pursuant to the CWA, EPA promulgated the NTR to establish numeric criteria for priority toxic pollutants for California. The NTR established water quality standards for 42 pollutants not covered, at that time, under California's statewide water quality regulations. As a result of a court-ordered revocation of California's statewide Water Quality Control Plan (WQCP) for priority pollutants in September 1994, EPA initiated efforts to promulgate additional numeric water quality criteria for California. In May 2000, EPA issued the California Toxics Rule (CTR) that promulgated numeric criteria for priority pollutants not included in the NTR. The CTR documentation (Federal Register 65 31682, May 18, 2000) carried forward the previously promulgated standards of the NTR, thereby providing a single document listing California's fully adopted and applicable water quality criteria for priority pollutants.

25.2.3.2 California Safe Drinking Water Act

EPA has designated CDPH as the primary agency to administer and enforce the requirements of the federal SDWA in California. A state or a tribe with primacy has direct oversight of the regulated public water systems and is responsible for ensuring that the systems meet all of the requirements of the drinking water regulations. Public water systems are required to be monitored for regulated contaminants in their drinking water supply. California's drinking water standards (e.g., MCLs) are the same as or more stringent than the federal standards, and include additional contaminants not regulated by EPA. Like the federal enforceable MCLs, California's primary MCLs address health concerns, while secondary MCLs address aesthetics, such as taste and odor. Although federal secondary drinking water standards are established only as guidelines, California secondary MCLs, like primary MCLs, are legally enforceable. The California SDWA is administered by CDPH, primarily through a permit system.

25.2.3.3 Assembly Bill 1200

Assembly Bill 1200 amended Section 139.2 of the State Water Code to require DWR to evaluate the potential impacts on water supplies derived from the Delta based on 50-, 100-, and 200-year projections for each of these possible impacts on the Delta.

- Subsidence
- Earthquakes
- Floods
- Changes in precipitation, temperature, and ocean levels
- A combination of these impacts

25.2.3.4 The California Department of Public Health's *Best Management Practices for Mosquito Control in California*

The *Best Management Practices for Mosquito Control in California* was prepared by CDPH in collaboration with the Mosquito and Vector Control Association of California to promote mosquito control on California properties and enhance early detection of WNV. This plan describes mosquito control Best Management Practices (BMPs) to be implemented by property owners and managers to reduce mosquito populations through a variety of ways including: 1) reducing or eliminating breeding sites; 2) increasing the efficacy of biological control, and 3) decrease the amount of pesticides applied while increasing the efficacy of chemical control measures (California Department of Public Health 2012). In addition to these recommended practices, the plan stresses coordination between property owners and local vector control agencies regarding control practices on lands located within or near a local agency's jurisdiction and appropriate integrated pest management strategies that are most suitable for specific land-use types.

25.2.4 Regional Agencies and Programs Responsible for Regulating Drinking Water

25.2.4.1 Regional Water Quality Control Board Water Rights Decisions, Water Quality Control Plans, and Water Quality Objectives

The preparation and adoption of WQCPs is required by California Water Code Section 13240 and supported by the CWA. Section 303 of the CWA requires states to adopt water quality standards that "consist of the designated uses of the navigable waters involved and the water quality criteria for such waters based upon such uses." According to Water Code Section 13050, WQCPs consist of a designation or establishment for the waters within a specified area of beneficial uses to be protected, water quality objectives to protect those uses, and a program of implementation needed for achieving the objectives. Water Code Section 13050(f) defines beneficial uses to include domestic, municipal, agricultural, and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and the preservation and enhancement of fish, wildlife, and other aquatic resources or preserves. Because beneficial uses, together with their corresponding water quality objectives, can be defined per federal regulations as water quality standards, the WQCPs are regulatory references for meeting the state and federal requirements for water quality control. One substantial difference between the state and federal programs is that California's WQCPs establish standards for groundwater in addition to surface water. Adoption or revision of surface water standards is subject to EPA approval.

The State Water Board Water Rights Division has primary regulatory authority over water supplies and issues permits for water rights—specifying amounts, conditions, and construction timetables—for diversion and storage facilities. Water rights decisions implement the objectives adopted in the Delta WQCP and reflect water availability, recognize prior water rights and flows needed to preserve instream uses (such as water quality and fish habitat), and whether the diversion of water is in the public interest.

WQCPs adopted by Regional Water Boards are primarily implemented through the National Pollutant Discharge Elimination System permitting system and issuance of waste discharge requirements to regulate waste discharges. Basin plans provide the technical basis for determining waste discharge requirements and authorize the Regional Water Boards to take regulatory enforcement actions if deemed necessary.

25.2.4.2 Water Quality Control Plan for the Sacramento River and San Joaquin River Basins

The Basin Plan defines the beneficial uses, water quality objectives, implementation programs, and surveillance and monitoring programs for waters of the Sacramento River and San Joaquin River basins. The narrative water quality objectives and numeric freshwater criteria/objectives for priority pollutants (i.e., trace metals) adopted for the Delta are included in Appendix 8A, *Water Quality Criteria and Objectives*. The Basin Plan contains specific numeric water quality objectives that are applicable to certain water bodies or portions of water bodies. Numerical objectives have been established for bacteria, dissolved oxygen, pH, pesticides, electrical conductivity, total dissolved solids, temperature, turbidity, and trace metals. The Basin Plan also contains narrative descriptions of water quality objectives for certain parameters that must be attained through pollutant control measures and watershed management. Narrative water quality objectives also serve as the basis for the development of detailed numerical objectives. The water quality objectives apply to all surface waters in the Delta, unless otherwise specified (Central Valley Regional Water Quality Control Board 2007).

25.2.4.3 Water Quality Control Plan for the San Francisco Bay Basin

The Water Quality Control Plan for the San Francisco Bay Basin is the State Water Resources Control Board's master water quality control planning document. It designates beneficial uses and water quality objectives for waters of the state, including surface waters and groundwater. It also includes programs of implementation to achieve water quality objectives. The Basin Plan has been adopted and approved by the State Water Board, EPA, and the Office of Administrative Law where required (San Francisco Bay Regional Water Quality Control Board 2011).

25.2.4.4 Central Valley Regional Water Quality Control Board Drinking Water Policy

As directed in Resolution R5-2010-0079, Central Valley Water Board staff is developing a proposed Drinking Water Policy to include additions and modifications to three chapters of the *Water Quality Control Plan for the Sacramento River and San Joaquin River Basins*: Water Quality Objectives, Implementation, and Surveillance and Monitoring. The policy provisions will apply to surface waters only.

25.2.4.5 California Drinking Water Standards Incorporated by Reference in Basin Plans

CDPH establishes state drinking water standards, enforces both federal and state standards, administers water quality testing programs, and issues permits for public water system operations. The drinking water regulations are found in Title 22 of the California Code of Regulations. The state drinking water standards for public water systems consist of enforceable primary and secondary maximum MCLs. Primary MCLs are established for the protection of environmental health and secondary MCLs are established for constituents that affect the aesthetic qualities of drinking water, such as taste and odor. Both the Central Valley and San Francisco Bay Basin Plans incorporate by reference the CDPH numerical drinking water MCLs. The incorporation into the Basin Plans of the MCLs makes these standards also applicable to ambient receiving waters regulated by the Regional

Water Boards. The state primary and secondary MCLs applicable to the Central Valley and San Francisco Bay Basin Plans are provided in Appendix 8A, *Water Quality Criteria and Objectives*.

25.2.4.6 Safe, Clean, Reliable, Water Supply Act

The Safe, Clean, Reliable Water Supply Act declares that the basic goals for the Delta include the protection of the state's water supply system from catastrophic failure attributable to earthquakes and flooding.

25.2.5 Regional Agencies and Programs Responsible for Vector Control

California's Health and Safety Code (Sections 2001–2007; 2060–2067 and 2001 b[2]) provide the legal procedures that each district in the State of California must follow to achieve effective vector control programs. The Health and Safety Code outlines the physical, biological, and chemical controls by which each district must achieve effective mosquito abatement.

Under the Health and Safety Code, local mosquito and vector control agencies have the authority to conduct surveillance for vectors, prevent the occurrence of vectors, and legally abate production of vectors, any water that is a breeding place for vectors, and "any activity that supports the development, attraction, or harborage of vectors, or that facilitates the introduction or spread of vectors (Section 2002[j] and 2040). Further, vector control agencies are authorized to participate in review, comment, and make recommendations regarding local, state, or federal land use planning and environmental quality processes, permits, licenses, entitlements, and documents for projects with potential effects with respect to vector production (Section 2041).

25.2.5.1 Alameda County Vector Control Services District

The Alameda County Vector Control Services District was established in June 1984 as a County Service Area (VC 1984-1). The District serves all of the cities in Alameda County, as well as the unincorporated area. In the City of Berkeley, the Vector Control Services Section is under the Division of Community Health Protection, Health and Human Services Department (Alameda County Vector Control Services District 2009).

25.2.5.2 Contra Costa Mosquito and Vector Control District

The Contra Costa Mosquito and Vector Control District began service in 1927 as the Contra Costa Mosquito Abatement District. The district's mission is to maintain the public healthy by preventing the transmission of diseases and improving the quality of life. The district employs a number of techniques, services, and programs to combat emerging disease while preserving and/or enhancing the environment (Contra Costa Mosquito and Vector Control District 2011).

25.2.5.3 Sacramento-Yolo Mosquito and Vector Control District

The Sacramento County-Yolo County Mosquito Abatement District was formed in 1946 to protect the public against diseases transmitted by mosquitoes and provide relief from serious pest nuisance. The district's mission is to "provide safe, effective, and economical mosquito and vector control for Sacramento and Yolo counties" (Sacramento-Yolo Mosquito and Vector Control District 2009).

25.2.5.4 San Joaquin County Mosquito and Vector Control District

San Joaquin County Mosquito and Vector Control District provides comprehensive vector surveillance and control services to enhance the public health and quality of life for the residents and visitors of San Joaquin County. This independent agency seeks to fulfill its mission by utilizing advanced technology; educating the public regarding the health implications of disease-transmitting pests; providing services consistent with a concern for environmental protection; and maintaining a safe and effective public health pest management program.

25.2.5.5 Solano County Mosquito Abatement District

The Solano County Mosquito Abatement District is a special district responsible for mosquito abatement throughout the incorporated and unincorporated areas of Solano County. The function of the district is to control all mosquitoes that may bring disease or harassment to humans and domestic animals. The district uses a variety of preventive correctional management, naturalistic, physical, and chemical control measures singly or in combination. Preventive measures are emphasized, principally naturalistic and physical control. Chemical control is integrated with other measures as necessary (Solano County Mosquito Abatement District 2013).

25.2.5.6 Sutter-Yuba Mosquito Abatement District

The Sutter-Yuba Mosquito Abatement District covers 486 square miles within Sutter County and 220 square miles within Yuba County. The district is responsible for suppressing mosquito populations and thereby preventing the spread of mosquito-borne diseases. The district's integrated mosquito management program uses physical control (source reduction/elimination), biological control (mosquitofish), public education, and chemical control to reduce mosquito populations.

25.2.5.7 The Central Valley Joint Venture's Technical Guide to *Best Management Practices for Mosquito Control in Managed Wetlands*

This document was prepared by the Central Valley Joint Venture to present a full range of BMP options specific to managed wetlands. The BMPs were identified from the scientific literature as well as applications from MVCDs and wetland managers. The information in the guide is applicable to managed wetlands in the Central Valley of California, including the Sacramento and San Joaquin Valleys and the Delta-Suisun region. It is intended to be a reference for wetland stewards including the private wetland owner or caretaker, refuge or wildlife area manager, wetland biologist, or mosquito and vector control technician. The guide is intended to be as comprehensive as possible and describe BMPs based on the best available information.

The BMPs identified in the guide are also an essential component of IPM for mosquitoes. IPM incorporates knowledge of mosquito biology and the use of effective treatments to control mosquitoes. IPM employs a variety of mosquito control methods that include habitat management, biological control agents, and pesticide application. Ideally, BMPs can be used to lower the production of mosquitoes and reduce the need for chemical treatment without significantly disrupting the ecological character, habitat function, or wildlife use of managed wetlands.

BMPs to achieve mosquito control should not greatly disrupt the ecological character or habitat function of the wetland site. Not all BMPs can be effectively implemented in every wetland environment. Some initial investigation will be required of wetland managers, in cooperation with MVCDs, to identify those BMPs most applicable to an individual site. Prior to the implementation of BMPs, consultation should be conducted with MVCDs and appropriate resource agencies to determine the suitability of BMPs, and to ensure compliance with state and federal wetland regulations and conservation easements.

The BMPs included in the guide are organized into five categories and are generally used in combination.

- Water Management Practices
- Vegetation Management Practices
- Wetland Infrastructure Maintenance
- Wetland Restoration and Enhancement Features
- Biological Controls

Water management practices include changes to the timing of flooding; changes in the speed of flooding; controlling the water such that elevations do not dramatically fluctuate; and, modifying the frequency and duration of irrigation.

Vegetation management practices include methods to reduce thick vegetation, such as mowing, burning, disking, haying, and grazing.

Wetland infrastructure maintenance includes levee and water control structure inspection and repair; ditch and swale cleaning; and pump test repair. These actions would be conducted to correctly operate water control structures and maintain pumps to avoid unnecessary production of mosquitoes through neglect.

Wetland restoration and enhancement features include design features to reduce mosquito production such as independent flooding or drainage capabilities. These features would promote habitats for mosquito predators and allow predators to access mosquitoes.

Biological controls include encouraging onsite predator populations and providing predator access to mosquitoes.

In addition to the BMPs discussed above, the guidelines identify that coordination with the MVCDs is needed to provide them with information regarding habitat and water management schedules and identify targeted implementation of certain BMPs. MVCDs can provide input on site design and project enhancement that can consider mosquito reducing techniques. Use of IPM by the MVCDs depends on the cooperation and sharing of information on habitat and water management schedules, collaborating on the identification of problem areas, and monitoring the effectiveness of the BMPs selected for application on the wetland restoration and enhancement projects.

25.2.5.8 County General Plan Policies Related to Vector Control

Sacramento County General Plan

The Sacramento County General Plan Safety Element considers the issue of vector habitat in the context of flooding hazards.

> GOAL: Minimize the loss of life, injury, and property damage due to flood hazards.
>
> Policy SA-5. A comprehensive drainage plan for major planning efforts shall be prepared for streams and their tributaries prior to any development within the 100-year floodplain defined by full watershed development without channel modifications. The plan shall:
>
> j. Develop and ensure implementation of measures that would reduce vector larvae.

Implementation Measure B states, "In cooperation with the Sacramento-Yolo Mosquito & Vector Control District (SYMVCD), siting and design of wetlands near residential and commercial areas should consider the SYMVCD Best Management Practices and the County's Stormwater Quality Design Manual" (Sacramento County 2011).

25.2.6 State and Regional Agencies and Programs Responsible for Regulating Electromagnetic Fields

25.2.6.1 California Public Utilities Commission EMF Design Guidelines for Electrical Facilities

In 1993, CPUC issued Decision 93-11-013 establishing EMF policy for California's regulated electric utilities. In recognizing the scientific uncertainty, CPUC addressed public concern over EMF by establishing a no-cost and low-cost EMF reduction policy that utilities would follow for proposed electrical facilities.

In 2006, CPUC updated its EMF Policy in Decision 06-01-042. The decision reaffirmed that health hazards from exposures to EMF have not been established and that state and federal public health regulatory agencies have determined that setting numeric exposure limits is not appropriate. CPUC also reaffirmed that the existing no-cost and low-cost precautionary-based EMF policy should remain in place. In the decision, CPUC required utilities to update their EMF Design Guidelines to reflect the following key elements of the updated EMF Policy.

A) "The Commission [CPUC] has exclusive jurisdiction over issues related to EMF exposure from regulated utility facilities."

B) "…while we continue our current policy of low-cost and no-cost EMF mitigation, as defined by a 4% benchmark of total project cost, we would consider minor increases above the 4% benchmark if justified under unique circumstances, but not as a routine application in utility design guidelines. We add the additional distinction that any EMF mitigation cost increases above the 4% benchmark should result in significant EMF mitigation to be justified, and the total costs should be relatively low."

C) For low-cost mitigation, the "EMF reductions will be 15% or greater at the utility ROW [right-of-way]…"

D) "Parties generally agree on the following group prioritization for land use categories in determining how mitigation costs will be applied:

1. Schools and licensed day care
2. Residential
3. Commercial/industrial
4. Recreational
5. Agricultural
6. Undeveloped land"

E) "Low-cost EMF mitigation is not necessary in agricultural and undeveloped land except for permanently occupied residences, schools or hospitals located on these lands."

F) "Although equal mitigation for an entire class is a desirable goal, we will not limit the spending of EMF mitigation to zero on the basis that not all class members can benefit."

G) "…. We [CPUC] do not request that utilities include non-routine mitigation measures, or other mitigation measures that are based on numeric values of EMF exposure, in revised design guidelines…"

CPUC also clarified utilities' roles on EMF during the Certificate of Public Convenience and Necessity (CPCN) and Permit to Construct (PTC) proceedings. CPUC stated, "EMF concerns in future CPCN and PTC proceedings for electric transmission and substation facilities should be limited to the utility's compliance with the Commission's low-cost and no-cost policies."

Furthermore, CPUC directed "the Commission's Energy Division to monitor and report on new EMF related scientific data as it becomes available." The EMF Design Guidelines will be revised as more information or direction from CPUC becomes available (California Public Utilities Commission 2006).

25.2.6.2 Local Utility Policies Regulating Electromagnetic Fields

There are five electrical utility districts within the study area, including Lodi Electric Utility, Modesto Irrigation District (MID), Pacific Gas and Electric Company (PG&E), Port of Stockton, and Sacramento Municipal Utility District (SMUD). Lodi Electric Utility and MID are publicly owned utilities, PG&E is an investor-owned utility, and the Port of Stockton and SMUD are municipal utilities. The utilities are responsible for reliably delivering electricity to consumers within their service boundaries. At this time, it is unknown which of the existing utility districts will be the provider for operations of the alternatives. However, the local utility policies regarding EMFs generally follow CPUC and federal policies regarding EMFs.

Most utilities, such as PG&E, rely on information from the federal and state health agencies that conduct EMF research and monitor this issue to help evaluate potential risks (Pacific Gas and Electric Company 2011a). PG&E's EMF policy states that it will provide reasonable EMF measurement service at no cost for property near electrical facilities owned by PG&E (Pacific Gas and Electric Company 2011b). Additionally, PG&E has procedures to consider EMF exposure in the designs, plans, and communications regarding new and upgraded facilities (Pacific Gas and Electric Company 2011c). SMUD's Board of Directors passed Resolution No. 91-04-18 on April 18, 1991, establishing an EMF policy statement and authorizing the implementation of an EMF program. This program also requires EMF considerations during the planning of facilities.

25.2.6.3 County General Plan Policies Related to Electromagnetic Fields

Sacramento County General Plan

Sacramento County's *General Plan of 2005–2030,* Public Facilities Element (Sacramento County 2011) includes a policy addressing electromagnetic fields.

Electric and Magnetic Fields Policy

PF-111. It is the policy of Sacramento County not to locate public school buildings or grant entitlements for private school buildings within, or directly adjacent to power line corridors as specified below:

Power Line Capacity	Setback from the Corridor (measured from edge of easement)
100-133 kV	100 feet
220-230 kV	150 feet
500-550 kV	350 feet

The construction of transmission lines proximate to an existing and/or planned public or private school site and subject to the County Siting Process (100 kV or greater) should also comply with the distance criteria listed above unless compliance with these setbacks would result in a greater EMF impact on other adjacent uses.

Alameda County East County Area Plan

The Environmental Health and Safety Element of the *East County Area Plan* (Alameda County 2000) also includes an Electromagnetic Fields policy.

Policy 325: The County shall not approve sensitive uses (e.g., hospitals, schools, and retirement homes) within setbacks recommended by the California Department of Education from sources of electromagnetic fields such as major electrical transmission lines and substations. The County shall also consider appropriate setbacks in siting residential subdivisions based on the best information available at the time.

25.3 Environmental Consequences

Potential public health consequences associated with the different alternatives are described below. Section 25.3.1, *Methods for Analysis* identifies the methodology and thresholds used to evaluate the effects of different alternatives. Section 25.3.2, *Determination of Effects*, explains the significance criteria used to evaluate effects on public health. Section 25.3.3, *Effects and Mitigation Approaches*, provides the detailed analysis of the criteria, effects associated with each alternative, and any mitigation measures used to reduce the significance of impacts.

Effects associated with construction, and operation and maintenance of the water conveyance facilities are evaluated at a project level, whereas effects associated with implementation of CM2–CM21 under the BDCP alternatives, or Environmental Commitments under the non-HCP alternatives, are evaluated at a program level. If the effect mechanism is common to construction or operation of the water conveyance facilities and other CMs or Environmental Commitments, for example vectors, the effects associated with the water conveyance facilities are discussed first and then combined, as necessary, with the discussion of other CMs or Environmental Commitments to capture the whole of the effect.

25.3.1 Methods for Analysis

The proposed action alternatives may affect public health in the study area through the following mechanisms.

- Construction of the water conveyance facilities and water supply operations under all action alternatives would result in an increase in sedimentation basins and solids lagoons. These new features could result in an increase in standing water, thereby potentially increasing vector breeding locations and vector-borne diseases in the study area.
- Water conveyance facilities operation activities could mobilize or increase the amount of trace metals or pesticides in surface waters.
- Water conveyance facilities operation activities under all action alternatives could change hydraulic residence times and increase water temperatures, which could cause an increase in the frequency, magnitude, and geographic extent of *Microcystis* blooms. This could result in negative effects on drinking water quality and recreational waters, which would represent a potential public health concern.
- Habitat restoration and enhancement activities under all action alternatives could change hydraulic residence times and increase water temperatures, which could cause an increase in the frequency, magnitude, and geographic extent of *Microcystis* blooms. This could result in negative effects on drinking water quality and recreational waters, which would represent a potential public health concern.
- Water conveyance facilities operation activities under all action alternatives would generally result in a change in source water inflow to the study area, thereby potentially influencing parameters that bioaccumulate (e.g., methylmercury).
- Water conveyance facilities operation activities under all action alternatives would require new transmission lines (with lines at 69 kV and 230 kV), electrical substations and transformers, thereby potentially increasing exposure of people to EMFs.
- Habitat restoration and enhancement activities under all action alternatives would increase the amount of tidal and wetland areas in the study area (including Suisun Marsh and the Yolo Bypass), which are known to generate pathogens that represent a potential public health concern to recreational activities.
- Habitat restoration activities under all action alternatives could increase standing water in the Delta throughout the year, thereby potentially resulting in an increase in vector breeding locations and in vector-borne diseases in the study area.
- Habitat restoration activities under all action alternatives could change the water quality such that there is an increase DOC in the study area, thereby potentially increasing the amount of DBPs in the water, which represents a potential drinking water public health concern.
- Restoration and certain habitat enhancement activities (e.g., channel margin enhancement) under all action alternatives could disturb and re-suspend existing sediment that is

contaminated with parameters which bioaccumulate (e.g., methylmercury) or result in mobilization of toxic constituents into the food chain (e.g., methylation of mercury).

The methodologies to evaluate these different mechanisms are described below.

25.3.1.1 Vectors

Most species of mosquitoes lay their eggs on the surface of stagnant water, although some species use damp soil. A body of standing water represents potential breeding habitat, with the exception of areas that are flushed daily by tidal action and that are either too saline or not stagnant long enough to support mosquito larvae to maturity. The increase in the public's risk of exposure is evaluated by describing the alternative actions during operation that could result in more potential breeding habitat, qualitatively evaluating it against the existing amount of potential breeding habitat and the existing level of documented illnesses associated with mosquitoes in the study area. A qualitative determination is made as to whether the alternative actions would result in a substantial[6] increase in the public's risk of exposure to vector-borne diseases.

25.3.1.2 Pathogens and Water Quality

There are numerous potential sources of pathogens in the study area, including urban runoff, wastewater treatment discharges, agricultural discharges, and wetlands (Tetra Tech 2007). Tidal wetlands are known to be sources of coliforms originating from aquatic, terrestrial, and avian wildlife that inhabit these areas (Desmarais et al. 2001; Grant et al. 2001; Evanson and Ambrose 2006; Tetra Tech 2007). As described in Chapter 8, *Water Quality,* Section 8.3.3, the findings of the Pathogen Conceptual Model state that pathogen concentrations are greatly influenced by proximity to the pathogen-generating source, and pathogen concentrations in the study area are generally not influenced by flow rates or inputs from the Sacramento and San Joaquin Rivers because of travel time and rapid die-off rates of some types pathogens.

Human exposure to pathogens primarily occurs through drinking water or contact with pathogen sources in water. The removal of pathogens in drinking water happens prior to distribution and treatment techniques generally have a greater than 99% removal rate, as described in Section 25.1.1.3; therefore, pathogens would have a very limited effect on drinking water quality. Thus, the analysis below focuses on recreationists as receptors to any potential increase in pathogens caused by each action alternative in the study area. The findings in Chapter 8, *Water Quality,* are summarized for each action alternative and a qualitative determination is made as to whether recreationists would experience a substantial increase of exposure to pathogens.

25.3.1.3 *Microcystis*

The conceptual model for evaluating effects of the action alternatives on *Microcystis* in the Plan Area is described in Chapter 8, *Water Quality*, Section 8.3.1.7, and includes consideration of abiotic factors considered to be the primary drivers of seasonal and interannual variation in abundance of

[6] Section 15064(b) of the State CEQA Guidelines states: "[t]he determination whether a project may have a significant effect on the environment calls for careful judgment on the part of the public agency involved, based to the extent possible on factual and scientific data. An ironclad definition of significant effect is not always possible because the significance of an activity may vary with the setting. For example, an activity which may not be significant in an urban area may be significant in a rural area." Accordingly, the significance of a potential impact will be determined qualitatively, depending on the location of the alternative.

Microcystis in the Delta. These factors include water temperature, hydraulic residence time, nutrients, and water clarity. Nutrient (i.e., ammonia, nitrate, and phosphorus) and water clarity effects on *Microcystis* abundance under the action alternatives relative to Existing Conditions and the No Action Alternative were determined to not be substantial (see Chapter 8).

In Chapter 8, *Water Quality,* a qualitative evaluation was done to determine if the action alternatives would result in an increase in frequency, magnitude, and geographic extent of *Microcystis* blooms in the Delta based on the following two additional abiotic factors that may affect *Microcystis*: 1) changes to water operations and creation of tidal and floodplain restoration areas that change hydraulic residence times within Delta channels, and 2) increases in Delta water temperatures. The findings from Chapter 8 are summarized for each action alternative and a qualitative determination is made as to whether recreationists would experience a substantial increase in exposure to *Microcystis* and whether there would be adverse effects on drinking water due to increases in *Microcystis*.

25.3.1.4 Constituents of Concern and Water Quality

As discussed in Chapter 8, *Water Quality*, Section 8.1.1.6, numerical water quality objectives and standards have been established to protect beneficial uses, and therefore represent concentrations or values that should not be exceeded. The beneficial uses provide standards that indirectly maintain public health, such as contact recreation to protect individuals against illness. Chapter 8, *Water Quality,* discusses the different water quality standards evaluated through modeling and determines whether these standards would be exceeded as a result of implementation of the action alternatives. Therefore, this analysis summarizes the qualitative and quantitative results presented in Chapter 8 to identify whether the construction and operation of the facilities associated with the alternatives would exceed water quality standards for pesticides that do not bioaccumulate (for this assessment, only present use pesticides for which substantial information is available, namely diazinon, chlorpyrifos, pyrethroids, and diuron, are addressed); trace metals of human health and drinking water concern (i.e., arsenic, iron, and manganese); and DBP precursors, DOC and bromide[7].

Qualitative assessments were conducted to determine whether operation of the action alternatives would result in adverse effects on drinking water quality as represented by an exceedance in water quality standards for these constituents of concern. Drinking water is generally treated for various standard constituents prior to distribution and use in the drinking water supply.

25.3.1.5 Bioaccumulation

Bioaccumulation by living organisms is a function of a chemical's specific properties and the way a chemical is metabolized—such as whether it is metabolized and excreted, or stored in fat. Toxics that are bioavailable and lipophilic (i.e., fat soluble), tend to accumulate in the fatty tissue of an organism. Lipophilic compounds have a higher potential to bioaccumulate relative to more water soluble compounds. If stored by organisms, chemicals such as mercury can biomagnify in the food chain. The study area is already out of compliance for many of the constituents that are known to bioaccumulate. Specifically addressed in the analysis are pesticides known to bioaccumulate (legacy organochlorine pesticides)) and methylmercury.

[7] Because organic carbon, such as DOC, and bromide can react with disinfectants during the water treatment disinfection process to form DBPs, such as THMs and HAAs, as described in Section 25.1.1.1, DOC and bromide concentrations can be an indicator of DBPs (discussed in detail in Chapter 8, Water Quality, Section 8.1.3.11).

The general methodology used to assess the potential for bioaccumulation effects as a result of project implementation was to examine existing conditions (i.e., levels and locations) of constituents that bioaccumulate in fish in the study area, and then to determine whether bioaccumulation in fish tissue would be expected to increase above existing levels and locations under the action alternatives. If bioaccumulation is expected to increase under the action alternatives, then a qualitative description of the populations that would be affected is discussed and a qualitative determination is made as to whether the increase would result in a public health concern. It is assumed any additional bioaccumulation that is detected is a potential effect.

As discussed in Appendix 8C, *Screening Analysis*, it is not possible at this time to accurately model sediment re-suspension and subsequent transport of PCBs in the Bay-Delta. Regardless, if sediment-transport dynamics were to change under the alternatives, it is not possible to predict how bioaccumulation of PCBs in the Delta would be altered, if at all. Many of the larger fish that bioaccumulate PCBs to problematic levels migrate through the San Francisco Bay and the Delta, resulting in low residence times in these waters, and therefore, would likely not experience substantially different bioaccumulation if distribution of sediment high in PCBs were to change under the alternatives. Information about fish migration and residence times within the Delta can be found in BDCP Chapter 5, *Effects Analysis*. Finally, because PCBs are no longer in production, the 2008 TMDL for PCBs in San Francisco Bay states that PCBs are expected to attenuate naturally and be lost through outflow from the Golden Gate (San Francisco Bay Regional Water Quality Control Board 2008). Therefore, any changes in PCB concentrations in water or sediment that may occur within the Delta would not be of frequency, magnitude, and geographic extent that would adversely affect any beneficial uses or substantially degrade the quality of the water bodies within the affected environment, with regards to PCBs (see Appendix 8C for more detail). Therefore, PCBs are not discussed further in the analysis.

Habitat Restoration

Methylmercury would be produced as a result of implementing select conservation measures or Environmental Commitments (e.g., tidal habitat restoration), and erosion and resuspension or mobilization of existing mercury in sediments could occur. The microbial conversion of mercury in soils to methylmercury, a much more toxic and bioavailable form of mercury, would occur in newly inundated restoration areas. There is insufficient information on soil mercury and methylmercury concentrations and the rate of transformation (which is determined by site-specific biogeochemistry, length of inundation, drying out of soils, and how often inundation occurs) to provide a quantitative analysis.

Therefore, factors that could result in increased methylmercury availability to the food chain and potential human exposures are qualitatively discussed, but the resulting concentrations in the different restored marshes and floodplains cannot be quantified.

Water Supply Construction and Operations

Bioaccumulation related to construction activities for the water conveyance facilities is discussed qualitatively. Due to restricted access, sediment samples were not obtained. Given this restriction, published scientific reports were used to determine the state of the sediment in question. Sediment sampling may be included in the Erosion and Sediment Control Plans as it will likely require testing prior to disturbance and then treatment and proper disposal of contaminated sediment.

There is insufficient data for some of the factors that result in toxics becoming more available in the food chain. For example, the full extent and magnitude of potential in-water sediment contamination is unknown along the Sacramento River where water supply facilities would be constructed. Also, mobilization of potentially toxic sediments would be directly related to levels of turbidity and suspended sediments resulting from construction. Although resulting turbidity has not been modeled, it is anticipated to be low given the permit requirements for controls. Furthermore, as an environmental commitment, DWR would develop and implement Erosion and Sediment Control Plans and Stormwater Pollution Prevention Plans (SWPPP). BMPs implemented as part of these plans would reduce turbidity levels and maintain water quality during construction (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). Therefore, the disturbance of potentially contaminated sediment will be discussed qualitatively as it relates to public health.

Bioaccumulation models that link the concentration of methylmercury in the water to resultant concentrations in fish tissues for methylmercury have been developed and are presented in Chapter 8, *Water Quality*. The model is based on the DSM2-predicted blending of various source waters and measured average concentrations of total mercury and methylmercury in source water. Levels of methylmercury in the water column under the water conveyance alternatives are modeled, and the resultant accumulation in fish tissue is also modeled based on the known relationship between methylmercury in the water column and largemouth bass fillet concentrations of mercury. The resulting model allows the prediction of future, altered average fish tissue mercury concentrations under the various alternatives.

The model captures effects resulting from water conveyance facilities operations and does not estimate the potential for methylation in existing or newly created environments (e.g., Restoration Opportunity Areas [ROAs]). The detailed, site-specific information needed for modeling, with acceptable margins of error, is currently lacking. Once specific locations for restoration activities are identified within the ROAs, future evaluations of actions can be made (see discussion above concerning key processes controlling mercury fate, transport, and risk determination). Agricultural lands and existing wetlands may be very different in production of methylmercury and uptake into various trophic levels and are not easily generalized or modeled (Windham-Myers et al. 2009).

25.3.1.6 Electromagnetic Fields

Electromagnetic fields from power lines vary continuously as electrical load varies on individual transmission lines. As such, EMF would vary with load during water conveyance facilities construction and operation. When the transmission lines are energized, there would likely be some change in the level of EMFs in the environment. The magnitude of the change would fluctuate over time based on load variations. These effects are anticipated to be localized within the immediate proximity of the transmission lines. Exposure to EMFs from new transmission lines, substations and transformers is dependent on the load on the transmission lines and the location of these structures in relation to sensitive receptors (e.g., hospitals, schools, parks) or densely populated urban areas given the strength of a magnetic field decreases dramatically with increasing distance from the source (National Institute of Environmental Health Sciences and National Institutes of Health 2002). For this analysis schools, hospitals, parks, and fire stations are considered to be sensitive receptors. Parks and schools provide a location for people to congregate, and fire stations and hospitals could have sensitive communications and health equipment that could be affected by EMF interference. Residences and other sensitive receptors located 300 feet or more from power lines are not considered to be at risk of high EMF exposure (National Institute of Environmental Health Sciences and National Institutes of Health 2002). At this distance, EMF exposure from power lines is no different than from typical levels around the home. Therefore, the methodology for analyzing EMFs involves identifying existing transmission line locations and comparing them with the location of proposed transmission lines and the population densities and sensitive receptors associated with existing and proposed transmission lines.

The length of the new temporary and permanent transmission lines for the alternatives is related to the number of intakes required by alternative and the differing location options for transmission lines to serve the different water conveyance options. Under the modified pipeline/tunnel alignment, the method of delivering power to construct and operate the water conveyance facilities is assumed to be a “split” system that would connect to the existing grid in two different locations to permanent transmission lines—one in the northern section of the alignment, and one in the southern section of the alignment. While only one of these points of interconnection would be used, the effects of constructing transmission lines leading from both sites are combined and accounted for the impact analysis. The northern point of interconnection would be located north of Lambert Road and west of Highway 99. From here, a new transmission line would run west, along Lambert Road, where one segment would run south to the intermediate forebay on Glannvale Tract; and one segment would run north to connect to a substation where temporary 69 kV lines would connect to the intakes. While this new transmission line could be 230 kV, 115 kV, or 69 kV depending on further study, a 230 kV line was conservatively assumed for the purposes of analysis. At the southern end of the modified pipeline/tunnel alignment, the point of interconnection may be in one of two possible locations: southeast of Brentwood or adjacent to the Jones pumping plant. From a substation northwest of Clifton Court Forebay, a potential 230 or 34.5 kV underbuild subtransmission line would run south to Clifton Court Forebay, and north following tunnel shaft locations, to Bacon Island. There, a potential 230 or 115 kV transmission line would connect Bacon Island to Mandeville Island. From that point a potential 230 and 34.5 kV underbuild subtransmission line would run north to Bouldin Island. Because the power required for operation of the water conveyance facilities would be much less than that required for construction, and because it would largely be limited to the pumping plants, the “split” system would enable all of the new power lines in the northern part of the alignment to be temporary Additionally, part of the proposed permanent 230 kV transmission line alignment for the west water conveyance alignment alternatives (i.e., 1C, 2C, and 6C) would be outside of the study area (near Rio Vista) and end at an interconnection point in Suisun City.

Table 25-9 identifies each alternative and potential lengths of new temporary and permanent transmission lines. Temporary transmission lines would be removed once construction was completed.

Table 25-9. Potential Range of New Permanent and Temporary Transmission Lines (miles)

	Permanent Transmission Lines (69 kV)		Temporary Transmission Lines (69 kV)		Permanent Transmission Lines (230 kV)		Temporary Transmission Lines (230 kV)		Permanent 230 kV/34.5 kV underbuild Transmission Lines		Temporary 230 kV/34.5 kV underbuild Transmission Lines	
Alternative	Miles	New Sensitive Receptors	Miles	New Sensitive Receptors	Miles	New Sensitive Receptors	Miles	New Sensitive Receptors	Miles	New Sensitive Receptors	Miles	New Sensitive Receptors
1A (Dual Conveyance with Pipeline/ Tunnel)	8.94	None	24.71	Stone Lakes National Wildlife Refuge (Elk Grove)	42.68	None	NA	NA	NA	NA	NA	NA
1B (Dual Conveyance with East Alignment)	36.79	Stone Lakes National Wildlife Refuge (Elk Grove)	13.49	None	16.35	None	NA	NA	NA	NA	NA	NA
1C (Dual Conveyance with West Alignment)	17.61	None	13.73	Fire Station 63 (9699 Highway 220, Walnut Grove)	18.45	None	NA	NA	NA	NA	NA	NA
2A (Dual Conveyance with Pipeline/ Tunnel)	14.46	None	24.71	Stone Lakes National Wildlife Refuge (Elk Grove)	42.68	None	NA	NA	NA	NA	NA	NA
2B (Dual Conveyance with East Alignment)	40.5	Stone Lakes National Wildlife Refuge (Elk Grove)	13.49	None	16.35	None	NA	NA	NA	NA	NA	NA
2C (Dual Conveyance with West Alignment)	17.61	None	13.73	Fire Station 63 (9699 Highway 220, Walnut Grove)	18.45	None	NA	NA	NA	NA	NA	NA
3 (Dual Conveyance with Pipeline/ Tunnel)	8.68	None	24.71	Stone Lakes National Wildlife Refuge (Elk Grove)	42.68	None	NA	NA	NA	NA	NA	NA

Alternative	Permanent Transmission Lines (69 kV)		Temporary Transmission Lines (69 kV)		Permanent Transmission Lines (230 kV)		Temporary Transmission Lines (230 kV)		Permanent 230 kV/34.5 kV underbuild Transmission Lines		Temporary 230 kV/34.5 kV underbuild Transmission Lines	
	Miles	New Sensitive Receptors	Miles	New Sensitive Receptors	Miles	New Sensitive Receptors	Miles	New Sensitive Receptors	Miles	New Sensitive Receptors	Miles	New Sensitive Receptors
4 (Dual Conveyance with Modified Pipeline/ Tunnel)	None	None	6.08	Courtland Fire Station 92 (154 Magnolia Ave, Courtland)	14.96	Clifton Court Forebay	18.72	Stone Lakes National Wildlife Refuge (Elk Grove) Cosumnes River Ecological Reserve (Galt)	1.00	Clifton Court Forebay	11.28	None
5 (Dual Conveyance with Pipeline/ Tunnel)	8.68	None	24.71	Stone Lakes National Wildlife Refuge (Elk Grove)	42.68	None	NA	NA	NA	NA	NA	NA
6A (Isolated Conveyance with Pipeline/ Tunnel)	8.94	None	24.71	Stone Lakes National Wildlife Refuge (Elk Grove)	42.68	None	NA	NA	NA	NA	NA	NA
6B (Isolated Conveyance with East Alignment)	36.79	Stone Lakes National Wildlife Refuge (Elk Grove)	13.49	None	16.35	None	NA	NA	NA	NA	NA	NA
6C (Isolated Conveyance with West Alignment)	17.61	None	13.73	Fire Station 63 (9699 Highway 220, Walnut Grove)	18.45	None	NA	NA	NA	NA	NA	NA
7 (Dual Conveyance with Pipeline/ Tunnel)	7.03	None	24.71	Stone Lakes National Wildlife Refuge (Elk Grove)	42.68	None	NA	NA	NA	NA	NA	NA
8 (Dual Conveyance with Pipeline/ Tunnel)	7.03	None	24.71	Stone Lakes National Wildlife Refuge (Elk Grove)	42.68	None	NA	NA	NA	NA	NA	NA
9 (Through Delta/Separate Corridors)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Alternative	Permanent Transmission Lines (69 kV)		Temporary Transmission Lines (69 kV)		Permanent Transmission Lines (230 kV)		Temporary Transmission Lines (230 kV)		Permanent 230 kV/34.5 kV underbuild Transmission Lines		Temporary 230 kV/34.5 kV underbuild Transmission Lines	
	Miles	New Sensitive Receptors	Miles	New Sensitive Receptors	Miles	New Sensitive Receptors	Miles	New Sensitive Receptors	Miles	New Sensitive Receptors	Miles	New Sensitive Receptors
4A (Dual Conveyance with Modified Pipeline Tunnel)	None	None	6.08	Courtland Fire Station 92 (154 Magnolia Ave, Courtland)	14.96	Clifton Court Forebay	18.72	Stone Lakes National Wildlife Refuge (Elk Grove) Cosumnes River Ecological Reserve (Galt)	1.00	Clifton Court Forebay	11.28	None
2D (Dual Conveyance with Modified Pipeline/ Tunnel)	4.97	None	3.13	Courtland Fire Station 92 (154 Magnolia Ave, Courtland)	14.96	Clifton Court Forebay	18.72	Stone Lakes National Wildlife Refuge (Elk Grove) Cosumnes River Ecological Reserve (Galt)	1.00	Clifton Court Forebay	11.28	None
5A (Dual Conveyance with Modified Pipeline/ Tunnel)	4.97	None	4.59	Courtland Fire Station 92 (154 Magnolia Ave, Courtland)	14.96	None	18.76	Stone Lakes National Wildlife Refuge (Elk Grove) Cosumnes River Ecological Reserve (Galt)	1.00	Clifton Court Forebay	11.28	None

NA = not applicable.

25.3.2 Determination of Effects

Implementation of an alternative could result in an adverse effect under NEPA and a significant impact under CEQA if it would result in any of the following.

- Substantial increase in the public's risk of exposure to vector-borne diseases. For purposes of this analysis, "substantial increase" is evaluated qualitatively, depending on the location of the alternative, in accordance with Section 15064(b) of the State CEQA Guidelines (see footnote 4, Section 25.3.1.1, *Vectors*).
- Exceedance(s) of water quality criteria for constituents of concern such that an adverse effect would occur to public health from drinking water sources. This analysis is based on the qualitative and quantitative results presented in Chapter 8, *Water Quality*, to identify whether the construction and operation of the alternatives would exceed water quality standards for pesticides that do not bioaccumulate (present use pesticides for which substantial information is available, namely diazinon, chlorpyrifos, pyrethroids, and diuron); trace metals of human health and drinking water concern (i.e., arsenic, iron, and manganese); and DBP precursors, DOC and bromide.
- Substantial mobilization or substantial increase of constituents known to bioaccumulate. For purposes of this analysis, an expected increase in bioaccumulation above existing conditions (levels and locations) in fish in the study area as a result of implementing an alternative would be considered a potential effect and is discussed qualitatively in terms of the populations affected and potential public health concerns. (See also Section 25.3.1.4, *Bioaccumulation*.)
- Exposing substantially more people to transmission lines (including electrical substations and power converter facilities) that provide new sources of EMFs. Exposure to EMFs from new transmission lines is dependent on the location of the transmission lines in relation to sensitive receptors. For purposes of this analysis, schools, hospitals, parks, and fire stations are considered to be sensitive receptors. Residences and other sensitive receptors located 300 feet or more from power lines are not considered to be at risk of high EMF exposure (National Institute of Environmental Health Sciences and National Institutes of Health 2002). (See the discussion in Section 25.3.1.5, *Electromagnetic Fields*.) Temporary transmission lines are those that would be removed once construction was completed.
- Substantial increase in recreationists' exposure to pathogens. For purposes of this analysis, a "substantial increase in recreationists' exposure" is based on the amount of tidal habitat restored, because pathogens in drinking water are effectively removed prior to distribution and have little effect on drinking water; and findings in Chapter 8, *Water Quality* (see also Section 25.3.1.2, *Pathogens and Water Quality*.)
- Increase in *Microcystis* in water bodies in the study area such that municipal and domestic supply and water contact recreation beneficial uses are negatively affected. This analysis is based on the results of the qualitative analysis presented in Chapter 8, *Water Quality.* As described in Chapter 8, assumptions regarding how certain habitat restoration activities (*CM2 Yolo Bypass Fisheries Enhancement*, and *CM4 Tidal Natural Communities Restoration* or Environmental Commitment 4: Tidal Natural Communities Restoration) would affect Delta hydrodynamics were included in the modeling scenario assumptions. To the extent that project restoration actions would alter hydrodynamics within the Delta, which would affect mixing of

source waters, these effects are included in the assessment of operations-related changes of hydraulic residence times and its effects on *Microcystis* production (Impact PH-8).

Compatibility with Plans and Policies

Constructing the proposed water conveyance facilities and implementing CM2–CM21 (under the BDCP alternatives) or the Environmental Commitments (under Alternatives 4A, 2D, and 5A), could potentially result in incompatibilities with plans and policies related to the effects of water quality constituents and vector-borne diseases on public health. Section 25.2, *Regulatory Setting*, provides an overview of federal, state, regional, and agency-specific plans and policies applicable to the public health effects of water quality and vector-borne diseases. This section summarizes ways in which the proposed project is compatible or incompatible with those plans and policies. Potential incompatibilities with local plans or policies do not necessarily translate into adverse environmental effects under NEPA or CEQA. Even where an incompatibility "on paper" exists, it does not by itself constitute an adverse physical effect on the environment, but rather may indicate the potential for a proposed activity to have a physical effect on the environment. The relationship among plans, policies, and regulations, and impacts on the physical environment is discussed in Chapter 13, *Land Use*, Section 13.2.3.

Consistent with requirements of California's Health and Safety Code (Sections 2001–2007; 2060–2067 and 2001 b[2]), the Alameda County Vector Control Services District, Contra Costa Mosquito and Vector Control District, Sacramento-Yolo Mosquito and Vector Control District, San Joaquin County Mosquito and Vector Control District, Solano County Mosquito Abatement District, and the Sutter-Yuba County Mosquito Abatement District, with jurisdictions in the study area, all have policies related to maintaining and protecting public health and quality of life by preventing the spread of mosquito-borne diseases and relieving pest nuisance. Implementing a selected action alternative could potentially create temporary, additional breeding habitat for mosquitoes during construction of the water conveyance facilities; and permanently increase mosquito breeding habitat as a result of restoration activities under the action alternatives, as described under Impact PH-1: *Increase in vector-borne diseases as a result of construction and operation of the water conveyance facilities*; and Impact PH-5: *Increase in vector-borne diseases as a result of implementing CM2–CM7, CM10, and CM11* (BDCP alternatives) or *Increase in Vector-Borne Diseases as a Result of Implementing Environmental Commitments 3, 4, 7–10* (Alternatives 4A, 2D, and 5A). The project proponents would implement an environmental commitment to conduct preconstruction consultation and coordinate with local MVCDs, and to prepare mosquito management plans (MMPs) (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). As part of that environmental commitment, project proponents would also follow guidelines provided in the Central Valley Joint Venture's Technical Guide to *Best Management Practices for Mosquito Control in Managed Wetlands* and CDPH's *Best Management Practices for Mosquito Control in California* to develop and implement BMPs to manage and control the risk of mosquito-borne disease. This environmental commitment would ensure that the proposed project is compatible with the mission and goals of the applicable MVCDs.

California Water Code Section 13240 requires preparation and adoption of WQCPs. The WQCPs are regulatory references for meeting the state and federal requirements for water quality control, and are primarily implemented through the National Pollutant Discharge Elimination System (NPDES) permitting system. Basin plans provide the technical basis for determining waste discharge requirements and authorize the Regional Water Boards to take regulatory enforcement actions if deemed necessary. Accordingly, the *Water Quality Control Plan for the Sacramento River and San*

Joaquin River Basins, Water Quality Control Plan for the San Francisco Bay Basin, and the *Central Valley Regional Water Quality Control Board Drinking Water Policy* deal with beneficial uses, water quality objectives, implementation programs, and surveillance and monitoring programs for waters in their respective jurisdictions. California Drinking Water Standards for primary and secondary maximum MCLs, found in Title 22 of the California Code of Regulations, are incorporated by reference in Central Valley and San Francisco Bay Basin Plans. DWR and/or project proponents would be required to apply for and comply with NPDES permits, and thereby would be compatible with these plans and policies.

The potential effects of implementing the action alternatives on constituents of concern and *Microcystis* and microcystin related to drinking water and recreationists' exposure to pathogens and *Microcystis* and microcystin are discussed under Impact PH-2: *Exceedances of water quality criteria for constituents of concern such that there is an adverse effect on public health as a result of operation of the water conveyance facilities* (for constituents that do not bioaccumulate); Impact PH-3: *Substantial mobilization of or increase in constituents known to bioaccumulate as a result of construction, operation or maintenance of the water conveyance facilities* (which assesses risk in terms of bioaccumulation in fish that people might eat); Impact PH-6: *Substantial increase in recreationists' exposure to pathogens as a result of implementing the restoration conservation measures* (which examines the extent of potential for recreationists to come in contact with pathogens in water while using restored tidal habitat); Impact PH-8: *Increase in Microcystis bloom formation as a result of operation of the water conveyance facilities* (which examines the potential for public health impacts due to *Microcystis* and microcystin in drinking water and recreational waters due to operation of the water conveyance facilities and hydrodynamic effects of habitat restoration under CM2 and CM4 or Environmental Commitment 4); and Impact PH-9: *Increase in Microcystis bloom formation as a result of implementing CM2 and CM4* for the BDCP alternatives or Impact PH-9: *Increase in Microcystis Bloom Formation as a Result of Implementing Environmental Commitment 4* for Alternatives 4A, 2D, and 5A; this impact analysis examines the potential for public health impacts implementation of restoration activities of CM2 and CM4 or Environmental Commitment 4. Most of the action alternatives would not create an adverse effect under NEPA or a significant impact under CEQA and therefore are compatible with the plans and policies related to water quality. However, implementing the action alternatives has the potential to be incompatible with the Basin Plan because projected increases in *Microcystis* and microcystin would affect beneficial uses of waters in the Delta and would result in an adverse effect under NEPA and a significant and unavoidable impact under CEQA. While Mitigation Measure WQ-32a, *Design Restoration Sites to Reduce Potential for Increased Microcystis Blooms* and Mitigation Measure WQ-32b, *Investigate and Implement Operational Measures to Manage Water Residence Time* would reduce the severity of the impact, the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain.

However, implementing the proposed action alternatives has the potential to be incompatible with the Basin Plan, because long-term average concentrations of DOC (Alternatives 6A–6C, and 7–9) and bromide (Alternatives 1A–9) and, by extension, DBPs are estimated to substantially increase various Delta locations in the study area as described under these alternatives in Impact PH-2: *Exceedances of water quality criteria for constituents of concern such that there is an adverse effect on public health as a result of operation of the water conveyance facilities*. Such increases could trigger the need for substantial and costly changes in drinking water treatment plant design or operations in order to achieve EPA Stage 1 Disinfectants and Disinfection Byproduct Rule action thresholds. If upgrades were not undertaken, the increase in DOC and/or bromide concentrations could create an increased risk of adverse effects on public health from increases in DBPs in drinking water. While Mitigation Measure WQ-5, *Avoid, minimize, or offset, as feasible, adverse water quality conditions; site and design restoration sites to reduce bromide increases in Barker Slough* and implementing the North Bay Aqueduct Alternative Intake Project (AIP) could reduce the effects of bromide, and Mitigation Measure WQ-17, *Consult with Delta water purveyors to identify means to avoid, minimize, or offset increases in long-term average DOC concentrations*, is available to reduce the effects of DOC, the feasibility and effectiveness of these measures are uncertain, and it is not known if implementation would reduce the severity such that it would not be an adverse effect.

The CPUC regulates electric utilities in the state and has established design guidelines for regulating EMFs. Recognizing that there is scientific uncertainty as to the health effects of EMFs on receptors in proximity to power lines, the CPUC affirmed that setting numeric exposure limits is not appropriate but established precautionary no-cost and low-cost policies that utilities would follow for proposed electrical facilities. The various electrical utilities in the Delta region that might be selected to provide power to the proposed project generally follow CPUC guidelines. The CPUC ranked land use categories for mitigation priority. In descending order these are: schools and licensed day care; residential; commercial/industrial; recreational; agricultural; and undeveloped land. The California Department of Education established minimum set-back distances for schools in relation to power lines of different voltages. These are similar to the National Institute of Health's 300- foot setback for sensitive receptors. The proposed project would be generally compatible with the policies established by CPUC and adopted by the selected utility because most new permanent and temporary power lines would be in sparsely populated areas, would be at least 300 feet from sensitive receptors, and would not expose new receptors or increase the exposure of current receptors. However, the proposed project could be considered incompatible with the guidelines because one or both of four new sensitive receptors, two fire stations and two parks, would be affected by alternatives. The proposed project would become compatible because the proponents would implement an environmental commitment that the location and design of the proposed new transmission lines would be conducted in accordance with CPUC's EMF Design Guidelines for Electrical Facilities, and would include one or more of three measures to reduce EMF exposure.

- Shielding by placing trees or other physical barriers along the transmission line right-of-way.
- Cancelation by configuring the conductors and other equipment on the transmission towers.
- Increasing the distance between the source of the EMF and the receptor either by increasing the height of the tower or increasing the width of the right-of-way.

The *Sacramento County General Plan of 2005–2030* and Alameda County East Area General Plan have policies related to safety concerns about electromagnetic fields. These policies reference power line setbacks for sensitive receptors such as schools. By implementing the environmental commitment to comply with CPUC's EMF Design Guidelines for Electrical Facilities, the proposed project would be compatible with these policies.

25.3.3 Effects and Mitigation Approaches

25.3.3.1 No Action Alternative

The No Action Alternative describes expected future conditions resulting from a continuation of existing policies and programs by federal, state, and local agencies in the absence of the BDCP, and projects that are permitted or are assumed to be constructed, by the year 2060. Under the No Action Alternative, none of the proposed action alternatives would be implemented; however, implementation of operations and maintenance of the CVP and SWP, and enforcement and protection programs by federal, state, and local agencies and nonprofit groups would be ongoing. Climate change projections are also assumed within the No Action Alternative. Table 25-10 identifies the projects assumed to be in the No Action Alternative and potential effects on public health.

Water Supply Facilities

New water supply facilities would be constructed under the No Action Alternative as listed in Table 25-10; therefore, there could be a disruption to existing sources of methylmercury associated with this type of construction. Water supply operations under the No Action Alternative likely would not involve the operation of solids lagoons or sedimentation basins; therefore, there would be no increase in the public's risk of exposure to vector-borne diseases. Under the No Action Alternative, there would be a change in various source waters throughout the Delta (i.e., upstream water, Bay water, and agricultural return flow), due to potential changes in inflows, particularly from the Sacramento River watershed because of increased water demands or changes to climate and precipitation levels. Water supply operations under the No Action Alternative would continue to use the existing source(s) of drinking water from the study area. These sources generally meet regulatory standards for most constituents or experience some exceedances for constituents such as arsenic (see Chapter 8, *Water Quality*, Section 8.3.3.1). However, under the No Action Alternative, existing exceedances would not increase above baseline conditions (see Chapter 8) to levels that adversely affect any beneficial uses or substantially degrade water quality. Furthermore, drinking water from the study area would continue to be treated prior to distribution into the drinking water system.

Any modified reservoir operations under the No Action Alternative are not expected to promote *Microcystis* production upstream of the Delta since large reservoirs upstream of the Delta are typically low in nutrient concentrations and phytoplankton outcompete cyanobacteria, including *Microcystis*. As indicated in Chapter 8, *Water Quality,* modeled hydraulic residence times in the Delta during *Microcystis* bloom season (June through September) would increase somewhat in most Delta areas, with hydraulic residence times in the East Delta having the greatest increase. The changes in hydraulic residence times are driven by several factors accounted for in the modeling, including climate change, sea level rise, and changes in operations and maintenance that affect net Delta outflows. Because the change is relatively small, it is unknown whether the increase in modeled hydraulic residence times expected under the No Action Alternative relative to Existing Conditions would result in measurable increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms throughout the Delta. Projected future water temperature changes in the Delta under the No Action Alternative indicate that water temperatures would increase due to climate change. This increase in temperature could lead to earlier attainment of the water temperature threshold of 19°C required to initiate *Microcystis* bloom formation, and thus earlier occurrences of

Microcystis blooms in the Delta. As explained in Chapter 8, *Water Quality*, ambient meteorological conditions are anticipated to be the primary driver of the projected increase of water temperatures in the Delta, and not water conveyance operations. However, because it is possible that increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms in the Delta would occur due to increased water temperatures from climate change under the No Action Alternative, long-term water quality degradation may occur in the Delta and water exported from the Delta to the SWP/CVP Export Service Areas. Therefore, impacts on beneficial uses, including drinking water and recreational waters, could occur and, as such, public health could be affected. Accordingly, this would be considered an adverse effect.

New Transmission Lines

The No Action Alternative may involve the operation of new transmission lines should additional sources of electricity be needed by either the water supply projects or as part of a general plan buildout. It is likely that with population growth projected by various general plans and regional plans would also result in an additional need for electricity and the construction and operation of new transmission lines. Furthermore, as more renewable energy sources such as solar power are developed, new transmission lines will likely be needed to convey power from the renewable energy source to users. Although, it is unknown where new transmission lines would be and if they would be located within close proximity to sensitive receptors (e.g., hospitals, schools, parks), it is likely some of them would be within close proximity to sensitive receptors and present new sources of EMFs. However, the utilities must implement the CPUC design criteria and guidelines regarding EMFs, and CPUC reviews all proposals for transmission lines. Investor-owned utilities are required to obtain a permit from CPUC for construction of certain specified infrastructure (including transmission lines) listed under Public Utilities Code Section 1001 (California Public Utilities Commission 2011). CPUC reviews permit applications under two concurrent processes: (1) an environmental review pursuant to CEQA, and (2) the review of project need and costs pursuant to Public Utilities Code Sections 1001 et seq. and General Order 131-D (CPCN or PTC) (California Public Utilities Commission 2011). Therefore, the No Action Alternative is not likely to result in adverse effects on public health with respect to EMFs.

Habitat Restoration

Habitat restoration activities in the study area already approved, such as those associated with the Suisun Marsh Habitat Management, Preservation, and Restoration Plan, would be implemented under the No Action Alternative. These habitat restoration activities would generally be located in areas that are already potential sources of vectors, such as existing channels or agricultural areas. Furthermore, activities would be designed to maximize water exchange and flow, thereby minimize stagnant water and the production of mosquitoes. Finally, all of the restoration activities would occur in consultation with existing MVCDs. Therefore, it is not expected that habitat restoration under the No Action Alternative would result in a substantial increase in the public’s risk of exposure to vector-borne diseases.

1 **Table 25-10. Effects on Public Health from the Plans, Policies, and Programs for the No Action Alternative**

Agency	Program/Project	Status	Description of Program/Project	Potential Effects on Public Health
California Department of Fish and Wildlife, US Fish and Wildlife Service, Bureau of Reclamation, California Department of Water Resources, Suisun Resource Conservation District	Suisun Marsh Habitat Management, Preservation, and Restoration Plan	EIR/EIS completed December 2011	Permanently restore 7,000 acres of tidal habitat over 30 years and maintain and operate managed wetlands.	No adverse effect on public health from vector-borne diseases or mobilization of constituents known to bioaccumulate during construction and operation.
California Department of Water Resources	Mayberry Farms Subsidence Reversal and Carbon Sequestration Project	Completed October 2010	Permanently flood 308-acre parcel of DWR-owned land (Hunting Club leased) and restore 274 acres of palustrine emergent wetlands within Sherman Island to create permanent wetlands and to monitor waterfowl, water quality, and greenhouse gases.	No adverse effect on public health from vector-borne diseases and mobilization of constituents known to bioaccumulate during construction and operation.
Contra Costa Water District	Contra Costa Canal Fish Screen Project (Rock Slough)	Completed in 2011.	Installation of a fish screen at Rock Slough Intake.	No effect on public health.
Contra Costa Water District, U.S. Bureau of Reclamation, and California Department of Water Resources	Middle River Intake and Pump Station (previously known as the Alternative Intake Project)	Completed in 2011.	Construction of a potable water intake and pump station to improve drinking water quality for Contra Costa Water District customers.	No effect on public health.
Freeport Regional Water Authority and U.S. Bureau of Reclamation	Freeport Regional Water Project	Project was completed late 2010.	Construction of an intake/pumping plant near Freeport on the Sacramento River and a conveyance structure to transport water through Sacramento County to the Folsom South Canal.	No adverse effect on public health from vector-borne diseases and mobilization of constituents known to bioaccumulate during construction and operation.
California Department of Water Resources and Solano County Water Agency	North Bay Aqueduct Alternative Intake Project	In development	Construction of an alternative intake on the Sacramento River and a new segment of pipeline to connect it to the North Bay Aqueduct system.	No adverse effect on public health is expected from vector-borne diseases and mobilization of constituents known to bioaccumulate during construction and operation.
Reclamation District 2093	Liberty Island Conservation Bank	Completed in 2011.	Restoration of inaccessible, flood prone land, zoned as agriculture but not actively farmed, to area enhancement of wildlife resources.	No effect on public health.

Agency	Program/Project	Status	Description of Program/Project	Potential Effects on Public Health
City of Stockton	Delta Water Supply Project	Completed in 2012.	Construction of a new intake structure and pumping station adjacent to the San Joaquin River; a water treatment plant along Lower Sacramento Road; and water pipelines along Eight Mile, Davis, and Lower Sacramento Roads.	No adverse effect on public health is expected from vector-borne diseases and mobilization of constituents known to bioaccumulate during construction and operation.
U.S. Bureau of Reclamation, California Department of Fish and Wildlife, and Natomas Central Mutual Water Company	American Basin Fish Screen and Habitat Improvement Project	Anticipated completion in 2012.	This project involves consolidation of diversion facilities; removal of decommissioned facilities; aquatic and riparian habitat restoration; and installing fish screens in the Sacramento River. Total project footprint encompasses about 124 acres east of the Yolo Bypass. Permanent conversion of 70 acres of farmland (including 60 acres of rice) during Phases I and II.	No adverse effect on public health is expected from vector-borne diseases and mobilization of constituents known to bioaccumulate during or after conversion.
U.S. Bureau of Reclamation	Delta-Mendota Canal/California Aqueduct Intertie	Completed in 2012.	Construct an intertie to better coordinate water delivery operations between the California Aqueduct (state) and the Delta-Mendota Canal (federal) and to provide better pumping capacity for the Jones Pumping Plant. New project facilities include a pipeline and pumping plant.	No adverse effect on public health is expected from vector-borne diseases and mobilization of constituents known to bioaccumulate during construction and operation.
Yolo County	General Plan Update	Adopted November 10, 2009.	Anticipated implementation of policies and programs such as the Farmland Conversion Mitigation Program would minimize conversion of agricultural land to nonagricultural uses through mitigation.	No adverse effect on public health is expected from vector-borne diseases and mobilization of constituents known to bioaccumulate during construction and operation.
Central Valley Regional Water Quality Control Board	Sacramento – San Joaquin Delta Estuary TMDL for Methylmercury	Basin Plan amendment adopted 2010.	Establish a TMDL for methylmercury in the Sacramento-San Joaquin Delta Estuary (the Delta).	No adverse effect on public health is expected from vector-borne diseases and mobilization of constituents known to bioaccumulate during construction and operation.
Semitropic Water Storage District	Delta Wetlands	EIR/EIS completed 2011	Water storage and wildlife enhancement on four Delta islands.	No adverse effect on public health is expected from vector-borne diseases and mobilization of constituents known to bioaccumulate during construction and operation.
National Marine Fisheries Service and U.S. Fish and Wildlife Service	2008 and 2009 Biological Opinions	Ongoing.	The Biological Opinions issued by NMFS and USFWS establish RPAs to be implemented requiring habitat restoration	No adverse effect on public health is expected from vector-borne diseases and mobilization of constituents known to bioaccumulate during construction and operation.

Under the No Action Alternative, as described in Appendix 3D, *Defining Existing Conditions, No Action Alternative, No Project Alternative, and Cumulative Impact Conditions*, there would be some change in inflows from the Sacramento River due to climate change-related changes in precipitation patterns; therefore, the amount of Delta waters consisting of agricultural return flow would increase slightly. Approximately 5% of the in-Delta agricultural use is livestock, the primary type of agricultural use that generates pathogens. The relatively small increase in the percentage of Delta waters consisting of agricultural return flow is not expected to cause a measureable change in the pathogen concentrations in the Delta waters because livestock is a small percentage of the overall agricultural use and none of the assumed No Action Alternative conditions would substantially change the amount of livestock in the study area. Therefore, under the No Action Alternative, the concentrations of pathogens would remain relatively similar to existing concentrations and recreationists would not experience a substantial increase in exposure.

Construction of habitat restoration projects that are reasonably foreseeable or approved and/or under construction under the No Action Alternative would likely temporarily mobilize existing constituents within sediments known to bioaccumulate, such as methylmercury or pesticides. This potential effect is expected in varying degrees depending on the location of restoration projects because the study area is generally known to be out of compliance with methylmercury levels. Construction effects would not be adverse because the mobilization would occur during a limited time and would be localized around the area of construction. Once operational, other habitat restoration projects could result in an increase of methylmercury as a result of biogeochemical processes and sediment conditions established in tidal wetlands. However, it is expected these projects either have, or would evaluate the potential for, methylmercury production and would implement measures to monitor and adaptively manage methylmercury production. For example, the Suisun Marsh Plan EIS/EIR evaluated the potential for methylmercury production due to tidal restoration and determined it would result in less than significant impacts and that monitoring and other measures would be incorporated into the adaptive management plan to manage methylmercury concerns. Therefore, the habitat restoration projects that would occur under the No Action Alternative are not likely to adversely affect public health.

Catastrophic Seismic Risks

The Delta and vicinity are within a highly active seismic area, with a generally high potential for major future earthquake events along nearby and/or regional faults, and with the probability for such events increasing over time. Based on the location, extent and non-engineered nature of many existing levee structures in the Delta area, the potential for significant damage to, or failure of, these structures during a major local seismic event is generally moderate to high. In the instance of a large seismic event, levees constructed on liquefiable foundations are expected to experience large deformations (in excess of 10 feet) under a moderate to large earthquake in the region. A major earthquake event could result in breaching/failure of existing levees within the Delta area, with a substantial number of these structures exhibiting moderate to high failure probabilities. The most immediate and significant effect to water quality under such a scenario would be the influx of large volumes of seawater and/or brackish water into the Delta, which would alter the "normal" balance of freshwater/seawater flows and result in flooding of the associated islands. The corresponding shift in Delta water quality conditions would be characterized by an increase in salinity levels, including specific associated constituents such as bromide (which affects total dissolved solids concentrations and can contribute to the formation of undesirable chemical byproducts in treated drinking water). (See Appendix 3E, *Potential Seismic and Climate Change Risks to SWP/CVP Water*

Supplies, for more detailed discussion). Flooding caused by levee failure could result in a substantial increase in the public's risk of exposure to vector-borne diseases due to large bodies of standing water prior to flood waters being pumped off inundated Delta islands. Additionally, flood events could cause exceedance(s) of water quality criteria for constituents of concern such that an adverse effect would occur to public health from drinking water sources.

***CEQA Conclusion*:** It is expected that implementation of existing plans, or existing and reasonably foreseeable habitat restoration projects, would not result in a substantial increase in the public's risk of exposure to vector-borne diseases because of the location of existing vector habitat, restoration design, and consultation with MVCDs. This is because habitat restoration would be located in areas that are already potential sources of vectors, such as existing channels or agricultural areas. Furthermore, activities would be designed to maximize water exchange and flow, thereby minimizing stagnant water and the production of mosquitoes. Finally, all of the restoration activities would occur in consultation with existing MVCDs. Therefore, it is not expected that habitat restoration under the No Action Alternative would result in a substantial increase in the public's risk of exposure to vector-borne diseases.

Construction impacts associated with No Action Alternative habitat restoration projects would not be adverse because the mobilization of existing sediment-bound contaminants (e.g., methylmercury) would occur during a limited time and would be localized around the area of construction. Once operational, other habitat restoration projects could result in an increase of methylmercury as a result of biogeochemical processes and sediment conditions established in tidal wetlands. However, it is expected these projects either have, or would evaluate the potential for, methylmercury production and would implement measures to monitor and adaptively manage methylmercury production.

Water supply operations under the No Action Alternative would continue to use the existing source(s) of drinking water from the study area. These sources generally meet regulatory standards for most constituents or experience some exceedances for constituents such as arsenic (see Chapter 8, *Water Quality*, Section 8.3.1.16). Under the No Action Alternative, existing exceedances would not increase above baseline conditions (see Chapter 8, Section 8.3.3.1).

It is unknown where new transmission lines would be and if they would be located in close proximity to sensitive receptors (e.g., hospitals, schools, parks); however, it is likely some of them would be within close proximity to sensitive receptors and present new sources of EMFs. Utilities must implement the CPUC design criteria and guidelines regarding EMFs, and CPUC reviews all proposals for transmission lines.

Because it is possible that increases in the frequency, magnitude, and geographic extent of Microcystis blooms in the Delta would occur due to increased water temperatures associated with climate change under the No Action Alternative, long-term water quality degradation may occur in the Delta and in water exported from the Delta to the SWP/CVP Export Service Areas. Thus, impacts on beneficial uses, including drinking water and recreational waters, could occur and could affect public health. As such, this would be considered significant impact.

25.3.3.2 Alternative 1A—Dual Conveyance with Pipeline/Tunnel and Intakes 1–5 (15,000 cfs; Operational Scenario A)

Alternative 1A includes changes to the SWP and CVP water conveyance infrastructure and operations as a result of five new north Delta intakes to be constructed and operated under CM1 and Operational Scenario A.

Construction and operation of the water conveyance facilities could create suitable mosquito habitat because of the need for solids lagoons and sedimentation basins. Additionally, construction and operation of the water conveyance facilities could result in exceedances of constituents of concern, such as disinfection byproducts, trace metals, and pesticides, in Delta waters as a result of potentially decreasing flow from the Sacramento River and increased relative contribution of the San Joaquin River. Construction and operation of the water conveyance facilities could result in mobilization or increase in constituents known to bioaccumulate during sediment disturbing in-water construction activities such as pile driving, and because of potential decreased flows from the Sacramento River. The water conveyance facilities would also require new temporary and permanent transmission lines, consisting of 69 kV or 230 kV, which could potentially expose more people to EMFs (the transmission lines are depicted in detail in Mapbook Figures M3-1, M3-2, M3-3, M3-4, and M3-5 in Chapter 3, *Description of Alternatives*). Finally, the remaining conservation measures could potentially increase suitable mosquito habitat and result in a potential increase of methylmercury or pathogens in the study area as a result of up to 65,000 acres of tidal habitat restoration and other habitat restoration and enhancement. These potential public health effects are discussed below.

Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of the Water Conveyance Facilities

NEPA Effects: Five intakes, up to 15 solids lagoons, five sedimentation basins, two forebays and a forebay inundation area would be constructed and operated under Alternative 1A. The sedimentation basins would be approximately 120 feet long by 40 feet wide by 55 feet deep, and the solids lagoons would be approximately 165 feet long by 86 feet wide by 10 feet deep. Construction of intake cofferdams would take place from June through October, and it is expected that dewatering of the cofferdams (i.e., removing water from behind the cofferdams) would occur after the construction of the cofferdams, when generally there are fewer mosquitoes breeding, as mosquitoes in northern California typically breed April–October (Sacramento–Yolo Mosquito and Vector Control District 2008). DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMPs to be implemented as part of the MMPs would help control mosquitoes and would be consistent with practices presented in CDPH's *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). BMP activities will include, but not necessarily be limited to, the following.

- Maintain stable water levels.
- Circulate water to avoid stagnation.
- Implement monitoring and sampling programs to detect early signs of mosquito population problems.
- Use biological agents such as mosquito fish to limit larval mosquito populations.

- Use larvicides and adulticides, as necessary.
- Test for mosquito larvae during the high mosquito season (June through September).
- Reduce or eliminate emergent vegetation in and along the edges of water.
- Manage the spread and density of floating and submerged vegetation that encourages mosquito production.
- Introduce physical controls to areas of standing water (e.g., discharging water more frequently or increasing circulation) if mosquitoes are present.

Implementation of these BMPs would reduce the likelihood that BDCP operations would require an increase in abatement activities by the local MVCDs.

The sedimentation basins and solids lagoons of Intakes 1 and 2 would be located within 1 mile of Clarksburg, and the sedimentation basins and solids lagoons of Intakes 3 and 4 would be located within 1 mile of Hood. The sedimentation basin and solids lagoons of Intake 5 would be located within 2.5 miles of Hood. The sedimentation basins would have a mat slab foundation and interior concrete walls to create separate sedimentation channels. The solids lagoons would be concrete-lined and approximately 10 feet deep. Up to three solids lagoons would be used in a rotating cycle for each intake, with one basin filling, one settling, and the third being emptied of settled and dewatered solids. The rate of filling and settling would depend on the volume of water pumped by the intakes; however, water would continuously move through the basins at a relatively slow but regulated rate so that the solids and sediments can be removed from the water prior to discharge into the conveyance facilities (i.e., fall out of the water via gravity) (Figure 25-1). The flow rates would be high enough to prevent water from stagnating, as stagnant water would not facilitate conveying the water to the conveyance system or removing the sediment from the water. As discussed in Section 25.1.1.4, mosquitoes typically prefer shallow stagnant water with little movement. The sedimentation basins and solids lagoons would be considered too deep and have too much regulated water movement to provide suitable mosquito habitat. Furthermore, during sediment drying and basin cleaning operations, flow would be stopped completely and the moisture in the sediment would be reduced to a point at which the sediment would not support insect/mosquito larvae production. Therefore, these basins would not substantially increase suitable vector habitat and would not substantially increase the public's exposure to vector-borne diseases. Accordingly, adverse effects on public health with respect to vector-borne diseases are not expected.

There would be an approximately 350-acre inundation area adjacent to the proposed intermediate forebay to accommodate emergency overflow from the forebay. Water would enter this area only during forebay emergency overflow situations; however, these situations could result in standing water approximately 2 feet deep. While water of this depth would be suitable habitat for mosquitoes, such events would be more likely to occur during high flow events in winter, when fewer mosquitoes are breeding (Sacramento–Yolo Mosquito and Vector Control District 2008). Water in the emergency overflow area would be pumped out and back to the intermediate forebay. The pumping would create circulation that would minimize the amount of suitable habitat for mosquitoes. Because the area would be used only during emergencies and the water would be pumped from the area, the potential for creating suitable mosquito habitat would be low and adverse effects on public health with respect to vector-borne diseases are not expected.

Although the proposed intermediate forebay and Byron Tract Forebay would increase surface water within the study area, it is unlikely that these water bodies would provide suitable breeding habitat for mosquitoes given that the water in these forebays would not be stagnant and would be too deep. However, the shallow edges of the forebays could provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. However, as part of the regular maintenance of these forebay areas, floating vegetation such pond weed would be harvested to maintain flow and forebay capacity. Further, BMPs to control mosquitoes would be implemented as part of this alternative. As such, operation of these forebays is not expected to result in an increase in mosquitoes or vector-borne diseases in the Plan Area.

In summary, although construction and operation of the water conveyance facilities would increase surface water area in the Plan Area and therefore potentially provide habitat for vectors that transmit diseases (e.g., mosquitoes), consultation and coordination with San Joaquin County and Sacramento-Yolo County MVCDs and preparation and implementation of MMPs would ensure that there would be no adverse effects on public health with respect to mosquito-borne diseases.

***CEQA Conclusion*:** Sedimentation basins, solids lagoons, the Byron Tract Forebay, an intermediate forebay, and the intermediate forebay inundation area have the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes) because of the large volumes of water that would be held within these areas. During operations, the depth, design, and operation of the sedimentation basins and solids lagoons would prevent the development of suitable mosquito habitat. Specifically, the basins would be too deep and the constant movement of water would prevent mosquitoes from breeding and multiplying. Furthermore, the 350-acre inundation area adjacent to the intermediate forebay would be limited to forebay emergency overflow situations and water would be physically pumped back to the intermediate forebay, creating circulation such that the area would have a low potential for creating suitable vector habitat. Similarly, water in the intermediate forebay and Byron Tract Forebay would be circulated regularly and, with the exception of shallower areas around the periphery, would be too deep to provided suitable mosquito breeding habitat. However, the shallow edges of the forebays could provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. As part of the regular maintenance of these forebays, floating vegetation such pond weed would be harvested to maintain flow and forebay capacity.

To minimize the potential for any impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes, thereby reducing the need for local MVCDs to increase abatement activities in response to BDCP operations. These BMPs would be consistent with practices presented in CDPH's *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). Therefore, construction and operation of Alternative 1A would not result in a substantial increase in vector-borne diseases and the impact on public health would be less than significant. No mitigation is required.

Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That There is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance Facilities

***NEPA Effects*:** Changes in water quality could result from decreased flows in the Sacramento River by two mechanisms: increased contributions from the San Joaquin River relative to the Sacramento River, and the decreased dilution capacity of the Sacramento River for contaminants.

Disinfection Byproducts

Changes to DOC and bromide concentrations and, by extension, DBPs, under Alternative 1A suggest that, for the most part, there would not be exceedances of DBP criteria due to operations, because long-term average DOC and bromide concentrations would be only slightly higher under this alternative relative to the No Action Alternative (Chapter 8, *Water Quality*, Section 8.3.3.2). However, under Alternative 1A, long-term average bromide concentrations are expected to increase at the North Bay Aqueduct at Barker Slough, Staten Island, and Emmaton on the Sacramento River relative to the No Action Alternative. This increase would be greatest at Barker Slough (43%). Increases at Barker Slough would be more substantial during the drought period (93%).

The Stage 1 Disinfectants and Disinfection Byproduct Rule, adopted by EPA in 1998 as part of the SDWA, requires drinking water utilities to reduce total organic carbon (TOC) concentrations by specified percentages prior to disinfection. These requirements were adopted because organic carbon, such as DOC, can react with disinfectants during the water treatment disinfection process to form DBPs such as THMs and HAAs, which can pose potential lifetime carcinogenic risks to humans. Water treatment plants that utilize Delta water are designed and operated to meet EPA's 1998 requirements based on the ambient concentrations and seasonal variability that currently exist in the Delta. Ambient DOC and bromide concentrations would need to change substantially to trigger significant changes in plant design or operations. With the exception of Barker Slough, the increases in long-term average DOC and bromide concentrations estimated to occur at most modeled Delta locations under Alternative 1A are of sufficiently small magnitude that they would not require existing drinking water treatment plants to substantially upgrade treatment. However, the long-term average increase predicted for the North Bay Aqueduct at Barker Slough could necessitate upgrades or changes in operations at certain water treatment plants. While treatment technologies sufficient to achieve the necessary bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken, a change of such magnitude in long-term average bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBP in drinking water sources. Mitigation Measure WQ-5 is available to reduce these effects. Implementation of this measure along with a separate other commitment as set forth in Appendix 3B, *Environmental Commitments, AMMs, and CMs*, relating to the potential increased treatment costs associated with bromide-related changes would reduce these effects. Further, DWR issued a Notice of Preparation on December 2, 2009 to construct and operate the AIP that would establish an alternative surface water intake on the Sacramento River upstream of the Sacramento Regional Wastewater Treatment Plant discharge. The AIP would connect to the existing North Bay Aqueduct system by a new segment of pipe. The proposed alternative intake would be operated in conjunction with the existing North Bay Aqueduct intake at Barker Slough. The proposed project would be designed to improve water quality and to provide reliable deliveries of State Water Project supplies to its contractors, the Solano County Water Agency and the Napa County Flood Control and Water Conservation District. The timing of DWR's implementation of the AIP is uncertain at this time. The adverse water quality effects on the North Bay Aqueduct at Barker Slough may be avoided or minimized by implementation of the AIP.

Trace Metals

Water quality modeling results indicate that water conveyance facilities operations would not substantially change concentrations of metals of primarily human health and drinking water concern (arsenic, iron, manganese) in Delta waters relative to the No Action Alternative. The arsenic criterion was established to protect human health from the effects of long-term chronic exposure, while secondary MCLs for iron and manganese were established as reasonable federal regulatory goals for drinking water quality, and are enforceable standards in California. Average concentrations for arsenic, iron, and manganese in the primary source water (Sacramento River, San Joaquin River, and the bay at Martinez) are below these criteria. No mixing of these three source waters could result in a metal concentration greater than the highest source water concentration, and, given that the modeled average water concentrations for arsenic, iron, and manganese do not exceed water quality criteria, more frequent exceedances of drinking water criteria in the Delta would not be an expected result under this alternative. Accordingly, no adverse effect on public health related to the trace metals arsenic, iron, or manganese from drinking water sources is anticipated.

Pesticides

Sources of pesticides to the study area include direct input of surface runoff from in-Delta agriculture and Delta urbanized areas as well as inputs from rivers upstream of the Delta. These sources would not be affected by implementing Alternative 1A. However, under Alternative 1A operations, the distribution and mixing of Delta source waters would change. Relative to the No Action Alternative, these modeled changes in the source water fractions of Sacramento, San Joaquin and Delta agriculture water would not be of sufficient magnitude to substantially increase pesticide concentrations in Delta waters and would not adversely affect beneficial uses of the Delta (see Chapter 8, *Water Quality*, Section 8.3.3.2). Therefore, adverse effects on public health from drinking water sources are not expected with respect to pesticides.

***CEQA Conclusion*:** Under Alternative 1A, water supply operations would increase relative contributions from the San Joaquin River relative to the Sacramento River, and decrease the dilution capacity of the Sacramento River for contaminants. This could result in changes in water quality. Water quality modeling results indicate that changes in flows under Alternative 1A operations would not, for the most part, result in increased exceedances of water quality criteria for constituents of concern (DBPs, trace metals and pesticides) in the study area (Chapter 8, *Water Quality*, Section 8.3.3.2). However, relative to Existing Conditions bromide concentrations would increase at the North Bay Aqueduct at Barker Slough, Staten Island, and Emmaton on the Sacramento River under Alternative 1A, with the greatest increase occurring at Barker Slough. The increase in long-term average bromide concentrations predicted for Barker Slough (38%) would result in a substantial change in source water quality to existing drinking water treatment plants drawing water from the North Bay Aqueduct. During drought periods, this increase would be more substantial (94%). These modeled increases in bromide at Barker Slough could lead to adverse changes in the formation of DBPs at drinking water treatment plants such that considerable water treatment plant upgrades would be necessary to achieve equivalent levels of drinking water health protection. This would be a significant impact.

While treatment technologies sufficient to achieve the necessary bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken, a change of such magnitude in long-term average bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBP in drinking water sources. Assuming the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be avoided or minimized by implementation of the AIP, the potential adverse water quality effects on the municipal beneficial uses potentially provided in Barker Slough would remain significant. While Mitigation Measure WQ-5 may reduce this impact, the feasibility and effectiveness of this mitigation measure are uncertain based on currently available information.

In addition to and to supplement Mitigation Measure WQ-5, the BDCP proponents have incorporated into the BDCP, as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, a separate other commitment to address the potential increased water treatment costs that could result from bromide-related concentration effects on municipal water purveyor operations. Potential options for making use of this financial commitment include funding or providing other assistance towards implementation of the North Bay Aqueduct AIP, acquiring alternative water supplies, or other actions to indirectly reduce the effects of elevated bromide and DOC in existing water supply diversion facilities. Please refer to Appendix 3B for the full list of potential actions that could be taken pursuant to this commitment in order to reduce the water quality treatment costs associated with water quality effects relating to chloride, electrical conductivity, and bromide. Because the BDCP proponents cannot ensure that the results of coordinated actions with water treatment entities will be fully funded or implemented successfully prior to the project's contribution to the impact, the ability to fully mitigate this impact is uncertain. If a solution that is identified by the BDCP proponents and an affected water purveyor is not fully funded, constructed, or implemented before the project's contribution to the impact is made, a significant impact in the form of increased DBP in drinking water sources could occur. Accordingly, this impact would be significant and unavoidable. If, however, all financial contributions, technical contributions, or partnerships required to avoid significant impacts prove to be feasible and any necessary agreements are completed before the project's contribution to the effect is made, impacts would be less than significant.

Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality Conditions; Site and Design Restoration Sites to Reduce Bromide Increases in Barker Slough

It remains to be determined whether, or to what degree, the available and existing salinity response and countermeasure actions of SWP and CVP facilities or municipal water purveyors would be capable of offsetting the actual level of changes in bromide that may occur from implementation of Alternative 1A. Therefore, to determine the feasibility of reducing the effects of increased bromide levels, and potential adverse effects on beneficial uses associated with CM1 operations (and hydrodynamic effects of tidal restoration under CM4), the proposed mitigation requires a series of phased actions to identify and evaluate existing and possible feasible actions, followed by development and implementation of the actions, if determined to be necessary. The development and implementation of any mitigation actions shall be focused on those incremental effects attributable to implementation of Alternative 1A operations only. Development of mitigation actions for the incremental bromide effects attributable to climate change/sea level rise are not required because these changed conditions would occur with or without implementation of Alternative 1A. The goal of specific actions would be to reduce/avoid additional degradation of Barker Slough water quality conditions with respect to the CALFED bromide goal.

BDCP proponents shall consider effects of site-specific restoration areas proposed under CM4 on bromide concentrations in Barker Slough. Design and siting of restoration areas shall attempt to reduce potential effects to the extent possible without compromising proposed benefits of the restoration areas. It is anticipated that these efforts will be able to reduce the level of projected increase, though it is unknown whether it would be able to completely eliminate any increases.

Additionally, following commencement of initial operations of CM1, the BDCP proponents will conduct additional evaluations described herein, and develop additional modeling (as necessary), to define the extent to which modified operations could reduce or eliminate the increased bromide concentrations currently modeled to occur under Alternative 1A. The additional evaluations should also consider specifically the changes in Delta hydrodynamic conditions associated with tidal habitat restoration under CM4 (in particular the potential for increased bromide concentrations that could result from increased tidal exchange) once the specific restoration locations are identified and designed. The evaluations will also consider up-to-date estimates of climate change and sea level rise, if and when such information is available. If sufficient operational flexibility to offset bromide increases is not practicable/feasible under Alternative 1A operations, and/or siting and design of restoration areas cannot feasibly reduce bromide increases to a less than significant level without compromising the benefits of the proposed areas, achieving bromide reduction pursuant to this mitigation measure would not be feasible under this alternative.

Impact PH-3: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Construction, Operation or Maintenance of the Water Conveyance Facilities

***NEPA Effects*:** Under Alternative 1A, sediment-disturbing activities during construction and maintenance could result in the disturbance of existing constituents in sediment, such as pesticides (including legacy pesticides) or methylmercury. In-channel construction activities, such as pile driving during the construction of cofferdams at the intakes and pier construction at the barge unloading facilities, which would occur during a 5-month time window, would result in the localized disturbance of river sediment. In addition, maintenance of the five proposed north Delta intakes and the Byron Tract and intermediate forebays would entail periodic dredging for sediment removal at these locations. During operation of water conveyance facilities, changes in dilution and mixing of sources of water could result in a change in constituents known to bioaccumulate. For example, the reduction of flows in the Sacramento River downstream of the proposed north Delta intakes may result in a decreased dilution of constituents known to bioaccumulate in the study area.

Pesticides

Legacy pesticides, such as organochlorines, have low water solubility; they do not readily volatilize and have a tendency to bond to particulates, settle out into the sediment, and not be transported far from the source. If present in sediment within in-water construction areas, legacy pesticides would be disturbed locally and would not be expected to partition into the water column to any substantial degree. Therefore, no significant adverse effect on public health would result from construction.

Further, residues of legacy organochlorine pesticides enter rivers primarily through surface runoff and erosion of terrestrial soils during storm events, and through resuspension of riverine bottom sediments. The combination of these processes may contribute to increases above water quality objectives (Central Valley Regional Water Quality Control Board 2010a). Water supply operations of the CVP and SWP do not affect terrestrial sources of these pesticides, but may result in geomorphic changes that ultimately could result in changes to sediment suspension and deposition. However, as discussed in greater detail in Chapter 8, *Water Quality* (Section 8.3.3), water supply operations under any BDCP action alternative would not be expected to change total suspended solids or turbidity levels (highs, lows, typical conditions) to any substantial degree. Changes in the magnitude, frequency, and geographic distribution of legacy pesticides in water bodies of the affected environment that would result in new or more severe adverse effects on other beneficial uses, relative to the No Action Alternative, would not be expected to occur.

Numerous pesticides are currently used throughout the affected environment. While some of these pesticides may be bioaccumulative, those present-use pesticides for which there is sufficient evidence of their presence in waters affected by SWP and CVP operations (i.e., organophosphate pesticides, such as diazinon, chlorpyrifos, diuron, and pyrethroids) are not considered bioaccumulative. Thus, changes in their concentrations would not directly cause bioaccumulative problems in aquatic life or humans. Furthermore, Alternative 1A would not result in increased tributary flows that would mobilize organochlorine pesticides in sediments. Thus, the change in source water in the Delta associated with the change in water supply operations is not expected to adversely affect public health with respect to bioaccumulation of pesticides.

Methylmercury

If mercury is sequestered in sediments at water facility construction sites, it could become suspended in the water column during construction activities, opening up a new pathway into the food chain. Disturbance of sediment associated with construction activities (e.g., pile driving and cofferdam installation) at intake sites or barge landing locations would result in a localized, short-term increase in turbidity during the construction activity, which may suspend sediment that contains methylmercury. Please see Chapter 8, Section 8.1.3.9, *Mercury*, for a discussion of existing methylmercury concentrations in sediments.

As environmental commitments, DWR would develop and implement Erosion and Sediment Control Plans and SWPPPs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMPs implemented under the Erosion and Sediment Control Plans and the SWPPPs would help reduce turbidity and keep sediment that may contain legacy organochlorine pesticides and methylmercury within the area of disturbance. These BMPs would include, but not necessarily be limited to the following.

- Install physical erosion control stabilization features (hydroseeding, mulch, silt fencing, fiber rolls, sand bags, and erosion control blankets) to capture sediment and control both wind and water erosion.
- Retain trees and natural vegetation to the extent feasible to stabilize hillsides, retain moisture, and reduce erosion.
- Limit construction, clearing of vegetation, and disturbance of soils to areas of proven stability.
- Use sediment ponds, silt traps, wattles, straw bale barriers or similar measures to retain sediment transported by runoff water onsite.
- Collect and direct surface runoff at non-erosive velocities to the common drainage courses.
- Deposit or store excavated materials away from drainage courses.

- Prevent transport of sediment at the construction site perimeter, toe of erodible slopes, soil stockpiles, and into storm drains.
- Reduce runoff velocity on exposed slopes.
- Reduce offsite sediment tracking.

These measures would help ensure that construction activities would not substantially increase or substantially mobilize methylmercury. Accordingly, there would be no adverse effect.

Modeling showed small, insignificant changes in total mercury and methylmercury levels in water and fish tissues resulting from Alternative 1A water operations. Upstream mercury contributions and methylmercury production in Delta waters would not be altered by the operation of Alternative 1A, as it would not change existing mercury sources and would not substantially alter methylmercury concentrations in the Sacramento River or San Joaquin River; therefore, the potential for Alternative 1A to create a public health effect is minimal, and effects would not be adverse. Modeling results indicate that percentage change in assimilative capacity of waterborne total mercury relative to the 25 ng/L Ecological Risk Benchmark for this alternative showed the greatest decrease (1.1%) at Franks Tract relative to the No Action Alternative. Fish tissue estimates showed small or no increase in exceedance quotients based on long-term annual average concentrations for mercury at the nine Delta locations modeled (See Chapter 8, *Water Quality*, Section 8.3.3.2, *Alternative 1A–Dual Conveyance with Pipeline/Tunnel and Intakes 1–5 (15,000 cfs; Operational Scenario A)*, for a detailed discussion). The greatest increase was at Mokelumne River (South Fork) at Staten Island (10% relative to the No Action Alternative). Currently, mercury concentrations in fish tissues exceed Delta TMDL guidance targets, which are set for human health rather than effects on fish, and Alternative 1A is not expected to substantially alter this condition through water operations. Large sport fish throughout the Delta are currently uniformly in exceedance of consumption guidelines for mercury, and Alternative 1A is not expected to substantially alter that condition.

Although methylmercury currently exceeds the TMDL, little to no change in mercury or methylmercury concentrations in water is expected under Alternative 1A water operations. Thus, the alternative would not result in increased exceedances of water quality criteria. Because water operations would not substantially increase methylmercury in the study area above what currently exists and would not expose people to an additional public health hazard, adverse effects on public health are not expected to result.

***CEQA Conclusion*:** Intermittent and short-term construction-related activities (as would occur for in-river construction) would not be anticipated to result in contaminant discharges of sufficient magnitude or duration to contribute to long-term bioaccumulation processes, or cause measureable long-term degradation such that existing 303(d) impairments would be made discernibly worse or TMDL actions to reduce loading would be adversely affected. Legacy pesticides typically bond to particulates, and do not mobilize easily. Construction and maintenance of Alternative 1A would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column. Other pesticides which are currently present in waters affected by SWP and CVP operations are not considered bioaccumulative. Although methylmercury currently exceeds the TMDL, little to no change in mercury or methylmercury concentrations in water is expected under Alternative 1A water conveyance construction. Further, BMPs implemented as part of Erosion and Sediment Control Plans and SWPPPs would help ensure that construction activities would not substantially increase or substantially mobilize legacy organochlorine pesticides or methylmercury during construction and maintenance. Therefore, construction and maintenance of Alternative 1A would not cause increased exposure of the public to these bioaccumulative sediment constituents.

Alternative 1A would not result in increased flows in the tributaries that would mobilize legacy organochlorine pesticides in sediments. Other pesticides that are present in study area water channels are not considered bioaccumulative and any changes in concentrations due to Alternative 1A operations would not cause them to become bioaccumulative. Water quality modeling results showed small, insignificant changes in mercury and methylmercury levels in water at certain Delta locations and fish tissues due to Alternative 1A water operations. Specifically, modeling results indicate that percentage change in assimilative capacity of waterborne total mercury relative to the 25 ng/L Ecological Risk Benchmark for this alternative showed the greatest decrease (1%) at Franks Tract and Old River relative to Existing Conditions. Fish tissue estimates showed the greatest increase (8%) in exceedance quotients relative to Existing Conditions at Mokelumne River (South Fork) at Staten Island.

Since construction, maintenance, or operation of the water conveyance facilities in Alternative 1A would not cause substantial mobilization or substantial increase of constituents known to bioaccumulate, impacts on public health would be less than significant. No mitigation is required.

Impact PH-4: Expose Substantially More People to Transmission Lines Generating New Sources of EMFs as a Result of the Construction and Operation of the Water Conveyance Facilities

***NEPA Effects*:** Approximately 621 miles of existing transmission lines are located within the study area. Table 25-9 identifies the miles of the new temporary and permanent 69 kV transmission lines and the miles of permanent 230 kV lines that would be located outside existing rights-of-way of existing transmission lines. As described in Table 25-9, a total of 24.71 miles of new temporary 69 kV transmission lines, 8.94 miles of new permanent 69 kV transmission lines, and 42.68 miles of new permanent 230 kV transmission lines would be required for this alternative. While new transmission lines generating new sources of EMFs would be constructed under this alternative, the new temporary and permanent transmission lines would be located in sparsely populated areas (Figure 25-2). Table 25-9 identifies only one potential new sensitive receptor (Stone Lakes National Wildlife Refuge) associated with the pipeline/tunnel alignment that is not currently within 300 feet of an existing transmission line; the majority of sensitive receptors are already located within 300 feet of an existing 69 kV or 230 kV transmission line. Accordingly, new temporary or new permanent transmission lines would not expose substantially more potential sensitive receptors or substantially more people to EMFs that they are not already experiencing. Stone Lakes National Wildlife Refuge would be within 300 feet of a proposed temporary 69 kV transmission line. Visitors to this area generally come for walks, water recreation, and hunting, and as such, it is unlikely that large groups of people would be staying in the area within 300 feet of this proposed transmission line, so any EMF exposure would be limited. Further, this line would be removed following completion of construction of the water conveyance facility features near this area so there would be no potential permanent effects. Therefore, this temporary transmission line would not substantially increase people's exposure to EMFs.

As discussed in Section 15.1.1.5, the current scientific evidence does not show conclusively that EMF exposure can increase health risks. In 2006, CPUC updated its EMF policy and reaffirmed that health hazards from exposures to EMF have not been established. State and federal public health regulatory agencies have determined that setting numeric exposure limits is not appropriate. CPUC also reaffirmed that the existing no-cost and low-cost precautionary-based EMF policy should be continued. Based on this, utility companies are required to establish and maintain EMF Design Guidelines in order to reduce potential health risks associated with power lines. These guidelines would be implemented for any new temporary or new permanent transmission lines constructed and operated under Alternative 1A, depending on which electric provider is selected by DWR. Furthermore, as described in Appendix 3B, *Environmental Commitments, AMMs, and CMs*, the location and design of the proposed new transmission lines would be conducted in accordance with CPUC's EMF Design Guidelines for Electrical Facilities, and would include one or more of three measures to reduce EMF exposure.

- Shielding by placing trees or other physical barriers along the transmission line right-of-way.
- Cancelation by configuring the conductors and other equipment on the transmission towers.
- Increasing the distance between the source of the EMF and the receptor either by increasing the height of the tower or increasing the width of the right-of-way.

Therefore, operation of the transmission line corridors would not expose substantially more people to transmission lines generating EMFs, and there would be no adverse effect on public health.

CEQA Conclusion: In general, the proposed temporary (69 kV) and permanent (69 kV and 230 kV) transmission lines would be located in sparsely populated areas generally away from existing potentially sensitive receptors. However, one sensitive receptor, Stone Lakes National Wildlife Refuge, would be within 300 feet of a proposed temporary 69 kV temporary transmission line. Because visitors to this area generally come for walks, water recreation, and hunting, it is unlikely that large groups of people would be staying in the area within 300 feet of this proposed transmission line, so any EMF exposure would be limited. Further, this line would be removed following completion of construction of the water conveyance facility features near this area so there would be no potential permanent effects. Therefore, this temporary transmission line would not substantially increase people's exposure to EMFs. Design and implementation of new temporary or permanent transmission lines not within the right-of-way of existing transmission lines would follow CPUC's EMF Design Guidelines for Electrical Facilities and would implement shielding, cancelation and/or distance measures to reduce EMF exposure. Since construction and operation of Alternative 1A would not expose substantially more people to transmission lines that generate new sources of EMFs, impacts on public health would be less than significant, and no mitigation is required.

Impact PH-5: Increase in Vector-Borne Diseases as a Result of Implementing CM2-CM7, CM10 and CM11

NEPA Effects: Implementation of the conservation measures under Alternative 1A would include fisheries enhancement (CM2); restoration of up to 65,000 acres of tidal and freshwater habitat (CM3 and CM4), 10,000 acres of inundated floodplain (CM5), and 1,200 acres of nontidal marsh and the creation of 500 acres of managed wetland (CM10); enhancement of channel margin and riparian habitat (CM6 and CM7); and protection of 150 acres of alkali seasonal wetland complex and 1,500 acres of managed wetlands (CM3 and CM11). These activities could potentially increase suitable mosquito habitat within the study area.

Under CM2, *Yolo Bypass Fisheries Enhancement*, the frequency, duration, and magnitude of inundation of the Yolo Bypass would increase. The increased floodplain inundation and water surface may result in an increase in mosquitoes in the Yolo Bypass.

Of the approximate 65,000-acre tidal and freshwater habitat restoration target, approximately 55,000 acres of this restoration will consist of tidal perennial aquatic, tidal mudflat, tidal freshwater emergent wetland, and tidal brackish emergent wetland natural communities, and the remaining up to 10,000 acres will consist of transitional uplands to accommodate sea level rise. Of the approximate 55,000 acres of tidally influenced natural community, approximately 20,600 acres must occur in particular ROAs as listed below.

- 7,000 acres of brackish tidal habitat, of which at least 4,800 acres would be tidal brackish emergent wetland and the remainder would be tidal perennial aquatic and tidal mudflat, in Suisun Marsh ROA.
- 5,000 acres of freshwater tidal habitat in the Cache Slough ROA.
- 1,500 acres of freshwater tidal habitat in the Cosumnes/Mokelumne ROA.
- 2,100 acres of freshwater tidal habitat in the West Delta ROA.
- 5,000 acres of freshwater tidal habitat in the South Delta ROA.

The remaining 34,400 acres would be distributed among the ROAs or may occur outside the ROAs. The areas within the ROAs currently have potentially suitable habitat for mosquitoes and aquatic habitat restoration in these areas may increase mosquito populations.

Potentially suitable mosquito habitat resulting from the implementation of CM2 – CM7, CM10 and CM11 would generally not be located near densely populated areas (Figure 25-3). Table 25-6 outlines the distances travelled from breeding grounds for the species listed. These distances range from less than 1 mile to up to 30 miles. The conservation measures would generally expand existing habitat or replace existing agricultural areas, both of which are currently sources for mosquitoes. Of the ROAs, the South Delta ROA and West Delta ROA currently have the fewest acres of habitat suitable for mosquitoes and are the closest to more densely populated areas (Figure 25-3). Similarly, although much of Yolo Bypass is not proximate to densely populated areas, there are areas of Yolo Bypass near populated areas including El Macero, Davis, and West Sacramento. Therefore, habitat restoration in these ROAs and in the Yolo Bypass may result in an increase in mosquitoes and exposure to vector-borne diseases when compared with restoration of aquatic habitat within the other ROAs.

The habitat restoration and enhancement under all of these CMs would be performed in accordance with Natural Communities Enhancement and Management (CM11), which would require preparation and implementation of management plans for the protected natural communities and covered species habitats. The preparation and implementation of the management plans would be performed in consultation with the appropriate MVCDs. This consultation would occur when specific restoration and enhancement projects and locations are identified within the ROAs and prior to implementation of CM2. It is standard practice to use IPM to control mosquitoes, and, as part of the consultation with the MVCDs, MMPs would be prepared (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). In addition, BMPs from the guidelines outlined in Section 25.2.3.4 and Section 25.2.5.7, and detailed in Appendix 3B, would be incorporated into the proposed project and executed to maintain proper water circulation and flooding during appropriate times of the year (e.g., fall) to prevent stagnant water and habitat for mosquitoes. These include the following practices.

- Delay or phase fall flooding—phased flooding involves flooding habitat throughout the fall and winter in proportion to wildlife need and takes into consideration other wetland habitat that may be available in surrounding areas.
- Use rapid fall flooding.
- Use deep initial flooding.
- Subsurface irrigate.
- Utilize water sources with mosquito predators for flooding.
- Drain irrigation water into ditches or other water bodies with abundant mosquito predators.
- Employ vegetation management practices to reduce mosquito production in managed wetlands (e.g., mowing, burning, disking of vegetation that serves as mosquito breeding substrate).
- Design wetlands and operations to be inhospitable to mosquitoes.
- Implement monitoring and sampling programs to detect early signs of mosquito population problems.
- Use biological agents such as mosquito fish to limit larval mosquito populations.
- Use larvicides and adulticides, as necessary.
- Test for mosquito larvae during the high mosquito season (June through September).

Finally, restoration of different types of habitat would potentially increase mosquito predators, such as birds and bats, using the habitat. Therefore, implementation of the habitat restoration and enhancement conservation measures would not significantly increase the public's risk of exposure to vector-borne diseases. There would be no adverse effect.

CEQA Conclusion: Although implementing conservation measures under Alternative 1A would increase restored and enhanced habitat in the study area that could result in a significant increase in vectors such as mosquitoes, BDCP proponents would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMPs to be implemented as part of the MMPs would help control mosquitoes. These BMPs would be consistent with practices presented in CDPH's *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). This would reduce the potential for an increase in mosquito breeding habitat, and an associated substantial increase in vector-borne diseases would not result. Furthermore, habitat would be restored in areas where existing potentially suitable habitat for mosquitoes already exists. Finally, predators on mosquitoes would likely increase as a result of restoration and enhancement, which would keep mosquito populations in check. Accordingly, implementation of CM2–CM7, CM10 and CM11 under Alternative 1A would not substantially increase the public's risk of exposure to vector-borne diseases beyond what currently exists and would be less than significant. No mitigation is required.

Impact PH-6: Substantial Increase in Recreationists' Exposure to Pathogens as a Result of Implementing the Restoration Conservation Measures

NEPA Effects: The study area currently supports habitat types, such as tidal habitat, upland wetlands, and agricultural lands, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). The study area does not currently have pathogen concentrations that rise to the level of adversely affecting beneficial uses of recreation. Restored habitat and protected agricultural lands under Alternative 1A could result in an increase in pathogen loading in the study area because these land uses are known to generate pathogens. However, as exemplified by the Pathogen Conceptual Model (Tetra Tech 2007), any potential increase in pathogens associated with the proposed habitat restoration would be localized and within the vicinity of the actual restoration. The result would be similar for lands protected for agricultural uses. This localized increase is not expected to be of sufficient magnitude and duration to result in adverse effects on recreationists as described in Chapter 8, *Water Quality,* Section 8.3.3.2. Furthermore, depending on the level of recreational access granted by management plans, habitat restoration could increase or decrease opportunities for recreationists within the Delta region. Mechanisms that permit public access could increase opportunities related to upland hunting, hiking, walking, wildlife viewing, botanical viewing, nature photography, picnicking, and sightseeing. Alternatively, acquisition that would exclude public recreational use would decrease opportunities for these activities, thus limiting recreationists' potential exposure to pathogens. Even if recreationists were allowed in the ROAs, the characteristics of pathogens in water as described by the conceptual model would not substantially increase recreationists' exposure. Accordingly, implementation of the restoration conservation measures under Alternative 1A would not result in a substantial increase in recreationists' exposure to pathogens. There would be no adverse effect.

CEQA Conclusion: Implementation of the restoration conservation measures would support habitat types, such as wetlands and agricultural lands, that could produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). However, the localized nature of pathogen generation, as well as the quick die-off of some types of pathogens once released into water bodies, would generally prevent substantial pathogen exposure to recreationists. Accordingly, impacts on public health would be less than significant. No mitigation is required.

Impact PH-7: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Implementing CM2, CM4, CM5, and CM10

NEPA Effects: The primary concern with habitat restoration regarding constituents known to bioaccumulate is the potential for mobilizing contaminants sequestered in sediments of the newly inundated floodplains and marshes. The mobilization depends on the presence of the constituent and the biogeochemical behavior of the constituent to determine whether it could re-enter the water column or be reintroduced into the food chain.

Pesticides

Organochlorines and other relatively water insoluble pesticides would likely be sequestered in the former agricultural soils in ROAs. Additionally, because these chemicals tend to bind to particulates, concentrations are typically highest in sediment. Flooding of former agricultural land, as would occur under CM4, CM5, and CM10, is expected to result in some level of accessibility to biota through uptake by benthic organisms. Moreover, CM2 and CM5 may be managed alongside continuing agriculture, where pesticides may be used on a seasonal basis and where water during flood events may come in contact with residues of these pesticides. However, rapid dissipation would be expected, particularly in the large volumes of water involved in flooding; therefore, it is unlikely that a substantial increase in bioaccumulation by fish would result. Further, CM2–CM21 do not include the use of pesticides known to be bioaccumulative in animals or humans. Additionally, significant increases in organochlorine and other legacy pesticides are not expected in the water column because these lipophilic chemicals strongly partition to sediments. Also, concentrations in the water column should be relatively short-lived because these pesticides settle out of the water column via sediment adsorption in low-velocity flow. As described in Section D.4.6.1 of BDCP Appendix 5.D[8], if sediment with existing pesticide levels erodes and is transported from an ROA, it is likely that the pesticides would not be transported very far from the source area, and would settle out with suspended particulates and be deposited close to the ROA. For these reasons a substantial mobilization of nor a substantial increase in bioaccumulative pesticides in the study area is not anticipated. Therefore, no adverse effect on public health with respect to bioaccumulation of pesticides is expected.

Methylmercury

Conversion of inorganic mercury to methylmercury occurs in flooded fine sediments subjected to periodic drying-out periods and is associated with anaerobic (oxygen-depleted), reducing environments (Alpers et al. 2008; Ackerman and Eagles-Smith 2010). Methylmercury production is greatest in high marshes that are subjected to wet and dry periods over the highest monthly tidal cycles; production appears to be less in low marshes that are always inundated and not subject to dry periods (Alpers et al. 2008).

Methylmercury generation rates are ultimately dependent on the concentrations of mercury in the soils, and on the specific biogeochemistry of the system. The biogeochemistry and fate and transport of mercury and methylmercury are very complex. Restoration would involve inundation of areas where mercury has been sequestered in soils, and, if methylation occurs, the methylmercury would be mobilized into the aquatic system. Results of the CALFED Mercury Project Annual Report for 2007 (Stephenson et al. 2007) indicate that river inputs (11.5 grams per day [g/day] methylmercury) and in-situ production from wetland/marsh sediments (11.3 g/day methylmercury) are the leading sources of methylmercury to the Delta waters, and have roughly comparable levels of input. Wood (2010) estimates that in-situ methylmercury production in open water and wetlands contributes approximately 36% of the overall methylmercury load to the Delta (approximately 5 g/day) but is less than riverine/tributary inputs (8 g/day). The higher estimate of methylmercury production from sediments reported by Stephenson is based on periods of higher water (wet) and may be more representative of what might occur when new ROAs are opened for inundation. Once in the aquatic system, the methylmercury can be transported with water flow, taken up by biota, volatilized, demethylated, or returned to sediment (but not necessarily at the original restoration site).

The Sacramento River watershed, and specifically the Yolo Bypass, is the primary source of mercury in the study area. The highest concentrations of mercury and methylmercury are in the Cache Creek area and the Yolo Bypass. The amount of methylmercury produced in the Yolo Bypass has been estimated to represent 40% of the total methylmercury production for the entire Sacramento River watershed (Foe et al. 2008). Water discharging from the Yolo Bypass at Prospect Slough has a reported average annual methylmercury concentration of 0.27 ng/L, more than four times greater than the 0.06 ng/L TMDL.

The highest levels of methylmercury generation, mobilization, and bioavailability are expected in the Yolo Bypass with implementation of CM2 under Alternative 1A. Implementation of CM2 would

[8] As described in Chapter 1, *Introduction*, Section 1.1, the Final EIR/EIS includes the 2013 Draft EIR/EIS, BDCP, 2015 RDEIR/SDEIS, and all associated appendices with these documents; as well as revisions to these documents as contained in this Final EIR/EIS.

subject Yolo Bypass to more frequent and wider areas of inundation. The concentrations of methylmercury in water exiting the Yolo Bypass would depend on many variables. However, implementation of CM2 has the potential to significantly increase the loading, concentrations, and bioavailability of methylmercury in the aquatic system.

As part of Alternative 1A, measures are being developed to reduce the production of methylmercury in ROAs, and these measures will be implemented as part of *CM12 Methylmercury Management*. These measures may include construction and grading in a way that minimizes the introduction of mercury-containing soils to the water column; designing areas to support/enhance photodegradation; and pre-design field studies to identify depositional areas where mercury accumulation is most likely and characterization and/or design that avoids these areas. *CM12 Methylmercury Management* provides for consideration of new information related to methylmercury degradation that could effectively mitigate methylmercury production and mobilization.

In summary, Alternative 1A restoration actions are likely to result in increased production, mobilization, and bioavailability of methylmercury in the aquatic system. Methylmercury would be generated by inundation of restoration areas, with highest concentrations expected in the Yolo Bypass, Cosumnes River and Mokelumne River, and at ROAs closest to these source areas as a result of the BDCP actions. An increase in bioavailability in the aquatic system could result in a corresponding increase in bioaccumulation in fish tissue, biomagnification through the food chain, and human exposure. Because the increase in bioavailability in the food chain cannot be quantified, the increase in human exposure also cannot be quantified. OEHHA standards would continue to be implemented for the consumption of study area fish and thus would serve to protect people against the overconsumption of fish with increased body burdens of mercury. Furthermore, implementation of *CM12 Methylmercury Management*, would minimize effects because it provides for project-specific mercury management plans including a quality assurance/quality control (QA/QC) program, and specific tidal habitat restoration design elements to reduce the potential for methylation of mercury and its bioavailability in tidal habitats. Accordingly, adverse effects on public health due to the substantial mobilization of or increase in methylmercury are not expected to occur.

CEQA Conclusion: Flooding of former agricultural land under CM4, CM5, and CM10, could result in some level of accessibility of legacy organochlorine pesticides to biota through uptake by benthic organisms. Further, CM2 and CM5 may be managed alongside continuing agriculture, where pesticides may be used on a seasonal basis and where water during flood events may come in contact with organochlorine and legacy pesticide residues. Additionally, while there would likely be an increase in mobilization of and potentially an increase in bioaccumulation of methylmercury in the study area's aquatic systems (e.g., fish and water) in the near term, it is unlikely to be substantial. Further, *CM12 Methylmercury Management*, as well as existing OEHHA standards, would serve to reduce the public's exposure to contaminated fish. Implementation of the these conservation measures under Alternative 1A would not substantially mobilize or substantially increase the public's exposure to constituents known to bioaccumulate and therefore, this impact would be less than significant. No mitigation is required.

Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water Conveyance Facilities

NEPA Analysis: Any modified reservoir operations under Alternative 1A are not expected to promote *Microcystis* production upstream of the Delta since large reservoirs upstream of the Delta are typically low in nutrient concentrations and phytoplankton outcompete cyanobacteria, including *Microcystis*. Further, in the rivers and streams of the Sacramento River watershed, watersheds of the eastern tributaries (Cosumnes, Mokelumne, and Calaveras Rivers), and the San Joaquin River upstream of the Delta, bloom development would be limited by high water velocity and low hydraulic residence times.

As described in Chapter 8, *Water* Quality, *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not due to water conveyance facility operations. Similarly, hydraulic residence times in the Export Service Area would not be affected by operations of CM1. Accordingly, conditions would not be more conducive to *Microcystis* bloom formation. Water diverted from the Sacramento River in the north Delta is expected to be unaffected by *Microcystis,* but the fraction of water flowing through the Delta that reaches the existing south Delta intakes is expected to be influenced by an increase in *Microcystis* blooms. Therefore, relative to the No Action Alternative, the addition of Sacramento River water from the north Delta under Alternative 1A would dilute *Microcystis* and microcystins in water diverted from the south Delta. Because the degree to which *Microcystis* blooms, and thus microcystins concentrations, will increase in source water from the south Delta is unknown, it cannot be determined whether Alternative 1A will result in increased or decreased levels of microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Ambient meteorological conditions are the primary driver of Delta water temperatures, and therefore climate warming, and not water operations, would determine future water temperatures in the Delta. Increasing water temperatures due to climate change could lead to earlier attainment of the water temperature threshold of 19°C required to initiate *Microcystis* bloom formation, and therefore earlier occurrences of *Microcystis* blooms in the Delta, as well as increases in the duration and magnitude. However, these temperature-related changes under Alternative 1A would not be different from what would occur under the No Action Alternative. Siting and design of restoration areas would have a substantial influence on the magnitude of hydraulic residence time increases under Alternative 1A. The modeled increase in residence time in the Delta could result in an increase in the frequency, magnitude, and geographic extent of *Microcystis* blooms, and thus microcystin levels, throughout the Delta. Therefore, impacts on beneficial uses, including drinking water and recreational waters, could occur and, as such, public health could be affected. Accordingly, this would be considered an adverse effect. Mitigation Measure WQ-32a and WQ-32b are available to reduce the effects of degraded water quality, and therefore potential public health effects, in the Delta due to *Microcystis*. Mitigation Measure WQ-32a has been included here because the DSM2 modeling that was done for this alternative and utilized for the CM1 assessment included both operations and restoration. Because the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain, the effect would still be considered adverse.

CEQA Conclusion: Under Alternative 1A, operation of the water conveyance facilities is not expected to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta because large reservoirs upstream are typically low in nutrient concentrations and phytoplankton outcompete cyanobacteria, including *Microcystis*, and high water velocity and low hydraulic residence times in the upstream area limit the development of *Microcystis* blooms. *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not water conveyance facility operations. Hydraulic residence times in the Export Service Area would not be affected by operations of CM1, and therefore conditions would not be more conducive to *Microcystis* bloom formation. Water exported from the Delta to the Export

Service Area is expected to be a mixture of *Microcystis*-affected source water from the south Delta intakes and unaffected source water from the Sacramento River. Because of this, it cannot be determined whether operations and maintenance under Alternative 1A would result in increased or decreased levels of *Microcystis* and microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Water temperatures and hydraulic residence times in the Delta are expected to increase, which would result in an increase in the frequency, magnitude and geographic extent of *Microcystis*, and therefore microcystin levels. However, the potential water quality effects due to temperature increases would be due to climate change, not effects resulting from operation of the water conveyance facilities. Increases in Delta residence times would be due in small part to climate change and sea level rise, but due to a greater degree to operation of the water conveyance facilities and hydrodynamic impacts of restoration included in CM2 and CM4. Consequently, it is possible that increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms in the Delta would occur due to the operations and maintenance of the water conveyance facilities and the hydrodynamic impacts of restoration under CM2 and CM4. Accordingly, beneficial uses including drinking water and recreational waters would potentially be impacted and therefore, so would public health. Therefore this impact would be significant.

Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time considerations be incorporated into restoration area site design for CM2 and CM4 using the best available science at the time of design. Mitigation Measure WQ-32b requires that the project proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods to determine whether increases in abundance are significant. This mitigation measure also requires that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will investigate and evaluate measures that could be taken to reduce residence time in the affected areas of the Delta. However, because the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and CM4

***NEPA Effects*:** As described in Chapter 8, *Water Quality*, implementation of CM3 and CM6–CM21 is unlikely to affect *Microcystis* abundance in the rivers and reservoirs upstream of the Delta, in the Delta region, or the waters exported to the CVP and SWP service areas. Implementation of *CM5 Seasonally Inundated Floodplain Restoration* could result in increased local water temperatures in areas near restored seasonally inundated floodplains. However, floodplain inundation typically occurs during spring and winter months when *Microcystis* growth is limited in general by low water temperatures and by insufficient surface water irradiance. Water temperatures would not increase sufficiently due to floodplain inundation such that effects on *Microcystis* growth would occur. Therefore, implementation of CM5 is unlikely to affect *Microcystis* blooms in the study area. Implementation of *CM13 Invasive Aquatic Vegetation Control* may increase turbidity and flow velocity, particularly in restored aquatic habitats, which could discourage *Microcystis* growth in these areas. To the extent that invasive aquatic vegetation (IAV) removal would affect turbidity and water velocity, it is possible that IAV removal could, to some degree, help offset the increase in *Microcystis* production expected under Alternative 1A, relative to the No Action Alternative.

As discussed under Impact PH-8, development of restoration areas under CM2 and CM4 could potentially increase the frequency, magnitude, and geographic extent of *Microcystis* blooms due to the hydrodynamic impacts that are expected to increase hydraulic residence times throughout the Delta. Additionally, restoration activities implemented under CM2 and CM4 that create shallow backwater areas could result in local increases in water temperature that may encourage *Microcystis* growth during the summer bloom season, which could result in further degradation of water quality to the extent that beneficial uses are affected. Were *Microcystis* blooms to increase with implementation of CM2 and CM4, there would be an increase in the potential for impacts on public health as a result of potential effects on drinking water quality and recreational waters. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. However this would be an adverse effect.

CEQA Conclusion: Restoration activities implemented under CM2 and CM4 that create shallow backwater areas could result in local increases in water temperature conducive to *Microcystis* growth during summer bloom season. This could compound the water quality degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact PH-8 and result in additional water quality degradation such that beneficial uses are affected. An increase in *Microcystis* blooms could potentially result in impacts on public health through exposure via drinking water quality and recreational waters. Therefore, this impact would be significant. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and hydraulic residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased Microcystis Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

25.3.3.3 Alternative 1B—Dual Conveyance with East Alignment and Intakes 1–5 (15,000 cfs; Operational Scenario A)

Alternative 1B would be similar to Alternative 1A except that the water routed from the north Delta to the south Delta would be conveyed primarily through a canal along the east side of the Delta instead of through pipelines/tunnels, and there would be no intermediate forebay. From an intermediate pumping plant, water would be raised to an elevation allowing gravity to carry it through a continuing canal to the new Byron Tract Forebay, adjacent to and south of Clifton Court Forebay. Along the way, diverted water would travel under existing watercourses through culvert siphons or tunnel siphons. CM2–CM21 would also be implemented under this alternative, and their effects would be the same as under Alternative 1A. A detailed description of the alternative is provided in Chapter 3, *Description of the Alternatives,* Section 3.5.3; a detailed depiction is provided in Mapbook Figure M3-2 in Chapter 3.

Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of the Water Conveyance Facilities

***NEPA Effects*:** As with Alternative 1A, implementation of CM1 under Alternative 1B would involve construction and operation of five north Delta intakes, up to 15 solids lagoons, five sedimentation basins, and Byron Tract Forebay. These facilities have the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes) because of the large volumes of water that would be held within these areas. Sedimentation basins would be 120 feet long by 40 feet wide by 55 feet deep, and solids lagoons would be 165 feet long by 86 feet wide by 10 feet deep. The depth, design, and operation of the sedimentation basins and solids lagoons would prevent the development of suitable mosquito habitat (Figure 25-1). Specifically, the basins would be too deep and the constant movement of water would prevent mosquitoes from breeding and multiplying.

Although the proposed Byron Tract Forebay would increase surface water within the study area, it is unlikely that the forebay would provide suitable breeding habitat for mosquitoes given that the water in this forebay would not be stagnant and would be too deep. However, the shallow edges of the forebay could potentially provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. However, as part of the regular maintenance of the forebay, floating vegetation such as pond weed would be harvested to maintain flow and forebay capacity.

Although construction and operation of the water conveyance facilities would increase surface water area in the Plan Area and therefore potentially provide habitat for vectors that transmit diseases (e.g., mosquitoes), DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes during construction and operation of the water conveyance facilities. These BMPs would be consistent with practices presented in CDPH's *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). See Impact PH-1 under Alternative 1A. Therefore, construction and operation of the water conveyance facilities under Alternative 1B would not result in a substantial increase in vector-borne diseases and the impact would not be adverse.

***CEQA Conclusion*:** As with Alternative 1A, implementation of CM1 under Alternative 1B would involve construction and operation of solids lagoons, sedimentation basins, and the Byron Tract Forebay. Public exposure to vector-borne diseases would not substantially increase because water depth and circulation in sedimentation basins and the Byron Tract Forebay would prevent development of suitable mosquito habitat. However, the shallow edges on the periphery of Byron Tract Forebay could potentially provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes. See Impact PH-1 for Alternative 1A. These BMPs would be consistent with practices presented in CDPH's *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). During operations, water depth and circulation would prevent the areas from substantially increasing suitable vector habitat. Therefore, construction and operation of the water conveyance facilities under Alternative 1B would not result in a substantial increase in vector-borne diseases and the impact would be less than significant. No mitigation is required.

Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That There is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance Facilities

NEPA Effects: The water supply facilities under Alternative 1B would be the same as those described for 1A with the exception that the water would be primarily conveyed via an east canal rather than pipelines and tunnels, and there would be no intermediate forebay. Alternative 1B would have the same number of intakes as Alternative 1A and they would be constructed and operated in the same manner. Water supply operations under Alternative 1B (Operational Scenario A) would be identical to Alternative 1A. Therefore, the water quality and public health effects described for Alternative 1A also appropriately characterize effects under Alternative 1B. There would be no substantial changes in trace metals, pesticides, or DBPs under Operational Scenario A with the exception of bromide concentrations at Barker Slough. Under Alternative 1B, long-term average bromide concentrations are expected to increase at the North Bay Aqueduct at Barker Slough, Staten Island, and Emmaton on the Sacramento River relative to the No Action Alternative. This increase would be greatest at Barker Slough (43%). Increases at Barker Slough would be more substantial during the drought period (93%).

This increase in long-term average bromide concentration at Barker Slough may require upgrades and/or changes at certain water treatment plants. While treatment technologies sufficient to achieve the necessary bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken, a change of such magnitude in long-term average bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBP in drinking water sources. Mitigation Measure WQ-5 is available to reduce these effects. Implementation of this measure along with a separate other commitment as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, relating to the potential increased treatment costs associated with bromide-related changes would reduce these effects. Further, as described for Impact PH-2 under Alternative 1A, the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be further minimized by implementation of the AIP.

CEQA Conclusion**:** The operation of water supply facilities under Alternative 1B would be the same as described for Alternative 1A. Water supply operations would increase contributions from the San Joaquin River relative to the Sacramento River, and decrease the dilution capacity of the Sacramento River for contaminants. Water quality modeling results indicate that changes in flows under

Alternative 1B would, for the most part, not result in increased exceedances of water quality criteria for trace metals, pesticides, or DBP in the study area (Chapter 8, *Water Quality*, Section 8.3.3.3). However, relative to Existing Conditions, under Alternative 1B bromide concentrations would increase at the North Bay Aqueduct at Barker Slough, Staten Island, and Emmaton on the Sacramento River, with the greatest increase occurring at Barker Slough (38%). Increases would be more substantial during the drought period (94%).

The increase in long-term average bromide concentrations predicted for Barker Slough would result in a substantial change in source water quality to existing drinking water treatment plants drawing water from the North Bay Aqueduct. These modeled increases in bromide at Barker Slough could lead to adverse changes in the formation of DBPs at drinking water treatment plants such that considerable water treatment plant upgrades would be necessary in order to achieve equivalent levels of drinking water health protection. This would be a significant impact.

While treatment technologies sufficient to achieve the necessary bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken, a change of such magnitude in long-term average bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBP in drinking water sources. Assuming the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be avoided or minimized by implementation of the AIP, the potential adverse water quality effects on the municipal beneficial uses potentially provided in Barker Slough would remain significant.

While Mitigation Measure WQ-5 may reduce this impact, the feasibility and effectiveness of this mitigation measure are uncertain based on currently available information.

In addition to and to supplement Mitigation Measure WQ-5, the BDCP proponents have incorporated into the BDCP, as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, a separate other commitment to address the potential increased water treatment costs that could result from bromide-related concentration effects on municipal water purveyor operations. Potential options for making use of this financial commitment include funding or providing other assistance towards implementation of the North Bay Aqueduct AIP, acquiring alternative water supplies, or other actions to indirectly reduce the effects of elevated bromide and DOC in existing water supply diversion facilities. Please refer to Appendix 3B, *Environmental Commitments, AMMs, and CMs*, for the full list of potential actions that could be taken pursuant to this commitment in order to reduce the water quality treatment costs associated with water quality effects relating to chloride, electrical conductivity, and bromide. Because the BDCP proponents cannot ensure that the results of coordinated actions with water treatment entities will be fully funded or implemented successfully prior to the project's contribution to the impact, the ability to fully mitigate this impact is uncertain. If a solution that is identified by the BDCP proponents and an affected water purveyor is not fully funded, constructed, or implemented before the project's contribution to the impact is made, a significant impact in the form of increased DBP in drinking water sources could occur. Accordingly, this impact would be significant and unavoidable. If, however, all financial contributions, technical contributions, or partnerships required to avoid significant impacts prove to be feasible and any necessary agreements are completed before the project's contribution to the effect is made, impacts would be less than significant.

Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality Conditions; Site and Design Restoration Sites to Reduce Bromide Increases in Barker Slough

Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

Impact PH-3: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Construction, Operation or Maintenance of the Water Conveyance Facilities

NEPA Effects: Similar to effects described for Alternative 1A, sediment-disturbing activities during construction and maintenance of the water conveyance facilities under Alternative 1B could result in the disturbance of existing constituents, such as legacy pesticides or methylmercury, in sediment. During water conveyance facilities operation, changes in dilution and mixing of sources of water could result in a change in constituents known to bioaccumulate. For example, the reduction of flows in the Sacramento River downstream of the proposed north Delta intakes may result in a decreased dilution of constituents known to bioaccumulate in the study area.

As described for Alternative 1A, construction and operation of the water conveyance facilities under Alternative 1B would not result in a change in water dilution, and mixing of existing constituents would not affect the status of legacy organochlorine pesticides, or methylmercury in the study area. Intermittent and/or short-term construction-related activities (as would occur for in-river construction) would not be anticipated to result in contaminant discharges of sufficient magnitude or duration to contribute to long-term bioaccumulation processes, or cause measureable long-term water quality degradation, as described under Alternative 1A. Legacy pesticides typically bond to particulates and do not mobilize easily. Construction and maintenance of Alternative 1B would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column, as described under Alternative 1A. Water supply operations under any BDCP action alternative would not be expected to change total suspended solids or turbidity levels (highs, lows, typical conditions) to any substantial degree. Changes in the magnitude, frequency, and geographic distribution of legacy organochlorine pesticides in water bodies of the affected environment that would result in new or more severe adverse effects on other beneficial uses, relative to the No Action Alternative, would not be expected to occur.

Furthermore, based on modeling results presented in Chapter 8, *Water Quality.* Section 8.3.3.3, operation of water conveyance facilities under Alternative 1B, as under Alternative 1A, would not substantially alter mercury or methylmercury concentrations in the Sacramento River or San Joaquin River, nor would it substantially result in an increase in mercury concentrations in fish tissues.

As environmental commitments, DWR would develop and implement Erosion and Sediment Control Plans and SWPPPs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMPs implemented under Erosion and Sediment Control Plans and the SWPPPs would help reduce turbidity and keep sediment that may contain legacy organochlorine pesticides and methylmercury within the area of disturbance. Examples of these BMPs are described under Alternative 1A, Impact PH-3. Accordingly, the potential for Alternative 1B to create a public health effect from bioaccumulation of legacy organochlorine pesticides and methlymercury in fish is minimal, and public health effects are not expected to be adverse.

CEQA Conclusion: As described under Alternative 1A, construction and maintenance of Alternative 1B would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column based on the chemical properties of the pesticides. Although methylmercury currently exceeds the TMDL, little to no change in mercury or methylmercury concentrations in water is expected under Alternative 1B water construction. BMPs implemented as part of Erosion and Sediment Control Plans and SWPPPs would help ensure that construction activities would not substantially increase or substantially mobilize legacy organochlorine pesticides or methylmercury during construction and maintenance. Therefore, construction and maintenance of Alternative 1B would not cause increased exposure of the public to these bioaccumulative sediment constituents.

Operation of Alternative 1B would not result in increased flows in the tributaries that would mobilize legacy organochlorine pesticides in sediments. Water quality modeling results showed small changes in mercury and methylmercury levels in water at certain Delta locations and in mercury in fish tissues due to Alternative 1B water operations (Chapter 8, *Water Quality*, Section 8.3.3.3). Because construction, maintenance or operation of Alternative 1B would not cause substantial mobilization or a substantial increase of constituents known to bioaccumulate (i.e., organochlorine pesticides or mercury), impacts on public health would be less than significant. No mitigation is required.

Impact PH-4: Expose Substantially More People to Transmission Lines Generating New Sources of EMFs as a Result of the Construction and Operation of the Water Conveyance Facilities

***NEPA Effects*:** Approximately 621 miles of existing transmission lines are located within the study area. As described in Table 25-9, a total of 13.49 miles of new temporary 69 kV transmission lines; 36.79 miles of new permanent 69 kV transmission lines; and 16.35 miles of new permanent 230 kV transmission lines would be required for this alternative. While new transmission lines generating new sources of EMFs would be constructed under Alternative 1B, the new temporary and permanent transmission lines would generally be located in sparsely populated areas (Figure 25-2). Table 25-9 identifies only one potential new sensitive receptor (Stone Lakes National Wildlife Refuge) that is not currently within 300 feet of an existing transmission line; the majority of sensitive receptors are already located within 300 feet of an existing 69 kV or 230 kV transmission line. Stone Lakes National Wildlife Refuge would be within 300 feet of a proposed permanent 69 kV transmission line. Visitors to this area generally come for walks, water recreation, and hunting, and as such, it is unlikely that large groups of people would be staying in the area within 300 feet of this proposed transmission line, so any EMF exposure would be limited. The majority of sensitive receptors are already located within 300 feet of an existing transmission line. Accordingly, the majority of new temporary or new permanent transmission lines would not expose sensitive receptors or substantially more people to EMFs that they are not already experiencing. Because the proposed transmission lines would be located in sparsely populated areas and would be within 300 feet of only one potential new sensitive receptor, the proposed temporary and permanent transmission lines would not substantially increase people's exposure to EMFs.

As discussed in Section 25.2.6.1, the current scientific evidence does not show conclusively that EMF exposure increases health risks. In 2006, CPUC updated its EMF Policy and reaffirmed that health hazards from exposures to EMF have not been established. State and federal public health regulatory agencies have determined that setting numeric exposure limits is not appropriate. CPUC also reaffirmed that the existing no-cost and low-cost precautionary-based EMF policy should be continued. Based on this, utility companies are required to establish and maintain EMF Design Guidelines in order to minimize health risks associated with power lines. These guidelines would be implemented for any new temporary or new permanent transmission lines constructed and operated under Alternative 1B, depending on which electric provider is selected by DWR. Furthermore, as described under Impact PH-4 for Alternative 1A (and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*), location and design of the new transmission lines would be conducted in accordance with CPUC's EMF Design Guidelines for Electrical Facilities. Measures implemented under these guidelines would reduce EMF exposure from the proposed transmission lines. Therefore, operation of the transmission line corridors would not expose substantially more people to transmission lines generating EMFs, and there would be no adverse effect on public health.

CEQA Conclusion: Under Alternative 1B, new transmission lines would be located in sparsely populated areas generally away from existing sensitive receptors. However, one sensitive receptor, Stone Lakes National Wildlife Refuge, would be within 300 feet of a proposed permanent 69 kV transmission line. Because visitors to this area generally come for walks, water recreation, and hunting, it is unlikely that large groups of people would be staying in the area within 300 feet of this proposed transmission line, so any EMF exposure would be limited. Design and implementation of new temporary or permanent transmission lines not within the right-of-way of existing transmission lines would follow CPUC's EMF Design Guidelines for Electrical Facilities and would implement shielding, cancelation, or distance measures to reduce EMF exposure. Since construction and operation of Alternative 1B would not expose substantially more people to transmission lines that generate new sources of EMFs, impacts on public health would be less than significant, and no mitigation is required.

Impact PH-5: Increase in Vector-Borne Diseases as a Result of Implementing CM2-CM7, CM10 and CM11

NEPA Effects: The amount and location of habitat restoration and enhancement that would occur under Alternative 1B would be the same as that described under Alternative 1A. Although there would be an increase in restored and enhanced aquatic habitat in the study area as a result of implementing Alternative 1B, implementation of environmental commitments, such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*), would reduce the potential for an increase in mosquito breeding habitat, and a substantial increase in vector-borne diseases is unlikely to result. Furthermore, habitat would be restored in areas where potentially suitable habitat for mosquitoes already exists. Finally, mosquito predators (e.g., bats, spiders) would likely increase as a result of restoration and enhancement, which would keep mosquito populations in check. Therefore, effects would be the same under Alternative 1B as under Alternative 1A and there would not be a substantial increase in the public's risk of exposure to vector-borne diseases with implementation of CM2-CM7, CM10 and CM11. Accordingly, there would be no adverse effect.

CEQA Conclusion: Habitat restoration and enhancement would result in an increased amount of land potentially suitable for vector habitat (e.g., mosquitoes). However, Alternative 1B would require environmental commitments, such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*) that would help control mosquitoes and reduce the potential for an increase in mosquito breeding habitat. These BMPs would be consistent with practices presented in CDPH's *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). Furthermore, habitat would be restored where potentially suitable vector habitat already exists, and habitat restoration and enhancement would likely increase the number of mosquito predators. Therefore, as described under Alternative 1A, implementation of CM2–CM7, CM10 and CM11 under Alternative 1B would not substantially increase the public's risk of exposure to vector-borne diseases beyond what currently exists. Accordingly, this impact would be less than significant and no mitigation is required.

Impact PH-6: Substantial Increase in Recreationists' Exposure to Pathogens as a Result of Implementing the Restoration Conservation Measures

NEPA Effects**:** The amount and location of habitat restoration and enhancement that would occur under Alternative 1B would be the same as that described under Alternative 1A. Implementation of the restoration conservation measures would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). As exemplified by the Pathogen Conceptual Model, any potential increase in pathogens associated with habitat restoration would be localized and within the vicinity of the actual restoration. This would be similar for lands protected for agricultural uses. Depending on the level of recreational access granted by management plans, habitat restoration could increase or decrease opportunities for recreationists in the Delta region. However, effects associated with pathogens would be the same under Alternative 1B as under Alternative 1A. Any increase in pathogens would be localized and likely of insufficient magnitude or duration to result in adverse effects on recreationists. Even if recreationists were allowed in the ROAs, the characteristics of pathogens in water as described by the conceptual model would not substantially increase recreationists' exposure. Therefore, recreationists would not experience a substantial increase in exposure to pathogens as a result of the restoration and no adverse effect would result.

CEQA Conclusion**:** Implementation of the restoration conservation measures under Alternative 1B would support habitat types, such as wetlands and agricultural areas, that could produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). However, the localized nature of pathogen generation and the quick die-off of some types of pathogens once released into water bodies would generally prevent a substantial increase in pathogen exposure by recreationists. Therefore, impacts on public health would be less than significant. No mitigation is required.

Impact PH-7: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Implementing CM2, CM4, CM5, and CM10

NEPA Effects**:** The amount of habitat restoration would be the same under Alternative 1B as described for Alternative 1A. The primary concern with habitat restoration regarding constituents known to bioaccumulate (i.e., legacy organochlorine pesticides and methylmercury) is the potential for mobilizing contaminants sequestered in sediments of the newly inundated floodplains and marshes, as described under Alternative 1A. It is likely that the pesticide-bearing sediments would not be transported very far from the source area and would settle out with suspended particulates and be deposited close to the ROA. Further, CM2–CM21 do not include the use of pesticides known to be bioaccumulative in animals or humans.

Methylmercury generation rates are ultimately dependent on the concentrations of mercury in the soils, and on the specific biogeochemistry of the system. The biogeochemistry and fate and transport of mercury and methylmercury are very complex. Restoration would involve inundation of areas where mercury has been sequestered in soils, and, if methylation occurs, the methylmercury would be mobilized into the aquatic system. While there would likely be an increase in mobilization and bioaccumulation of methylmercury in the study area's aquatic systems (i.e., fish and water) during the near-term, *CM12 Methylmercury Management* and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Implementation of methylmercury management measures under CM12 would minimize conditions conducive to generation of methylmercury in restored areas.

Therefore, implementation of CM2, CM4, CM5, and CM10 under Alternative 1B would not result in the substantial mobilization or increase of constituents known to bioaccumulate and, as such, would not result in an adverse effect on public health with respect to bioaccumulative pesticides or methylmercury.

***CEQA Conclusion*:** Implementation of CM2, CM4, CM5 and CM10 would have the potential to mobilize sediment with existing levels of legacy organochlorine pesticides as a result of disturbing sediment during habitat restoration construction. However, it is unlikely that the pesticide-bearing sediments would be transported very far from the source area and they would likely settle out with suspended particulates and be deposited close to the ROAs during habitat restoration construction. While there would likely be an increase in mobilization and bioaccumulation of methylmercury in the study area's aquatic systems (i.e., fish and water) during the near-term, measures implemented under *CM12 Methylmercury Management*, and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Therefore, implementation of CM2, CM4, CM5 and CM10 under Alternative 1B would not substantially mobilize or substantially increase the public's exposure to constituents known to bioaccumulate and this impact would be less than significant. No mitigation is required.

Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water Conveyance Facilities

***NEPA Effects*:** Water operations under Alternative 1B would be the same as under Alternative 1A. Therefore, potential effects on public health due to changes in water quality and beneficial uses as a result of *Microcystis* blooms and microcystin levels would be the same. Any modified reservoir operations under Alternative 1B are not expected to promote *Microcystis* production upstream of the Delta or in the rivers and streams of the Sacramento River watershed, watersheds of the eastern tributaries (Cosumnes, Mokelumne, and Calaveras Rivers), and the San Joaquin River upstream of the Delta.

As described in Chapter 8, *Water Quality*, *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not due to water conveyance facility operations. Similarly, hydraulic residence times in the Export Service Area would not be affected by operations of CM1. Accordingly, conditions would not be more conducive to *Microcystis* bloom formation. Water diverted from the Sacramento River in the north Delta is expected to be unaffected by *Microcystis*. However, the fraction of water flowing through the Delta that reaches the existing south Delta intakes is expected to be influenced by an increase in *Microcystis* blooms, as discussed below. Therefore, relative to the No Action Alternative, the addition of Sacramento River water from the north Delta under Alternative 1B would dilute *Microcystis* and microcystins in water diverted from the south Delta. Because the degree to which *Microcystis* blooms, and thus microcystins concentrations, would increase in source water from the south Delta is unknown, it cannot be determined whether Alternative 1B would result in increased or decreased levels of microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Ambient meteorological conditions would be the primary driver of Delta water temperatures, and climate warming, not water operations, would determine future water temperatures in the Delta. Increasing water temperatures due to climate change could lead to earlier attainment of the water temperature threshold required to initiate Microcystis bloom formation, and therefore earlier occurrences of Microcystis blooms in the Delta, as well as increases in the duration and magnitude. However, these temperature-related changes would not be different from what would occur under the No Action Alternative. Modeled hydraulic residence times in the Delta are projected to increase in the summer and fall periods in the north and west Delta and in the summer in Cache Slough, the east Delta, and south Delta relative to the No Action Alternative. Siting and design of restoration areas would have a substantial influence on the magnitude of residence time increases under Alternative 1B. The modeled increase in hydraulic residence time in the Delta could result in an increase in the frequency, magnitude, and geographic extent of Microcystis blooms, and thus microcystin levels. Therefore, impacts on beneficial uses, including drinking water and recreational waters, could occur and public health could be affected. Accordingly, this would be considered an adverse effect.

Mitigation Measure WQ-32a and WQ-32b are available to reduce the effects of degraded water quality, and therefore potential public health effects, in the Delta due to Microcystis. However, because the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain, the effect would still be considered adverse.

CEQA Conclusion: Under Alternative 1B, operation of the water conveyance facilities is not expected to promote Microcystis bloom formation in the reservoirs and watersheds upstream of the Delta. Microcystis blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not due to water conveyance facility operations. Hydraulic residence times in the Export Service Area would not be affected by operations of CM1, and therefore conditions in those areas would not be more conducive to Microcystis bloom formation. Water exported from the Delta to the Export Service Area is expected to be a mixture of Microcystis-affected source water from the south Delta intakes and unaffected source water from the Sacramento River. Because of this, it cannot be determined whether operations and maintenance under Alternative 1B would result in increased or decreased levels of Microcystis and microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Water temperatures and hydraulic residence times in the Delta are expected to increase, which could result in an increase in Microcystis blooms and therefore microcystin levels. However, the water temperature increases in the Delta would be due to climate change primarily and not due to operation of the water conveyance facilities. Increases in Delta residence times would be due in small part to climate change and sea level rise, but due to a greater degree to operation of the water conveyance facilities and hydrodynamic impacts of restoration included in CM2 and CM4. Consequently, it is possible that increases in the frequency, magnitude, and geographic extent of Microcystis blooms in the Delta would occur due to the operations and maintenance of the water conveyance facilities and the hydrodynamic impacts of restoration under CM2 and CM4. Accordingly, beneficial uses including drinking water and recreational waters would be impacted and, as a result, public health. Therefore, this impact would be significant.

Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water quality due to Microcystis. Mitigation Measure WQ-32a requires that hydraulic residence time considerations be incorporated into restoration area site design for CM2 and CM4 using the best available science at the time of design. Mitigation Measure WQ-32b requires that the project proponents monitor for Microcystis abundance in the Delta and use appropriate statistical methods to determine whether increases in abundance are significant. This mitigation measure also requires that if Microcystis abundance increases (relative to Existing Conditions), the project proponents will investigate and evaluate measures that could be taken to reduce hydraulic residence time in the affected areas of the Delta. However, because the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and CM4

NEPA Effects: The amount and location of habitat restoration and enhancement that would occur under Alternative 1B would be the same as that described under Alternative 1A. Restoration activities implemented under CM2 and CM4 that would create shallow backwater areas could result in local increases in water temperature that may encourage Microcystis growth during the summer bloom season. This would result in further degradation of water quality beyond the hydrodynamic effects of CM2 and CM4 on Microcystis blooms identified in Impact PH-8. An increase in Microcystis blooms with implementation of CM2 and CM4 could potentially result in adverse effects on public health through exposure via drinking water quality and recreational waters. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on Microcystis from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain. This would be an adverse effect.

CEQA Conclusion: Restoration activities implemented under CM2 and CM4 that create shallow backwater areas could result in local increases in water temperature conducive to Microcystis growth during summer bloom season. This could compound the water quality degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact PH-8 and result in additional water quality degradation such that beneficial uses are affected. An increase in Microcystis blooms could potentially result in impacts on public health through exposure via drinking water quality and recreational waters. Therefore, this impact would be significant. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on Microcystis from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

25.3.3.4 Alternative 1C—Dual Conveyance with West Alignment and Intakes W1–W5 (15,000 cfs; Operational Scenario A)

The water supply facilities under Alternative 1C would be similar to those described for 1A with the exception that the five intakes would be located on the west bank of the Sacramento River between Clarksburg and Walnut Grove, rather than the east bank; the water would be conveyed from intakes to the intermediate pumping plant via a canal on the western side of the Delta rather than a pipeline/tunnel. There would be no intermediate forebay under this alternative. Water would be carried south along the western side of the Delta to an intermediate pumping plant, then pumped through a dual-bore tunnel to a continuing canal to the proposed Byron Tract Forebay immediately northwest of Clifton Court Forebay. Along the conveyance route, diverted water would travel under existing watercourses and one rail crossing through culvert siphons. A detailed description of the alternative is provided in Chapter 3, *Description of the Alternatives*, Section 3.5.4; a depiction of the physical components is provided in Mapbook Figure M3-3 in Chapter 3.

Generally, the water conveyance facilities construction techniques and operation for Alternative 1C would be the same as under Alternative 1A; therefore, Alternative 1C would have similar effects on public health to those described under Alternative 1A. CM2–CM21 would also be implemented under this alternative, and their effects would be the same as under Alternative 1A.

Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of the Water Conveyance Facilities

NEPA Effects: As with Alternative 1A, implementation of CM1 under Alternative 1C would involve construction and operation of five north Delta intakes, up to 15 solids lagoons, five sedimentation basins, and Byron Tract Forebay. Sedimentation basins and solids lagoons near the intakes have the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes) because of the large volumes of water that would be held within these areas. The depth, design, and operation of the sedimentation basins and solids lagoons would prevent the development of suitable mosquito habitat (Figure 25-1). Specifically, the basins would be too deep and the constant movement of water would prevent mosquitoes from breeding and multiplying. Sedimentation basins would be 120 feet long by 40 feet wide by 55 feet deep, and solids lagoons would be 165 feet long by 86 feet wide by 10 feet deep.

Although the proposed Byron Tract Forebay would increase surface water within the study area, it is unlikely that the forebay would provide suitable breeding habitat for mosquitoes given that the water in these forebay would not be stagnant and would be too deep. However, the shallow edges of the forebay could provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. However, as part of the regular maintenance of the forebay, floating vegetation such pond weed would be harvested to maintain flow and forebay capacity.

Although construction and operation of the water conveyance facilities would increase surface water area in the Plan Area and therefore potentially provide habitat for vectors that transmit diseases (e.g., mosquitoes), DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes. These BMPs would be consistent with practices presented in CDPH's *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). Activities will include, but not be limited to: testing for mosquito larvae during the high mosquito season (June through September), introducing biological controls such as mosquitofish if mosquitoes are present, and introducing physical controls (e.g., discharging water more frequently or increasing circulation) if mosquitoes are present. Accordingly, as described under Alternative 1A, construction and operation of the intakes, solids lagoons, and/or sedimentation basins under Alternative 1C would not substantially increase suitable vector habitat, and would not substantially increase vector-borne diseases. Therefore, no adverse effects would result.

***CEQA Conclusion*:** As with Alternative 1A, implementation of CM1 under Alternative 1C would involve construction and operation of solids lagoons, sedimentation basins and Byron Tract Forebay. These areas could provide suitable habitat for vectors (i.e., mosquitoes). During operations, water depth and circulation would prevent the solids lagoons and sedimentation basins from substantially increasing suitable vector habitat. However, the shallow edges on the periphery of Byron Tract Forebay could potentially provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes (see Impact PH-1 under Alternative 1A). These BMPs would be consistent with practices presented in CDPH's *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). Accordingly, construction and operation of the water conveyance facilities under Alternative 1C would not result in a substantial increase in vector-borne diseases and the impact would be less than significant. No mitigation is required.

Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That There is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance Facilities

NEPA Effects: Water supply operations under Alternative 1C (Operational Scenario A) would be identical to Alternative 1A. Further, Alternative 1C would have the same number of intakes as Alternative 1A and they would be constructed and operated in the same manner. Therefore, the water quality and public health effects described for Alternative 1A also appropriately characterize effects under Alternative 1C. There would be no substantial changes in trace metals, pesticides, or DBPs under Operational Scenario A relative to the No Action Alternative, with the exception of bromide concentrations at Barker Slough. Under Alternative 1C, long-term average bromide concentrations are expected to increase at the North Bay Aqueduct at Barker Slough, Staten Island, and Emmaton on the Sacramento River relative to the No Action Alternative. This increase would be greatest at Barker Slough (43%). Increases at Barker Slough would be more substantial during the drought period (93%). This increase in the long-term average bromide concentration at Barker Slough may require upgrades and/or changes to the existing water treatment plant. While treatment technologies sufficient to achieve the necessary bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken, a change of such magnitude in long-term average bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBPs in drinking water sources. Mitigation Measure WQ-5 is available to reduce these effects.I Implementation of this measure along with a separate other commitment as set forth in Appendix 3B, *Environmental Commitments, AMMs, and CMs*, relating to the potential increased treatment costs associated with bromide-related changes would reduce these effects. Further, as described for Impact PH-2 under Alternative 1A, the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be further minimized by implementation of the AIP.

CEQA Conclusion: The operation of water supply facilities under Alternative 1C would be the same as those described above for Alternative 1A. Water supply operations would increase contributions from the San Joaquin River relative to the Sacramento River, and decrease the dilution capacity of the Sacramento River for contaminants. Water quality modeling results indicate that changes in flows under Alternative 1C would, for the most part, not result in increased exceedances of water quality criteria for trace metals, pesticides, or DBPs in the study area (Chapter 8, *Water Quality*, Section 8.3.3.4). However, relative to Existing Conditions, bromide concentrations would increase at the North Bay Aqueduct at Barker Slough, Staten Island, and Emmaton on the Sacramento River, with the greatest increase occurring at Barker Slough (38%). During drought periods the increase would be more substantial (94%). The increase in long-term average bromide concentrations predicted for Barker Slough would result in a substantial change in source water quality to existing drinking water treatment plants drawing water from the North Bay Aqueduct. These modeled increases in bromide at Barker Slough could lead to adverse changes in the formation of DBPs at drinking water treatment plants such that considerable water treatment plant upgrades would be necessary to achieve equivalent levels of drinking water health protection. This would be a significant impact.

While treatment technologies sufficient to achieve the necessary bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken, a change of such magnitude in long-term average bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBPs in drinking water sources. Assuming the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be avoided or minimized by implementation of the AIP, the potential adverse water quality effects on the municipal beneficial uses potentially provided in Barker Slough would remain significant. While Mitigation Measure WQ-5 may reduce this impact, the feasibility and effectiveness of this mitigation measure are uncertain based on currently available information.

In addition to and to supplement Mitigation Measure WQ-5, the BDCP proponents have incorporated into the BDCP, as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, a separate other commitment to address the potential increased water treatment costs that could result from bromide-related concentration effects on municipal water purveyor operations. Potential options for making use of this financial commitment include funding or providing other assistance towards implementation of the North Bay Aqueduct AIP, acquiring alternative water supplies, or other actions to indirectly reduce the effects of elevated bromide and DOC in existing water supply diversion facilities. Please refer to Appendix 3B for the full list of potential actions that could be taken pursuant to this commitment in order to reduce the water quality treatment costs associated with water quality effects relating to chloride, electrical conductivity, and bromide. Because the BDCP proponents cannot ensure that the results of coordinated actions with water treatment entities will be fully funded or implemented successfully prior to the project's contribution to the impact, the ability to fully mitigate this impact is uncertain. If a solution that is identified by the BDCP proponents and an affected water purveyor is not fully funded, constructed, or implemented before the project's contribution to the impact is made, a significant impact in the form of increased DBP in drinking water sources could occur. Accordingly, this impact would be significant and unavoidable. If, however, all financial contributions, technical contributions, or partnerships required to avoid significant impacts prove to be feasible and any necessary agreements are completed before the project's contribution to the effect is made, impacts would be less than significant.

Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality Conditions; Site and Design Restoration Sites to Reduce Bromide Increases in Barker Slough

Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

Impact PH-3: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Construction, Operation or Maintenance of the Water Conveyance Facilities

NEPA Effects**:** Similar to effects described for Alternative 1A, sediment-disturbing activities during construction and maintenance of the water conveyance facilities under Alternative 1C could result in the disturbance of existing constituents in sediment, such as organochlorine or other legacy pesticides or methylmercury. During water conveyance facilities operation, changes in dilution and mixing of sources of water could result in a change in constituents known to bioaccumulate. For example, the reduction of flows in the Sacramento River downstream of the proposed north Delta intakes may result in a decreased dilution of constituents known to bioaccumulate in the study area.

As described for Alternative 1A, construction and operation of the water conveyance facilities under Alternative 1C would not result in a change in water dilution, and mixing of existing constituents would not affect the current status of legacy organochlorine pesticides or methylmercury in the study area. Intermittent and/or short-term construction-related activities (as would occur for in-river construction) would not be anticipated to result in contaminant discharges of substantial magnitude or duration sufficient to contribute to long-term bioaccumulation processes, or cause measureable long-term degradation, as described under Alternative 1A. Legacy pesticides typically bond to particulates and do not mobilize easily. Construction and maintenance of Alternative 1C would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column, as described in Alternative 1A. Additionally, water supply operations under any BDCP action alternative would not be expected to change total suspended solids or turbidity levels (highs, lows, typical conditions) to any substantial degree. Changes in the magnitude, frequency, and geographic distribution of legacy organochlorine pesticides in water bodies of the study area that would result in new or more severe adverse effects on beneficial uses, relative to the No Action Alternative, would not be expected to occur.

Based on water quality modeling results presented in Chapter 8, *Water Quality,* Section 8.3.3.4, and described under Impact PH-3 for Alternative 1A, operation of water conveyance facilities under Alternative 1C would not substantially alter mercury or methylmercury concentrations in the

Sacramento River or San Joaquin River, nor would it substantially alter mercury concentrations in fish tissues.

As environmental commitments, DWR would develop and implement Erosion and Sediment Control Plans and SWPPPs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMPs implemented under the Erosion and Sediment Control Plans and the SWPPPs would help reduce turbidity and keep sediment that may contain legacy organochlorine pesticides and methylmercury within the area of disturbance. Examples of these BMPs are described under Alternative 1A, Impact PH-3.

Accordingly, the potential for Alternative 1C to create a public health effect from bioaccumulation of legacy organochlorine pesticides and mercury or methlymercury in fish is minimal, and public health effects are not expected to be adverse.

***CEQA Conclusion*:** As described for Alternative 1A, construction and maintenance of Alternative 1C would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column based on the chemical properties of the pesticides. Although methylmercury currently exceeds the TMDL, little to no change in mercury or methylmercury concentrations in water is expected under Alternative 1C water conveyance construction. BMPs implemented as part of Erosion and Sediment Control Plans and SWPPPs would help ensure that construction activities would not substantially increase or substantially mobilize legacy organochlorine pesticides or methylmercury during construction and maintenance. Therefore, construction and maintenance of Alternative 1C would not cause increased exposure of the public to these bioaccumulative sediment constituents.

Alternative 1C would not result in increased tributary flows that would mobilize legacy organochlorine pesticides in sediments. Water quality modeling results showed small but insignificant changes in mercury and methylmercury levels in water at certain Delta locations and fish tissues due to Alternative 1C water operations. Because construction, maintenance, or operation of Alternative 1C would not cause substantial mobilization or substantial increase of constituents known to bioaccumulate, impacts on public health would be less than significant. No mitigation is required.

Impact PH-4: Expose Substantially More People to Transmission Lines Generating New Sources of EMFs as a Result of the Construction and Operation of the Water Conveyance Facilities

***NEPA Effects*:** Approximately 621 miles of existing transmission lines are located within the study area. As described in Table 25-9, a total of 13.73 miles of new temporary 69 kV transmission lines; 17.61 miles of new permanent 69 kV transmission lines; and 18.45 miles of new permanent 230 kV transmission lines would be required for this alternative. New transmission lines generating new sources of EMFs would be constructed under this alternative, the new temporary and permanent transmission lines would be located in rights-of-way of existing transmission lines or in sparsely populated areas (Figure 25-2). Table 25-9 identifies only two potential new sensitive receptor associated with this alternative, Under Alternative 1C, Fire Station 63, in Walnut Grove, would be within 300 feet of a proposed temporary 69 kV transmission line This line would be removed following completion of construction of the water conveyance facility features near this area so there would be no potential permanent effects. The majority of sensitive receptors in the study area are already located within 300 feet of an existing transmission line. Therefore, new temporary or new permanent transmission lines would not expose new sensitive receptors or substantially more people to EMFs that they are not already exposed. Because this proposed temporary 69 kV transmission line would be located in a sparsely populated area, would be within 300 feet of only one potential new sensitive receptor, and would be removed following construction of the water conveyance facilities for this alternative, the proposed temporary transmission line would not substantially increase people's exposure to EMFs.

As discussed in Section 25.1.1.5, the current scientific evidence does not show conclusively that EMF exposure increases health risks. In 2006, CPUC updated its EMF Policy and reaffirmed that health hazards from exposures to EMF have not been established. State and federal public health regulatory agencies have determined that setting numeric exposure limits is not appropriate. CPUC also reaffirmed that the existing no-cost and low-cost precautionary-based EMF policy should be continued. Based on this, utility companies are required to establish and maintain EMF Design Guidelines in order to minimize health risks associated with power lines. These guidelines would be implemented for any new temporary or new permanent transmission lines constructed and operated under Alternative 1C, depending on which electrical provider is selected by DWR. Furthermore, location and design of the proposed new transmission lines would be conducted in accordance with CPUC's EMF Design Guidelines for Electrical Facilities. Therefore, operation of the transmission line corridors would not expose substantially more people to transmission lines generating EMFs and there would be no adverse effects.

***CEQA Conclusion*:** The majority of proposed temporary and permanent transmission lines would be located within the right-of-way of existing transmission lines. In general, any new temporary or permanent transmission lines not within the right-of-way of existing transmission lines would be located in sparsely populated areas generally away from existing sensitive receptors. However, under this alternative a proposed temporary 69 kV transmission line would be located within 300 feet of Fire Station 63, in Walnut Grove. Design and implementation of new temporary or permanent transmission lines not within the right-of-way of existing transmission lines would follow CPUC's EMF Design Guidelines for Electrical Facilities and would implement shielding, cancelation, or distance measures to reduce EMF exposure. Further, this temporary transmission line would be removed once construction of the water conveyance facilities is completed. Since construction and operation of Alternative 1C would not expose substantially more people to transmission lines that generate new sources of EMFs, impacts would be less than significant, and no mitigation is required.

Impact PH-5: Increase in Vector-Borne Diseases as a Result of Implementing CM2-CM7, CM10 and CM11

***NEPA Effects*:** The amount and location of habitat restoration and enhancement that would occur under Alternative 1C would be the same as that described for Alternative 1A. Although there would be an increase in restored and enhanced aquatic habitat in the study area as a result of implementing Alternative 1C, implementation of environmental commitments, such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*), would reduce the potential for an increase in mosquito breeding habitat and a substantial increase in vector-borne diseases is unlikely to result. Furthermore, habitat would be restored in areas where potentially suitable habitat for mosquitoes already exists. Finally, mosquito predators (e.g., bats, spiders) would likely increase as a result of restoration and enhancement, which would keep mosquito populations in check. Accordingly, effects would be the same under Alternative 1C as 1A and there would not be a substantial increase in the public's risk of exposure to vector-borne diseases with implementation of CM2-CM7, CM10 and CM11. Accordingly, there would be no adverse effect.

CEQA Conclusion: Habitat restoration and enhancement would result in an increased amount of land potentially suitable for vector habitat (e.g., mosquitoes). However, as described above in Alternative 1A, Alternative 1C would require environmental commitments, such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*) that would help control mosquitoes and reduce the potential for an increase in mosquito breeding habitat. Furthermore, habitat would be restored where potentially suitable vector habitat already exists, and habitat restoration and enhancement would likely increase the number of mosquito predators. Therefore, as described under Alternative 1A, implementation of CM2–CM7, CM10 and CM11 under Alternative 1C would not substantially increase the public's risk of exposure to vector-borne diseases beyond what currently exists. Accordingly, this impact would be less than significant and no mitigation is required.

Impact PH-6: Substantial Increase in Recreationists' Exposure to Pathogens as a Result of Implementing the Restoration Conservation Measures

NEPA Effects: The amount and location of habitat restoration and enhancement that would occur under Alternative 1C would be the same as that described under Alternative 1A. Implementation of the restoration conservation measures would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). As exemplified by the Pathogen Conceptual Model, any potential increase in pathogens associated with the habitat restoration would be localized and within the vicinity of the actual restoration. This would be similar for lands protected for agricultural uses. Depending on the level of recreational access granted by management plans, habitat restoration could increase or decrease opportunities for recreationists within the Delta region. However, effects associated with pathogens would be the same under Alternative 1C as under Alternative 1A. Recreationists would not experience a substantial increase in exposure to pathogens as a result of the restoration and no adverse effect would result.

CEQA Conclusion: Implementation of the restoration conservation measures under Alternative 1C would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). However, the localized nature of pathogen generation and the quick die-off of some types of pathogens once released into water bodies would generally prevent substantial pathogen exposure to recreationists. Accordingly, impacts on public health would be less than significant and no mitigation is required.

Impact PH-7: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Implementing CM2, CM4, CM5, and CM10

NEPA Effects: The amount of habitat restoration would be the same under Alternative 1C as described under Alternative 1A. The primary concern with habitat restoration regarding constituents known to bioaccumulate is the potential for mobilizing contaminants sequestered in sediments of the newly inundated floodplains and marshes, as described under Alternative 1A. It is likely that the pesticide-bearing sediments would not be transported very far from the source area and would settle out with suspended particulates and be deposited close to the ROA during habitat restoration construction. Further, CM2–CM21 do not include the use of pesticides known to be bioaccumulative in animals or humans.

Methylmercury generation rates are ultimately dependent on the concentrations of mercury in the soils, and on the specific biogeochemistry of the system. The biogeochemistry and fate and transport of mercury and methylmercury are very complex. Restoration would involve inundation of areas where mercury has been sequestered in soils, and, if methylation occurs, the methylmercury would be mobilized into the aquatic system. While there would likely be an increase in mobilization and bioaccumulation of mercury and/or methylmercury in the study area's aquatic systems (i.e., fish and water) during the near-term, *CM12 Methylmercury Management* and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Therefore, implementation of the CM2, CM4, CM5, and CM10 under Alternative 1C is not expected to result in an adverse effect on public health with respect to pesticides or methylmercury.

CEQA Conclusion: Implementation of CM2, CM4, CM5, and CM10 would have the potential to mobilize sediment with existing levels of legacy organochlorine pesticides as a result of disturbing sediment during habitat restoration construction. However, it is unlikely that the pesticide-bearing sediments would be transported very far from the source area and they would likely settle out with suspended particulates and be deposited close to the ROAs during habitat restoration construction. While there would likely be an increase in mobilization and bioaccumulation of methylmercury in the study area's aquatic systems (i.e., fish and water) during the near-term, measures implemented under *CM12 Methylmercury Management*, and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Therefore, implementation of CM2, CM4, CM5, and CM10 under Alternative 1C would not substantially mobilize or substantially increase the public's exposure to constituents known to bioaccumulate and this impact would be less than significant. No mitigation is required.

Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water Conveyance Facilities

NEPA Effects: Water operations under Alternative 1C would be the same as under Alternative 1A. Therefore, potential effects on public health due to changes in water quality and beneficial uses as a result of *Microcystis* blooms and microcystin levels would be the same. Any modified reservoir operations under Alternative 1C are not expected to promote *Microcystis* production upstream of the Delta or in the rivers and streams of the Sacramento River watershed, watersheds of the eastern tributaries (Cosumnes, Mokelumne, and Calaveras Rivers), and the San Joaquin River upstream of the Delta.

As described in Chapter 8, *Water* Quality, *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not due to water conveyance facility operations. Similarly, hydraulic residence times in the Export Service Area would not be affected by operations of CM1. Accordingly, conditions would not be more conducive to *Microcystis* bloom formation. Water diverted from the Sacramento River in the north Delta is expected to be unaffected by *Microcystis*. However, the fraction of water flowing through the Delta that reaches the existing south Delta intakes is expected to be influenced by an increase in *Microcystis* blooms, as discussed below. Therefore, relative to the No Action Alternative, the addition of Sacramento River water from the north Delta under Alternative 1C would dilute *Microcystis* and microcystins in water diverted from the south Delta. Because the degree to which *Microcystis* blooms, and thus microcystins concentrations, would increase in source water from the south Delta is unknown, it cannot be determined whether Alternative 1C would result in increased or decreased levels of microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Ambient meteorological conditions would be the primary driver of Delta water temperatures, and climate warming, not water operations, would determine future water temperatures in the Delta. Increasing water temperatures due to climate change could lead to earlier attainment of the water temperature threshold required to initiate *Microcystis* bloom formation, and therefore earlier occurrences of *Microcystis* blooms in the Delta, as well as increases in the duration and magnitude. However, these temperature-related changes would not be different from what would occur under the No Action Alternative. Modeled hydraulic residence times in the Delta are projected to increase in the summer and fall periods in the north and west Delta and in the summer in Cache Slough, the east Delta, and south Delta relative to the No Action Alternative. Siting and design of restoration areas would have a substantial influence on the magnitude of residence time increases under Alternative 1C. The modeled increase in residence time in the Delta could result in an increase in the frequency, magnitude, and geographic extent of *Microcystis* blooms, and thus microcystin levels. Therefore, impacts on beneficial uses, including drinking water and recreational waters, could occur and public health could be affected. Accordingly, this would be considered an adverse effect.

Mitigation Measure WQ-32a and WQ-32b are available to reduce the effects of degraded water quality, and therefore potential public health effects, in the Delta due to *Microcystis*. However, because the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain, the effect would still be considered adverse.

CEQA Conclusion: Under Alternative 1C, operation of the water conveyance facilities is not expected to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta. *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not due to water conveyance facility operations. Residence times in the Export Service Area would not be affected by operations of CM1, and therefore conditions in those areas would not be more conducive to *Microcystis* bloom formation. Water exported from the Delta to the Export Service Area is expected to be a mixture of *Microcystis*-affected source water from the south Delta intakes and unaffected source water from the Sacramento River. Because of this, it cannot be determined whether operations and maintenance under Alternative 1C would result in increased or decreased levels of *Microcystis* and microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Water temperatures and hydraulic residence times in the Delta are expected to increase, which could result in an increase in *Microcystis* blooms and therefore microcystin levels. However, the water temperature increases in the Delta would be due to climate change primarily and not due to operation of the water conveyance facilities. Increases in Delta residence times would be due in small part to climate change and sea level rise, but due to a greater degree to operation of the water conveyance facilities and hydrodynamic impacts of restoration included in CM2 and CM4. Consequently, it is possible that increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms in the Delta would occur due to the operations and maintenance of the water conveyance facilities and the hydrodynamic impacts of restoration under CM2 and CM4. Accordingly, beneficial uses including drinking water and recreational waters would be impacted and, as a result, public health. Therefore, this impact would be significant.

Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time considerations be incorporated into restoration area site design for CM2 and CM4 using the best available science at the time of design. Mitigation Measure WQ-32b requires that the project proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods to determine whether increases in abundance are significant. This mitigation measure also requires that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will investigate and evaluate measures that could be taken to reduce residence time in the affected areas of the Delta. However, because the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and CM4

NEPA Effects: The amount and location of habitat restoration and enhancement that would occur under Alternative 1C would be the same as that described under Alternative 1A. Restoration activities implemented under CM2 and CM4 that would create shallow backwater areas could result in local increases in water temperature that may encourage *Microcystis* growth during the summer bloom season. This would result in further degradation of water quality beyond the hydrodynamic effects of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase in *Microcystis* blooms with implementation of CM2 and CM4 could potentially result in adverse effects on public health through exposure via drinking water quality and recreational waters. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain. This would be an adverse effect.

CEQA Conclusion: Restoration activities implemented under CM2 and CM4 that create shallow backwater areas could result in local increases in water temperature conducive to *Microcystis* growth during summer bloom season. This could compound the water quality degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact PH-8 and result in additional water quality degradation such that beneficial uses are affected. An increase in *Microcystis* blooms could potentially result in impacts on public health through exposure via drinking water quality and recreational waters. Therefore, this impact would be significant. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and hydraulic residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

25.3.3.5 Alternative 2A—Dual Conveyance with Pipeline/Tunnel and Five Intakes (15,000 cfs; Operational Scenario B)

Alternative 2A would include the same physical/structural components as Alternative 1A, but could potentially utilize two different intake and intake pumping plant locations. Water supply and conveyance operations would follow the guidelines described as Operational Scenario B, which includes Fall X2. In addition, an operable barrier at the Head of Old River to control fish passage would be constructed towards the end of the construction period, between 2022 and 2025. It would include a fish passage approximately 40 feet long and 10 feet wide, constructed of reinforced concrete. The fish passage would likely be open during summer and fall and closed with stoplogs during spring. CM2–CM21 would be implemented under this alternative, and would be the same as under Alternative 1A. See Chapter 3, *Description of Alternatives,* Section 3.5.5, for additional details on Alternative 2A.

Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of the Water Conveyance Facilities

***NEPA Effects*:** As with Alternative 1A, implementation of CM1 under Alternative 2A would involve construction and operation of up to 15 solids lagoons, five sedimentation basins, Byron Tract Forebay, an intermediate forebay, and a 350-acre inundation area adjacent to the intermediate forebay. Sedimentation basins, solids lagoons, the intermediate forebay inundation area, and the periphery of the intermediate forebay and Byron Tract Forebay have the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes) because of the large volumes of water that would be held within these areas. The depth, design, and operation of the sedimentation basins and solids lagoons would prevent the development of suitable mosquito habitat (Figure 25-1). Specifically, the basins would be too deep and the constant movement of water would prevent mosquitoes from breeding and multiplying. Sedimentation basins would be approximately 120 feet long by 40 feet wide by 55 feet deep, and solids lagoons would be approximately 165 feet long by 86 feet wide by 10 feet deep. Furthermore, use of the 350-acre inundation area would be limited to forebay emergency overflow situations and water would be pumped, creating circulation such that the area would have a low potential for creating suitable vector habitat. Similarly, water in the intermediate forebay and the Byron Tract Forebay would be circulated regularly and, with the exception of shallower areas around the periphery, would be too deep to provide suitable mosquito habitat. The shallower edges of the forebays could provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow.

To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County

MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes (see Impact PH-1 under Alternative 1A). These BMPs would be consistent with practices presented in CDPH's Best Management Practices for Mosquito Control in California (California Department of Public Health 2012).Implementation of these BMPs would reduce the likelihood that BDCP operations would require an increase in abatement activities by the local MVCDs. Therefore, as described under Alternative 1A, construction and operation of the intakes, solids lagoons, sedimentation basins, the forebays, and the intermediate forebay inundation area under Alternative 2A would not substantially increase suitable vector habitat and would not substantially increase vector-borne diseases. Accordingly, no adverse effects on public health would result.

CEQA Conclusion: As with Alternative 1A, implementation of CM1 under Alternative 2A would involve construction and operation of solids lagoons, sedimentation basins, an intermediate forebay and associated 350-acre inundation area, and Byron Tract Forebay. While these facilities could provide suitable habitat for vectors (e.g., mosquitoes), water depth and circulation would prevent the areas from substantially increasing suitable vector habitat. The inundation area would only be used during emergency overflow situations and water would be pumped back into the intermediate forebay, creating circulation that would discourage mosquito breeding. The shallower periphery of the intermediate forebay and Bryon Tract Forebay could provide suitable mosquito breeding habitat.

To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes. These BMPs would be consistent with practices presented in CDPH's Best Management Practices for Mosquito Control in California (California Department of Public Health 2012). See Impact PH-1 under Alternative 1A. Accordingly, construction and operation of the water conveyance facilities under Alternative 2A would not result in a substantial increase in vector-borne diseases and the impact on public health would be less than significant. No mitigation is required.

Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That There is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance Facilities

NEPA Effects:

Disinfection Byproducts

Under Alternative 2A, the geographic extent of effects pertaining to long-term average DOC concentrations and, by extension, the DBPs in the study area would be similar to that described for Alternative 1A and the magnitude of predicted long-term change and relative frequency of concentration threshold exceedances would be slightly greater (see Chapter 8, *Water Quality*, Section 8.3.3.5, for a detailed discussion). DOC water quality exceedance would conflict with the Basin Plan, as it exceeds the Basin Plan's requirements. The long-term change and exceedances in DOC would not be of a sufficient magnitude that they would require existing drinking water treatment plants to substantially upgrade treatment for DOC removal above levels currently employed. Under Alternative 2A, the geographic extent of effects pertaining to long-term average bromide concentrations in the study area would be similar to those described for Alternative 1A, although the magnitude of predicted long-term change and relative frequency of concentration threshold exceedances would be different. Relative to the No Action Alternative, modeled long-term average bromide concentrations would increase at Buckley Cove, Staten Island, Emmaton (during the drought period only) and the North Bay Aqueduct at Barker Slough. This increase would be greatest at Barker Slough, where average concentrations could increase by approximately 26%. This increase would be substantially greater in drought years (75%). (Chapter 8, *Water Quality*, Section 8.3.3.5).

This increase in long-term average bromide concentrations at Barker Slough could necessitate upgrades or changes in operations at certain water treatment plants. While treatment technologies sufficient to achieve the necessary bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken, a change of such magnitude in long-term average bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBP in drinking water sources. Mitigation Measure WQ-5 is available to reduce these effects. Implementation of this measure along with a separate other commitment as set forth in Appendix 3B, *Environmental Commitments, AMMs, and CMs*, relating to the potential increased treatment costs associated with bromide-related changes would reduce these effects. Further, as described for Impact PH-2 under Alternative 1A, the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be further minimized by implementation of the AIP.

Trace Metals

Water quality modeling results indicate that for metals of primarily human health and drinking water concern (arsenic, iron, manganese), concentrations in Delta waters relative to the No Action Alternative are not expected to change substantially. Average concentrations for arsenic, iron, and manganese in the primary source water (Sacramento River, San Joaquin River, and the Bay at Martinez) would not exceed drinking water quality criteria. No mixing of these three source waters would result in a metal concentration greater than the highest source water concentration, and, given that the average water concentrations for arsenic, iron, and manganese do not exceed water quality criteria, more frequent exceedances of drinking water criteria in the Delta would not be expected to occur under this alternative. Consequently, no adverse effect on public health related to the trace metals arsenic, iron, or manganese from drinking water sources is anticipated.

Pesticides

Sources of pesticides to the study area include direct input of surface runoff from in-Delta agriculture and Delta urbanized areas as well inputs from rivers upstream of the Delta. These sources would not be affected by implementing Alternative 2A. However, under Alternative 2A operations, the distribution and mixing of Delta source waters would change relative to the No Action Alternative. As discussed in Chapter 8, *Water Quality*, modeling results indicate that in the long-term, relative to the No Action Alternative, modeled changes in the source water fractions of Sacramento, San Joaquin and Delta agriculture water are not of sufficient magnitude to adversely affect beneficial uses of the Delta. Therefore, it is not anticipated that there would be adverse effects on public health related to pesticides from drinking water sources.

CEQA Conclusion: The operation of water supply facilities under Alternative 2A would adhere to the criteria set forth under Operational Scenario B. As described in Chapter 8, *Water Quality*, Section 8.3.3.5, water quality modeling results indicate that, for the most part, there would be no substantial changes in trace metals, DBPs, or pesticides relative to Existing Conditions under this operational scenario. However, relative to Existing Conditions, bromide concentrations would increase at the

North Bay Aqueduct at Barker Slough, Staten Island, and Emmaton (during the drought period only), with the greatest increase occurring at Barker Slough (22%). During the drought period the increase in bromide would be more substantial (75%). The increase in long-term average bromide concentrations predicted for Barker Slough would result in a substantial change in source water quality to existing drinking water treatment plants drawing water from the North Bay Aqueduct. These modeled increases in bromide at Barker Slough could lead to adverse changes in the formation of DBPs at drinking water treatment plants such that considerable water treatment plant upgrades would be necessary in order to achieve equivalent levels of drinking water health protection. This would be a significant impact.

While treatment technologies sufficient to achieve the necessary bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken, a change of such magnitude in long-term average bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBPs in drinking water sources. Assuming the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be avoided or minimized by implementation of the AIP, the potential adverse water quality effects on the municipal beneficial uses potentially provided in Barker Slough would remain significant. While Mitigation Measure WQ-5 may reduce this impact, the feasibility and effectiveness of this mitigation measure are uncertain based on currently available information.

In addition to and to supplement Mitigation Measure WQ-5, the BDCP proponents have incorporated into the BDCP, as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, a separate other commitment to address the potential increased water treatment costs that could result from bromide-related concentration effects on municipal water purveyor operations. Potential options for making use of this financial commitment include funding or providing other assistance towards implementation of the North Bay Aqueduct AIP, acquiring alternative water supplies, or other actions to indirectly reduce the effects of elevated bromide and DOC in existing water supply diversion facilities. Please refer to Appendix 3B, *Environmental Commitments, AMMs, and CMs*, for the full list of potential actions that could be taken pursuant to this commitment in order to reduce the water quality treatment costs associated with water quality effects relating to chloride, electrical conductivity, and bromide. Because the BDCP proponents cannot ensure that the results of coordinated actions with water treatment entities will be fully funded or implemented successfully prior to the project's contribution to the impact, the ability to fully mitigate this impact is uncertain. If a solution that is identified by the BDCP proponents and an affected water purveyor is not fully funded, constructed, or implemented before the project's contribution to the impact is made, a significant impact in the form of increased DBP in drinking water sources could occur. Accordingly, this impact would be significant and unavoidable. If, however, all financial contributions, technical contributions, or partnerships required to avoid significant impacts prove to be feasible and any necessary agreements are completed before the project's contribution to the effect is made, impacts would be less than significant.

Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality Conditions; Site and Design Restoration Sites to Reduce Bromide Increases in Barker Slough

Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

Impact PH-3: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Construction, Operation or Maintenance of the Water Conveyance Facilities

NEPA Effects: Similar to effects described for Alternative 1A, sediment-disturbing activities during construction and maintenance of the water conveyance facilities under Alternative 2A could result in the disturbance of existing constituents, such as legacy organochlorine pesticides, or methylmercury in sediment. During water conveyance facilities operation, changes in dilution and mixing of sources of water could result in a change in constituents known to bioaccumulate. For example, the reduction of flows in the Sacramento River downstream of the proposed north Delta intakes may result in a decreased dilution of constituents known to bioaccumulate in the study area.

As described under Alternative 1A, construction and operation of the water conveyance facilities under Alternative 2A would not result in a change in water dilution and mixing of existing constituents and would not affect the current status of organochlorine or other legacy pesticides. Intermittent and/ short-term construction-related activities (as would occur for in-river construction) would not be anticipated to result in contaminant discharges of sufficient magnitude or duration to contribute to long-term bioaccumulation processes, or cause measureable long-term degradation as described under Alternative 1A. Legacy organochlorine pesticides typically bond to particulates, and do not mobilize easily. Construction and maintenance of Alternative 2A would not cause these pesticides to be transported far from the source or to partition into the water column, as described under Alternative 1A. Additionally, water supply operations under any BDCP action alternative would not be expected to change total suspended solids or turbidity levels (highs, lows, typical conditions) to any substantial degree. Changes in the magnitude, frequency, and geographic distribution of legacy organochlorine pesticides in water bodies of the affected environment that would result in new or more severe adverse effects on beneficial uses, relative to the No Action Alternative, would not be expected to occur.

Modeling results indicate small, insignificant changes in total mercury and methylmercury levels in water and fish tissues resulting from Alternative 2A water operations (Chapter 8, *Water Quality*, Section 8.3.3.5). Upstream mercury contributions and methylmercury production in Delta waters would not be altered by the operation of Alternative 2A, as it would not change existing mercury sources and would not substantially alter methylmercury concentrations in the Sacramento River or San Joaquin River. Modeling results indicate that the percentage change in assimilative capacity of waterborne total mercury relative to the 25 ng/L Ecological Risk Benchmark for this alternative showed the greatest decrease (2.1%), relative to the No Action Alternative, at Old River at Rock Slough. Similarly, changes in methylmercury concentration are expected to be very small. Fish tissue estimates showed small or no increase in exceedance quotients based on long-term annual average concentrations at the nine Delta locations modeled. The greatest increase in exceedance quotients was 11-12% at Mokelumne River (South Fork) at Staten Island, Franks Tract and Old River at Rock Slough relative to the No Action Alternative.

As environmental commitments, DWR would develop and implement Erosion and Sediment Control Plans and SWPPPs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMPs implemented under the Erosion and Sediment Control Plans and the SWPPPs would help reduce turbidity and keep sediment that may contain methylmercury within the area of disturbance during construction and maintenance. Further, operations under Alternative 2A are not expected to increase mercury concentrations substantially and therefore there would be no long-term water quality degradation such that beneficial uses are adversely affected. Increases in mercury or methylmercury concentrations are not likely to be measurable, and changes in mercury concentrations or fish tissue mercury concentrations would not make any existing mercury-related impairment measurably worse. Therefore, it is not expected that aquatic organisms would have measurably higher body burdens of mercury as a result of Alternative 2A water operations. Accordingly, the potential for Alternative 2A to create a public health effect from bioaccumulation of legacy organochlorine pesticides and mercury or methlymercury in fish is minimal, and public health effects are not expected to be adverse.

CEQA Conclusion**:** Construction and maintenance of the water conveyance facilities under Alternative 2A would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column based on the chemical properties of the pesticides. Although methylmercury currently exceeds the TMDL, little to no change in methylmercury concentrations in water is expected under Alternative 2A water conveyance facilities construction. BMPs implemented as part of Erosion and Sediment Control Plans and SWPPPs would help ensure that construction activities would not substantially increase or substantially mobilize legacy organochlorine pesticides or methylmercury during construction and maintenance. Therefore, construction and maintenance of Alternative 2A would not cause increased exposure of the public to these bioaccumulative sediment constituents.

Alternative 2A would not result in increased tributary flows that would mobilize legacy organochlorine pesticides in sediments. Water quality modeling results showed small changes in mercury and methylmercury levels in water at certain Delta locations. Specifically the analysis of percentage change in assimilative capacity of waterborne total mercury relative to the 25 ng/L ecological risk benchmark showed a 2.2% decrease for Old River at Rock Slough relative to Existing Conditions. The greatest increase in exceedance quotients for mercury in fish tissues due to Alternative 2A water operations relative to Existing Conditions was 13% at Old River at Rock Slough. Because mercury concentrations are not expected to increase substantially, no long-term water quality degradation is expected to occur and, thus, no adverse effects to beneficial uses would occur. Because any increases in mercury or methylmercury concentrations are not likely to be measurable, changes in mercury concentrations or fish tissue mercury concentrations would not make any existing mercury-related impairment measurably worse. In comparison to Existing Conditions, Alternative 2A would not increase levels of mercury by frequency, magnitude, and geographic extent such that the affected environment would be expected to have measurably higher body burdens of mercury in aquatic organisms or humans consuming those organisms.

Because construction, maintenance, or operation of Alternative 2A would not cause substantial mobilization or substantial increase of constituents known to bioaccumulate (i.e., organochlorine pesticides or mercury), and therefore impacts on public health would be less than significant. No mitigation is required.

Impact PH-4: Expose Substantially More People to Transmission Lines Generating New Sources of EMFs as a Result of the Construction and Operation of the Water Conveyance Facilities

NEPA Effects**:** Alternative 2A has different intakes than 1A, as the intakes could be 1, 2, 3, 4, and 5; or 1, 2, 3, 6, and 7. Thus, a different configuration of transmission lines may be required; however, the total number of intakes would remain the same (five). Approximately 621 miles of existing transmission lines are located within the study area. As described in Table 25-9, a total of 24.71 miles of new temporary 69 kV transmission lines; 14.46 mile of new permanent 69 kV transmission lines; and 42.68 miles of new permanent 230 kV transmission lines would be required for this alternative.

New transmission lines generating new sources of EMFs would be constructed under this alternative; the new temporary and permanent transmission lines would generally be located in sparsely populated areas (Figure 25-2). However, as indicated in Table 25-9, Stone Lakes National Wildlife Refuge would be within 300 feet of a proposed temporary 69 kV transmission line. Visitors to this area generally come for walks, water recreation, and hunting, and as such, it is unlikely that large groups of people would be staying in the area within 300 feet of this proposed transmission line, so any EMF exposure would be limited. Further, this line would be removed when construction of the water conveyance facility features near this area is completed, so there would be no potential permanent effects. Therefore, this temporary transmission line would not substantially increase people's exposure to EMFs. As described for Alternative 1A, the majority of sensitive receptors are already located within 300 feet of an existing 69 kV or 230 kV transmission line. Accordingly, the majority of new temporary or new permanent transmission lines would not expose sensitive receptors or substantially more people to EMFs that they are not already experiencing. Because the lines would be located in sparsely populated areas and would be within 300 feet of only one potential new sensitive receptor, the proposed transmission line would not substantially increase people's exposure to EMFs.

As discussed in Section 25.1.1.5, the current scientific evidence does not show conclusively that EMF exposure can increase health risks. In 2006, CPUC updated its EMF Policy and reaffirmed that health hazards from exposures to EMF have not been established. State and federal public health regulatory agencies have determined that setting numeric exposure limits is not appropriate. CPUC also reaffirmed that the existing no-cost and low-cost precautionary-based EMF policy should be continued. Based on this, utility companies are required to establish and maintain EMF Design Guidelines in order to minimize health risks associated with power lines. These guidelines would be implemented for any new temporary or new permanent transmission lines constructed and operated under Alternative 2A, depending on which electric provider is selected by DWR. Furthermore, location and design of the new transmission lines would be conducted in accordance with CPUC's EMF Design Guidelines for Electrical Facilities. Therefore, operation of the transmission line corridors would not expose substantially more people to transmission lines generating EMFs, and there would be no adverse effect on public health.

CEQA Conclusion**:** In general, the proposed temporary (69 kV) and permanent (69 kV and 230 kV) transmission lines would be located in rights-of-way of existing transmission lines or in sparsely populated areas generally away from existing potentially sensitive receptors. However, one sensitive receptor, Stone Lakes National Wildlife Refuge, would be within 300 feet of a proposed 69 kV temporary transmission line for Alternative 2A. Because visitors to this area generally come for walks, water recreation, and hunting, it is unlikely that large groups of people would be staying in the area within 300 feet of this proposed transmission line, so any EMF exposure would be limited. Further, this line would be removed when construction of the water conveyance facility features near this area is completed, so there would be no potential permanent effects. Therefore, this temporary transmission line would not substantially increase people's exposure to EMFs. Design and implementation of new temporary or permanent transmission lines not within the right-of-way of existing transmission lines would follow CPUC's EMF Design Guidelines for Electrical Facilities and would implement shielding, cancelation, or distance measures to reduce EMF exposure. Because construction and operation of Alternative 2A would not expose substantially more people to transmission lines that generate new sources of EMFs, impacts on public health would be less than significant, and no mitigation is required.

Impact PH-5: Increase in Vector-Borne Diseases as a Result of Implementing CM2-CM7, CM10 and CM11

***NEPA Effects*:** The amount and location of habitat restoration and enhancement that would occur under Alternative 2A would be the same as that described for Alternative 1A. Although there would be an increase in restored and enhanced aquatic habitat in the study area as a result of implementing Alternative 2A, implementation of environmental commitments, such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*), would reduce the potential for an increase in mosquito breeding habitat, and a substantial increase in vector-borne diseases is unlikely to result. Furthermore, habitat would be restored in areas where potentially suitable habitat for mosquitoes already exists. Finally, mosquito predators (e.g., bats, spiders) would likely increase as a result as restoration and enhancement, which would keep mosquito populations in check. Therefore, effects would be the same under Alternative 2A as under Alternative 1A and there would not be a substantial increase in the public's risk of exposure to vector-borne diseases with implementation of CM2-CM7, CM10 and CM11. Accordingly, there would be no adverse effect.

***CEQA Conclusion*:** Habitat restoration and enhancement would result in an increased amount of land potentially suitable for vector habitat (e.g., mosquitoes). However, as described above under Alternative 1A, Alternative 2A would require environmental commitments, such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*) that would help control mosquitoes and reduce the potential for an increase in mosquito breeding habitat. Furthermore, habitat would be restored where potentially suitable vector habitat already exists, and habitat restoration and enhancement would likely increase the number of mosquito predators. Therefore, as described under Alternative 1A, implementation of CM2-CM7, CM10 and CM11 under Alternative 2A would not substantially increase the public's risk of exposure to vector-borne diseases beyond what currently exists. Accordingly, this impact would be less than significant and no mitigation is required.

Impact PH-6: Substantial Increase in Recreationists' Exposure to Pathogens as a Result of Implementing the Restoration Conservation Measures

***NEPA Effects*:** The amount and location of habitat restoration and enhancement that would occur under Alternative 2A would be the same as that described for Alternative 1A. Implementation of the conservation measures would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). As exemplified by the Pathogen Conceptual Model, any potential increase in pathogens associated with the habitat restoration would be localized and within the vicinity of the actual restoration. This would be similar for lands protected for agricultural uses. Depending on the level of recreational access granted by management plans, habitat restoration could increase or decrease opportunities for recreationists within the Delta region. However, effects associated with pathogens and would be the same under Alternative 2A as under Alternative 1A. Recreationists would not experience a substantial increase in exposure to pathogens as a result of the restoration and no adverse effect would result.

CEQA Conclusion: Implementation of the restoration conservation measures under Alternative 2A would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). However, the localized nature of pathogen generation and the quick die-off of some types of pathogens once released into water bodies would generally prevent substantial pathogen exposure to recreationists. Accordingly, impacts on public health would be less than significant. No mitigation is required.

Impact PH-7: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Implementing CM2, CM4, CM5, and CM10

NEPA Effects: The amount of habitat restoration would be the same under Alternative 2A as described for Alternative 1A. The primary concern with habitat restoration regarding constituents known to bioaccumulate is the potential for mobilizing contaminants sequestered in sediments of the newly inundated floodplains and marshes, as described under Alternative 1A. It is likely that the pesticide-bearing sediments would not be transported very far from the source area, and would settle out with suspended particulates and be deposited close to the ROA. Further, CM2–CM21 do not include the use of pesticides known to be bioaccumulative in animals or humans.

Methylmercury generation rates are ultimately dependent on the concentrations of mercury in the soils, and on the specific biogeochemistry of the system. The biogeochemistry and fate and transport of mercury and methylmercury are very complex. Restoration would involve inundation of areas where mercury has been sequestered in soils, and, if methylation occurs, the methylmercury would be mobilized into the aquatic system. While there would likely be an increase in mobilization and bioaccumulation for methylmercury in the study area's aquatic systems (e.g., fish and water) during the near-term, *CM12 Methylmercury Management* and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Therefore, implementation of CM2, CM4, CM5, and CM10 under Alternative 2A is not expected to result in an adverse effect on public health with respect to pesticides or methylmercury.

CEQA Conclusion: Implementation of CM2, CM4, CM5, and CM10 would have the potential to mobilize sediment with existing levels of legacy organochlorine pesticides as a result of disturbing sediment during habitat restoration construction. However, it is unlikely that the pesticide-bearing sediments would be transported very far from the source area and they would likely settle out with suspended particulates and be deposited close to the ROAs during habitat restoration construction. While there would likely be an increase in mobilization and bioaccumulation of methylmercury in the study area's aquatic systems (i.e., fish and water) during the near-term, measures implemented under *CM12 Methylmercury Management*, and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Therefore, implementation of CM2, CM4, CM5, and CM10 under Alternative 1C would not substantially mobilize or substantially increase the public's exposure to constituents known to bioaccumulate and this impact would be less than significant. No mitigation is required.

Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water Conveyance Facilities

NEPA Effects: Because factors that affect *Microcystis* abundance in waters upstream of the Delta, in the Delta, and in the SWP/CVP Export Services Areas under Alternative 1A would similarly change under Alternative 2A, *Microcystis* abundance, and thus microcystins concentrations, in water bodies of the affected environment under Alternative 2A would be very similar (i.e., nearly the same) to those discussed for Alternative 1A.

As described in Chapter 8, *Water Quality*, although *Microcystis* blooms have not occurred in the Export Service Areas, conditions in the Export Service Areas under Alternative 2A may become more conducive to *Microcystis* bloom formation because water temperatures will increase in the Export Service Areas due to the expected increase in ambient air temperatures resulting from climate change, but not from operation of the water conveyance facilities. Under Alternative 2A, relative to No Action Alternative, water exported to the SWP/CVP Export Service Area will be a mixture of *Microcystis*-affected source water from the south Delta intakes and unaffected source water from the Sacramento River, diverted at the north Delta intakes. It cannot be determined whether operations and maintenance under Alternative 2A will result in increased or decreased levels of *Microcystis* and microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Like Alternative 1A, elevated ambient water temperatures would occur in the Delta under Alternative 2A, which could lead to earlier occurrences of *Microcystis* blooms in the Delta, and increase the overall duration and magnitude of blooms. However, as described in Chapter 8, *Water Quality*, the increase in Delta water temperatures, and consequent potential increase in *Microcystis* blooms, would be driven entirely by climate change, not by operation of water conveyance facilities. There would be differences in the direction and magnitude of hydraulic residence time changes during the *Microcystis* bloom period due to operation of the water conveyance facilities under Alternative 2A compared to Alternative 1A, relative to the No Action Alternative. As a result, *Microcystis* blooms, and therefore microcystin, could increase in surface waters throughout the Delta. Therefore, impacts on beneficial uses, including drinking water and recreational waters, could occur and public health could be affected. Accordingly, this would be considered an adverse effect.

Mitigation Measure WQ-32a and WQ-32b are available to reduce the effects of degraded water quality in the Delta. Although there is uncertainty regarding this impact, the effects on *Microcystis* from implementing CM1 is determined to be adverse.

CEQA Conclusion: Under Alternative 2A, operation of the water conveyance facilities is not expected to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta. *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not due to water conveyance facility operations. Residence times in the Export Service Area would not be affected by operations of CM1, and therefore conditions in those areas would not be more conducive to *Microcystis* bloom formation. Water exported from the Delta to the Export Service Area is expected to be a mixture of *Microcystis*-affected source water from the south Delta intakes and unaffected source water from the Sacramento River. Because of this, it cannot be determined whether operations and maintenance under Alternative 2A would result in increased or decreased levels of *Microcystis* and microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Water temperatures and hydraulic residence times in the Delta are expected to increase, which could result in an increase in *Microcystis* blooms and therefore microcystin levels. However, the water temperature increases in the Delta would be due to climate change and not due to operation of the water conveyance facilities. Increases in Delta residence times would be due in small part to climate change and sea level rise, but due to a greater degree to operation of the water conveyance facilities and hydrodynamic impacts of restoration included in CM2 and CM4. Consequently, it is possible that increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms in the Delta would occur due to the operations and maintenance of the water conveyance facilities and the hydrodynamic impacts of restoration under CM2 and CM4. Accordingly, beneficial uses including drinking water and recreational waters would be impacted and, as a result, public health. Therefore, this impact would be significant.

Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time considerations be incorporated into restoration area site design for CM2 and CM4 using the best available science at the time of design. Mitigation Measure WQ-32b requires that the project proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods to determine whether increases in abundance are significant. This mitigation measure also requires that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will investigate and evaluate measures that could be taken to reduce residence time in the affected areas of the Delta. However, because the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and CM4

NEPA Effects: The amount and location of habitat restoration and enhancement that would occur under Alternative 2A would be the same as that described under Alternative 1A. Restoration activities implemented under CM2 and CM4 that would create shallow backwater areas could result in local increases in water temperature that may encourage *Microcystis* growth during the summer bloom season. This would result in further degradation of water quality beyond the hydrodynamic effects of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase in *Microcystis* blooms with implementation of CM2 and CM4 could potentially result in adverse effects on public health through exposure via drinking water quality and recreational waters. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain. This would be an adverse effect.

CEQA Conclusion: The effects of CM2 and CM4 on *Microcystis* under Alternative 2A are the same as those discussed for Alternative 1A. Restoration activities implemented under CM2 and CM4 that create shallow backwater areas could result in local increases in water temperature conducive to *Microcystis* growth during summer bloom season. This could compound the water quality degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact

PH-8 and result in additional water quality degradation such that beneficial uses are affected. An increase in *Microcystis* blooms could potentially result in impacts on public health through exposure via drinking water quality and recreational waters. Therefore, this impact would be significant. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

25.3.3.6 Alternative 2B—Dual Conveyance with East Alignment and Five Intakes (15,000 cfs; Operational Scenario B)

Alternative 2B would involve construction activities similar to those under Alternative 1A, with the addition of an operable barrier at the Head of Old River to facilitate fish passage during summer and fall. However, the water conveyance facilities would be the same as under Alternative 1B with the exception that two alternative intake locations (Intakes 6 and 7—located downstream of Sutter and Steamboat Sloughs) might be utilized. In addition, Alternative 2B has the same diversion and conveyance operations as Alternative 2A. The primary difference between the two alternatives is that conveyance under Alternative 2B would be in a lined or unlined canal, instead of a pipeline/tunnel conveyance. Because there would be no difference in conveyance capacity or operations, there would be no differences between these two alternatives in Delta inflow, source fractions to various Delta locations, and hydrodynamics in the Delta. CM2–CM21 under Alternative 2B would be the same as described under Alternative 1A.

Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of the Water Conveyance Facilities

NEPA Effects**:** As with Alternative 1A, implementation of CM1 under Alternative 2B would involve construction and operation of up to 15 solids lagoons, 5 sedimentation basins and Bryon Tract Forebay. These facilities have the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes) because of the large volumes of water that would be held within these areas. Sedimentation basins would be 120 feet long by 40 feet wide by 55 feet deep, and solids lagoons would be 165 feet long by 86 feet wide by 10 feet deep. The depth, design, and operation of the sedimentation basins and solids lagoons would prevent the development of suitable mosquito habitat (Figure 25-1). Specifically, the basins would be too deep and the constant movement of water would prevent mosquitoes from breeding and multiplying.

Although the proposed Byron Tract Forebay would increase surface water within the study area, it is unlikely that the forebay would provide suitable breeding habitat for mosquitoes given that the water in this forebay would not be stagnant and would be too deep. However, the shallow edges of the forebay could potentially provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. However, as part of the regular maintenance of the forebay, floating vegetation such as pond weed would be harvested to maintain flow and forebay capacity.

To minimize the potential for causing impacts related to increasing suitable mosquito habitat in the Plan Area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes. These BMPs would be consistent with practices presented in CDPH's *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). See Impact PH-1 under Alternative 1A. Therefore, as described for Alternative 1A, construction and operation of the water conveyance facilities under Alternative 2B would not substantially increase suitable vector habitat and would not substantially increase vector-borne diseases. No adverse effects would result.

***CEQA Conclusion*:** As with Alternative 1A, implementation of CM1 under Alternative 2B would involve construction and operation of solids lagoons, sedimentation basins, and the Byron Tract Forebay. These areas could provide suitable habitat for vectors (e.g., mosquitoes). During operations, water depth and circulation would prevent these areas from substantially increasing suitable vector habitat. However, the shallow edges on the periphery of Byron Tract Forebay could potentially provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes. See Impact PH-1 under Alternative 1A. These BMPs would be consistent with practices presented in *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). Therefore, construction and operation of the water conveyance facilities under Alternative 2B would not result in a substantial increase in vector-borne diseases and the impact would be less than significant. No mitigation is required.

Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That There is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance Facilities

NEPA Effects: The water quality and public health effects related to DBPs, pesticides and trace metals described for Alternative 2A also appropriately characterize effects under this alternative. There would be no substantial changes in trace metals or DBPs under Operational Scenario B. DOC water quality exceedances described above in Alternative 2A would conflict with the Basin Plan, as it exceeds the Basin Plan's requirements. However, the long-term change and exceedances in DOC would not be of a sufficient magnitude that they would require existing drinking water treatment plants to substantially upgrade treatment for DOC removal above levels currently employed. Relative to the No Action Alternative, bromide concentrations would increase at Buckley Cove, the North Bay Aqueduct at Barker Slough, Staten Island, and Emmaton (during the dry period only), with the greatest increase (26%) occurring at Barker Slough (Chapter 8, *Water Quality*, Section 8.3.3.6). This increase would be more substantial during the drought period (75%).

This increase in the long-term average bromide concentration at Barker Slough may require upgrades and/or changes in operations at certain water treatment plants. While treatment technologies sufficient to achieve the necessary bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken, a change of such magnitude in long-term average bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBP in drinking water sources. Mitigation Measure WQ-5 is available to reduce these effects. Implementation of this measure along with a separate other commitment as set forth in Appendix 3B, *Environmental Commitments, AMMs, and CMs* relating to the potential increased treatment costs associated with bromide-related changes would reduce these effects. Further, as described for Impact PH-2 under Alternative 1A, the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be further minimized by implementation of the AIP.

Water quality modeling results for pesticides indicate that in the long-term, relative to the No Action Alternative, there would be a potential increase in pesticide toxicity to aquatic life in the summer source water fraction at Buckley Cove. This increase would result from the apparent greater incidence of pesticides in the San Joaquin River and its relative contribution to the total source water volume at this location during July and August. A conclusion regarding the risk to human health at this location, based on the predicted adverse effects from pesticides on aquatic life, cannot be made. However, because the modeled increase would only occur at one location, and over a very short period during the year, it is expected that the potential for affecting public health would be relatively low. Additionally, the prediction of adverse effects of pesticides on water quality relative to the No Action Alternative fundamentally assumes that the present pattern of pesticide incidence in surface water would occur at similar levels into the future. In reality, the makeup and character of the pesticide use market during the late long-term would not be exactly as it is today. Use of chlorpyrifos and diazinon is on the decline with their replacement by pyrethroids on the rise. Yet in this assessment it is the apparent greater incidence of diazinon and chlorpyrifos in the San Joaquin River that serves as the basis for concluding that substantially increased San Joaquin River source water fraction would correspond to an increased risk of pesticide-related toxicity to aquatic life. Water treatment plants are required to meet certain drinking water standards, as previously described. Therefore, it is not anticipated that there would be adverse effects on public health from exceedances of water quality criteria for pesticides in drinking water sources.

CEQA Conclusion: The operation of water supply facilities under Alternative 2B would adhere to the criteria set forth under Operational Scenario B. Water quality modeling results indicate that, for the most part, there would be no substantial changes in trace metals, DBPs, or pesticides relative to Existing Conditions under this operational scenario. However, relative to Existing Conditions bromide concentrations would increase at the North Bay Aqueduct at Barker Slough, Staten Island, and Emmaton (during the dry period only), with the greatest increase occurring at Barker Slough (22%). The increase in bromide concentration would be more substantial during the drought period (75%). This modeled increase in in the long-term average bromide concentration at Barker Slough could lead to adverse changes in the formation of DBPs at drinking water treatment plants such that considerable water treatment plant upgrades would be necessary to achieve equivalent levels of drinking water health protection. This would be a significant impact.

While treatment technologies sufficient to achieve the necessary bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken, a change of such magnitude in long-term average bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBPs in drinking water sources. Assuming the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be avoided or minimized by implementation of the AIP, the potential adverse water quality effects on the municipal beneficial uses potentially provided in Barker Slough would remain significant. While Mitigation Measure WQ-5 may reduce this impact, the feasibility and effectiveness of this mitigation measure are uncertain based on currently available information.

In addition to and to supplement Mitigation Measure WQ-5, the BDCP proponents have incorporated into the BDCP, as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, a separate other commitment to address the potential increased water treatment costs that could result from bromide-related concentration effects on municipal water purveyor operations. Potential options for making use of this financial commitment include funding or providing other assistance towards implementation of the North Bay Aqueduct AIP, acquiring alternative water supplies, or other actions to indirectly reduce the effects of elevated bromide and DOC in existing water supply diversion facilities. Please refer to Appendix 3B for the full list of potential actions that could be taken pursuant to this commitment in order to reduce the water quality treatment costs associated with water quality effects relating to chloride, electrical conductivity, and bromide. Because the BDCP proponents cannot ensure that the results of coordinated actions with water treatment entities will be fully funded or implemented successfully prior to the project's contribution to the impact, the ability to fully mitigate this impact is uncertain. If a solution that is identified by the BDCP proponents and an affected water purveyor is not fully funded, constructed, or implemented before the project's contribution to the impact is made, a significant impact in the form of increased DBP in drinking water sources could occur. Accordingly, this impact would be significant and unavoidable. If, however, all financial contributions, technical contributions, or partnerships required to avoid significant impacts prove to be feasible and any necessary agreements are completed before the project's contribution to the effect is made, impacts would be less than significant.

Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality Conditions; Site and Design Restoration Sites to Reduce Bromide Increases in Barker Slough

Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

Impact PH-3: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Construction, Operation or Maintenance of the Water Conveyance Facilities

***NEPA Effects*:** Similar to Alternative 1A, sediment-disturbing activities during construction and maintenance of the water conveyance facilities under Alternative 2B could result in the disturbance of existing bioaccumulative constituents, such as legacy organochlorine pesticides, or methylmercury in sediment. During water conveyance facilities operation, changes in dilution and mixing of sources of water could result in a change in constituents known to bioaccumulate. For example, the reduction of flows in the Sacramento River downstream of the proposed north Delta intakes may result in a decreased dilution of constituents known to bioaccumulate in the study area.

As described for Alternative 1A, construction and operation of the water conveyance facilities under Alternative 2B would not result in a change in water dilution and mixing of existing constituents and would not affect the existing conditions of legacy organochlorine pesticides. Intermittent and/or short-term construction-related activities (as would occur for in-river construction) would not be anticipated to result in contaminant discharges of sufficient magnitude or duration to contribute to long-term bioaccumulation processes, or cause measureable long-term degradation as described under Alternative 1A. Legacy organochlorine pesticides typically bond to particulates and do not mobilize easily. Construction and maintenance of Alternative 2B would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column, as described under Alternative 1A. Additionally, water supply operations under any BDCP action alternative would not be expected to change total suspended solids or turbidity levels (highs, lows, typical conditions) to any substantial degree. Changes in the magnitude, frequency, and geographic distribution of legacy pesticides in water bodies of the affected environment that would result in new or more severe adverse effects on beneficial uses, relative to the No Action Alternative, would not be expected to occur.

Further, as described under Impact PH-3 for Alternative 2A, modeling results indicate small, insignificant changes in total mercury and methylmercury levels in water and in mercury in fish tissues resulting from Alternative 2B water operations (Chapter 8, *Water Quality*, Section 8.3.3.6). Upstream mercury contributions and methylmercury production in Delta waters would not be altered by the operation of Alternative 2B, as it would not change existing mercury sources and would not substantially alter methylmercury concentrations in the Sacramento River or San Joaquin River, as discussed for Alternative 2A.

As environmental commitments, DWR would develop and implement Erosion and Sediment Control Plans and SWPPPs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMPs implemented under the Erosion and Sediment Control Plans and the SWPPPs would help reduce turbidity and keep sediment that may contain legacy organochlorine pesticides and methylmercury within the area of disturbance. Examples of these BMPs are described under Alternative 1A, Impact PH-3. Accordingly, the potential for Alternative 2B to create a public health effect from bioaccumulation of legacy organochlorine pesticides and methlymercury in fish is minimal, and public health effects from construction, operation, or maintenance of the water conveyance facilities are not expected to be adverse.

***CEQA Conclusion*:** Construction and maintenance of Alternative 2B would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column based on the chemical properties of the pesticides. Although methylmercury currently exceeds the TMDL, little to no change in methylmercury concentrations in water are expected under Alternative 2B water conveyance facilities construction. BMPs implemented as part of Erosion and Sediment Control Plans and SWPPPs would help ensure that construction activities would not substantially increase or substantially mobilize legacy organochlorine pesticides or methylmercury during construction and maintenance. Therefore, construction and maintenance of Alternative 2B would not cause increased exposure of the public to these bioaccumulative sediment constituents.

Alternative 2B would not result in increased flows in the tributaries that would mobilize legacy organochlorine pesticides in sediments. Modeling showed small changes in mercury and methylmercury levels in water at certain Delta locations and in mercury in fish tissues due to Alternative 2B water operations. However, these changes would not substantially affect the current level of existing methylmercury degradation in the study area or substantially affect the existing fish tissue concentrations. Environmental commitments and BMPs would help ensure that construction activities would not substantially increase or substantially mobilize methylmercury. Because construction, maintenance, or operation of Alternative 2B would not cause substantial mobilization or substantial increase of constituents known to bioaccumulate, impacts on public health would be less than significant. No mitigation is required.

Impact PH-4: Expose Substantially More People to Transmission Lines Generating New Sources of EMFs as a Result of the Construction and Operation of the Water Conveyance Facilities

NEPA Effects**:** Alternative 2B could have different intakes than Alternative 1B (Intakes 1, 2, 3, 4, and 5 or 1, 2, 3, 6, and 7), thus a different configuration of transmission lines may be required; however, the total number of intakes would remain the same (five) between the two alternatives. Approximately 621 miles of existing transmission lines are located within the study area. As described in Table 25-9, a total of 13.49 miles of new temporary 69 kV transmission lines; 40.5 miles of new permanent 69 kV transmission lines; and 16.35 miles of new permanent 230 kV transmission lines would be required for this alternative.

While new transmission lines generating new sources of EMFs would be constructed under this alternative, the new temporary and permanent transmission lines would be located in rights-of-way of existing transmission lines or in sparsely populated areas (Figure 25-2). Table 25-9 identifies only one potential new sensitive receptor (Stone Lakes National Wildlife Refuge) that is not currently within 300 feet of an existing transmission line; the majority of sensitive receptors are already located within 300 feet of an existing 69 kV or 230 kV transmission line. Stone Lakes National Wildlife Refuge would be within 300 feet of a proposed permanent 69 kV transmission line. Visitors to this area generally come for walks, water recreation, and hunting, and as such, it is unlikely that large groups of people would be staying in the area within 300 feet of this proposed transmission line, so any EMF exposure would be limited. However, also as described for Alternative 1A, the majority of sensitive receptors are already located within 300 feet of an existing transmission line; therefore, the majority of new temporary or new permanent transmission lines would not expose new sensitive receptors or substantially more people to EMFs that they are not already experiencing. Because the proposed transmission line would be located in a sparsely populated area and would be within 300 feet of only one potential new sensitive receptor, there would not be a substantial increase in people's exposure to EMFs.

As discussed in Section 25.1.1.5, the current scientific evidence does not show conclusively that EMF exposure can increase health risks. In 2006, CPUC updated its EMF Policy and reaffirmed that health hazards from exposures to EMF have not been established. State and federal public health regulatory agencies have determined that setting numeric exposure limits is not appropriate. CPUC also reaffirmed that the existing no-cost and low-cost precautionary-based EMF policy should be continued. Based on this, utility companies are required to establish and maintain EMF Design Guidelines in order to minimize health risks associated with power lines and these guidelines would be implemented for any new temporary or new permanent transmission lines constructed and operated under Alternative 2B, depending on which electric provider is selected by DWR. Furthermore, as described in Appendix 3B, *Environmental Commitments, AMMs, and CMs*, location and design of the proposed new transmission lines would be conducted in accordance with CPUC's EMF Design Guidelines for Electrical Facilities. Therefore, operation of the transmission line corridors would not expose substantially more people to transmission lines generating EMFs. Therefore, operation of the transmission line corridors would not expose substantially more people to transmission lines generating EMFs, and there would be no adverse effect on public health.

CEQA Conclusion: In general, the proposed temporary (69 kV) and permanent (69 kV and 230 kV) transmission lines would be located within the rights-of-way of existing transmission lines, or in sparsely populated areas generally away from existing sensitive receptors. However, one sensitive receptor, Stone Lakes National Wildlife Refuge, would be within 300 feet of a proposed permanent 69 kV transmission line. Because visitors to this area generally come for walks, water recreation, and hunting, it is unlikely that large groups of people would be staying in the area within 300 feet of this proposed transmission line, so any EMF exposure would be limited. Design and implementation of new temporary or permanent transmission lines not within the right-of-way of existing transmission lines would follow CPUC's EMF Design Guidelines for Electrical Facilities and would implement shielding, cancelation, or distance measures to reduce EMF exposure. Since construction and operation of Alternative 2B would not expose substantially more people to transmission lines that provide new sources of EMFs, impacts on public health would be less than significant, and no mitigation is required.

Impact PH-5: Increase in Vector-Borne Diseases as a Result of Implementing CM2-CM7, CM10 and CM11

NEPA Effects: The amount and location of habitat restoration and enhancement that would occur under Alternative 2B would be the same as that described for Alternative 1A. Although there would be an increase in restored and enhanced aquatic habitat in the study area as a result of implementing CM2-CM7, CM10 and CM11 under Alternative 2B, implementation of environmental commitments, such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*) would reduce the potential for an increase in mosquito breeding habitat, and a substantial increase in vector-borne diseases is unlikely to result. Furthermore, habitat would be restored in areas where potentially suitable habitat for mosquitoes already exists. Finally, mosquito predators (e.g., bats, spiders) would likely increase as a result of restoration and enhancement, which would keep mosquito populations in check. Therefore, effects would be the same under Alternative 2B as under Alternative 1A and there would not be a substantial increase in the public's risk of exposure to vector-borne diseases with implementation of CM2-CM7, CM10 and CM11. Accordingly, there would be no adverse effect.

CEQA Conclusion: Habitat restoration and enhancement would result in an increased amount of land potentially suitable for vector habitat (e.g., mosquitoes). However, as described in Alternative 1A, Alternative 2B would require environmental commitments such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*) that would help control mosquitoes and reduce the potential for an increase in mosquito breeding habitat. Furthermore, habitat would be restored where potentially suitable vector habitat already exists and habitat restoration and enhancement would likely increase the number of mosquito predators. Therefore, as described for Alternative 1A, implementation of CM2-CM7, CM10 and CM11 under Alternative 2B would not substantially increase the public's risk of exposure to vector-borne diseases beyond what currently exists. Accordingly, this impact would be less than significant and no mitigation is required.

Impact PH-6: Substantial Increase in Recreationists' Exposure to Pathogens as a Result of Implementing the Restoration Conservation Measures

NEPA Effects: The amount and location of habitat restoration and enhancement that would occur under Alternative 2B would be the same as that described for Alternative 1A. Implementation of the restoration conservation measures would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). As exemplified by the Pathogen Conceptual Model, any potential increase in pathogens associated with the habitat restoration would be localized and within the vicinity of the actual restoration. This would be similar for lands protected for agricultural uses. Depending on the level of recreational access granted by management plans, habitat restoration could increase or decrease opportunities for recreationists within the Delta region. However, effects However, effects associated with pathogens would be the same under Alternative 2B as under Alternative 1A. Recreationists would not experience a substantial increase in exposure to pathogens as a result of the restoration and no adverse effect would result.

CEQA Conclusion**:** Implementation of the restoration conservation measures under Alternative 2B would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). However, the localized nature of pathogen generation and the quick die-off of some types of pathogens once released into water bodies would generally prevent substantial pathogen exposure to recreationists. Therefore, impacts would be less than significant, and no mitigation is required.

Impact PH-7: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Implementing CM2, CM4, CM5, and CM10

NEPA Effects**:** The amount of habitat restoration under Alternative 2B would be the same as Alternative 1A. The primary concern with habitat restoration regarding constituents known to bioaccumulate is the potential for mobilizing contaminants sequestered in sediments of the newly inundated floodplains and marshes, as described under Alternative 1A. It is likely that the pesticide-bearing sediments would not be transported very far from the source area and would settle out with suspended particulates and be deposited close to the ROA. Further, CM2–CM21 do not include the use of pesticides known to be bioaccumulative in animals or humans.

Methylmercury generation rates are ultimately dependent on the concentrations of mercury in the soils, and on the specific biogeochemistry of the system. The biogeochemistry and fate and transport of mercury and methylmercury are very complex. Restoration would involve inundation of areas where mercury has been sequestered in soils, and, if methylation occurs, the methylmercury would be mobilized into the aquatic system. While there would likely be an increase in mobilization and bioaccumulation for methylmercury in the aquatic systems (e.g., fish and water quality) of the study area in the near-term, measures implemented under *CM12 Methylmercury Management* as well as existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Therefore, implementation of CM2, CM4, CM5, and CM10 under Alternative 2B is not expected to result in an adverse effect on public health with respect to pesticides or methylmercury.

CEQA Conclusion**:** Implementation of CM2, CM4, CM5, and CM10 would have the potential to mobilize sediment with existing levels of legacy organochlorine pesticides as a result of disturbing sediment during habitat restoration construction. However, it is unlikely that the pesticide-bearing sediments would be transported very far from the source area and they would likely settle out with suspended particulates and be deposited close to the ROAs during habitat restoration construction. While there would likely be an increase in mobilization and bioaccumulation of methylmercury in the study area's aquatic systems (i.e., fish and water) during the near-term, measures implemented under *CM12 Methylmercury Management*, and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Therefore, implementation of CM2, CM4, CM5, and CM10 under Alternative 2B would not substantially mobilize or substantially increase the public's exposure to constituents known to bioaccumulate and this impact would be less than significant. No mitigation is required.

Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water Conveyance Facilities

NEPA Effects: Water operations under Alternative 2B would be the same as under Alternative 2A. Therefore, potential effects on public health due to changes in water quality and beneficial uses as a result of *Microcystis* blooms and microcystin levels would be the same.

Any modified reservoir operations under Alternative 2B are not expected to promote *Microcystis* production in waters upstream of the Delta. As described in Chapter 8, *Water Quality*, *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not due to water conveyance facility operations. Similarly, hydraulic residence times in the Export Service Area would not be affected by operations of CM1. Accordingly, conditions would not be more conducive to *Microcystis* bloom formation. Water diverted from the Sacramento River in the north Delta is expected to be unaffected by *Microcystis*. However, the fraction of water flowing through the Delta that reaches the existing south Delta intakes is expected to be influenced by an increase in *Microcystis* blooms, as discussed below. Therefore, relative to the No Action Alternative, the addition of Sacramento River water from the north Delta under Alternative 2B would dilute *Microcystis* and microcystins in water diverted from the south Delta. Because the degree to which *Microcystis* blooms, and thus microcystins concentrations, would increase in source water from the south Delta is unknown, it cannot be determined whether Alternative 2B would result in increased or decreased levels of microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Ambient meteorological conditions would be the primary driver of Delta water temperatures, and climate warming, not water operations, would determine future water temperatures in the Delta. Increasing water temperatures could lead to earlier attainment of the water temperature threshold required to initiate *Microcystis* bloom formation, and therefore earlier occurrences of Microcystis blooms in the Delta, as well as increases in the duration and magnitude. However, these temperature-related changes would not be different from what would occur under the No Action Alternative. Siting and design of restoration areas would have a substantial influence on the magnitude of hydraulic residence time increases under Alternative 2B. The modeled increase in residence time in the Delta could result in an increase in the frequency, magnitude, and geographic extent of *Microcystis* blooms, and thus microcystin levels. Therefore, impacts on beneficial uses, including drinking water and recreational waters, could occur and public health could be affected. Accordingly, this would be considered an adverse effect.

Mitigation Measure WQ-32a and WQ-32b are available to reduce the effects of degraded water quality, and therefore potential public health effects, in the Delta due to *Microcystis*. However, because the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain, the effect would still be considered adverse.

CEQA Conclusion: Under Alternative 2B, operation of the water conveyance facilities is not expected to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta. *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not due to water conveyance facility operations. Residence times in the Export Service Area would not be affected by operations of CM1, and therefore conditions in those areas would not be more conducive to *Microcystis* bloom formation. Water exported from the Delta to the Export Service Area is expected to be a mixture of *Microcystis*-affected source water from the south Delta intakes and unaffected source water from the Sacramento River. Because of this, it cannot be determined whether operations and maintenance under Alternative 2B would result in increased or decreased levels of *Microcystis* and microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Water temperatures and hydraulic residence times in the Delta are expected to increase, which could result in an increase in *Microcystis* blooms and therefore microcystin levels. However, the water temperature increases in the Delta would be due to climate change primarily and not due to operation of the water conveyance facilities. Increases in Delta residence times would be due in small part to climate change and sea level rise, but due to a greater degree to operation of the water conveyance facilities and hydrodynamic impacts of restoration included in CM2 and CM4. Consequently, it is possible that increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms in the Delta would occur due to the operations and maintenance of the water conveyance facilities and the hydrodynamic impacts of restoration under CM2 and CM4. Accordingly, beneficial uses including drinking water and recreational waters would be impacted and, as a result, there could be potential impacts on public health. Therefore, this impact would be significant.

Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time considerations be incorporated into restoration area site design for CM2 and CM4 using the best available science at the time of design. Mitigation Measure WQ-32b requires that the project proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods to determine whether increases in abundance are significant. This mitigation measure also requires that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will investigate and evaluate measures that could be taken to reduce residence time in the affected areas of the Delta. However, because the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and CM4

NEPA Effects: The amount and location of habitat restoration and enhancement that would occur under Alternative 2B would be the same as that described under Alternative 1A. Restoration activities implemented under CM2 and CM4 that would create shallow backwater areas could result in local increases in water temperature that may encourage *Microcystis* growth during the summer bloom season. This would result in further degradation of water quality beyond the hydrodynamic effects of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase in *Microcystis* blooms with implementation of CM2 and CM4 could potentially result in adverse effects on public health through exposure via drinking water quality and recreational waters. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain. This would be an adverse effect.

CEQA Conclusion: The effects of CM2 and CM4 on *Microcystis* under Alternative 2B are the same as those discussed for Alternative 1A. Restoration activities implemented under CM2 and CM4 that create shallow backwater areas could result in local increases in water temperature conducive to *Microcystis* growth during summer bloom season. This could compound the water quality degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact PH-8 and result in additional water quality degradation such that beneficial uses are affected. An increase in *Microcystis* blooms could potentially result in impacts on public health through exposure via drinking water quality and recreational waters. Therefore, this impact would be significant. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

25.3.3.7 Alternative 2C—Dual Conveyance with West Alignment and Intakes W1–W5 (15,000 cfs; Operational Scenario B)

Alternative 2C would involve construction activities similar to those described under Alternative 1A; therefore, construction impacts in terms of public health would be the same and are summarized below for vector-borne diseases and water quality concerns. Alternative 2C has the same diversion and conveyance operations as Alternative 2A. Alternative 2C would also have the same transmission line needs as Alternative 2A. The primary differences between the two alternatives are that under Alternative 2C, the intakes would be on the west bank of the Sacramento River between Clarksburg and Walnut Grove, and may utilize intake locations 1, 2, 3, 4, and 5, or 1, 2, 3, 6, and 7; the primary water conveyance between intakes and the intermediate pumping plant would be a lined or unlined canal along the western side of the Delta, instead of a pipeline/tunnel; there would be no intermediate forebay; and water would be pumped from the intermediate pumping plant through a dual-bore tunnel to a continuing canal to the proposed Byron Tract Forebay immediately northwest of Clifton Court Forebay. Alternative 2C also includes the construction of an operable barrier at the Head of Old River, to facilitate fish passage during summer and fall and be closed with stoplogs in spring. However, because there would be no difference in conveyance capacity or operations, there would be no differences between these two alternatives in Delta inflow, source fractions to various Delta locations, and hydrodynamics in the Delta. CM2-CM21 under Alternative 2C would be the same as described under Alternative 1A. Therefore, Alternative 2C would have effects on public health similar to those under Alternative 1A.

Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of the Water Conveyance Facilities

NEPA Effects: As with Alternative 1A, implementation of CM1 under Alternative 2C would involve construction and operation of five north Delta intakes; up to 15 solids lagoons; five sedimentation basins; and Byron Tract Forebay. These facilities have the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes) because of the large volumes of water that would be held within these areas. The depth, design, and operation of the sedimentation basins and solids lagoons would prevent the development of suitable mosquito habitat (Figure 25-1). Specifically, the basins would be too deep and the constant movement of water would prevent mosquitoes from breeding and multiplying. Sedimentation basins would be 120 feet long by 40 feet wide by 55 feet deep, and solids lagoons would be 165 feet long by 86 feet wide by 10 feet deep.

Although the proposed Byron Tract Forebay would increase surface water within the study area, it is unlikely that the forebay would provide suitable breeding habitat for mosquitoes given that the water in this forebay would not be stagnant and would be too deep. However, the shallow edges of the forebay could potentially provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. However, as part of the regular maintenance of the forebay, floating vegetation such as pond weed would be harvested to maintain flow and forebay capacity.

To minimize the potential for impacts related to increasing suitable mosquito habitat in the Plan Area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes. These BMPs would be consistent practices presented in *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). See Impact PH-1 under Alternative 1A. Therefore, as described for Alternative 1A, construction and operation of the intakes, solids lagoons, and/or sedimentation basins under Alternative 2C would not substantially increase suitable vector habitat and would not substantially increase vector-borne diseases. Accordingly, there would be no adverse effects on public health.

CEQA Conclusion: As with Alternative 1A, implementation of CM1 under Alternative 2C would involve construction and operation of solids lagoons, sedimentation basins, and Byron Tract Forebay. These areas could provide suitable habitat for vectors (e.g., mosquitoes). During operations, water depth and circulation would prevent these areas from substantially increasing suitable vector habitat. However, the shallow edges on the periphery of Byron Tract Forebay could potentially provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes. See Impact PH-1 under Alternative 1A. These BMPs would be consistent practices presented in *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). Therefore, construction and operation of the water conveyance facilities under Alternative 2C would not result in a substantial increase in vector-borne diseases and the impact on public health would be less than significant. No mitigation is required.

Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That There is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance Facilities

NEPA Effects: The description of water quality and public health effects related to DBPs, pesticides and trace metals for Alternative 2A also appropriately characterizes effects under this alternative. For the most part, there would be no substantial changes in trace metals or DBPs under Operational Scenario B. As described under Alternative 2A, increases in long-term average DOC concentrations estimated to occur at various Delta locations are of sufficiently small magnitude that they would not require existing drinking water treatment plants to substantially upgrade treatment for DOC removal above levels currently employed (Chapter 8, *Water Quality*, Section 8.3.3.7).

Relative to the No Action Alternative, long-term average bromide concentrations would increase at Buckley Cove, the North Bay Aqueduct at Barker Slough, Staten Island, and Emmaton (during the dry period only), with the greatest increase (26%) occurring at Barker Slough (Chapter 8, *Water Quality*, Section 8.3.3.7). This increase would be more substantial during the drought period (75%). This increase in bromide may require upgrades and/or changes in operations at certain water treatment plant. While treatment technologies sufficient to achieve the necessary bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken, a change of such magnitude in long-term average bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBP in drinking water sources. Mitigation Measure WQ-5 is available to reduce these effects. Implementation of this measure along with a separate other commitment as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, relating to the potential increased treatment costs associated with bromide-related changes would reduce these effects. Further, as described for Impact PH-2 under Alternative 1A, the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be further minimized by implementation of the AIP.

Water quality modeling results for pesticides indicate that in the long-term, relative to the No Action Alternative, there would be a potential increase in pesticide toxicity to aquatic life in the summer source water fraction at Buckley Cove. This increase would result from the apparent greater incidence of pesticides in the San Joaquin River and its relative contribution to the total source water volume at this location during July and August. A conclusion regarding the risk to human health at this location, based on the predicted adverse effects from pesticides on aquatic life, cannot be made. However, because the modeled increase would only occur in one location, and over a very short period during the year, it is expected that the potential for affecting public health would be relatively low. Additionally, the prediction of adverse effects of pesticides relative to the No Action

Alternative fundamentally assumes that the present pattern of pesticide incidence in surface water would occur at similar levels into the future. In reality, the makeup and character of the pesticide use market during the late long-term would not be exactly as it is today. Use of chlorpyrifos and diazinon is on the decline with their replacement by pyrethroids on the rise. Yet in this assessment it is the apparent greater incidence of diazinon and chlorpyrifos in the San Joaquin River that serves as the basis for concluding that substantially increased San Joaquin River source water fraction would correspond to an increased risk of pesticide-related toxicity to aquatic life. Water treatment plants are required to meet certain drinking water standard, as described in Section 25.2.4. Therefore, it is not anticipated that levels of pesticides in drinking water sources would have adverse effects on public health.

CEQA Conclusion: The operation of water supply facilities under Alternative 2C would adhere to the criteria set forth under Operational Scenario B. Water quality modeling results indicate that, for the most part, there would be no substantial changes in trace metals, DBPs, or pesticides relative to Existing Conditions under this operational scenario. An exception to this is that concentrations of bromide would increase at the North Bay Aqueduct at Barker Slough, Staten Island, and Emmaton on the Sacramento River (during drought conditions) under Alternative 2C, with the greatest increase at Barker Slough (22%). This increase would be more substantial during the drought period (75%). The increase in long-term average bromide concentrations predicted for Barker Slough would result in a substantial change in source water quality to existing drinking water treatment plants drawing water from the North Bay Aqueduct. These modeled increases in bromide at Barker Slough could lead to adverse changes in the formation of DBPs at drinking water treatment plants such that considerable water treatment plant upgrades would be necessary r to achieve equivalent levels of drinking water health protection. This would be a significant impact.

While treatment technologies sufficient to achieve the necessary bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken, a change of such magnitude in long-term average bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBPs in drinking water sources. Assuming the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be avoided or minimized by implementation of the AIP, the potential adverse water quality effects on the municipal beneficial uses potentially provided in Barker Slough would remain significant. While Mitigation Measure WQ-5 may reduce this impact, the feasibility and effectiveness of this mitigation measure are uncertain based on currently available information.

In addition to and to supplement Mitigation Measure WQ-5, the BDCP proponents have incorporated into the BDCP, as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, a separate other commitment to address the potential increased water treatment costs that could result from bromide-related concentration effects on municipal water purveyor operations. Potential options for making use of this financial commitment include funding or providing other assistance towards implementation of the North Bay Aqueduct AIP, acquiring alternative water supplies, or other actions to indirectly reduce the effects of elevated bromide and DOC in existing water supply diversion facilities. Please refer to Appendix 3B for the full list of potential actions that could be taken pursuant to this commitment in order to reduce the water quality treatment costs associated with water quality effects relating to chloride, electrical conductivity, and bromide. Because the BDCP proponents cannot ensure that the results of coordinated actions with water treatment entities will be fully funded or implemented successfully prior to the project's contribution to the impact, the ability to fully mitigate this impact is uncertain. If a solution that is identified by the BDCP proponents and an affected water purveyor is not fully funded, constructed, or implemented before the project's contribution to the impact is made, a significant impact in the form of increased DBP in drinking water sources could occur. Accordingly, this impact would be significant and unavoidable. If, however, all financial contributions, technical contributions, or partnerships required to avoid significant impacts prove to be feasible and any necessary agreements are completed before the project's contribution to the effect is made, impacts would be less than significant.

Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality Conditions; Site and Design Restoration Sites to Reduce Bromide Increases in Barker Slough

Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

Impact PH-3: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Construction, Operation or Maintenance of the Water Conveyance Facilities

***NEPA Effects*:** Similar to effects described for Alternative 1A, sediment-disturbing activities during construction and maintenance of the water conveyance facilities under Alternative 2C could result in the disturbance of existing constituents, such as legacy pesticides, or methylmercury in sediment. During water conveyance facilities operation, changes in dilution and mixing of sources of water could result in a change in constituents known to bioaccumulate. For example, the reduction of flows in the Sacramento River downstream of the proposed north Delta intakes may result in a decreased dilution of constituents known to bioaccumulate in the study area.

As described for Alternative 1A, construction and operation of water conveyance facilities under Alternative 2C would not result in a change in water dilution and mixing of existing constituents and would not affect the existing conditions of legacy organochlorine pesticides in the study area. Intermittent and/ short-term construction-related activities (as would occur for in-river construction) would not be anticipated to result in contaminant discharges of sufficient magnitude or duration to contribute to long-term bioaccumulation processes, or cause measureable long-term degradation, as described under Alternative 1A. Legacy organochlorine pesticides typically bond to particulates, and do not mobilize easily. Construction and maintenance of Alternative 2C would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column, as described for Alternative 1A. Water supply operations under any BDCP action alternative would not be expected to change total suspended solids or turbidity levels (highs, lows, typical conditions) to any substantial degree. Changes in the magnitude, frequency, and geographic distribution of legacy pesticides in water bodies of the affected environment that would result in new or more severe adverse effects on beneficial uses, relative to the No Action Alternative, would not be expected to occur.

Further, as described under Impact PH-3 for Alternative 2A, modeling results indicate small, insignificant changes in total mercury and methylmercury levels in water and in mercury in fish tissues resulting from Alternative 2C water operations (Chapter 8, *Water Quality*, Section 8.3.3.7). Upstream mercury contributions and methylmercury production in Delta waters would not be altered by the operation of Alternative 2C, as it would not change existing mercury sources and would not substantially alter methylmercury concentrations in the Sacramento River or San Joaquin River.

As environmental commitments, DWR would develop and implement Erosion and Sediment Control Plans and SWPPPs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMPs implemented under the Erosion and Sediment Control Plans and the SWPPPs would help reduce turbidity and keep sediment that may contain legacy organochlorine pesticides and methylmercury within the area of disturbance. Examples of these BMPs are described under Alternative 1A, Impact PH-3. Accordingly, the potential for Alternative 2C to create a public health effect from bioaccumulation of legacy organochlorine pesticides and methlymercury in fish is minimal, and public health effects are not expected to be adverse.

***CEQA Conclusion*:** As described for Alternative 1A, construction and maintenance of Alternative 2C would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column based on the chemical properties of the pesticides. Although methylmercury currently exceeds the TMDL, little to no change in methylmercury concentrations in water are expected under Alternative 2C water conveyance construction. BMPs implemented as part of Erosion and Sediment Control Plans and SWPPPs would help ensure that construction activities would not substantially increase or substantially mobilize legacy organochlorine pesticides or methylmercury during construction and maintenance. Therefore, construction and maintenance of Alternative 2C would not cause increased exposure of the public to these bioaccumulative sediment constituents.

Alternative 2C would not result in increased tributary flows that would mobilize legacy organochlorine pesticides in sediments. Water quality modeling results show small changes in mercury and methylmercury levels in water at certain Delta locations and in mercury in fish tissues due to Alternative 2C water operations. However, these changes would not substantially affect the current level of existing methylmercury degradation in the study area or substantially affect the existing fish tissue concentrations. Because construction, maintenance, or operation of Alternative 2C would not cause substantial mobilization or substantial increase of constituents known to bioaccumulate, impacts on public health would be less than significant. No mitigation is required.

Impact PH-4: Expose Substantially More People to Transmission Lines Generating New Sources of EMFs as a Result of the Construction and Operation of the Water Conveyance Facilities

***NEPA Effects*:** Approximately 621 miles of existing transmission lines are located within the study area. As described in Table 25-9, a total of 13.73 miles of new temporary 69 kV transmission lines; 17.61 miles of new permanent 69 kV transmission lines; and 18.45 miles of new permanent 230 kV transmission lines would be required for this alternative.

While new transmission lines generating new sources of EMFs would be constructed under this alternative, the new temporary and permanent transmission lines would be located in existing rights-of-way or in sparsely populated areas (Figure 25-2). Under Alternative 2C, only one potential new sensitive receptor, Fire Station 63, in Walnut Grove, would be located within 300 feet of a proposed 69 kV temporary transmission line (Table 25-9). However, also as described for Alternative 1A, the majority of sensitive receptors are already located within 300 feet of an existing transmission line; therefore, the majority of new temporary or new permanent transmission lines would not expose new sensitive receptors or substantially more people to EMFs that they are not already experiencing. Because the lines would be located in sparsely populated areas and would be within 300 feet of only one potential new sensitive receptor, the proposed temporary and permanent transmission lines would not substantially increase people's exposure to EMFs.

As discussed in Section 25.1.1.5, the current scientific evidence does not show conclusively that EMF exposure can increase health risks. In 2006, CPUC updated its EMF Policy and reaffirmed that health hazards from exposures to EMF have not been established. State and federal public health regulatory agencies have determined that setting numeric exposure limits is not appropriate. CPUC also reaffirmed that the existing no-cost and low-cost precautionary- based EMF policy should be continued. Based on this, utility companies are required to establish and maintain EMF Design Guidelines in order to minimize health risks associated with power lines. These guidelines would be implemented for any new temporary or new permanent transmission lines constructed and operated under Alternative 2C, depending on which electrical provider is selected by DWR. Furthermore, location and design of the new transmission lines would be conducted in accordance with CPUC's EMF Design Guidelines for Electrical Facilities. Therefore, operation of the transmission line corridors would not expose substantially more people to transmission lines generating EMFs.

CEQA Conclusion: The majority of proposed temporary and permanent transmission lines would be located within the rights-of-way of existing transmission lines. In general, any new temporary or permanent transmission lines not within the right-of-way of existing transmission lines would be located in sparsely populated areas generally away from existing sensitive receptors. However, under this alternative a temporary 69 kV transmission line would be located within 300 feet of Fire Station 63, in Walnut Grove. Design and implementation of new temporary or permanent transmission lines not within the right-of-way of existing transmission lines would follow CPUC's EMF Design Guidelines for Electrical Facilities and would implement shielding, cancelation, or distance measures to reduce EMF exposure. Further, this temporary transmission line would be removed once construction of the water conveyance facilities under this alternative is completed. Because construction and operation of Alternative 2C would not expose substantially more people to transmission lines that generate new sources of EMFs, impacts would be less than significant, and no mitigation is required.

Impact PH-5: Increase in Vector-Borne Diseases as a Result of Implementing CM2-CM7, CM10 and CM11

NEPA Effects: The amount and location of habitat restoration and enhancement that would occur under Alternative 2C would be the same as that described for Alternative 1A. Although there would be an increase in restored and enhanced aquatic habitat in the study area as a result of implementing Alternative 2C, implementation of environmental commitments such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*) would reduce the potential for an increase in mosquito breeding habitat, and a substantial increase in vector-borne diseases is unlikely to result. Furthermore, habitat would be restored in areas where potentially suitable habitat for mosquitoes already exists. Finally, mosquito predators (e.g., bats, spiders) would likely increase as a result of restoration and enhancement, which would keep mosquito populations in check. Therefore, effects would be the same under Alternative 2C as under Alternative 1A and there would not be a substantial increase in the public's risk of exposure to vector-borne diseases with implementation of CM2-CM7, CM10 and CM11. Accordingly, there would be no adverse effect.

CEQA Conclusion: Habitat restoration and enhancement would result in an increased amount of land potentially suitable for vector habitat (e.g., mosquitoes). However, as described in Alternative 1A, Alternative 2C would require environmental commitments, such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*) that would help control mosquitoes and reduce the potential for an increase in mosquito breeding habitat. Furthermore, habitat would be restored where potentially suitable vector habitat already exists, and habitat restoration and enhancement would likely increase the number of mosquito predators. Therefore, as described for Alternative 1A, implementation of CM2-CM7, CM10 and CM11 under Alternative 2C would not substantially increase the public's risk of exposure to vector-borne diseases beyond what currently exists. Accordingly, this impact would be less than significant and no mitigation is required.

Impact PH-6: Substantial Increase in Recreationists' Exposure to Pathogens as a Result of Implementing the Restoration Conservation Measures

NEPA Effects**:** The amount and location of habitat restoration and enhancement that would occur under Alternative 2C would be the same as that described for Alternative 1A. Implementation of the restoration conservation measures would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). As exemplified by the Pathogen Conceptual Model, any potential increase in pathogens associated with the habitat restoration would be localized and within the vicinity of the actual restoration. This would be similar for lands protected for agricultural uses. Depending on the level of recreational access granted by management plans, habitat restoration could increase or decrease opportunities for recreationists within the Delta region. However, effects associated with pathogens would be the same under Alternative 2C as under Alternative 1A. Recreationists would not experience a substantial increase in exposure to pathogens as a result of the restoration and no adverse effect would result.

CEQA Conclusion**:** Implementation of the restoration conservation measures under Alternative 2C would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). However, the localized nature of pathogen generation and the quick die-off of some types of pathogens once released into water bodies would generally prevent substantial pathogen exposure to recreationists. Accordingly, impacts would be less than significant and no mitigation is required.

Impact PH-7: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Implementing CM2, CM4, CM5, and CM10

NEPA Effects**:** The amount of habitat restoration would be the same under Alternative 2C as described for Alternative 1A. The primary concern with habitat restoration regarding constituents known to bioaccumulate is the potential for mobilizing contaminants sequestered in sediments of the newly inundated floodplains and marshes, as described under Alternative 1A. It is likely that the pesticide-bearing sediments would not be transported very far from the source area and would settle out with suspended particulates and be deposited close to the ROA. Further, CM2–CM21 do not include the use of pesticides known to be bioaccumulative in animals or humans.

Methylmercury generation rates are ultimately dependent on the concentrations of mercury in the soils, and on the specific biogeochemistry of the system. The biogeochemistry and fate and transport of mercury and methylmercury are very complex. Restoration would involve inundation of areas where mercury has been sequestered in soils, and, if methylation occurs, the methylmercury would be mobilized into the aquatic system. While there would likely be an increase in mobilization and bioaccumulation for methylmercury in the study area's aquatic systems (i.e., fish and water) during the near-term, *CM12 Methylmercury Management* and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Therefore, implementation of CM2, CM4, CM5, and CM10 under Alternative 2C is not expected to result in an adverse effect on public health with respect to pesticides or methylmercury.

***CEQA Conclusion*:** Implementation of CM2, CM4, CM5, and CM10 would have the potential to mobilize sediment with existing levels of legacy organochlorine pesticides as a result of disturbing sediment during habitat restoration construction. However, it is unlikely that the pesticide-bearing sediments would be transported very far from the source area and they would likely settle out with suspended particulates and be deposited close to the ROAs during habitat restoration construction. While there would likely be an increase in mobilization and bioaccumulation of methylmercury in the study area's aquatic systems (i.e., fish and water) during the near-term, measures implemented under *CM12 Methylmercury Management*, and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Therefore, implementation of CM2, CM4, CM5, and CM10 under Alternative 2C would not substantially mobilize or substantially increase the public's exposure to constituents known to bioaccumulate and this impact would be less than significant. No mitigation is required.

Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water Conveyance Facilities

NEPA Effects: Water operations under Alternative 2C would be the same as under Alternative 2A. Therefore, potential effects on public health due to changes in water quality and beneficial uses as a result of *Microcystis* blooms and microcystin levels would be the same.

Any modified reservoir operations under Alternative 2C are not expected to promote *Microcystis* production in waters upstream of the Delta. As described in Chapter 8, *Water* Quality, *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not due to water conveyance facility operations. Similarly, hydraulic residence times in the Export Service Area would not be affected by operations of CM1. Accordingly, conditions would not be more conducive to *Microcystis* bloom formation. Water diverted from the Sacramento River in the north Delta is expected to be unaffected by *Microcystis*. However, the fraction of water flowing through the Delta that reaches the existing south Delta intakes is expected to be influenced by an increase in *Microcystis* blooms, as discussed below. Therefore, relative to the No Action Alternative, the addition of Sacramento River water from the north Delta under Alternative 2C would dilute *Microcystis* and microcystins in water diverted from the south Delta. Because the degree to which *Microcystis* blooms, and thus microcystins concentrations, would increase in source water from the south Delta is unknown, it cannot be determined whether Alternative 2C would result in increased or decreased levels of microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Ambient meteorological conditions would be the primary driver of Delta water temperatures, and climate warming, not water operations, would determine future water temperatures in the Delta. Increasing water temperatures could lead to earlier attainment of the water temperature threshold required to initiate *Microcystis* bloom formation, and therefore earlier occurrences of *Microcystis* blooms in the Delta, as well as increases in the duration and magnitude. However, these temperature-related changes would not be different from what would occur under the No Action Alternative. Siting and design of restoration areas would have a substantial influence on the magnitude of hydraulic residence time increases under Alternative 2C. The modeled increase in residence time in the Delta could result in an increase in the frequency, magnitude, and geographic extent of *Microcystis* blooms, and thus microcystin levels. Therefore, impacts on beneficial uses, including drinking water and recreational waters, could occur and public health could be affected. Accordingly, this would be considered an adverse effect.

Mitigation Measure WQ-32a and WQ-32b are available to reduce the effects of degraded water quality, and therefore potential public health effects, in the Delta due to *Microcystis*. However, because the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain, the effect would still be considered adverse.

CEQA Conclusion: Under Alternative 2C, operation of the water conveyance facilities is not expected to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta. *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not due to water conveyance facility operations. Hydraulic residence times in the Export Service Area would not be affected by operations of CM1, and therefore conditions in those areas would not be more conducive to *Microcystis* bloom formation. Water exported from the Delta to the Export Service Area is expected to be a mixture of *Microcystis*-affected source water from the south Delta intakes and unaffected source water from the Sacramento River. Because of this, it cannot be determined whether operations and maintenance under Alternative 2C would result in increased or decreased levels of *Microcystis* and microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Water temperatures and hydraulic residence times in the Delta are expected to increase, which could result in an increase in *Microcystis* blooms and therefore microcystin levels. However, the water temperature increases in the Delta would be due to climate change primarily and not due to operation of the water conveyance facilities. Increases in Delta residence times would be due in small part to climate change and sea level rise, but due to a greater degree to operation of the water conveyance facilities and hydrodynamic impacts of restoration included in CM2 and CM4. Consequently, it is possible that increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms in the Delta would occur due to the operations and maintenance of the water conveyance facilities and the hydrodynamic impacts of restoration under CM2 and CM4. Accordingly, beneficial uses including drinking water and recreational waters would be impacted and, as a result, there could be potential impacts on public health. Therefore, this impact would be significant.

Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time considerations be incorporated into restoration area site design for CM2 and CM4 using the best available science at the time of design. Mitigation Measure WQ-32b requires that the project proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods to determine whether increases in abundance are significant. This mitigation measure also requires that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will investigate and evaluate measures that could be taken to reduce residence time in the affected areas of the Delta. However, because the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and CM4

NEPA Effects: The amount and location of habitat restoration and enhancement that would occur under Alternative 2C would be the same as that described under Alternative 1A. Restoration activities implemented under CM2 and CM4 that would create shallow backwater areas could result in local increases in water temperature that may encourage *Microcystis* growth during the summer bloom season. This would result in further degradation of water quality beyond the hydrodynamic effects of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase in *Microcystis* blooms with implementation of CM2 and CM4 could potentially result in adverse effects on public health through exposure via drinking water quality and recreational waters. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain. This would be an adverse effect.

CEQA Conclusion: The effects of CM2 and CM4 on *Microcystis* under Alternative 2C are the same as those discussed for Alternative 1A. Restoration activities implemented under CM2 and CM4 that create shallow backwater areas could result in local increases in water temperature conducive to *Microcystis* growth during summer bloom season. This could compound the water quality degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact PH-8 and result in additional water quality degradation such that beneficial uses are affected. An increase in *Microcystis* blooms could potentially result in impacts on public health through exposure via drinking water quality and recreational waters. Therefore, this impact would be significant. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

25.3.3.8 Alternative 3—Dual Conveyance with Pipeline/Tunnel and Intakes 1 and 2 (6,000 cfs; Operational Scenario A)

Alternative 3 would have fewer new intakes than Alternative 1A (only Intakes 1 and 2, as compared with five) and would convey less water (6,000 cfs as compared with 15,000 cfs). Because of these differences, Alternative 3 would involve fewer solids lagoons and sedimentation basins and fewer transmission lines. Therefore, the public health effects of Alternative 3 would generally be less than those identified under Alternative 1A. However, Alternative 3 would have the same conservation measures with the same amount of habitat restoration and therefore public health effects associated with habitat restoration would be the same as those described for Alternative 1A.

Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of the Water Conveyance Facilities

***NEPA Effects*: ** Alternative 3 would be similar to Alternative 1A, but the water conveyance facilities would involve construction and operation of up to six solids lagoons, two sedimentation basins, Byron Tract Forebay, an intermediate forebay, and a 350-acre inundation area adjacent to the intermediate forebay. The mechanisms for potential public health effects from construction and operation of the water conveyance facilities are similar to those described for Alternative 1A. Specifically, sedimentation basins, solids lagoons, the intermediate forebay and associated inundation area, and Byron Tract Forebay have the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes) because of the large volumes of water that would be held within these areas.

The depth, design, and operation of the sedimentation basins and solids lagoons would prevent the development of suitable mosquito habitat (Figure 25-1). Specifically, the basins would be too deep and the constant movement of water would prevent mosquitoes from breeding and multiplying. Sedimentation basins would be 120 feet long by 40 feet wide by 55 feet deep, and solids lagoons would be 165 feet long by 86 feet wide by 10 feet deep. Furthermore, use of the 350-acre inundation area would be limited to forebay emergency overflow situations and water would be pumped back to the intermediate forebay, creating circulation such that the area would have a low potential for creating suitable vector habitat. Similarly, water in the Byron Tract Forebay and intermediate forebay would be circulated regularly and, with the exception of shallower areas around the periphery, would be too deep to provide suitable mosquito habitat. The shallower edges of the forebays could provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow.

To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes (see Impact PH-1 under Alternative 1A). These BMPs would be consistent with practices presented in *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012).Implementation of these BMPs would reduce the likelihood that

BDCP operations would require an increase in abatement activities by the local MVCDs. Therefore, Alternative 3 would not substantially increase suitable vector habitat, and would not substantially increase vector-borne diseases. Accordingly, no adverse effects on public health would result.

CEQA Conclusion: Implementation of CM1 under Alternative 3 would involve construction and operation of an intermediate forebay and associated 350-acre inundation area, and Bryon Tract Forebay, but fewer solids lagoons and sedimentation basins would be constructed under this alternative relative to Alternative 1A. These areas could provide suitable habitat for vectors (e.g., mosquitoes). During operations, water depth and circulation would prevent the areas from substantially increasing suitable vector habitat. However, the shallower periphery of the intermediate forebay and Bryon Tract Forebay could provide suitable mosquito breeding habitat.

To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes. These BMPs would be consistent with practices presented in *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). See Impact PH-1 under Alternative 1A. Therefore, construction and operation of the water conveyance facilities under Alternative 3 would not result in a substantial increase in vector-borne diseases and the impact on public health would be less than significant. No mitigation is required.

Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That There is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance Facilities

NEPA Effects: The operation of water supply facilities under Alternative 3 would be the same as those described for Alternative 1A. Although Alternative 3 would have three fewer intakes, they would be constructed and operated in the same manner as described under Alternative 1A. Therefore, the description of water quality and public health effects for Alternative 1A also appropriately characterizes effects under Alternative 3. For the most part, there would be no substantial changes in trace metals, pesticides, or DBPs under Operational Scenario A. However, relative to the No Action Alternative, there would be an increase in the long-term average bromide concentrations at all modeled Delta locations (except at Banks and Jones pumping plants), with Barker Slough showing the greatest increase (38%). This increase would be more substantial during the drought period (85%).

This increase in the long-term average bromide concentration at Barker Slough could necessitate upgrades or changes in operations at certain water treatment plants. While treatment technologies sufficient to achieve the necessary bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken, a change of such magnitude in long-term average bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBPs in drinking water sources. Mitigation Measure WQ-5 is available to reduce these effects. Implementation of this measure along with a separate other commitment as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, relating to the potential increased treatment costs associated with bromide-related changes would reduce these effects. Further, as described for Impact PH-2 under Alternative 1A, the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be further minimized by implementation of the AIP.

CEQA Conclusion: The operation of water supply facilities under Alternative 3 would be the same as that described above for Alternative 1A. Water supply operations would increase relative contributions from the San Joaquin River relative to the Sacramento River, and decrease the dilution capacity of the Sacramento River for contaminants. This could result in changes in water quality. Water quality modeling results indicate that changes in flows under Alternative 3 operations would not, for the most part, result in increased exceedances of water quality criteria for constituents of concern (DBPs, trace metals and pesticides) in the study area. However, relative to Existing Conditions bromide concentrations would increase at the North Bay Aqueduct at Barker Slough, Staten Island, and Emmaton on the Sacramento River, with the greatest increase occurring at Barker Slough (34%). This increase would be more substantial during the drought period (85%).

The increase in long-term average bromide concentrations predicted for Barker Slough would result in a substantial change in source water quality to existing drinking water treatment plants drawing water from the North Bay Aqueduct. These modeled increases in bromide at Barker Slough could lead to adverse changes in the formation of DBPs at drinking water treatment plants such that considerable water treatment plant upgrades would be necessary in order to achieve equivalent levels of drinking water health protection. This would be a significant impact.

While treatment technologies sufficient to achieve the necessary bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken, a change of such magnitude in long-term average bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBP in drinking water sources. Assuming the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be avoided or minimized by implementation of the AIP, the potential adverse water quality effects on the municipal beneficial uses potentially provided in Barker Slough would remain significant. While Mitigation Measure WQ-5 may reduce this impact, the feasibility and effectiveness of this mitigation measure are uncertain based on currently available information.

In addition to and to supplement Mitigation Measure WQ-5, the BDCP proponents have incorporated into the BDCP, as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, a separate other commitment to address the potential increased water treatment costs that could result from bromide-related concentration effects on municipal water purveyor operations. Potential options for making use of this financial commitment include funding or providing other assistance towards implementation of the North Bay Aqueduct AIP, acquiring alternative water supplies, or other actions to indirectly reduce the effects of elevated bromide and DOC in existing water supply diversion facilities. Please refer to Appendix 3B for the full list of potential actions that could be taken pursuant to this commitment in order to reduce the water quality treatment costs associated with water quality effects relating to chloride, electrical conductivity, and bromide. Because the BDCP proponents cannot ensure that the results of coordinated actions with water treatment entities will be fully funded or implemented successfully prior to the project's contribution to the impact, the ability to fully mitigate this impact is uncertain. If a solution that is identified by the BDCP proponents and an affected water purveyor is not fully funded, constructed, or implemented before the project's contribution to the impact is made, a significant impact in the form of increased DBP in drinking water sources could occur. Accordingly, this impact would be significant and unavoidable. If, however, all financial contributions, technical contributions, or partnerships required to avoid significant impacts prove to be feasible and any necessary agreements are completed before the project's contribution to the effect is made, impacts would be less than significant.

Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality Conditions; Site and Design Restoration Sites to Reduce Bromide Increases in Barker Slough

Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

Impact PH-3: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Construction, Operation or Maintenance of the Water Conveyance Facilities

NEPA Effects**:** Alternative 3 would entail constructing and operating only Intakes 1 and 2, three fewer intakes than Alternative 1A would have; however, they would be constructed and operated in the same manner as under Alternative 1A. As described under Alternative 1A, sediment-disturbing activities during construction and maintenance of the water conveyance facilities under Alternative 3 could result in the disturbance of existing constituents in sediment, such as pesticides or methylmercury. The public health effects associated with pesticides and methylmercury under Alternative 3 would be similar to, although slightly less than, those under Alternative 1A.

Intermittent and/or short-term construction-related activities (as would occur for in-river construction) would not be anticipated to result in contaminant discharges of sufficient magnitude or duration to contribute to long-term bioaccumulation processes, or cause measureable long-term degradation, as described under Alternative 1A. Legacy organochlorine pesticides typically bond to particulates, and do not mobilize easily. Construction and maintenance of Alternative 3 would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column as described for Alternative 1A. Additionally, water supply operations under any BDCP action alternative would not be expected to change total suspended solids or turbidity levels (highs, lows, typical conditions) to any substantial degree. Changes in the magnitude, frequency, and geographic distribution of legacy pesticides in water bodies of the affected environment that would result in new or more severe adverse effects on beneficial uses, relative to the No Action Alternative, would not be expected to occur.

Modeling results indicate small, insignificant changes in total mercury and methylmercury levels in water and fish tissues resulting from Alternative 3 water operations (Chapter 8, *Water Quality*, Section 8.3.3.8). Upstream mercury contributions and methylmercury production in Delta waters would not be altered by the operation of Alternative 3, as it would not change existing mercury sources and would not substantially alter methylmercury concentrations in the Sacramento River or San Joaquin River. Results indicate that the percentage change in assimilative capacity of waterborne total mercury relative to the 25 ng/L Ecological Risk Benchmark showed the greatest decrease (0.8%) relative to the No Action Alternative at the Mokelumne River (South Fork) at Staten Island and Franks Tract. Similarly, changes in methylmercury concentration are expected to be very small. Fish tissue mercury concentrations showed small or no increase based on long-term annual average concentrations at the nine Delta locations modeled. There was an 8% increase in the exceedance quotient at the Mokelumne River (South Fork) at Staten Island relative to the No Action Alternative. All water export locations except the Contra Costa Pumping Plant #1 showed improved bass tissue mercury estimates (see Chapter 8, *Water Quality*).

As environmental commitments, DWR would develop and implement Erosion and Sediment Control Plans and SWPPPs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMPs implemented under the Erosion and Sediment Control Plans and the SWPPPs would help reduce turbidity and keep sediment that may contain legacy organochlorine pesticides and methylmercury within the area of disturbance during construction and maintenance. Examples of these BMPs are described under Alternative 1A, Impact PH-3. Further, operations under Alternative 3 are not expected to increase mercury concentrations substantially and therefore there would be no long-term water quality degradation such that beneficial uses are adversely affected. Increases in mercury or methylmercury concentrations are not likely to be measurable, and changes in mercury concentrations or fish tissue mercury concentrations would not make any existing mercury-related impairment measurably worse. Therefore, it is not expected that aquatic organisms would have measurably higher body burdens of mercury as a result of Alternative 3 water operations.

Accordingly, the potential for Alternative 3 to create a public health effect from bioaccumulation of legacy organochlorine pesticides and methlymercury in fish is minimal, and public health effects from construction, operation, or maintenance of the water conveyance facilities are not expected to be adverse.

***CEQA Conclusion*:** Construction and maintenance of Alternative 3 would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column based on the chemical properties of the pesticides. Although methylmercury currently exceeds the TMDL, little to no change in methylmercury concentrations in water are expected under Alternative 3 water conveyance facilities construction. BMPs implemented as part of Erosion and Sediment Control Plans and SWPPPs would help ensure that construction activities would not substantially increase or substantially mobilize legacy organochlorine pesticides or methylmercury during construction and maintenance. Therefore, construction and maintenance of Alternative 3 would not cause increased exposure of the public to these bioaccumulative sediment constituents.

Alternative 3 would not result in increased tributary flows that would mobilize legacy organochlorine pesticides in sediments. Modeling showed small changes in mercury and methylmercury levels in water at certain Delta locations relative to Existing Conditions due to water conveyance operations under this alternative. Specifically, there was a 0.7% decrease, relative to the 25 ng/L ecological risk benchmark, for Franks Tract, Old River at Rock Slough, and Contra Costa Pumping Plant. There was a 4% increase in the mercury exceedance quotient for fish tissues, relative to Existing Conditions, at the Mokelumne River (South Fork) at Staten Island, the San Joaquin River at Buckley Cove, Franks Tract, and Old River at Rock Slough due to Alternative 3 water operations. However, these changes would not substantially affect the current level of existing methylmercury degradation in the study area or substantially affect the existing fish tissue concentrations. Since construction, maintenance, or operation of Alternative 3 would not cause substantial mobilization or substantial increase of constituents known to bioaccumulate, impacts on public health would be less than significant. No mitigation is required.

Impact PH-4: Expose Substantially More People to Transmission Lines Generating New Sources of EMFs as a Result of the Construction and Operation of the Water Conveyance Facilities

***NEPA Effects*:** Approximately 621 miles of existing transmission lines are located within the study area. As described in Table 25-9, a total of 24.71 miles of new temporary 69 kV transmission lines; 8.68 mile of new permanent 69 kV transmission lines; and 42.68 miles of new permanent 230 kV transmission lines would be required for this alternative. This alternative would have fewer intakes than Alternative 1A, but would still include the pipeline/tunnel conveyance.

As with Alternative 1A, any new temporary and permanent transmission lines needed for Alternative 3 would, for the most part, be located in rights-of-way of existing transmission lines or in areas that are not densely populated and therefore would not expose substantially more people to transmission lines (Figure 25-2). However, as indicated in Table 25-9, Stone Lakes National Wildlife Refuge would be within 300 feet of a proposed temporary 69 kV transmission line. Visitors to this area generally come for walks, water recreation, and hunting, and as such, it is unlikely that large groups of people would be staying in the area within 300 feet of this proposed transmission line, so any EMF exposure would be limited. Further, this line would be removed when construction of the water conveyance facility features near this area is completed, so there would be no potential permanent effects. Therefore, this temporary transmission line would not substantially increase people's exposure to EMFs.

While the current scientific evidence does not show conclusively that EMF exposure can increase health risks, the location and design of the proposed new transmission lines would be conducted in accordance with CPUC's EMF Design Guidelines for Electrical Facilities, as described for Alternative 1A. Therefore, operation of the transmission line corridors would not expose substantially more people to transmission lines generating EMFs, and there would be no adverse effect on public health.

CEQA Conclusion: In general, the proposed temporary (69 kV) and permanent (69 kV and 230 kV) transmission lines would be located in rights-of-way of existing transmission lines or in sparsely populated areas generally away from existing potentially sensitive receptors. However, one sensitive receptor, Stone Lakes National Wildlife Refuge, would be within 300 feet of a proposed 69 kV temporary transmission line. Because visitors to this area generally come for walks, water recreation, and hunting, it is unlikely that large groups of people would be staying in the area within 300 feet of this proposed transmission line, so any EMF exposure would be limited. Further, this line would be removed when construction of the water conveyance facility features near this area is completed, so there would be no potential permanent effects. Therefore, this temporary transmission line would not substantially increase people's exposure to EMFs. Design and implementation of new temporary or permanent transmission lines not within the right-of-way of existing transmission lines would follow CPUC's EMF Design Guidelines for Electrical Facilities and would implement shielding, cancelation, or distance measures to reduce EMF exposure. Because construction and operation of Alternative 3 would not expose substantially more people to transmission lines that generate new sources of EMFs, impacts on public health would be less than significant, and no mitigation is required.

Impact PH-5: Increase in Vector-Borne Diseases as a Result of Implementing CM2-CM7, CM10 and CM11

NEPA Effects: The amount and location of habitat restoration and enhancement that would occur under Alternative 3 would be the same as that described for Alternative 1A. Although there would be an increase in restored and enhanced aquatic habitat in the study area as a result of implementing Alternative 3, implementation of environmental commitments, such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*) would reduce the potential for an increase in mosquito breeding habitat, and a substantial increase in vector-borne diseases is unlikely to result. Furthermore, habitat would be restored in areas where potentially suitable habitat for mosquitoes already exists. Finally, mosquito predators (e.g., bats, spiders) would likely increase as a result of restoration and enhancement, which would keep mosquito populations in check. Therefore, effects would be the same under Alternative 3 as under Alternative 1A and there would not be a substantial increase in the public's risk of exposure to vector-borne diseases with implementation of CM2-CM7, CM10 and CM11. Accordingly, there would be no adverse effect.

***CEQA Conclusion*:** Habitat restoration and enhancement would result in an increased amount of land potentially suitable for vector habitat (e.g., mosquitoes). However, Alternative 3 would require environmental commitments, such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*) that would help control mosquitoes and reduce the potential for an increase in mosquito breeding habitat. Furthermore, habitat would be restored where potentially suitable vector habitat already exists, and habitat restoration and enhancement would likely increase the number of mosquito predators. Therefore, as described for Alternative 1A, implementation of CM2-CM7, CM10 and CM11 under Alternative 3 would not substantially increase the public's risk of exposure to vector-borne diseases beyond what currently exists. Accordingly, this impact would be less than significant and no mitigation is required.

Impact PH-6: Substantial Increase in Recreationists' Exposure to Pathogens as a Result of Implementing the Restoration Conservation Measures

***NEPA Effects*:** The amount and location of habitat restoration and enhancement that would occur under Alternative 3 would be the same as that described for Alternative 1A. Implementation of the restoration conservation measures would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). As exemplified by the Pathogen Conceptual Model, any potential increase in pathogens associated with the habitat restoration would be localized and within the vicinity of the actual restoration. This would be similar for lands protected for agricultural uses. Depending on the level of recreational access granted by management plans, habitat restoration could increase or decrease opportunities for recreationists within the Delta region. However, effects associated with pathogens would be the same under Alternative 3 as under Alternative 1A. Accordingly, recreationists would not experience a substantial increase in exposure to pathogens as a result of implementing restoration conservation measures and no adverse effect would result.

***CEQA Conclusion*:** Implementation of the restoration conservation measures under Alternative 3 would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, and waste products of animals). However, the localized nature of pathogen generation and the quick die-off of some types of pathogens once released into water bodies would generally prevent substantial pathogen exposure to recreationists. Accordingly, impacts would be less than significant. No mitigation is required.

Impact PH-7: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Implementing CM2, CM4, CM5, and CM10

***NEPA Effects*:** The amount of habitat restoration would be the same under Alternative 3 as described for Alternative 1A. The primary concern with habitat restoration regarding constituents known to bioaccumulate is the potential for mobilizing contaminants sequestered in sediments of the newly inundated floodplains and marshes, as described under Alternative 1A. It is likely that the pesticide-bearing sediments would not be transported very far from the source area and would settle out with suspended particulates and be deposited close to the ROA. Further, CM2–CM21 do not include the use of pesticides known to be bioaccumulative in animals or humans.

Methylmercury generation rates are ultimately dependent on the concentrations of mercury in the soils, and on the specific biogeochemistry of the system. The biogeochemistry and fate and transport of mercury and methylmercury are very complex. Restoration would involve inundation of areas where mercury has been sequestered in soils, and, if methylation occurs, the methylmercury would be mobilized into the aquatic system. While there would likely be an increase in mobilization and bioaccumulation of methylmercury in the study area's aquatic systems (i.e., fish and water) during the near-term, *CM12 Methylmercury Management* and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Accordingly, adverse effects on public health due to the substantial mobilization of or increase in methylmercury as a result of implementing CM2, CM4, CM5, and CM10 are not expected to occur.

CEQA Conclusion**:** Implementation of CM2, CM4, CM5, and CM10 would have the potential to mobilize sediment with existing levels of legacy organochlorine pesticides as a result of disturbing sediment during habitat restoration construction. However, it is unlikely that the pesticide-bearing sediments would be transported very far from the source area and they would likely settle out with suspended particulates and be deposited close to the ROAs during habitat restoration construction. While there would likely be an increase in mobilization and bioaccumulation of methylmercury in the study area's aquatic systems (i.e., fish and water) during the near-term, measures implemented under *CM12 Methylmercury Management*, and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Therefore, implementation of CM2, CM4, CM5, and CM10 under Alternative 3 would not substantially mobilize or substantially increase the public's exposure to constituents known to bioaccumulate and this impact would be less than significant. No mitigation is required.

Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water Conveyance Facilities

NEPA Effects**:** Because factors that affect *Microcystis* abundance in waters upstream of the Delta, in the Delta, and in the SWP/CVP Export Services Areas under Alternative 1A would similarly change under Alternative 3, *Microcystis* abundance, and thus microcystin concentrations, in water bodies of the affected environment under Alternative 3 would be very similar (i.e., nearly the same) to those discussed for Alternative 1A.

As described in Chapter 8, *Water Quality*, although *Microcystis* blooms have not occurred in the Export Service Areas, conditions in the Export Service Areas under Alternative 3 may become more conducive to *Microcystis* bloom formation because water temperatures will increase in the Export Service Areas due to the expected increase in ambient air temperatures resulting from climate change, but not from operation of the water conveyance facilities. Under Alternative 3, relative to No Action Alternative, water exported to the SWP/CVP Export Service Area will be a mixture of *Microcystis*-affected source water from the south Delta intakes and unaffected source water from the Sacramento River, diverted at the north Delta intakes. It cannot be determined whether operations and maintenance under Alternative 3 will result in increased or decreased levels of *Microcystis* and microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Like Alternative 1A, elevated ambient water temperatures would occur in the Delta under Alternative 3, which could lead to earlier occurrences of *Microcystis* blooms in the Delta, and increase the overall duration and magnitude of blooms. However, as described in Chapter 8, *Water Quality,* the increase in Delta water temperatures, and consequent potential increase in *Microcystis* blooms, would be driven entirely by climate change, not by operation of water conveyance facilities. There would be differences in the direction and magnitude of water residence time changes during the *Microcystis* bloom period due to operation of the water conveyance facilities under Alternative 3 compared to Alternative 1A, relative to the No Action Alternative. As a result, *Microcystis* blooms, and therefore microcystin, could increase in surface waters throughout the Delta. Therefore, impacts on beneficial uses, including drinking water and recreational waters, could occur and public health could be affected. Although Mitigation Measure WQ-32a and WQ-32b are available to reduce the severity of degraded water quality in the Delta due to *Microcystis* blooms, this would be an adverse effect.

CEQA Conclusion: Under Alternative 3, operation of the water conveyance facilities is not expected to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta. *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not due to water conveyance facility operations. Hydraulic residence times in the Export Service Area would not be affected by operations of CM1, and therefore conditions in those areas would not be more conducive to *Microcystis* bloom formation. Water exported from the Delta to the Export Service Area is expected to be a mixture of *Microcystis*-affected source water from the south Delta intakes and unaffected source water from the Sacramento River. Because of this, it cannot be determined whether operations and maintenance under Alternative 3 would result in increased or decreased levels of *Microcystis* and microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Water temperatures and hydraulic residence times in the Delta are expected to increase, which could result in an increase in *Microcystis* blooms and therefore microcystin levels. However, the water temperature increases in the Delta would be due to climate change and not due to operation of the water conveyance facilities. Increases in Delta residence times would be due in small part to climate change and sea level rise, but due to a greater degree to operation of the water conveyance facilities and hydrodynamic impacts of restoration included in CM2 and CM4. Consequently, it is possible that increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms in the Delta would occur due to the operations and maintenance of the water conveyance facilities and the hydrodynamic impacts of restoration under CM2 and CM4. Accordingly, beneficial uses including drinking water and recreational waters would be impacted and, as a result, public health. Therefore, this impact would be significant.

Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time considerations be incorporated into restoration area site design for CM2 and CM4 using the best available science at the time of design. Mitigation Measure WQ-32b requires that the project proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods to determine whether increases in abundance are significant. This mitigation measure also requires that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will investigate and evaluate measures that could be taken to reduce residence time in the affected areas of the Delta. However, because the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and CM4

***NEPA Effects*:** The amount and location of habitat restoration and enhancement that would occur under Alternative 3 would be the same as that described under Alternative 1A. Restoration activities implemented under CM2 and CM4 that would create shallow backwater areas could result in local increases in water temperature that may encourage *Microcystis* growth during the summer bloom season. This would result in further degradation of water quality beyond the hydrodynamic effects of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase in *Microcystis* blooms with implementation of CM2 and CM4 could potentially result in adverse effects on public health through exposure via drinking water quality and recreational waters. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects related to *Microcystis* is uncertain. This would be an adverse effect.

CEQA Conclusion: The effects of CM2 and CM4 on *Microcystis* under Alternative 3 are the same as those discussed for Alternative 1A. Restoration activities implemented under CM2 and CM4 that create shallow backwater areas could result in local increases in water temperature conducive to *Microcystis* growth during summer bloom season. This could compound the water quality degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact PH-8 and result in additional water quality degradation such that beneficial uses are affected. An increase in *Microcystis* blooms could potentially result in impacts on public health through exposure via drinking water quality and recreational waters. Therefore, this impact would be significant. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

25.3.3.9 Alternative 4—Dual Conveyance with Modified Pipeline/Tunnel and Intakes 2, 3, and 5 (9,000 cfs; Operational Scenario H)

Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of the Water Conveyance Facilities

NEPA Effects: Alternative 4 would involve construction and operation of three intakes (Intakes 2, 3, and 5); six sedimentation basins; 12 solids lagoons; a 243-acre intermediate forebay with a water surface area of 37 acres, a 131-acre inundation (emergency overflow) area adjacent to the intermediate forebay on Glannvale Tract, and an expanded Clifton Court Forebay. The Clifton Court Forebay would be expanded by approximately 590 acres; the north cell of the expanded Clifton Court Forebay would have a surface area of approximately 806 acres at maximum operation level, and the south cell would have surface area of approximately 1,691 acres. A map and a schematic diagram depicting the conveyance facilities associated with Alternative 4 are provided in Figures 3-9 and 3-10 in Chapter 3, *Description of Alternatives*. A detailed depiction is provided in Mapbook Figure M3-4 in Chapter 3.

Each intake site would require a temporary cofferdam to create a dewatered construction area encompassing the entire intake site. Construction of the cofferdams would take place from June through October, and it is expected that dewatering of the cofferdams (i.e., removing water from behind the cofferdams) would occur after the construction of the cofferdams, when generally there are fewer mosquitoes breeding, as mosquitoes in northern California typically breed April–October (Sacramento–Yolo Mosquito and Vector Control District 2008).

Sedimentation basins, solids lagoons, the intermediate forebay inundation area, the periphery of the intermediate forebay, and the expanded Clifton Court Forebay have the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes) because of the large volumes of water that would be held within these areas. The depth, design, and operation of the sedimentation basins and solids lagoons would prevent the development of suitable mosquito habitat (see Chapter 3, *Description of Alternatives*, Section 3.6.1). Specifically, the basins would be too deep (25 feet) and the constant movement of water would prevent mosquitoes from breeding and multiplying. The sedimentation basins would be triangular in shape and would be approximately 250 to 677 feet wide (with the maximum width facing the intake channels), 660 feet long and 25 feet deep. Solids lagoons would be approximately 160 feet wide at the bottom, and 350 feet long. The lagoons would be 15 feet deep. Use of the inundation area adjacent to the intermediate forebay would be limited to forebay emergency overflow situations and water would be physically pumped back to the intermediate forebay, creating circulation such that the area would have a low potential for creating suitable vector habitat. Similarly, water in the intermediate forebay and the expanded Clifton Court Forebay would be circulated regularly and, with the exception of shallower areas around the periphery, would be too deep to provide suitable mosquito breeding habitat.

The sedimentation basins and solids lagoons at Intake 2 would be located within 1 mile of and across the Sacramento River from Clarksburg, and the sedimentation basins and solids lagoons at Intake 3 would be located within 1 mile of Hood. The sedimentation basins and solids lagoons at Intake 5 would be located within 1.5 miles (south) of Hood and 2 miles (north) of Courtland. The sedimentation basins would have a mat slab foundation and interior concrete walls to create separate sedimentation channels. The solids lagoons would be concrete-lined and approximately 10 feet deep. Up to three solids lagoons would be used in a rotating cycle for each intake, with one basin filling, one settling, and the third being emptied of settled and dewatered solids. The rate of filling and settling would depend on the volume of water pumped by the intakes; however, water would continuously move through the basins at a relatively slow but regulated rate so that the solids and sediments can be removed from the water, via settling, prior to discharge into the conveyance facilities (Figure 25-1). The flow rates would be high enough to prevent water from stagnating, as stagnant water would not facilitate conveying the water to the conveyance system or removing the sediment from the water. As discussed in Section 25.1.1.5, mosquitoes typically prefer shallow stagnant water with little movement. The sedimentation basins and solids lagoons would be considered too deep and have too much regulated water movement to provide suitable mosquito habitat. Furthermore, during sediment drying and basin cleaning operations, flow would be stopped completely and the moisture in the sediment would be reduced to a point at which the sediment would not support insect/mosquito larvae production. Therefore, it is anticipated that these basins would not substantially increase suitable vector habitat and would not substantially increase the public's exposure to vector-borne diseases. Accordingly, adverse effects are not expected.

There would be an approximately 131-acre inundation area adjacent to the 243-acre intermediate forebay to accommodate emergency overflow from the forebay. Water would enter this inundation area only during forebay emergency overflow situations; however, these situations could result in standing water approximately 2 feet deep. While water of this depth would be suitable habitat for mosquitoes, such events would be more likely to occur during high flow events in winter, when fewer mosquitoes are breeding (Sacramento–Yolo Mosquito and Vector Control District 2008). Water in the emergency overflow area would be pumped out and back to the intermediate forebay once the danger of overflow has passed. This pumping would create circulation that would minimize the amount of suitable habitat for mosquitoes. Because the area would be used only during emergencies and the water would be pumped from the area, the potential for creating suitable mosquito habitat would be low. Therefore, adverse effects are not expected.

Although the proposed intermediate forebay and the expanded Clifton Court Forebay will increase surface water within the study area, it is unlikely that these water bodies would provide suitable breeding habitat for mosquitoes given that the water in these forebays would not be stagnant and would be too deep. However, the shallow edges of the forebays could provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. However, as part of the regular maintenance of these forebay areas, floating vegetation such as pond weed would be harvested to maintain flow and forebay capacity. Further, BMPs to control mosquitoes would be implemented as part of this alternative. As such, the intermediate forebay and the expanded Clifton Court Forebay would not likely increase mosquito breeding habitat in the Plan Area.

To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs, as necessary, to control mosquitoes and reduce the likelihood that construction and operation of the water conveyance facilities would require an increase in mosquito abatement activities by the local MVCDs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMPs to be implemented as part of the MMPs would help control mosquitoes during construction and operation of the sedimentation basins, solids lagoons, intermediate forebay, intermediate forebay inundation area, and the expanded Clifton Court Forebay. BMP activities would be consistent with the CDPH's *Best Management Practices for Mosquito Control* plan (described in Section 25.2.3.4) include, but not necessarily be limited to, the following.

- Maintain stable water levels.
- Circulate water.
- Implement monitoring and sampling programs to detect early signs of mosquito population problems.
- Use biological agents such as mosquito fish to limit larval mosquito populations, and introduce biological agents to areas of standing water if mosquitoes are present.
- Use larvicides and adulticides, as necessary.
- Test for mosquito larvae during the high mosquito season (June through September).
- Reduce or eliminate emergent vegetation in and along the edges of water
- Introduce physical controls to areas of standing water (e.g., discharging water more frequently or increasing circulation) if mosquitoes are present.

Accordingly, Alternative 4 would not substantially increase suitable vector habitat, and would not substantially increase vector-borne diseases. No adverse effects on public health would result.

***CEQA Conclusion*:** Sedimentation basins, solids lagoons, and the intermediate forebay inundation area have the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes) because of the large volumes of water that would be held within these areas. However, during operations, the depth, design, and operation of the sedimentation basins and solids lagoons would prevent the development of suitable mosquito habitat. Specifically, the basins would be too deep and the constant movement of water would prevent mosquitoes from breeding and multiplying. Furthermore, the 131-acre inundation area adjacent to the intermediate forebay would be limited to forebay emergency overflow situations and water would be pumped back to the intermediate forebay, creating circulation such that the area would have a low potential for creating suitable vector habitat. In addition, although the proposed intermediate forebay and the expanded Clifton Court Forebay would increase surface water within the study area, it is unlikely that these water bodies would provide suitable breeding habitat for mosquitoes given that the water in these forebays would not be stagnant and would be too deep. However, the shallow edges of the forebays could provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow.

To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes during construction and operation of the sedimentation basins, solids lagoons, the expanded Clifton Court Forebay, the intermediate forebay, and the intermediate forebay inundation area. Therefore, construction and operation of Alternative 4 would not result in a substantial increase in vector-borne diseases and the impact on public health would be less than significant. No mitigation is required.

Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That There is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance Facilities

Facilities under Alternative 4 would be operated to provide diversions up to a total of 9,000 cfs from the new north Delta intakes. Alternative 4 water conveyance operations would follow the guidelines described as Operational Scenario H and would include criteria for north Delta diversion bypass flows; south Delta OMR flows; south Delta E/I Ratio; flows over Fremont Weir into Yolo Bypass; Delta inflow; Delta outflow, as determined by the outcome of a decision tree process needed to account for uncertainties related to delta smelt and longfin smelt flow requirements; Delta Cross Channel gate operations; Rio Vista minimum in-stream flow; operations for Delta water quality and residence; and water quality for agricultural and municipal/industrial diversions. These criteria are discussed in detail in Chapter 3, *Description of Alternatives*, Section 3.6.4.2.

NEPA Effects:

Disinfection Byproducts

As described in Chapter 8, *Water Quality*, modeling scenarios included assumptions regarding how certain habitat restoration activities (CM2 and CM4) would affect Delta hydrodynamics, To the extent that restoration actions alter hydrodynamics within the Delta region, which affects mixing of source waters, these effects are included in this assessment of operations-related water quality changes (i.e., CM1).

Changes to DOC and bromide concentrations and, by extension, DBPs, under Alternative 4 operational scenarios (H1–H4) suggest that there would not be exceedances of DBP criteria due to operations, because long-term average DOC and bromide concentrations would be only slightly higher under this alternative relative to the No Action Alternative. For all of the operational scenarios relative to the No Action Alternative, the modeled DOC effects would be greatest at Franks Tract, Rock Slough, and Contra Costa Pumping Plant #1. Increased long-term average DOC concentrations at these locations would be greatest under Scenario H4 and would be least under Scenario H1, although differences would generally be small (i.e., ≤0.2 mg/L). Under Scenario H4, maximum increases of DOC would be ≤12% for these locations. In addition, relative to the No Action Alternative, the frequency which long-term average DOC concentrations would exceed 4 mg/L during the modeled drought period at Buckley Cove would increase by 8%. In general, substantial change in ambient DOC concentrations would need to occur before significant changes in drinking water treatment plant design or operations are triggered. The increases in long-term average DOC concentrations estimated to occur at various Delta locations under the four alternative operational scenarios of Alternative 4 are of sufficiently small magnitude that they would not require existing drinking water treatment plants to substantially upgrade treatment for DOC removal above levels currently employed.

Under operational Scenarios H1-H4, modeled long-term average bromide concentrations would increase at Buckley Cove, Staten Island, Emmaton, and Barker Slough, and would decrease at other assessment locations, relative to the No Action Alternative. Overall effects would be greatest under Scenario H2 at Barker Slough, source of the North Bay Aqueduct, where long-term average concentrations are predicted to increase by 44% (97% during the drought period). Although Scenario H2 would result in the greatest relative increase in long-term average bromide concentrations at Barker Slough, the difference between operational scenarios is very small (see Chapter 8, *Water Quality*, Section 8.3.3.9, for detail). Regardless of the particular Alternative 4 operational scenario, the increase in long-term average bromide concentrations at Barker Slough could necessitate changes in water treatment plant operations or require treatment plant upgrades in order to maintain DBP compliance.

Important to the results presented above is the assumed habitat restoration footprint on both the temporal and spatial scales incorporated into the modeling. Modeling sensitivity analyses have indicated that habitat restoration (which is reflected in the modeling—see Chapter 8, *Water Quality*, Section 8.3.1.3), not operations covered under CM1, are the driving factor in the modeled bromide increases. The timing, location, and specific design of habitat restoration will have effects on Delta hydrodynamics, and any deviations from modeled habitat restoration and implementation schedule will lead to different outcomes. Although habitat restoration near Barker Slough is an important factor contributing to modeled bromide concentrations at the North Bay Aqueduct, BDCP habitat restoration elsewhere in the Delta can also have large effects. Because of these uncertainties, and the possibility of adaptive management changes to BDCP restoration activities, including location, magnitude, and timing of restoration, the estimates are not predictive of the bromide levels that would actually occur in Barker Slough or elsewhere in the Delta.

The Stage 1 Disinfectants and Disinfection Byproduct Rule, adopted by EPA in 1998 as part of the SDWA, requires drinking water utilities to reduce TOC concentrations by specified percentages prior to disinfection. These requirements were adopted because organic carbon, such as DOC, can react with disinfectants during the water treatment disinfection process to form DBPs such as THMs and HAAs, which can pose potential lifetime carcinogenic risks to humans. Water treatment plants that utilize Delta water are designed and operated to meet EPA's 1998 requirements based on the ambient concentrations and seasonal variability that currently exists in the Delta. Ambient DOC and bromide concentrations would need to change substantially to trigger significant changes in plant design or operations. Although the increases in long-term average DOC and bromide concentrations estimated to occur at most modeled Delta locations under Alternative 4 operational scenarios are of sufficiently small magnitude that they would not require existing drinking water treatment plants to substantially upgrade treatment, the modeled average bromide concentration increase predicted for the North Bay Aqueduct at Barker Slough could necessitate upgrades or changes in operations at certain water treatment plants, and this would be considered an adverse effect.

While treatment technologies sufficient to achieve the necessary bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken, a change of such magnitude in long-term average bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBPs in drinking water sources. Mitigation Measure WQ-5 is available to reduce these effects (implementation of this measure along with a separate, other commitment as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, relating to the potential increased treatment costs associated with bromide-related changes would reduce these effects). Further, DWR issued a Notice of Preparation on December 2, 2009 to construct and operate the AIP that would establish an alternative surface water intake on the Sacramento River upstream of the Sacramento Regional Wastewater Treatment Plant discharge. The AIP would connect to the existing North Bay Aqueduct system by a new segment of pipe. The proposed alternative intake would be operated in conjunction with the existing North Bay Aqueduct intake at Barker Slough. The proposed project would be designed to improve water quality and to provide reliable deliveries of SWP supplies to its contractors, the Solano County Water Agency and the Napa County Flood Control and Water Conservation District. The timing of DWR's implementation of the AIP is uncertain at this time. The adverse water quality effects on the North Bay Aqueduct at Barker Slough due to increased bromide may be minimized by implementation of the AIP.

Trace Metals

Water quality modeling results indicate that water conveyance facilities operations would not substantially change concentrations of metals of primarily human health and drinking water concern (arsenic, iron, manganese) in Delta waters relative to the No Action Alternative. The arsenic criterion was established to protect human health from the effects of long-term chronic exposure, while secondary MCLs for iron and manganese were established as reasonable federal regulatory goals for drinking water quality, and enforceable standards in California. Average concentrations for arsenic, iron, and manganese in the primary source water (Sacramento River, San Joaquin River, and the bay at Martinez) are below these criteria. No mixing of these three source waters could result in a metal concentration greater than the highest source water concentration, and, given that the modeled average water concentrations for arsenic, iron, and manganese do not exceed water quality criteria, more frequent exceedances of drinking water criteria in the Delta would not be an expected result under this alternative. Accordingly, no adverse effect on public health related to the trace metals arsenic, iron, or manganese from drinking water sources is anticipated.

Pesticides

Sources of pesticides to the study area include direct input of surface runoff from in-Delta agriculture and Delta urbanized areas as well as inputs from rivers upstream of the Delta. These sources would not be affected by implementing Alternative 4. However, under Alternative 4 Scenarios H1-H4, the distribution and mixing of Delta source waters would change. Changes in source water fractions at the modeled Delta assessment locations would vary depending on operational scenario, but relative differences between the operational scenarios would be small. As described in Chapter 8, *Water Quality*, Section 8.3.3.9, at most modeled Delta locations, these modeled changes in the source water fractions of Sacramento, San Joaquin and Delta agriculture water would not be of sufficient magnitude to substantially increase pesticide concentrations in Delta waters and would not adversely affect beneficial uses of the Delta relative to the No Action Alternative. However, depending on operational scenario, modeled San Joaquin River fractions at Buckley Cove would increase between 16–17% in July (31–34% for the modeled drought period) and 24–25% in August (47–49% for the modeled drought period). Despite these San Joaquin River increases, the resulting net San Joaquin River source water fraction for July and August would remain less than all other months. As such, these increases are of insufficient magnitude to substantially alter the long-term risk of pesticide-related water quality degradation in the Delta, and therefore there would be no adverse public health effect related to these changes in pesticide concentrations.

***CEQA Conclusion*:** Under Alternative 4, water supply operations would increase contributions from the San Joaquin River relative to the Sacramento River, and decrease the dilution capacity of the Sacramento River for contaminants. This could result in changes in water quality. Water quality modeling results (Chapter 8, *Water Quality*, Section 8.3.3.9) indicate that changes in flows under Alternative 4 operational scenarios would not, for the most part, result in increased exceedances of water quality criteria for constituents of concern (DBPs, trace metals and pesticides) in the study area. As described in Chapter 8, under this alternative there would be a modeled increase in source water fraction of the San Joaquin River at Rock Slough and Contra Costa Pumping Plant #1 of 22-23% in November. For all operational scenarios, relative to Existing Conditions, there would be no modeled increases in Sacramento River fractions greater than 14% and Delta agricultural fractions greater than 8%. These modeled changes in the source water fractions of Sacramento, San Joaquin and Delta agriculture water are not of sufficient magnitude to substantially alter the long-term risk of pesticide-related toxicity to aquatic life, nor adversely affect other beneficial uses of the Delta. Long-term average DOC concentrations for the modeled 16-year hydrologic period and the modeled drought period would be predicted to increase by ≤14%. Under Scenario H4, increases in long-term average DOC concentrations at Franks Tract, Rock Slough, and Contra Costa Pumping Plant would correspond to more frequent concentration threshold exceedances, with the greatest change occurring at Rock Slough and Contra Costa Pumping Plant (see Chapter 8, Section 8.3.3.9). However, this predicted change would not be expected to adversely affect MUN beneficial uses, or any other beneficial use.

Further, relative to Existing Conditions, Scenario H1-H4 long-term average bromide concentrations would increase at the North Bay Aqueduct at Barker Slough, Staten Island, and Emmaton on the Sacramento River under Alternative 4. Overall effects would be greatest at Barker Slough, with the smallest model predicted increases occurring under Scenario H3 (21%; 72% increase during the drought period), and the largest model predicted increases occurring under Scenario H2 (40%; 98% increase during the drought period). The increase in long-term average bromide concentrations predicted for Barker Slough would result in a substantial change in source water quality to existing drinking water treatment plants drawing water from the North Bay Aqueduct. These modeled increases in bromide at Barker Slough could contribute to the formation of DBPs and could potentially result in an exceedance of the MCL for DBPs at drinking water treatment plants ultimately resulting in impacts on public health. Accordingly, this would be a significant impact.

The increase in bromide concentrations in drinking water sources could require considerable water treatment plant upgrades in order to achieve equivalent levels of drinking water health protection. While treatment technologies sufficient to achieve the necessary bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken, a change of such magnitude in long-term average bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBPs in drinking water sources. Assuming the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be avoided or minimized by implementation of the AIP, the potential adverse water quality effects on the municipal beneficial uses potentially provided in Barker Slough would remain significant.

Implementation of Mitigation Measure WQ-5 would reduce the severity of this impact. The proposed mitigation requires a series of phased actions to identify and evaluate existing and possible feasible actions to avoid, minimize, or offset increased bromide concentrations, followed by development and implementation of the actions, if determined to be necessary. However, the feasibility and effectiveness of this mitigation measure are uncertain based on currently available information.

In addition to and to supplement Mitigation Measure WQ-5, the BDCP proponents have incorporated into the BDCP, as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, a separate, other commitment to address the potential increased water treatment costs that could result from bromide-related concentration effects on municipal water purveyor operations. Potential options for making use of this financial commitment include funding or providing other assistance towards implementation of the North Bay Aqueduct AIP, acquiring alternative water supplies, or other actions to indirectly reduce the effects of elevated bromide and DOC in existing water supply diversion facilities. Please refer to Appendix 3B for the full list of potential actions that could be taken pursuant to this commitment in order to reduce the water quality treatment costs associated with water quality effects relating to chloride, electrical conductivity, and bromide. Because the BDCP proponents cannot ensure that the results of coordinated actions with water treatment entities will be fully funded or implemented successfully prior to the project's contribution to the impact, the ability to fully mitigate this impact is uncertain. If a solution that is identified by the BDCP proponents and an affected water purveyor is not fully funded, constructed, or implemented before the project's contribution to the impact is made, a significant impact in the form of increased DBP in drinking water sources could occur. Accordingly, this impact would be significant and unavoidable. If, however, all financial contributions, technical contributions, or partnerships required to avoid significant impacts prove to be feasible and any necessary agreements are completed before the project's contribution to the effect is made, impacts would be less than significant.

Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality Conditions; Site and Design Restoration Sites to Reduce Bromide Increases in Barker Slough

It remains to be determined whether, or to what degree, the available and existing salinity response and countermeasure actions of SWP and CVP facilities or municipal water purveyors would be capable of offsetting the actual level of changes in bromide that may occur from implementation of Alternative 4. Therefore, in order to determine the feasibility of reducing the effects of increased bromide levels, and potential adverse effects on beneficial uses associated with CM1 operations (and hydrodynamic effects of tidal restoration under CM4), the proposed mitigation requires a series of phased actions to identify and evaluate existing and possible feasible actions, followed by development and implementation of the actions, if determined to be necessary. The development and implementation of any mitigation actions shall be focused on those incremental effects attributable to implementation of Alternative 4 operations only. Development of mitigation actions for the incremental bromide effects attributable to climate change/sea level rise are not required because these changed conditions would occur with or without implementation of Alternative 4. The goal of specific actions would be to reduce/avoid additional degradation of Barker Slough water quality conditions with respect to the CALFED bromide goal.

BDCP proponents shall also consider effects of site-specific restoration areas proposed under CM4 on bromide concentrations in Barker Slough. Design and siting of restoration areas shall attempt to reduce potential effects to the extent possible without compromising proposed benefits of the restoration areas. It is anticipated that these efforts will be able to reduce the level of projected increase, though it is unknown whether it would be able to completely eliminate any increases.

In addition, following commencement of initial operations of CM1, the BDCP proponents will conduct additional evaluations described herein, and develop additional modeling (as necessary), to define the extent to which modified operations could reduce or eliminate the increased bromide concentrations currently modeled to occur under Alternative 4. The additional evaluations should also consider specifically the changes in Delta hydrodynamic conditions associated with tidal habitat restoration under CM4 (in particular the potential for increased bromide concentrations that could result from increased tidal exchange) once the specific restoration locations are identified and designed. The evaluations will also consider up-to-date estimates of climate change and sea level rise, if and when such information is available.

If sufficient operational flexibility to offset bromide increases is not practicable/feasible under Alternative 4 operations, and/or siting and design of restoration areas cannot feasibly reduce bromide increases to a less than significant level without compromising the benefits of the proposed areas, achieving bromide reduction pursuant to this mitigation measure would not be feasible under this alternative.

Impact PH-3: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Construction, Operation or Maintenance of the Water Conveyance Facilities

***NEPA Effects*:** Three intakes would be constructed and operated under Alternative 4. Sediment-disturbing activities during construction and maintenance of these intakes and other water conveyance facilities proposed near or in surface waters under this alternative could result in the disturbance of existing constituents in sediment, such as pesticides or methylmercury. In-channel construction activities, such as pile driving during the construction of cofferdams at the intakes and pier construction at the barge unloading facilities, which would occur over a period of 5 months, would result in the localized disturbance of river sediment. In addition, maintenance of the three proposed north Delta intakes and the intermediate forebay would entail periodic dredging for sediment removal at these locations. Sediment accumulation in both the northern and southern portion of the expanded Clifton Court Forebay is expected to be minimal over the 50-year permit period. However, it is anticipated that there may be some sediment accumulation at the inlet structure of the northern portion of Clifton Court Forebay. Therefore, while overall sediment accumulation in this forebay is not expected to be substantial, some dredging may be required at the inlet structure to maintain an even flow path. Under the various Alternative 4 operational scenarios (H1–H4), changes in dilution and mixing of sources of water could result in a change in constituents known to bioaccumulate. For example, the reduction of flows in the Sacramento River downstream of the proposed north Delta intakes may result in a decreased dilution of constituents known to bioaccumulate in the study area.

Pesticides

Legacy pesticides, such as organochlorines, have low water solubility; they do not readily volatilize and have a tendency to bond to particulates (e.g., soil and sediment), settle out into the sediment, and not be transported far from the source. If present in sediment within in-water construction areas, legacy pesticides would be disturbed locally and would not be expected to partition into the water column to any substantial degree. Therefore, no significant adverse effect on public health would result from construction.

Numerous pesticides are currently used throughout the affected environment. While some of these pesticides may be bioaccumulative, those present-use pesticides for which there is sufficient evidence of their presence in waters affected by SWP and CVP operations (i.e., organophosphate pesticides, such as diazinon, chlorpyrifos, diuron, and pyrethroids) are not considered bioaccumulative. Thus, changes in their concentrations would not directly cause bioaccumulative problems in aquatic life or humans. Furthermore, Alternative 4 would not result in increased tributary flows that would mobilize organochlorine pesticides in sediments. Thus, the change in source water in the Delta associated with the change in water supply operations is not expected to adversely affect public health with respect to bioaccumulation of pesticides.

Methylmercury

If mercury is sequestered in sediments at water facility construction sites, it could become suspended in the water column during construction activities, opening up a new pathway into the food chain. Disturbance of sediment associated with construction activities (e.g., pile driving and cofferdam installation) at intake sites or barge landing locations would result in a localized, short-term increase in turbidity during the construction activity, which may suspend sediment that contains methylmercury. Please see Chapter 8, Section 8.1.3.9, *Mercury*, for a discussion of methylmercury concentrations in sediments.

As environmental commitments DWR would develop and implement Erosion and Sediment Control Plans and SWPPPs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMPs implemented under the Erosion and Sediment Control Plans and the SWPPPs would help reduce turbidity and keep sediment that may contain legacy organochlorine pesticides and methylmercury within the area of disturbance. These BMPs would include, but not necessarily be limited to the following.

- Install physical erosion control stabilization features (hydroseeding, mulch, silt fencing, fiber rolls, sand bags, and erosion control blankets) to capture sediment and control both wind and water erosion.
- Retain trees and natural vegetation to the extent feasible to stabilize hillsides, retain moisture, and reduce erosion.
- Limit construction, clearing of vegetation, and disturbance of soils to areas of proven stability.
- Use sediment ponds, silt traps, wattles, straw bale barriers or similar measures to retain sediment transported by runoff water onsite.
- Collect and direct surface runoff at non-erosive velocities to the common drainage courses.
- Deposit or store excavated materials away from drainage courses.
- Prevent transport of sediment at the construction site perimeter, toe of erodible slopes, soil stockpiles, and into storm drains.
- Reduce runoff velocity on exposed slopes.
- Reduce offsite sediment tracking.

Implementation of these measures would help ensure that construction activities would not substantially increase or substantially mobilize methylmercury. Accordingly, there would be no adverse effect.

Water quality and fish tissue modeling results showed small, insignificant changes in total mercury and methylmercury levels in water and fish tissues resulting from Alternative 4 water operations (see Chapter 8, Section 8.3.3.9, *Alternative 4—Dual Conveyance with Modified Pipeline/Tunnel and Intakes 2, 3, and 5 [9,000 cfs; Operational Scenario H*]), for a detailed discussion). Upstream mercury contributions and methylmercury production in Delta waters would not be altered by the operation of Alternative 4, as it would not change existing mercury sources and would not substantially alter methylmercury concentrations in the Sacramento River or San Joaquin River. Water quality modeling results indicate that the percentage change in assimilative capacity of waterborne total mercury relative to the 25 ng/L Ecological Risk Benchmark was greatest for Scenario H4 relative to the No Action Alternative. These changes ranged, from 5.0% at the Jones Pumping Plant to -2.3% at Old River at Rock Slough. These same sites show the smallest range of effects on assimilative capacity for Alternative 4 H1, with 4.3% and -1.4% for these same two stations, respectively. Operational Scenarios H2 and H3 fall between these two extremes. The changes are not expected to result in adverse effects on beneficial uses. Similarly, changes in methylmercury concentration are expected to be very small as predicted by modeling.

Fish tissue estimates showed small or no increase in exceedance quotient based on long-term annual average mercury concentrations at the nine Delta locations modeled. The greatest increases in exceedance quotients relative to the No Action Alternative were estimated to be 12% for both Old River at Rock Slough, and for Franks Tract. The lowest percentage change in modeled bass mercury concentrations is predicted to occur under Operational Scenario H1 relative to the No Action Alternative for these locations.

Currently, mercury concentrations in fish tissues exceed Delta TMDL guidance targets, which are set for human health rather than effects on fish, and operation of Alternative 4 is not expected to substantially alter this condition. Large sport fish throughout the Delta are currently uniformly in exceedance of consumption guidelines for mercury, and Alternative 4 is not expected to substantially alter that condition. Although methylmercury currently exceeds the TMDL, little to no change in mercury or methylmercury concentrations in water is expected under Alternative 4 operational scenarios. Thus, the alternative would not result in increased exceedances of water quality criteria. Because water operations would not substantially increase methylmercury above what currently exists in the study area and would not expose people to an additional public health hazard, adverse effects on public health are not expected to result. In addition, because these increases are relatively small, and it is not evident that substantive increases are expected at numerous locations throughout the Delta, these changes are expected to be within the uncertainty inherent in the modeling approach, and would likely not be measurable in the environment. See Appendix 8I, *Mercury*, for a discussion of the uncertainty associated with the fish tissue estimates.

CEQA Conclusion: Intermittent and/or short-term construction-related activities (as would occur for in-river construction) would not be anticipated to result in contaminant discharges of sufficient magnitude or duration to contribute to long-term bioaccumulation processes, or cause measureable long-term degradation such that existing 303(d) impairments would be made discernibly worse or TMDL actions to reduce loading would be adversely affected. Legacy organochlorine pesticides typically bond to particulates and do not mobilize easily. Construction and maintenance of Alternative 4 would not cause these legacy pesticides to be transported far from the source or to partition into the water column. Other pesticides which are currently present in waters affected by SWP and CVP operations are not considered bioaccumulative. Although methylmercury currently exceeds the TMDL, little to no change in methylmercury concentrations in water are expected under Alternative 4 water conveyance construction.

Alternative 4 would not result in increased flows in the tributaries that would mobilize legacy organochlorine pesticides in sediments. Other pesticides that are present in study area water channels are not considered bioaccumulative and any changes in concentrations due to Alternative 4 operations would not cause them to become bioaccumulative.

Water quality modeling results indicated small, insignificant changes in mercury and methylmercury levels in water at certain Delta locations and in mercury in fish tissues due to Alternative 4 operational scenarios (H1–H4). Specifically, modeling results indicate that the percentage change in assimilative capacity of waterborne total mercury relative to the 25 ng/L Ecological Risk Benchmark for this alternative relative to Existing Conditions would show the greatest decrease (2.4%) in the Old River at Rock Slough and at the Contra Costa Pumping Plant. These are bounded by Alternative 4 H1 estimates of -1.4% and -1.5% at these two locations, respectively. In contrast the greatest increase in assimilative capacity relative to Existing Conditions would be 4.4% for operational Scenario H4 at the Jones Pumping Plant. Scenarios H2 and H3 range in changes in assimilative capacity in relation to Existing Conditions from -2.1% (H3 at Contra Costa

Pumping Plant) to 4.1% (H2 at Banks). These small changes in assimilative capacity are not expected to result in significant impacts to beneficial uses. Fish tissue estimates show only small or no increases in exceedance quotients based on long-term annual average concentrations for mercury at the nine Delta locations modeled. The greatest increase over Existing Conditions was for Scenario H4 and was 15% at Old River at Rock Slough and 13% for Franks Tract as compared to Scenario H1 estimates for both of those locations of 9%. Because these increases are relatively small, and it is not evident that substantive increases are expected at numerous locations throughout the Delta, these changes are expected to be within the uncertainty inherent in the modeling approach, and would likely not be measurable in the environment. See Appendix 8I, *Mercury*, for a discussion of the uncertainty associated with the fish tissue estimates.

BMPs implemented as part of Erosion and Sediment Control Plans and SWPPPs would help ensure that construction activities would not substantially increase or substantially mobilize legacy organochlorine pesticides or methylmercury during construction and maintenance. Further, because mercury concentrations are not expected to increase substantially, no long-term water quality degradation is expected to occur and, thus, no adverse effects to beneficial uses would occur. Because any increases in mercury or methylmercury concentrations are not likely to be measurable, changes in mercury concentrations or fish tissue mercury concentrations would not make any existing mercury-related impairment measurably worse. In comparison to Existing Conditions, Alternative 4 would not increase levels of mercury by frequency, magnitude, and geographic extent such that the affected environment would be expected to have measurably higher body burdens of mercury in aquatic organisms or humans consuming those organisms.

Therefore, construction, operation and maintenance of Alternative 4 would not cause increased exposure of the public to these bioaccumulative sediment constituents. Since construction, maintenance, or operation of the water conveyance facilities under Alternative 4 would not cause substantial mobilization or a substantial increase of constituents known to bioaccumulate, impacts on public health would be less than significant. No mitigation is required.

Impact PH-4: Expose Substantially More People to Transmission Lines Generating New Sources of EMFs as a Result of the Construction and Operation of the Water Conveyance Facilities

NEPA Effects**:** Approximately 621 miles of existing transmission lines are located within the study area. Under Alternative 4, the method of delivering power to construct and operate the water conveyance facilities is assumed to be a "split" system that would connect to the existing grid in two different locations—one in the northern section of the alignment, and one in the southern section of the alignment. As described in Table 25-9, a total of 6.08 miles of new temporary 69 kV transmission lines; 18.72 miles of new temporary 230 kV transmission lines; and 14.96 miles of new permanent 230 kV transmission lines; 1.00 mile of new permanent 230 kV/34.5 kV (underbuild) transmission lines; and 11.28 miles of new permanent 230 kV/34.5 kV (underbuild) transmission lines would be constructed and operated under Alternative 4. In addition, an existing 1.19-mile 500 kV transmission line south/southeast of the Clifton Court Forebay will be relocated to an area less than half a mile southeast of the current location of the existing towers.

Any new temporary and permanent transmission lines constructed and operated under Alternative 4 would, for the most part, be located in areas that are not densely populated (Figure 25-2) and, therefore, would not expose substantially more people to EMF from transmission lines. Table 25-9 identifies four potential new sensitive receptors (Stone Lakes National Wildlife Refuge, Courtland

Fire Station 92, Cosumnes River Ecological Reserve, and Clifton Court Forebay) associated with the pipeline/tunnel alignment that are not currently within 300 feet of an existing transmission line; the majority of sensitive receptors are already located within 300 feet of an existing 69 kV or 230 kV transmission line. Accordingly, new temporary or new permanent transmission lines would not expose substantially more potential sensitive receptors or substantially more people to EMFs that they are not already experiencing. Stone Lakes National Wildlife Refuge and Cosumnes River Ecological Reserve would be within 300 feet of a proposed temporary 230 kV transmission line and Clifton Court Forebay would be within 300 feet of a proposed permanent 230 kV transmission line and a 230 kV/34.5 kV (underbuild) transmission line. Visitors to these areas generally come for walks, water recreation, fishing and hunting, and as such, it is unlikely that large groups of people would be staying in the area within 300 feet of this proposed transmission line, so any EMF exposure would be limited. Courtland Fire Station 92 would be within 300 feet of a temporary 69 kV transmission line. These temporary transmission lines would be removed following completion of construction of the water conveyance facility features near this area so there would be no potential permanent effects.

As discussed in Section 25.1.1.6, the current scientific evidence does not show conclusively that EMF exposure can increase health risks. In 2006, CPUC updated its EMF policy and reaffirmed that health hazards from exposures to EMF have not been established. State and federal public health regulatory agencies have determined that setting numeric exposure limits is not appropriate. CPUC also reaffirmed that the existing no-cost and low-cost precautionary-based EMF policy should be continued. Based on this, utility companies are required to establish and maintain EMF Design Guidelines in order to reduce potential health risks associated with power lines. These guidelines would be implemented for any new temporary or new permanent transmission lines constructed and operated under Alternative 4, depending on which electric provider is selected by DWR. Furthermore, as described in Appendix 3B, *Environmental Commitments, AMMs, and CMs*, the location and design of the proposed new transmission lines would be conducted in accordance with CPUC's EMF Design Guidelines for Electrical Facilities, and would include one or more of three measures to reduce EMF exposure.

- Shielding by placing trees or other physical barriers along the transmission line right-of-way.
- Cancelation by configuring the conductors and other equipment on the transmission towers.
- Increasing the distance between the source of the EMF and the receptor either by increasing the height of the tower or increasing the width of the right-of-way.

Therefore, operation of the transmission line corridors would not expose substantially more people to transmission lines generating EMFs, and there would be no adverse effect on public health.

***CEQA Conclusion*:** Under Alternative 4, the majority of proposed new temporary (69 kV and 230 kV) and new permanent (230 kV and 230 kV/34.5 kV) transmission lines would be located within the rights-of-way of existing transmission lines; any new temporary or permanent transmission lines not within the right-of-way of existing transmission lines would, for the most part, be located in sparsely populated areas generally away from existing sensitive receptors. Four potential new sensitive receptors (Stone Lakes National Wildlife Refuge, Courtland Fire Station 92, Cosumnes River Ecological Reserve, and Clifton Court Forebay) associated with the pipeline/tunnel alignment that are not currently within 300 feet of an existing transmission line; the majority of sensitive receptors are already located within 300 feet of an existing 69 kV or 230 kV transmission line. Accordingly, new temporary or new permanent transmission lines would not expose substantially more potential sensitive receptors or substantially more people to EMFs that they are not already experiencing. Stone Lakes National Wildlife Refuge and Cosumnes River Ecological Reserve would be within 300 feet of a proposed temporary 230 kV transmission line and Clifton Court Forebay would be within 300 feet of a proposed permanent 230 kV transmission line and a 230 kV/34.5 kV (underbuild) transmission line. Visitors to these areas generally come for walks, water recreation, fishing and hunting, and as such, it is unlikely that large groups of people would be staying in the area within 300 feet of this proposed transmission line, so any EMF exposure would be limited. Courtland Fire Station 92 would be within 300 feet of a temporary 69 kV transmission line. The temporary transmission lines would be removed when construction of the water conveyance facility features is completed, so there would be no potential permanent effects. Therefore, these transmission lines would not substantially increase people's exposure to EMFs.

Additionally, design and implementation of new proposed temporary or permanent transmission lines not within the right-of-way of existing transmission lines would follow CPUC's EMF Design Guidelines for Electrical Facilities and would implement shielding, cancelation, or distance measures to reduce EMF exposure. Since construction and operation of Alternative 4 would not expose substantially more people to transmission lines that provide new sources of EMFs, impacts on public health would be less than significant. No mitigation is required.

Impact PH-5: Increase in Vector-Borne Diseases as a Result of Implementing CM2-CM7, CM10 and CM11

NEPA Effects: Implementation of CM2-CM7, CM10 and CM11 under Alternative 4 would include fisheries enhancement (CM2); the restoration of up to 65,000 acres of tidal and freshwater habitat (CM3 and CM4), 10,000 acres of seasonally inundated floodplain (CM5), and 1,200 acres of nontidal marsh and 500 acres of managed wetlands (CM10); enhancement of channel margin and riparian habitat (CM6 and CM7); and protection of 150 acres of alkali seasonal wetland complex and 1,500 acres of managed wetlands (CM3 and CM11). These activities could potentially increase suitable mosquito habitat within the study area.

Under CM2, *Yolo Bypass Fisheries Enhancement*, the frequency, duration, and magnitude of inundation of the Yolo Bypass would increase. The increased floodplain inundation and water surface may result in an increase in mosquitoes in the Yolo Bypass.

Of the approximate 65,000-acre tidal and freshwater habitat restoration target, approximately 55,000 acres of this restoration will consist of tidal perennial aquatic, tidal mudflat, tidal freshwater emergent wetland, and tidal brackish emergent wetland natural communities, and the remaining up to 10,000 acres will consist of transitional uplands to accommodate sea level rise. Of the approximate 55,000 acres of tidally influenced natural community, approximately 20,600 acres must occur in particular ROAs as listed below.

- 7,000 acres of brackish tidal habitat, of which at least 4,800 acres would be tidal brackish emergent wetland and the remainder would be tidal perennial aquatic and tidal mudflat, in Suisun Marsh (ROA).
- 5,000 acres of freshwater tidal habitat in the Cache Slough ROA.
- 1,500 acres of freshwater tidal habitat in the Cosumnes/Mokelumne ROA.
- 2,100 acres of freshwater tidal habitat in the West Delta ROA.
- 5,000 acres of freshwater tidal habitat in the South Delta ROA.

The remaining 34,400 acres would be distributed among the ROAs or may occur outside the ROAs. The areas within the ROAs currently have potentially suitable habitat for mosquitoes and aquatic habitat restoration in these areas may increase mosquito populations.

Potentially suitable mosquito habitat resulting from the implementation of CM2–CM7, CM10 and CM11 would generally not be located near densely populated areas (Figure 25-3). Table 25-6 outlines the distances travelled from breeding grounds for the species listed. These distances range from less than 1 mile to up to 30 miles. The conservation measures would generally expand existing habitat or replace existing agricultural areas, both of which are currently sources for mosquitoes. Of the ROAs, the South Delta ROA and West Delta ROA currently have the fewest acres of habitat suitable for mosquitoes and are the closest to more densely populated areas (Figure 25-3). Similarly, although much of Yolo Bypass is not proximate to densely populated areas, there are areas of Yolo Bypass near populated areas including El Macero, Davis, and West Sacramento. Therefore, habitat restoration in these ROAs and in the Yolo Bypass may result in an increase in mosquitoes and exposure to vector-borne diseases when compared with restoration of aquatic habitat within the other ROAs.

The habitat restoration and enhancement under all of these CMs would be performed in accordance with Natural Communities Enhancement and Management (CM11), which would require preparation and implementation of management plans for the protected natural communities and covered species habitats. The preparation and implementation of the management plans would be performed in consultation with the appropriate MVCDs. This consultation would occur when specific restoration and enhancement projects and locations are identified within the ROAs and prior to implementation of CM2. It is standard practice to use IPM to control mosquitoes, and, as part of the consultation with the MVCDs, BDCP proponents would prepare and implement MMPs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). In addition, BMPs from the guidelines outlined in Section 25.2.3.4 and Section 25.2.5.7 and detailed in Appendix 3B would be incorporated into the proposed project and executed to maintain proper water circulation and flooding during appropriate times of the year (e.g., fall) to prevent stagnant water and habitat for mosquitoes. BMPs to be implemented as part of the MMPs would include, but not necessarily be limited to, the following.

- Delay or phase fall flooding—phased flooding involves flooding habitat throughout the fall and winter in proportion to wildlife need and takes into consideration other wetland habitat that may be available in surrounding areas.
- Use rapid fall flooding
- Use deep initial flooding
- Subsurface irrigate
- Utilize water sources with mosquito predators for flooding
- Drain irrigation water into ditches or other water bodies with abundant mosquito predators
- Employ vegetation management practices to reduce mosquito production in managed wetlands (e.g., mowing, burning, discing of vegetation that serves as mosquito breeding substrate)
- Design wetlands and operations to be inhospitable to mosquitoes
- Implement monitoring and sampling programs to detect early signs of mosquito population problems

- Use biological agents such as mosquito fish to limit larval mosquito populations.
- Use larvicides and adulticides, as necessary
- Test for mosquito larvae during the high mosquito season (June through September)

Finally, restoration of different types of habitat would potentially increase mosquito predators, such as birds and bats, using the habitat. Therefore, implementation of the habitat restoration and enhancement conservation measures would not significantly increase the public's risk of exposure to vector-borne diseases. Accordingly, there would be no adverse effect.

***CEQA Conclusion*:** Although implementing Alternative 4 would increase restored and enhanced habitat in the study area that could result in a significant increase in vectors such as mosquitoes, implementation of environmental commitments, including consultation with the MVCDs and implementation of BMPs as part of MMPs as set forth in Appendix 3B, *Environmental Commitments, AMMs, and CMs*, would reduce the potential for an increase in mosquito breeding habitat, and, as such, an associated substantial increase in vector-borne diseases would not result. Furthermore, habitat would be restored in areas where existing potentially suitable habitat for mosquitoes already exists. Finally, predators on mosquitoes would likely increase as a result of restoration and enhancement, which would keep mosquito populations in check. Accordingly, implementation of CM2-CM7, CM10 and CM11 under Alternative 4 would not substantially increase the public's risk of exposure to vector-borne diseases beyond what currently exists and would be less than significant. No mitigation is required.

Impact PH-6: Substantial Increase in Recreationists' Exposure to Pathogens as a Result of Implementing the Restoration Conservation Measures

***NEPA Effects*:** The study area currently supports habitat types, such as tidal habitat, upland wetlands, and agricultural lands, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). The study area does not currently have pathogen concentrations that rise to the level of adversely affecting beneficial uses of recreation. Restored habitat and protected agricultural lands under Alternative 4 could result in an increase in pathogen loading in the study area because these land uses are known to generate pathogens. However, as exemplified by the Pathogen Conceptual Model, any potential increase in pathogens associated with the proposed habitat restoration and enhancement (as part of implementation of restoration conservation measure) would be localized and within the vicinity of the actual restoration. The result would be similar for lands protected for agricultural uses. This localized increase is not expected to be of sufficient magnitude and duration to result in adverse effects on recreationists as described in Chapter 8, *Water Quality*, Section 8.3.3.9. Furthermore, depending on the level of recreational access granted by management plans, habitat restoration and enhancement could increase or decrease opportunities for recreationists within the study area. Mechanisms that permit public access could increase opportunities related to upland hunting, hiking, walking, wildlife and botanical viewing, nature photography, picnicking, and sightseeing. Alternatively, land acquisition that would exclude public recreational use would decrease opportunities for these activities, thus limiting recreationists' potential exposure to pathogens. Even if recreationists were allowed in the ROAs, the characteristics of pathogens in water as described by the conceptual model would not substantially increase recreationists' exposure. Accordingly, implementation of the restoration conservation measures under Alternative 4 would not result in a substantial increase in recreationists' exposure to pathogens. There would be no adverse effect.

CEQA Conclusion: Implementation of the restoration conservation measures would support habitat types, such as wetlands and agricultural lands, that could produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). However, the localized nature of pathogen generation, as well as the quick die-off of some types of pathogens once released into water bodies, would generally prevent substantial pathogen exposure to recreationists. Therefore, impacts would be less than significant. No mitigation is required.

Impact PH-7: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Implementing CM2, CM4, CM5, and CM10

NEPA Effects: The primary concern with habitat restoration regarding constituents known to bioaccumulate is the potential for mobilizing contaminants sequestered in sediments of the newly inundated floodplains and marshes. The mobilization depends on the presence of the constituent and the biogeochemical behavior of the constituent to determine whether it could re-enter the water column or be reintroduced into the food chain.

Pesticides

Organochlorines and other relatively water insoluble pesticides would likely be sequestered in the former agricultural soils in ROAs. Additionally, because these chemicals tend to bind to particulates, concentrations are typically highest in sediment. Flooding of former agricultural land, as would occur under CM4, CM5, and CM10, is expected to result in some level of accessibility to biota through uptake by benthic organisms. Moreover, CM2 and CM5 may be managed alongside continuing agriculture, where pesticides may be used on a seasonal basis and where water during flood events may come in contact with residues of these pesticides. However, rapid dissipation would be expected, particularly in the large volumes of water involved in flooding; therefore, it is unlikely that a substantial increase in bioaccumulation by fish would result. Further, implementation of CM2, CM4, CM5, and CM10 would not include the use of bioaccumulative pesticides. Additionally, significant increases in concentrations of organochlorine and other legacy pesticides are not expected in the water column because these lipophilic chemicals strongly partition to sediments, and concentrations in the water column would be relatively short-lived because these pesticides settle out of the water column via sediment adsorption in low-velocity flow.

As described in Section D.4.6.1 of BDCP Appendix 5.D, if pesticide-laden sediment erodes and is transported from an ROA, it is likely that the pesticides would not be transported very far from the source area, and would settle out with suspended particulates and be deposited close to the ROA. For these reasons, a substantial mobilization of, or a substantial increase in, bioaccumulative pesticides in the study area is not anticipated. Therefore, no adverse effect on public health with respect to bioaccumulation of pesticides is expected.

Methylmercury

Conversion of inorganic mercury to methylmercury occurs in flooded fine sediments subjected to periodic drying-out periods and is associated with anaerobic (oxygen-depleted), reducing environments (Alpers et al. 2008; Ackerman and Eagles-Smith 2010). Methylmercury production is greatest in high marshes that are subjected to wet and dry periods over the highest monthly tidal cycles; production appears to be less in low marshes that are always inundated and not subject to dry periods (Alpers et al. 2008).

Methylmercury generation rates are ultimately dependent on the concentrations of mercury in the soils, and on the specific biogeochemistry of the system. The biogeochemistry and fate and transport of mercury and methylmercury are very complex. Restoration would involve inundation of areas where mercury has been sequestered in soils, and, if methylation occurs, the methylmercury would be mobilized into the aquatic system. Results of the CALFED Mercury Project Annual Report for 2007 (Stephenson et al. 2007) indicate that river inputs (11.5 grams per day [g/day] methylmercury) and in-situ production from wetland/marsh sediments (11.3 g/day methylmercury) are the leading sources of methylmercury to the Delta waters, and have roughly comparable levels of input. Wood (2010) estimates that in-situ methylmercury production in open water and wetlands contributes approximately 36% of the overall methylmercury load to the Delta (approximately 5 g/day) but is less than riverine/tributary inputs (8 g/day). The higher estimate of methylmercury production from sediments reported by Stephenson is based on periods of higher water (wet) and may be more representative of what might occur when new ROAs are opened for inundation. Once in the aquatic system, the methylmercury can be transported with water flow, taken up by biota, volatilized, demethylated, or returned to sediment (but not necessarily at the original restoration site).

The Sacramento River watershed, and specifically the Yolo Bypass, is the primary source of mercury in the study area. The highest concentrations of mercury and methylmercury are in the Cache Creek area and the Yolo Bypass. The amount of methylmercury produced in the Yolo Bypass has been estimated to represent 40% of the total methylmercury production for the entire Sacramento River watershed (Foe et al. 2008). Water discharging from the Yolo Bypass at Prospect Slough has a reported average annual methylmercury concentration of 0.27 ng/L, more than four times greater than the 0.06 ng/L TMDL.

The highest levels of methylmercury generation, mobilization, and bioavailability are expected in the Yolo Bypass with implementation of CM2 under Alternative 4. Implementation of CM2 would subject Yolo Bypass to more frequent and wider areas of inundation. The concentrations of methylmercury in water exiting the Yolo Bypass would depend on many variables. However, implementation of CM2 has the potential to significantly increase the loading, concentrations, and bioavailability of methylmercury in the aquatic system.

As part of the implementation of conservation measures under Alternative 4, measures would be developed to reduce the production of methylmercury in ROAs, and these measures would be implemented as part of *CM12 Methylmercury Management*. These measures may include construction and grading in a way that minimizes exposure of mercury-containing soils to the water column; designing areas to support/enhance photodegradation; and pre-design field studies to identify depositional areas where mercury accumulation is most likely and characterization and/or design that avoids these areas. CM12 provides for consideration of new information related to methylmercury degradation that could effectively mitigate methylmercury production and mobilization.

In summary, Alternative 4 restoration actions are likely to result in increased production, mobilization, and bioavailability of methylmercury in the aquatic system. Methylmercury would be generated by inundation of restoration areas, with highest concentrations expected in the Yolo Bypass, Cosumnes River and Mokelumne River, and at ROAs closest to these source areas as a result of the BDCP actions. An increase in bioavailability in the aquatic system could result in a corresponding increase in bioaccumulation in fish tissue, biomagnification through the food chain, and human exposure. Because the increase in bioavailability in the food chain cannot be quantified, the increase in human exposure also cannot be quantified. OEHHA standards would continue to be implemented for the consumption of study area fish and thus would serve to protect people against the overconsumption of fish with increased body burdens of mercury. Furthermore, implementation of *CM12 Methylmercury Management* would minimize effects because it provides for project-specific mercury management plans including a QA/QC program, and specific tidal habitat restoration design elements to reduce the potential for methylation of mercury and its bioavailability in tidal habitats. As such, adverse effects on public health due to the substantial mobilization of or increase in methylmercury are not expected to occur.

***CEQA Conclusion*:** Flooding of former agricultural land under CM4, CM5, and CM10, could result in some level of accessibility of legacy organochlorine pesticides to biota through uptake by benthic organisms. Further, CM2 and CM5 may be managed alongside continuing agriculture, where pesticides may be used on a seasonal basis and where water during flood events may come in contact with organochlorine and legacy pesticide residues. However, rapid dissipation would be expected, particularly in the large volumes of water involved in flooding; therefore, it is unlikely that a substantial increase in bioaccumulation by fish would result. Additionally, while there would likely be an increase in mobilization of and potentially an increase in bioaccumulation of methylmercury in the study area's aquatic systems (e.g., fish and water) in the near term, it is unlikely to be substantial. Further, *CM12 Methylmercury Management* as well as existing OEHHA standards, would serve to reduce the public's exposure to contaminated fish. Implementation of CM2, CM4, CM5, and CM10 under Alternative 4 would not substantially mobilize or substantially increase the public's exposure to constituents known to bioaccumulate and would be less than significant. No mitigation is required.

Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water Conveyance Facilities

Any modified reservoir operations under Alternative 4 are not expected to promote *Microcystis* production upstream of the Delta since large reservoirs upstream of the Delta are typically low in nutrient concentrations and phytoplankton outcompete cyanobacteria, including *Microcystis*. Further, in the rivers and streams of the Sacramento River watershed, watersheds of the eastern tributaries (Cosumnes, Mokelumne, and Calaveras Rivers), and the San Joaquin River upstream of the Delta, bloom development would be limited by high water velocity and low hydraulic residence times.

Conditions in the Export Service Areas under the four operational scenarios of Alternative 4 are not expected to become more conducive to *Microcystis* bloom formation, relative to the No Action Alternative, because neither water residence time nor water temperatures will increase in the Export Service Areas. As described in Chapter 8, *Water Quality*, *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not due to water conveyance facility operations. Similarly, residence times in the Export Service Area would not be affected by operations of CM1. Accordingly, conditions would not be more conducive to *Microcystis* bloom formation. Water diverted from the Sacramento River in the north Delta is expected to be unaffected by *Microcystis*, but the fraction of water flowing through the Delta that reaches the existing south Delta intakes is expected to be influenced by an increase in *Microcystis* blooms. Therefore, relative to the No Action Alternative, the addition of Sacramento River water from the north Delta under Alternative 4 would dilute *Microcystis* and microcystins in water diverted from the south Delta. Because the degree to which *Microcystis* blooms, and thus microcystins concentrations, would increase in source water from the south Delta is unknown, it cannot be determined whether Alternative 4 will result in increased or decreased levels of microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Ambient meteorological conditions are the primary driver of Delta water temperatures, and therefore climate warming, and not water operations, would determine future water temperatures in the Delta. Increasing water temperatures due to climate change could lead to earlier attainment of the water temperature threshold of 19°C required to initiate *Microcystis* bloom formation, and therefore earlier occurrences of *Microcystis* blooms in the Delta, as well as increases in the duration and magnitude. However, these temperature-related changes under Alternative 4 would not be different from what would occur under the No Action Alternative. Under H1-H4 operational scenarios, the modeled increase in hydraulic residence time in the Delta indicate varying levels of change depending on Delta location and timeframe (see Chapter 8, *Water Quality*). The changes in hydraulic residence time are driven by several factors accounted for in the modeling, including the hydrodynamic effects of restoration actions planned under CM2 and CM4, diversion of Sacramento River water at the proposed north Delta intake facility, as well as changes in net Delta outflows. Siting and design of restoration areas would have a substantial influence on the magnitude of residence time increases under Alternative 4. The modeled increase in hydraulic residence time in the Delta under operational scenarios H1-H4 could potentially increase the frequency, magnitude, and geographic extent of *Microcystis* blooms, and therefore microcystin in the Delta. Therefore, impacts on beneficial uses, including drinking water and recreational waters, could occur and, as such, public health could be affected. Accordingly, this would be considered an adverse effect. Mitigation Measure WQ-32a and WQ-32b are available to reduce the effects of degraded water quality, and therefore potential public health effects due to *Microcystis*. However, because the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain, the effect would still be considered adverse.

CEQA Conclusion: Under Alternative 4, operation of the water conveyance facilities is not expected to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta because large reservoirs upstream are typically low in nutrient concentrations and phytoplankton outcompete cyanobacteria, including *Microcystis*, and high water velocity and low hydraulic residence times in the upstream area limit the development of *Microcystis* blooms. *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not water conveyance facility operations. Residence times in the Export Service Area would not be affected by operations of CM1, and therefore conditions would not be more conducive to *Microcystis* bloom formation. Water exported from the Delta to the Export Service Area is expected to be a mixture of *Microcystis*-affected source water from the south Delta intakes and unaffected source water from the Sacramento River. Because of this, it cannot be determined whether operations and maintenance under Alternative 4 would result in increased or decreased levels of *Microcystis* and microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Water temperatures and hydraulic residence times in the Delta are expected to increase, which would result in an increase in the frequency, magnitude and geographic extent of *Microcystis*, and therefore microcystin levels. However, the potential water quality effects due to temperature increases would be due to climate change, not effects resulting from operation of the water conveyance facilities. Increases in Delta residence times under all Alternative 4 operational scenarios (i.e., H1-H4) would be due in small part to climate change and sea level rise, but due to a greater degree to operation of the water conveyance facilities and hydrodynamic impacts of restoration included in CM2 and CM4. Consequently, it is possible that increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms in the Delta would occur due to the operations and maintenance of the water conveyance facilities and the hydrodynamic impacts of restoration under CM2 and CM4. Accordingly, beneficial uses including drinking water and recreational waters would potentially be impacted and therefore, so would public health. Therefore this impact would be significant.

Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time considerations be incorporated into restoration area site design for CM2 and CM4 using the best available science at the time of design. Mitigation Measure WQ-32b requires that the project proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods to determine whether increases in abundance are significant. This mitigation measure also requires that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will investigate and evaluate measures that could be taken to manage hydraulic residence time in the affected areas of the Delta. However, because the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and CM4

***NEPA Effects*:** As described in Chapter 8, *Water Quality*, implementation of CM3 and CM6–CM21 is unlikely to affect *Microcystis* abundance in the rivers and reservoirs upstream of the Delta, in the Delta region, or the waters exported to the SWP/CVP Export Service Areas. Implementation of *CM5 Seasonally Inundated Floodplain Restoration* could result in increased local water temperatures in areas near restored seasonally inundated floodplains. However, floodplain inundation typically occurs during spring and winter months when *Microcystis* growth is limited in general by low water temperatures and by insufficient surface water irradiance. Water temperatures would not increase sufficiently due to floodplain inundation such that effects on *Microcystis* growth would occur. Therefore, implementation of CM5 is unlikely to affect *Microcystis* blooms in the study area. Implementation of *CM13 Invasive Aquatic Vegetation Control* may increase turbidity and flow velocity, particularly in restored aquatic habitats, which could discourage *Microcystis* growth in these areas. To the extent that IAV removal would affect turbidity and water velocity, it is possible that IAV removal could, to some degree, help offset the increase in *Microcystis* production expected under Alternative 4, relative to the No Action Alternative.

As discussed under Impact PH-8, development of restoration areas under CM2 and CM4 could potentially increase the frequency, magnitude, and geographic extent of *Microcystis* blooms due to the hydrodynamic impacts that are expected to increase water residence times throughout the Delta. Additionally, restoration activities implemented under CM2 and CM4 that create shallow backwater areas could result in local increases in water temperature that may encourage *Microcystis* growth during the summer bloom season, which could result in further degradation of water quality to the extent that beneficial uses are affected. Were *Microcystis* blooms to increase with implementation of CM2 and CM4, there would be an increase in the potential for impacts on public health as a result of potential effects on drinking water quality and recreational waters. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time, but the effects would be adverse.

CEQA Conclusion: Restoration activities implemented under Alternative 4 for CM2 and CM4 that create shallow backwater areas could result in local increases in water temperature conducive to *Microcystis* growth during summer bloom season. This could compound the water quality degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact PH-8 and result in additional water quality degradation such that beneficial uses are affected. An increase in *Microcystis* blooms could potentially result in impacts on public health through exposure via drinking water quality and recreational waters. Therefore, this impact would be significant. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

25.3.3.10 Alternative 5—Dual Conveyance with Pipeline/Tunnel and Intake 1 (3,000 cfs; Operational Scenario C)

Alternative 5 would involve construction activities similar to those described under Alternative 1A; therefore, types of construction impacts would be the same, although somewhat less because there would be only one intake compared to five. Construction impacts are summarized below for vector-borne diseases and water quality concerns. Alternative 5 would have four fewer intakes than Alternative 1A would have, and correspondingly fewer solids lagoons, sedimentation basins, and transmission lines. Therefore, the public health effects of Alternative 5 would be similar to but generally less than those identified for Alternative 1A. Water supply operations under Alternative 5 would adhere to the Operational Scenario C criteria. The location of habitat restoration and enhancement that would occur under Alternative 5 would be similar to that of Alternative 1A; however, only 25,000 acres of tidal habitat restoration would occur under Alternative 5, rather than

65,000 acres. All other conservation measures under Alternative 5 would be the same as those described under Alternative 1A.

Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of the Water Conveyance Facilities

***NEPA Effects*:** Alternative 5 would involve construction and operation of up to three solids lagoons, one sedimentation basin, an intermediate forebay and associated 350-acre inundation area adjacent, and Bryon Tract Forebay.; The mechanisms for potential public health effects are similar to those described above for Alternative 1A. Specifically, the sedimentation basin, solids lagoons, Byron Tract Forebay, the intermediate forebay, and the inundation area have the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes) because of the large volumes of water that would be held within these areas. The depth, design, and operation of the sedimentation basin and solids lagoons would prevent the development of suitable mosquito habitat (Figure 25-1). Specifically, the basins would be too deep and the constant movement of water would prevent mosquitoes from breeding and multiplying. Sedimentation basins would be 120 feet long by 40 feet wide by 55 feet deep, and solids lagoons would be 165 feet long by 86 feet wide by 10 feet deep. Furthermore, use of the 350-acre inundation area adjacent to the intermediate forebay would be limited to forebay emergency overflow situations and water would be pumped back to the intermediate forebay, creating circulation such that the inundation area would have a low potential for creating suitable vector habitat. Similarly, water in the Byron Tract Forebay and intermediate forebay would be circulated regularly and, with the exception of shallower areas around the periphery, would be too deep to provide suitable mosquito habitat. The shallower edges of the forebays could provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow.

To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes (see Impact PH-1 under Alternative 1A). These BMPs would be consistent with practices presented in *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). Implementation of these BMPs would reduce the likelihood that BDCP operations would require an increase in abatement activities by the local MVCDs. Accordingly, as described under Alternative 1A, construction and operation of the intakes, solids lagoons, sedimentation basins, the forebays, and the intermediate forebay inundation area under Alternative 5 would not substantially increase suitable vector habitat, and would not substantially increase vector-borne diseases. Therefore, no adverse effects would result.

***CEQA Conclusion*:** Implementation of CM1 under Alternative 5 would involve the construction and operation of four fewer solids lagoons and one sedimentation basin relative to Alternative 1A, and construction and operation of an intermediate forebay and associated 350-acre inundation area, and Byron Tract Forebay. While these facilities could provide suitable habitat for vectors (e.g., mosquitoes), water depth and circulation would prevent the areas from substantially increasing suitable vector habitat. The inundation area would only be used during emergency overflow situations and water would be pumped back into the intermediate forebay, creating circulation that would discourage mosquito breeding. The shallower periphery of the intermediate forebay and Bryon Tract Forebay could provide suitable mosquito breeding habitat.

To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes. These BMPs would be consistent with practices presented in *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). See Impact PH-1 under Alternative 1A. Therefore, construction and operation of the water conveyance facilities under Alternative 5 would not result in a substantial increase in vector-borne diseases and the impact on public health would be less than significant. No mitigation is required.

Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That There is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance Facilities

NEPA Effects: Like Alternative 1A, the distribution and mixing of study area source waters would change under Alternative 5. Modeled changes in DOC concentrations and, by extension, DBPs relative to the No Action Alternative suggest that there would not be exceedances of DBP criteria due to operations. Long-term average DOC concentrations would be only slightly higher under this alternative relative to the No Action Alternative. Similarly, as discussed in Chapter 8, *Water Quality,* Section 8.3.3.10*,* water supply operations under Alternative 5 would not result in substantial increases in trace metal concentrations in the study area relative the No Action Alternative.

However, under Alternative 5, long-term average bromide concentrations would increase at Buckley Cove, Rock Slough, and Contra Costa Pumping Plant #1, Staten Island, Emmaton, and Barker Slough, with the greatest increase at Barker Slough (27%). The increase would be more substantial during the drought period (83%). This increase in bromide might require upgrades or changes in operations at water treatment plants. While treatment technologies sufficient to achieve the necessary bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken, a change of such magnitude in long-term average bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBPs in drinking water sources. Mitigation Measure WQ-5 is available to reduce these effects. Implementation of this measure along with a separate, other commitment as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, relating to the potential increased treatment costs associated with bromide-related changes would reduce these effects. Further, as described for Impact PH-2 under Alternative 1A, the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be further minimized by implementation of the AIP.

As described in Chapter 8, *Water Quality,* modeled July and August San Joaquin River fractions at Buckley Cove would increase relative to the No Action Alternative under this alternative, with increases of 12% in July (25% for the modeled drought period) and 22% in August (43% for the modeled drought period). Despite these increases, the resulting net San Joaquin River source water fraction for July and August would remain less than all other months. As a result, these modeled changes in the source water fractions are not of sufficient magnitude to adversely affect other beneficial uses of the Delta. Therefore, it is not anticipated that there would be adverse effects on public health related to levels of pesticides in drinking water sources.

CEQA Conclusion: The operation of water conveyance facilities under Alternative 5 would adhere to the criteria set forth under Operational Scenario C. Water quality modeling results indicate that, for the most part, there would be no substantial changes in trace metals, DBPs, or pesticides relative to

Existing Conditions under this operational scenario. An exception to this is that concentrations of bromide would increase at the North Bay Aqueduct at Barker Slough, Staten Island, and Emmaton on the Sacramento River under Alternative 5, with the greatest increase occurring at Barker Slough (23%). This increase would be more substantial during the drought period (84%). These modeled increases in bromide at Barker Slough could lead to adverse changes in the formation of DBPs at drinking water treatment plants such that considerable water treatment plant upgrades would be necessary to achieve equivalent levels of drinking water health protection. This would be a significant impact.

While treatment technologies sufficient to achieve the necessary bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken, a change of such magnitude in long-term average bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBPs in drinking water sources. Assuming the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be avoided or minimized by implementation of the AIP, the potential adverse water quality effects on the municipal beneficial uses potentially provided in Barker Slough would remain significant. While Mitigation Measure WQ-5 may reduce this impact, the feasibility and effectiveness of this mitigation measure are uncertain based on currently available information.

In addition to and to supplement Mitigation Measure WQ-5, the BDCP proponents have incorporated into the BDCP, as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, a separate, other commitment to address the potential increased water treatment costs that could result from bromide-related concentration effects on municipal water purveyor operations. Potential options for making use of this financial commitment include funding or providing other assistance towards implementation of the North Bay Aqueduct AIP, acquiring alternative water supplies, or other actions to indirectly reduce the effects of elevated bromide and DOC in existing water supply diversion facilities. Please refer to Appendix 3B for the full list of potential actions that could be taken pursuant to this commitment in order to reduce the water quality treatment costs associated with water quality effects relating to chloride, electrical conductivity, and bromide. Because the BDCP proponents cannot ensure that the results of coordinated actions with water treatment entities will be fully funded or implemented successfully prior to the project's contribution to the impact, the ability to fully mitigate this impact is uncertain. If a solution that is identified by the BDCP proponents and an affected water purveyor is not fully funded, constructed, or implemented before the project's contribution to the impact is made, a significant impact in the form of increased DBP in drinking water sources could occur. Accordingly, this impact would be significant and unavoidable. If, however, all financial contributions, technical contributions, or partnerships required to avoid significant impacts prove to be feasible and any necessary agreements are completed before the project's contribution to the effect is made, impacts would be less than significant.

Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality Conditions; Site and Design Restoration Sites to Reduce Bromide Increases in Barker Slough

Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

Impact PH-3: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Construction, Operation or Maintenance of the Water Conveyance Facilities

***NEPA Effects*:** Alternative 5 would have four fewer intakes than Alternative 1A would have; however, the intake would be constructed and operated in a similar manner to those under Alternative 1A. As described under Alternative 1A, sediment-disturbing activities during construction and maintenance of the water conveyance facilities under Alternative 5 could result in the disturbance of existing constituents in sediment, such as pesticides or methylmercury. Therefore, the public health effects associated with pesticides and methylmercury would be similar, although, slightly less, than those associated with Alternative 1A. Intermittent and/or short-term construction-related activities (as would occur for in-river construction) would not be anticipated to result in contaminant discharges of sufficient magnitude or duration to contribute to long-term bioaccumulation processes, or cause measureable long-term degradation, as described under Alternative 1A. Legacy organochlorine pesticides typically bond to particulates, and do not mobilize easily. Construction and maintenance of Alternative 5 would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column, as described for Alternative 1A. Additionally, water supply operations under any BDCP action alternative would not be expected to change total suspended solids or turbidity levels (highs, lows, typical conditions) to any substantial degree. Changes in the magnitude, frequency, and geographic distribution of legacy pesticides in water bodies of the affected environment that would result in new or more severe adverse effects on beneficial uses, relative to the No Action Alternative, would not be expected to occur.

Modeling results indicate small, insignificant changes in total mercury and methylmercury levels in water and fish tissues resulting from Alternative 5 water operations (Chapter 8, *Water Quality*, Section 8.3.3.10). Upstream mercury contributions and methylmercury production in Delta waters would not be altered by the operation of Alternative 5, as it would not change existing mercury sources and would not substantially alter methylmercury concentrations in the Sacramento River or San Joaquin River. Results indicate that the percentage change in assimilative capacity of waterborne total mercury relative to the 25 ng/L Ecological Risk Benchmark for this alternative relative to the No Action Alternative would be greatest (a 0.9% decrease) at Franks Tract. This change is not expected to result in adverse effects on beneficial uses. Similarly, changes in methylmercury concentration are expected to be very small.

Fish tissue mercury concentrations showed small or no increase in exceedance quotients based on long-term annual average concentrations at the nine Delta locations modeled. The greatest increase relative to the No Action Alternative was 7% at Mokelumne River (South Fork) at Staten Island.

As environmental commitments, DWR would develop and implement Erosion and Sediment Control Plans and SWPPPs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMPs implemented under the Erosion and Sediment Control Plans and the SWPPPs would help reduce turbidity and keep sediment that may contain organochlorine pesticides and methylmercury within the area of disturbance during construction and maintenance. Examples of these BMPs are described under Alternative 1A, Impact PH-3. Further, operations under Alternative 5 are not expected to increase mercury concentrations substantially and therefore there would be no long-term water quality degradation such that beneficial uses are adversely affected. Increases in mercury or methylmercury concentrations are not likely to be measurable, and changes in mercury concentrations or fish tissue mercury concentrations would not make any existing mercury-related impairment measurably worse. Therefore, it is not expected that aquatic organisms would have measurably higher body burdens of mercury as a result of Alternative 5 water operations.

Accordingly, the potential for Alternative 5 to create a public health effect from bioaccumulation of legacy organochlorine pesticides and methlymercury in fish is minimal, and public health effects are not expected to be adverse.

***CEQA Conclusion*:** Construction and maintenance of Alternative 5 would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column based on the chemical properties of the pesticides. Although methylmercury currently exceeds the TMDL, little to no change in methylmercury concentrations in water is expected under Alternative 5 water construction. BMPs implemented as part of Erosion and Sediment Control Plans and SWPPPs would help ensure that construction activities would not substantially increase or substantially mobilize legacy organochlorine pesticides or methylmercury during construction and maintenance. Therefore, construction and maintenance of Alternative 5 would not cause increased exposure of the public to these bioaccumulative sediment constituents.

Alternative 5 would not result in increased flows in the tributaries that would mobilize legacy organochlorine pesticides in sediments. Modeling showed small changes in mercury and methylmercury levels in water at certain Delta locations and in mercury in fish tissues due to Alternative 5 water operations. Specifically, the analysis of percentage change in assimilative capacity of waterborne total mercury of Alternative 5 relative to the 25 ng/L ecological risk benchmark as compared to Existing Conditions showed the greatest decrease to be 0.9% at Old River at Rock Slough and the Contra Costa Pumping Plant. Fish tissue estimates show only small or no increases in exceedance quotients based on long-term annual average concentrations for mercury at the Delta locations. The greatest change in exceedance quotients of 5% is expected for Franks Tract and Old River at Rock Slough relative to Existing Conditions. However, these changes would not substantially affect the current level of existing methylmercury degradation in the study area or substantially affect the existing fish tissue concentrations.

Since construction, maintenance or operation of Alternative 5 are not expected to cause substantial mobilization or a substantial increase of constituents known to bioaccumulate (i.e., organochlorine pesticides), impacts on public health would be less than significant. No mitigation is required.

Impact PH-4: Expose Substantially More People to Transmission Lines Generating New Sources of EMFs as a Result of the Construction and Operation of the Water Conveyance Facilities

***NEPA Effects*:** Approximately 621 miles of existing transmission lines are located within the study area. As described in Table 25-9, a total of 24.71 miles of new temporary 69 kV transmission lines; 8.68 miles of new permanent 69 kV transmission lines; and 42.68 miles of new permanent 230 kV transmission lines would be required for this alternative. This alternative would have fewer intakes than Alternative 1A, but would still include the pipeline/tunnel conveyance.

As with Alternative 1A, any new temporary and permanent transmission lines needed for Alternative 5 would be located in rights-of-way of existing transmission lines or in areas that are not densely populated, and therefore would not expose substantially more people to transmission lines (Figure 25-2). However, as indicated in Table 25-9, Stone Lakes National Wildlife Refuge would be within 300 feet of a proposed temporary 69 kV transmission line. Visitors to this area generally come for walks, water recreation, and hunting, and as such, it is unlikely that large groups of people would be staying in the area within 300 feet of this proposed transmission line, so any EMF exposure would be limited. Further, this line would be removed when construction of the water conveyance facility features near this area is completed, so there would be no potential permanent effects. Therefore, this temporary transmission line would not substantially increase people's exposure to EMFs.

As described for Alternative 1A, the majority of sensitive receptors are already located within 300 feet of an existing transmission line; therefore, the majority of new temporary or new permanent transmission lines would not expose new sensitive receptors or substantially more people to EMFs that they are not already experiencing. Because the transmission lines would generally be located in sparsely populated areas and would be within 300 feet of only one potential new sensitive receptors, the proposed temporary and permanent transmission lines would not substantially increase people's exposure to EMFs. While the current scientific evidence does not show conclusively that EMF exposure can increase health risks, the location and design of the new transmission lines would be conducted in accordance with CPUC's EMF Design Guidelines for Electrical Facilities to reduce EMF exposure. Therefore, operation of the transmission line corridors would not expose substantially more people to transmission lines generating EMFs and there would be no adverse effect on public health.

***CEQA Conclusion*:** In general, the proposed temporary (69 kV) and permanent (69 kV and 230 kV) transmission lines would be located within the rights-of-way of existing transmission lines and any new temporary or permanent transmission lines not within the right-of-way of existing transmission lines would, for the most part, be located in sparsely populated areas generally away from existing sensitive receptors. However, one sensitive receptor, Stone Lakes National Wildlife Refuge, would be within 300 feet of a proposed 69 kV temporary transmission line. Because visitors to this area generally come for walks, water recreation, and hunting, it is unlikely that large groups of people would be staying in the area within 300 feet of this proposed transmission line, so any EMF exposure would be limited. Further, this line would be removed construction of the water conveyance facility features near this area is completed, so there would be no potential permanent effects. Therefore, this temporary transmission line would not substantially increase people's exposure to EMFs. Design and implementation of new temporary or permanent transmission lines not within the right-of-way of existing transmission lines would follow CPUC's EMF Design Guidelines for Electrical Facilities and would implement shielding, cancelation, or distance measures to reduce EMF exposure. Because construction and operation of Alternative 5 would not expose substantially more people to transmission lines that generate new sources of EMFs, impacts would be less than significant, and no mitigation is required.

Impact PH-5: Increase in Vector-Borne Diseases as a Result of Implementing CM2-CM7, CM10 and CM11

***NEPA Effects*:** The location of habitat restoration and enhancement that would occur under Alternative 5 would be similar to that of Alternative 1A; however, in addition to fisheries enhancement (CM2), only approximately 25,000 acres of tidal habitat restoration would occur under Alternative 5 rather than the approximate 65,000 acres under Alternative 1A. Because fewer acres would be restored, effects would be less than those described under Alternative 1A. Implementation of environmental commitments, such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*) would also reduce the potential for an increase in mosquito breeding habitat, and a substantial increase in vector-borne diseases is unlikely to result. Furthermore, habitat would be restored in areas where potentially suitable habitat for mosquitoes already exists. Finally, mosquito predators (e.g., bats, spiders) would likely increase as a result of restoration and enhancement, which would keep mosquito populations in check. Therefore, effects would be similar to those under Alternative 1A and there would not be a substantial increase in the public's risk of exposure to vector-borne diseases with implementation of CM2-CM7, CM10 and CM11. Accordingly, there would be no adverse effect.

CEQA Conclusion**:** Habitat restoration and enhancement would result in an increased amount of land potentially suitable for vector habitat (e.g., mosquitoes). However, as described for Alternative 1A, Alternative 5 would require environmental commitments such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*) that would help control mosquitoes and reduce the potential for an increase in mosquito breeding habitat. Furthermore, habitat would be restored where existing potentially suitable vector habitat already exists and habitat restoration and enhancement would likely increase the number of mosquito predators. Therefore, as described under Alternative 1A, implementation of CM2-CM7, CM10 and CM11 under Alternative 5 would not substantially increase the public's risk of exposure to vector-borne diseases beyond what currently exists. Accordingly, this impact would be less than significant and no mitigation is required.

Impact PH-6: Substantial Increase in Recreationists' Exposure to Pathogens as a Result of Implementing the Restoration Conservation Measures

NEPA Effects**:** The location of habitat restoration and enhancement that would occur under Alternative 5 would be similar to that of Alternative 1A; however, only approximately 25,000 acres of tidal habitat restoration would occur under Alternative 5 rather than the approximate 65,000 acres under Alternative 1A. Because fewer acres would be restored, effects would be less than those described under Alternative 1A. Implementation of the restoration conservation measures would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). As exemplified by the Pathogen Conceptual Model, any potential increase in pathogens associated with the habitat restoration would be localized and within the vicinity of the actual restoration. This would be similar for lands protected for agricultural uses. Depending on the level of recreational access granted by management plans, habitat restoration could increase or decrease opportunities for recreationists within the Delta region. However, as discussed above for Alternative 1A, recreationists would not experience a substantial increase of exposure to pathogens as a result of the restoration, and no adverse effect would result

CEQA Conclusion**:** Implementation of the restoration conservation measures under Alternative 5 would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). However, only approximately 25,000 acres of tidal habitat would be restored under Alternative 5, compared with the approximate 65,000 acres under Alternative 1A. In addition, the localized nature of pathogen generation and the quick die-off of some types of pathogens once released into water bodies would generally prevent substantial pathogen exposure to recreationists. Accordingly, impacts would be less than significant and no mitigation is required.

Impact PH-7: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Implementing CM2, CM4, CM5, and CM10

NEPA Effects: The amount of habitat restoration would be less in Alternative 5 than described for Alternative 1A. The primary concern with habitat restoration regarding constituents known to bioaccumulate is the potential for mobilizing contaminants sequestered in sediments of the newly inundated floodplains and marshes, as described under Alternative 1A. It is likely that the pesticide-bearing sediments would not be transported very far from the source area, and would settle out with suspended particulates and be deposited close to the ROA. Further, CM2–CM21 do not include the use of pesticides known to be bioaccumulative in animals or humans.

Methylmercury generation rates are ultimately dependent on the concentrations of mercury in the soils, and on the specific biogeochemistry of the system. The biogeochemistry and fate and transport of mercury and methylmercury are very complex. Restoration would involve inundation of areas where mercury has been sequestered in soils, and, if methylation occurs, the methylmercury would be mobilized into the aquatic system. While there would likely be an increase in mobilization and bioaccumulation of methylmercury in the study area's aquatic systems (i.e., fish and water) during the near-term, measures implemented under *CM12 Methylmercury Management* and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Therefore, implementation of CM2, CM4, CM5, and CM10 under Alternative 5 is not expected to result in an adverse effect on public health with respect to pesticides or methylmercury.

CEQA Conclusion: Implementation of CM2, CM4, CM5, and CM10 would have the potential to mobilize sediment with existing levels of legacy organochlorine pesticides as a result of disturbing sediment during habitat restoration construction. However, it is unlikely that the pesticide-bearing sediments would be transported very far from the source area and they would likely settle out with suspended particulates and be deposited close to the ROAs during habitat restoration construction. While there would likely be an increase in mobilization and bioaccumulation of methylmercury in the study area's aquatic systems (i.e., fish and water) during the near-term, measures implemented under *CM12 Methylmercury Management*, and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Therefore, implementation of CM2, CM4, CM5, and CM10 under Alternative 5 would not substantially mobilize or substantially increase the public's exposure to constituents known to bioaccumulate and this impact would be less than significant. No mitigation is required.

Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water Conveyance Facilities

NEPA Effects: Because factors that affect *Microcystis* abundance in waters upstream of the Delta, in the Delta, and in the SWP/CVP Export Services Areas under Alternative 1A would similarly change under Alternative 5, *Microcystis* abundance, and thus microcystin concentrations, in water bodies of the affected environment under Alternative 5 would be very similar (i.e., nearly the same) to those discussed for Alternative 1A.

As described in Chapter 8, *Water Quality*, although *Microcystis* blooms have not occurred in the Export Service Areas, conditions in the Export Service Areas under Alternative 5 may become more conducive to *Microcystis* bloom formation because water temperatures will increase in the Export Service Areas due to the expected increase in ambient air temperatures resulting from climate change, but not from operation of the water conveyance facilities. Under Alternative 5, relative to No Action Alternative, water exported to the SWP/CVP Export Service Areas will be a mixture of

Microcystis-affected source water from the south Delta intakes and unaffected source water from the Sacramento River, diverted at the north Delta intakes. It cannot be determined whether operations and maintenance under Alternative 5 will result in increased or decreased levels of *Microcystis* and microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Like Alternative 1A, elevated ambient water temperatures would occur in the Delta under Alternative 5, which could lead to earlier occurrences of *Microcystis* blooms in the Delta, and increase the overall duration and magnitude of blooms. However, as described in Chapter 8, *Water Quality,* the increase in Delta water temperatures, and consequent potential increase in *Microcystis* blooms, would be driven entirely by climate change, not by operation of water conveyance facilities. There would be differences in the direction and magnitude of water residence time changes during the *Microcystis* bloom period due to operation of the water conveyance facilities under Alternative 5 compared to Alternative 1A, relative to the No Action Alternative. As a result, *Microcystis* blooms, and therefore microcystin, could increase in surface waters throughout the Delta. Therefore, impacts on beneficial uses, including drinking water and recreational waters, could occur and public health could be affected. Although Mitigation Measure WQ-32a and WQ-32b are available to reduce the severity of degraded water quality in the Delta due to *Microcystis* blooms, this would be an adverse effect.

CEQA Conclusion: Under Alternative 5, operation of the water conveyance facilities is not expected to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta. *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not due to water conveyance facility operations. Hydraulic residence times in the Export Service Area would not be affected by operations of CM1, and therefore conditions in those areas would not be more conducive to *Microcystis* bloom formation. Water exported from the Delta to the Export Service Area is expected to be a mixture of *Microcystis*-affected source water from the south Delta intakes and unaffected source water from the Sacramento River. Because of this, it cannot be determined whether operations and maintenance under Alternative 5 would result in increased or decreased levels of *Microcystis* and microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Water temperatures and hydraulic residence times in the Delta are expected to increase, which could result in an increase in *Microcystis* blooms and therefore microcystin levels. However, the water temperature increases in the Delta would be due to climate change and not due to operation of the water conveyance facilities. Increases in Delta hydraulic residence times would be due in small part to climate change and sea level rise, but due to a greater degree to operation of the water conveyance facilities and hydrodynamic impacts of restoration included in CM2 and CM4. Consequently, it is possible that increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms in the Delta would occur due to the operations and maintenance of the water conveyance facilities and the hydrodynamic impacts of restoration under CM2 and CM4. Accordingly, beneficial uses including drinking water and recreational waters would be impacted and, as a result, public health. Therefore, this impact would be significant.

Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water quality due to *Microcystis*. Mitigation Measure WQ-32a requires that residence time considerations be incorporated into restoration area site design for CM2 and CM4 using the best available science at the time of design. Mitigation Measure WQ-32b requires that the project proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods to determine whether increases in abundance are significant. This mitigation measure also requires that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will investigate and evaluate measures that could be taken to manage hydraulic residence time in the affected areas of the Delta. However, because the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and CM4

NEPA Effects: The amount and location of habitat restoration and enhancement that would occur under Alternative 5 would be the same as that described under Alternative 1A, except that 25,000 rather than 65,000 acres of tidal habitat would be restored under CM4. Restoration activities implemented under CM2 and CM4 that would create shallow backwater areas could result in local increases in water temperature that may encourage *Microcystis* growth during the summer bloom season. This would result in further degradation of water quality beyond the hydrodynamic effects of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase in *Microcystis* blooms with implementation of CM2 and CM4 could potentially result in adverse effects on public health through exposure via drinking water quality and recreational waters. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects related to *Microcystis* is uncertain. This would be an adverse effect.

CEQA Conclusion: The effects of CM2 and CM4 on *Microcystis* under Alternative 5 are similar to those discussed for Alternative 1A. Restoration activities implemented under CM2 and CM4 that create shallow backwater areas could result in local increases in water temperature conducive to *Microcystis* growth during summer bloom season. This could compound the water quality degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact PH-8 and result in additional water quality degradation such that beneficial uses are affected. An increase in *Microcystis* blooms could potentially result in impacts on public health through exposure via drinking water quality and recreational waters. Therefore, this impact would be significant. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

25.3.3.11 Alternative 6A—Isolated Conveyance with Pipeline/Tunnel and Intakes 1–5 (15,000 cfs; Operational Scenario D)

Alternative 6A would eliminate the use of south Delta intakes, which would result in an increase in San Joaquin River water flowing into the Delta. There would be the same number of north Delta intakes (five) and they would pump the same amount of water as described under Alternative 1A (up to 15,000 cfs). Because of changes in the relative amounts of San Joaquin River and Sacramento River water entering the Delta, this alternative may result in changes to the water quality in the Delta. The conservation measures under Alternative 6A would be the same as those described under 1A.

Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of the Water Conveyance Facilities

***NEPA Effects*:** As described for Alternative 1A, Alternative 6A would involve similar construction and operation of up to 15 solids lagoons, five sedimentation basins, Byron Tract Forebay, and an intermediate forebay and associated 350-acre inundation area adjacent. These features have the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes) because of the large volumes of water that would be held within these areas. The depth, design, and operation of the sedimentation basins and solids lagoons would prevent the development of suitable mosquito habitat (Figure 25-1). Specifically, the basins would be too deep and the constant movement of water would prevent mosquitoes from breeding and multiplying. Sedimentation basins would be 120 feet long by 40 feet wide by 55 feet deep, and solids lagoons would be 165 feet long by 86 feet wide by 10 feet deep. Furthermore, use of the inundation area would be limited to forebay emergency overflow situations and water would be physically pumped back to the intermediate forebay, creating circulation such that the inundation area would have a low potential for creating suitable vector habitat. Similarly, water in the Byron Tract Forebay and intermediate forebay would be circulated regularly and, with the exception of shallower areas around the periphery, would be too deep to provide suitable mosquito habitat. The shallower edges of the forebays could provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow.

To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes (see Impact PH-1 under Alternative 1A). These BMPs would be consistent with practices presented in *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012).Implementation of these BMPs would reduce the likelihood that

BDCP operations would require an increase in abatement activities by the local MVCDs. Therefore, as described for Alternative 1A, construction and operation of the intakes, solids lagoons, sedimentation basins, the forebays and the intermediate forebay inundation area under Alternative 6A would not substantially increase suitable vector habitat, and would not substantially increase in vector-borne diseases. Accordingly, no adverse effects would result.

***CEQA Conclusion*:** As described for Alternative 1A, implementation of CM1 under Alternative 6A would involve construction and operation of solids lagoons, sedimentation basins, intermediate forebay and associated 350-acre inundation area, and Bryon Tract Forebay which would have the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes). While these facilities could provide suitable habitat for vectors (e.g., mosquitoes), water depth and circulation would prevent the areas from substantially increasing suitable vector habitat. The shallower periphery of the intermediate forebay and Bryon Tract Forebay could provide suitable mosquito breeding habitat.

To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes. These BMPs would be consistent with practices presented in *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). See Impact PH-1 under Alternative 1A. Therefore, construction and operation of the water conveyance facilities under Alternative 6A would not result in a substantial increase in vector-borne diseases and the impact on public health would be less than significant. No mitigation is required.

Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That There is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance Facilities

NEPA Effects:

Disinfection Byproducts

Modeled long-term average DOC concentrations and, by extension, DBPs, would decrease at Banks and Jones pumping plants, as described in Chapter 8, *Water Quality,* Section 8.3.3.11, relative to the No Action Alternative. Such long-term average DOC concentrations would include fewer exceedances of concentration thresholds. This modeled improvement would correspond to substantial improvement in SWP/CVP Export Service Areas water quality with respect to DOC. However, as discussed in Chapter 8, long-term average concentrations of DOC and, by extension, DBPs, are estimated to substantially increase at Franks Tract, Rock Slough and Contra Costa Pumping Plant #1 (≤41% net increase) relative to the No Action Alternative. DOC water quality exceedance would conflict with the Basin Plan, as it exceeds the Basin Plan's requirements. These increases could potentially trigger substantial changes in drinking water treatment plant design or operations. In particular, assessment locations at Rock Slough and Contra Costa Pumping Plant #1 represent municipal intakes servicing existing drinking water treatment plants. Under Alternative 6A, drinking water treatment plants obtaining water from these interior Delta locations would likely need to upgrade existing treatment systems in order to achieve EPA Stage 1 Disinfectants and Disinfection Byproduct Rule action thresholds.

Relative to the No Action Alternative, Alternative 6A would result in increases in long-term average bromide concentrations at Buckley Cove, Staten Island and the North Bay Aqueduct at Barker

Slough. Increases would be greatest at Staten Island (45%; 41% during the drought period) and at Barker Slough (22%; 72% during the drought period).The long-term average increase predicted for Barker Slough could necessitate changes in water treatment plant operations or require treatment plant upgrades in order to maintain DBP compliance.

While treatment technologies sufficient to achieve the necessary DOC and bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken for these predicted increases in DOC and bromide for the affected Delta locations, a change of such magnitude in long-term average DOC and bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBPs. Mitigation Measure WQ-17 is available to partially reduce the effect of DOC, the feasibility and effectiveness of this mitigation measure are uncertain, and, therefore, it is not known if its implementation would reduce the severity of this effect such that it would not be adverse. Similarly, Mitigation Measure WQ-5 is available to reduce the potential effects of increased bromide in drinking water sources at Barker Slough. Implementation of this measure along with a separate other commitment as set forth in Appendix 3B, *Environmental Commitments, AMMs, and CMs*, relating to the potential increased treatment costs associated with bromide-related changes would reduce these effects. Further, as described for Impact PH-2 under Alternative 1A, the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be further minimized by implementation of the AIP. However, the overall effect on public health related to potential increases in DBPs (resulting from DOC and bromide increases) at the aforementioned Delta locations would still be considered adverse unless affected water treatment plants are upgraded or undergo operational changes in order to achieve drinking water compliance standards.

Trace Metals

Alternative 6A would not result in substantial increases in trace metal concentrations in the Delta relative to the No Action Alternative. Changes in source water fraction would occur in the south Delta (see Appendix 8D, *Source Water Fingerprinting Results*). Throughout much of the south Delta, San Joaquin River water would replace Sacramento River water, with the future trace metals profile largely reflecting that of the San Joaquin River. However, trace metal concentration profiles between the San Joaquin and Sacramento Rivers are very similar and currently meet Basin Plan objectives and CTR criteria. While the change in trace metal concentrations in the south Delta would likely be measurable, Alternative 6A would not be expected to substantially increase the frequency with which applicable Basin Plan objectives or CTR criteria would be exceeded in the Delta or substantially degrade the quality of Delta waters with regard to trace metals. Therefore, trace metal concentrations are not expected to increase above conditions under the No Action Alternative and would not result in adverse impacts on public health.

Pesticides

The change in source water (e.g., more San Joaquin River water) associated with Alternative 6A would be of sufficient magnitude to increase the existing pesticide concentrations in the Delta, resulting in an increased risk of toxicity to aquatic life in certain areas (Buckley Cove, Franks Tract, Rock Slough, the San Joaquin River at Antioch, and Contra Costa Pumping Plant #1) during certain times of the year relative to the No Action Alternative. A conclusion regarding the risk to human health at these locations, based on the predicted adverse effects from pesticides on aquatic life, cannot be made. The prediction of adverse effects of pesticides fundamentally assumes that the present pattern of pesticide incidence in surface water would continue at similar levels into the future. In reality, the use of chlorpyrifos and diazinon pesticides, the two pesticides that serve as the basis for concluding a substantially increased San Joaquin River source water fraction, is on the decline with their replacement by pyrethroids on the rise. Furthermore, water treatment plants are required to meet drinking water requirements set forth in the California Safe Drinking Water Act and the regulations adopted by CDPH. Therefore, it is not anticipated that there would be adverse effects on public health from pesticides in drinking water sources.

***CEQA Conclusion*:** The change in source water (e.g., more San Joaquin River water) associated with operation of the water conveyance facilities under Alternative 6A would be of sufficient magnitude to increase the existing pesticide concentrations in the Delta relative to Existing Conditions, according to water quality modeling results. This increase could result in an increased risk of toxicity to aquatic life at some locations in the study area (Buckley Cove, Franks Tract, Rock Slough, the San Joaquin River at Antioch, and Contra Costa Pumping Plant #1) during certain times of the year relative to Existing Conditions. A conclusion regarding the risk to human health at these locations, based on the predicted adverse effects from pesticides on aquatic life, cannot be made. However, the prediction of adverse effects of pesticides relative to Existing Conditions fundamentally assumes that the present pattern of pesticide incidence in surface water would continue at similar levels into the future. In reality, the use of chlorpyrifos and diazinon pesticides, the two pesticides that serve as the basis for concluding a substantially increased San Joaquin River source water fraction, is on the decline with their replacement by pyrethroids on the rise. Furthermore, water treatment plants are required to meet drinking water requirements set forth in the California Safe Drinking Water Act and the regulations adopted by CDPH. Thus, these potential increases in pesticide concentrations would not significantly impact public health. The change in source water would not alter trace metal concentrations in the study area to the degree that there would be an impairment in beneficial uses. Finally, under Alternative 6A, modeled long-term average bromide concentrations would increase at Staten Island (41%; 37% during the drought period) and Barker Slough (19%; 73% during the drought period) relative to Existing Conditions. Modeled long-term average DOC concentrations at Franks Tract, Rock Slough and Contra Costa Pumping Plant #1 would increase ≤46%. The increases in bromide and DOC concentrations at these locations may be substantial enough to necessitate water treatment plant upgrades or changes in plant operations in order to maintain DBP compliance. Should treatment plant upgrades not be undertaken for the affected Delta locations, a change of such magnitude in long-term average DOC and bromide concentrations in drinking water sources would represent an increased risk for effects on public health from DBPs, which would be a significant impact.

Implementation of the AIP may reduce water quality effects due to bromide increases at Barker Slough by allowing operators of the North Bay Aqueduct to largely avoid periods of poor water quality by using an alternative surface water intake on the Sacramento River. Assuming the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be avoided or minimized by implementation of the AIP, the potential adverse water quality effects on the municipal beneficial uses potentially provided in Barker Slough would remain significant. While Mitigation Measure WQ-5 may reduce this impact, the feasibility and effectiveness of this mitigation measure are uncertain based on currently available information. Mitigation Measure WQ-17 would reduce the potential impacts associated with DOC; however, it is unknown if this mitigation would reduce impacts to a less-than-significant level.

In addition to and to supplement Mitigation Measure WQ-5, the BDCP proponents have incorporated into the BDCP, as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, a separate other commitment to address the potential increased water treatment costs that could result from bromide-related concentration effects on municipal water purveyor operations. Potential options for making use of this financial commitment include funding or providing other assistance towards implementation of the North Bay Aqueduct AIP, acquiring alternative water supplies, or other actions to indirectly reduce the effects of elevated bromide and DOC in existing water supply diversion facilities. Please refer to Appendix 3B for the full list of potential actions that could be taken pursuant to this commitment in order to reduce the water quality treatment costs associated with water quality effects relating to chloride, electrical conductivity, and bromide. Because the BDCP proponents cannot ensure that the results of coordinated actions with water treatment entities will be fully funded or implemented successfully prior to the project's contribution to the impact, the ability to fully mitigate this impact is uncertain. If a solution that is identified by the BDCP proponents and an affected water purveyor is not fully funded, constructed, or implemented before the project's contribution to the impact is made, a significant impact in the form of increased DBP in drinking water sources could occur. Accordingly, this impact would be significant and unavoidable. If, however, all financial contributions, technical contributions, or partnerships required to avoid significant impacts prove to be feasible and any necessary agreements are completed before the project's contribution to the effect is made, impacts would be less than significant.

Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality Conditions; Site and Design Restoration Sites to Reduce Bromide Increases in Barker Slough

Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

Mitigation Measure WQ-17: Consult with Delta Water Purveyors to Identify Means to Avoid, Minimize, or Offset Increases in Long-Term Average DOC Concentrations

To reduce the effect of CM1 operations on increased DOC concentrations specifically predicted to occur at municipal water purveyors obtaining raw source water through south Delta intakes at Rock Slough and those associated with Contra Costa Pumping Plant #1, the BDCP proponents shall consult with the purveyors (i.e., Contra Costa water district and entities to which they supply raw water) to identify the means to either avoid, minimize, or offset increases in long-term average DOC concentrations that affect the beneficial use of the water. The BDCP proponents shall consult with these entities to determine existing DBP concentrations (as system-wide running averages), and then implement any combination of measures sufficient to maintaining these concentrations at existing levels in treated drinking water of affected water purveyors. Such actions may include, but not be limited to: 1) upgrading and maintaining adequate drinking water treatment systems, 2) developing or obtaining replacement surface water supplies from other water rights holders, 3) developing replacement groundwater supplies, or 4) physically routing a portion of the water diverted from the Sacramento River through the associated new conveyance pipelines/tunnel to affected purveyors.

Impact PH-3: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Construction, Operation or Maintenance of the Water Conveyance Facilities

***NEPA Effects*:** As described for Alternative 1A, intermittent and/or short-term construction-related activities (as would occur for in-river construction) would not be anticipated to result in contaminant discharges (i.e., bioaccumulative organochlorine pesticides and methylmercury) of sufficient magnitude or duration to contribute to long-term bioaccumulation processes, or cause measureable long-term water quality degradation. Legacy organochlorine pesticides typically bond to particulates, and do not mobilize easily. Construction and maintenance of Alternative 6A would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column. Water supply operations under any BDCP action alternative would not be expected to change total suspended solids or turbidity levels (highs, lows, typical conditions) to any substantial degree. Changes in the magnitude, frequency, and geographic distribution of legacy pesticides in water bodies of the affected environment that would result in new or more severe adverse effects on beneficial uses, relative to the No Action Alternative, would not be expected to occur.

Water quality modeling results indicate small, insignificant changes in total mercury and methylmercury levels in water resulting from Alternative 6A water operations (Chapter 8, *Water Quality*, Section 8.3.3.11). Modeling results indicate that the percentage change in assimilative capacity of waterborne total mercury relative to the 25 ng/L Ecological Risk Benchmark for this alternative showed the greatest decrease (9.1%) at the Contra Costa Pumping Plant relative to the No Action Alternative. These changes are not expected to result in adverse effects on beneficial uses. Similarly, changes in methylmercury concentration are expected to be relatively small.

Fish tissue estimates showed substantial increases in concentration and exceedance quotients at some Delta locations modeled. The greatest increase in exceedance quotients (ranging from 33 to 64%) are expected for Franks Tract and Old River at Rock Slough relative to the No Action Alternative. These changes in fish tissue mercury concentrations would make existing mercury-related impairments in the Delta measurably worse. Relative to the No Action Alternative, body burdens of mercury in fish would be measurably higher, and could thereby substantially increase the health risks to people consuming those fish. Accordingly, the potential for Alternative 6A to create a public health effect from bioaccumulation of mercury would exist and this is considered an adverse effect.

As environmental commitments, DWR would develop and implement Erosion and Sediment Control Plans and SWPPPs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMPs implemented under the Erosion and Sediment Control Plans and the SWPPPs would help reduce turbidity and keep sediment that may contain legacy organochlorine pesticides and methylmercury within the area of disturbance during construction and maintenance. Additionally, OEHHA standards would continue to be implemented for the consumption of study area fish and thus would serve to protect people against the overconsumption of fish with increased body burdens of mercury.

CEQA Conclusion: Construction and maintenance of water conveyance facilities under Alternative 6A would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column based on the chemical properties of the pesticides. Therefore, construction and maintenance of Alternative 6A water conveyance facilities would not cause increased exposure of the public to these pesticides. As environmental commitments, DWR would develop and implement Erosion and Sediment Control Plans and SWPPPs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMPs implemented under the Erosion and Sediment Control Plans and the SWPPPs would help reduce turbidity and keep sediment that may contain legacy organochlorine pesticides and methylmercury within the area of disturbance.

Based on water quality modeling results, changes in water concentrations of mercury and methlymercury would occur at some locations relative to Existing Conditions as a result of operations under Alternative 6A. Specifically, the analysis of percentage change in assimilative capacity of waterborne total mercury of Alternative 6A relative to the 25 ng/L ecological risk benchmark as compared to Existing Conditions showed the greatest decrease to be 9.2% at the Contra Costa Pumping Plant, This change would not alter beneficial uses of waters in the study area. However, relative to Existing Conditions, modeling results indicate that body burdens of mercury in fish would be measurably higher at Franks Tract and Old River at Rock Slough; the increases in exceedance quotients are expected to range from 33% to 64% at these location. These increases in the body burdens of mercury, could increase the health risks to people consuming those fish. Accordingly, the potential for Alternative 6A to create a public health effect from bioaccumulation of mercury would exist and this is considered a significant and unavoidable impact. The estimated increases of mercury body burdens in fish are based on the changes expected from the modeled blending of source waters that define CM1 for Alternative 6A, and are therefore inherent to the alternative. OEHHA standards would continue to be implemented for the consumption of study area fish and thus would serve to protect people against the overconsumption of fish with increased body burdens of mercury.

Impact PH-4: Expose Substantially More People to Transmission Lines Generating New Sources of EMFs as a Result of the Construction and Operation of the Water Conveyance Facilities

***NEPA Effects*:** Approximately 621 miles of existing transmission lines are located within the study area. A total of 24.71 miles of new temporary 69 kV transmission lines; 8.94 miles of new permanent 69 kV transmission lines; and 42.68 miles of new permanent 230 kV transmission lines would be required for this alternative. The temporary and permanent transmission lines needed for Alternative 6A (Table 25-9) would be very similar in location and length to those for Alternative 1A because 6A would involve the construction and operation of five intakes and a pipeline/tunnel conveyance as described for Alternative 1A. As with Alternative 1A, any new temporary and permanent transmission lines needed for Alternative 6A would, for the most part, be located in rights-of-way of existing transmission lines or areas that are not densely populated (Figure 25-2).

However, as indicated in Table 25-9, Stone Lakes National Wildlife Refuge would be within 300 feet of a proposed temporary 69 kV transmission line. Visitors to this area generally come for walks, water recreation, and hunting, and as such, it is unlikely that large groups of people would be staying in the area within 300 feet of this proposed transmission line, so any EMF exposure would be limited. Further, this line would be removed construction of the water conveyance facility features near this area is completed, so there would be no potential permanent effects. Therefore, this temporary transmission line would not substantially increase people’s exposure to EMFs.

While the current scientific evidence does not show conclusively that EMF exposure can increase health risks, the location and design of the new transmission lines would be conducted in accordance with CPUC’s EMF Design Guidelines for Electrical Facilities, as described for Alternative 1A. Therefore, operation of the transmission line corridors would not expose substantially more people to transmission lines generating EMFs. Because the lines would be located in sparsely populated areas and would be within 300 feet of only one potential new sensitive receptors, the proposed temporary and permanent transmission lines would not substantially increase people’s exposure to EMFs, and there would be no adverse effect on public health.

***CEQA Conclusion*:** In general, the proposed temporary (69 kV) and permanent (69 kV and 230 kV) transmission lines would be located within the right-of-way of existing transmission lines and any new temporary or permanent transmission lines not within the right-of-way of existing transmission lines would, for the most part, be located in sparsely populated areas generally away from existing sensitive receptors. However, one sensitive receptor, Stone Lakes National Wildlife Refuge, would be within 300 feet of a proposed temporary 69 kV temporary transmission line. Because visitors to this area generally come for walks, water recreation, and hunting, it is unlikely that large groups of people would be staying in the area within 300 feet of this proposed transmission line, so any EMF exposure would be limited. Further, this line would be removed construction of the water conveyance facility features near this area is completed, so there would be no potential permanent effects. Therefore, this temporary transmission line would not substantially increase people's exposure to EMFs. While the current scientific evidence does not show conclusively that EMF exposure can increase health risks, design and implementation of new temporary or permanent transmission lines not within the right-of-way of existing transmission lines would follow CPUC's EMF Design Guidelines for Electrical Facilities and would implement shielding, cancelation, or distance measures to reduce EMF exposure. Since construction and operation of Alternative 6A would not expose substantially more people to transmission lines that generate new sources of EMFs, impacts on public health would be less than significant, and no mitigation is required.

Impact PH-5: Increase in Vector-Borne Diseases as a Result of Implementing CM2-CM7, CM10 and CM11

***NEPA Effects*:** The amount and location of habitat restoration and enhancement that would occur under Alternative 6A would be the same as that described for Alternative 1A. Although there would be an increase in restored and enhanced aquatic habitat in the study area as a result of implementing Alternative 6A, implementation of environmental commitments such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*), would reduce the potential for an increase in mosquito breeding habitat, and a substantial increase in vector-borne diseases is unlikely to result. Furthermore, habitat would be restored in areas where potentially suitable habitat for mosquitoes already exists. Finally, mosquito predators (e.g., bats, spiders) would likely increase as a result of restoration and enhancement, which would keep mosquito populations in check. Therefore, effects on public health would be the same under Alternative 6A as under Alternative 1A and there would not be a substantial increase in the public's risk of exposure to vector-borne diseases with implementation of CM2-CM7, CM10 and CM11. Accordingly, there would be no adverse effect.

***CEQA Conclusion*:** Habitat restoration and enhancement would result in an increased amount of land potentially suitable for vector habitat (e.g., mosquitoes). However, as described for Alternative 1A, Alternative 6A would require environmental commitments, such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*) that would help control mosquitoes and reduce the potential for an increase in mosquito breeding habitat. Furthermore, habitat would be restored where potentially suitable vector habitat already exists and habitat restoration and enhancement would likely increase the number of mosquito predators. Therefore, as described for Alternative 1A, implementation of CM2-CM7, CM10 and CM11 under Alternative 6A would not substantially increase the public's risk of exposure to vector-borne diseases beyond what currently exists. Accordingly, this impact would be less than significant and no mitigation is required.

Impact PH-6: Substantial Increase in Recreationists' Exposure to Pathogens as a Result of Implementing the Restoration Conservation Measures

NEPA Effects: The amount and location of habitat restoration and enhancement that would occur under Alternative 6A would be the same as that described for Alternative 1A. Implementation of the restoration conservation measures would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). As exemplified by the Pathogen Conceptual Model, any potential increase in pathogens associated with the proposed habitat restoration would be localized and within the vicinity of the actual restoration. This would be similar for lands protected for agricultural uses. Depending on the level of recreational access granted by management plans, habitat restoration could increase or decrease opportunities for recreationists within the Delta region. However, effects However, effects associated with pathogens would be the same under Alternative 6A as under Alternative 1A. Recreationists would not experience a substantial increase in exposure to pathogens as a result of the restoration and no adverse effect would result.

CEQA Conclusion: Implementation of the restoration conservation measures under Alternative 6A would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). However, the localized nature of pathogen generation and the quick die off of pathogens once released into water bodies would generally prevent substantial pathogen exposure to recreationists. Accordingly, impacts on public health would be less than significant. No mitigation is required.

Impact PH-7: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Implementing CM2, CM4, CM5, and CM10

NEPA Effects: The amount of habitat restoration under Alternative 6A would be the same as for Alternative 1A. The primary concern with habitat restoration regarding constituents known to bioaccumulate is the potential for mobilizing contaminants sequestered in sediments of the newly inundated floodplains and marshes, as described under Alternative 1A. It is likely that the legacy organochlorine pesticide-bearing sediments would not be transported very far from the source area and would settle out with suspended particulates and be deposited close to the ROA. Further, CM2–CM21 do not include the use of pesticides known to be bioaccumulative in animals or humans.

Methylmercury generation rates are ultimately dependent on the concentrations of mercury in the soils, and on the specific biogeochemistry of the system. The biogeochemistry and fate and transport of mercury and methylmercury are very complex. Restoration would involve inundation of areas where mercury has been sequestered in soils, and, if methylation occurs, the methylmercury would be mobilized into the aquatic system. While there would likely be an increase in mobilization and bioaccumulation of methylmercury in the study area's aquatic systems (i.e., fish and water) during the near-term, *CM12 Methylmercury Management* and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Therefore, implementation of CM2, CM4, CM5, and CM10 under Alternative 6A is not expected to result in an adverse effect on public health with respect to pesticides or methylmercury.

CEQA Conclusion: Implementation of CM2, CM4, CM5, and CM10 would have the potential to mobilize sediment with existing levels of legacy organochlorine pesticides as a result of disturbing sediment during habitat restoration construction. However, it is unlikely that the legacy organochlorine pesticide-bearing sediments would be transported very far from the source area and they would likely settle out with suspended particulates and be deposited close to the ROAs during habitat restoration construction. While there would likely be an increase in mobilization and bioaccumulation of methylmercury in the study area's aquatic systems (i.e., fish and water) during the near-term, measures implemented under *CM12 Methylmercury Management*, and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Therefore, implementation of CM2, CM4, CM5, and CM10 under Alternative 6A would not substantially mobilize or substantially increase the public's exposure to constituents known to bioaccumulate and this impact would be less than significant. No mitigation is required.

Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water Conveyance Facilities

NEPA Effects: Because factors that affect *Microcystis* abundance in waters upstream of the Delta, in the Delta, and in the SWP/CVP Export Services Areas under Alternative 1A would similarly change under Alternative 6A, *Microcystis* abundance, and thus microcystin concentrations, in water bodies of the affected environment under Alternative 6A would be nearly the same as those discussed for Alternative 1A.

As described in Chapter 8, *Water* Quality, although *Microcystis* blooms have not occurred in the Export Service Areas, conditions in the Export Service Areas under Alternative 6A may become more conducive to *Microcystis* bloom formation because water temperatures will increase in the Export Service Areas due to the expected increase in ambient air temperatures resulting from climate change, but not from operation of the water conveyance facilities. In contrast to Alternative 1A, under Alternative 6A, relative to No Action Alternative, water exported to the SWP/CVP Export Service Areas will consist entirely of water from the Sacramento River from the north Delta, which is unaffected by *Microcystis*. Accordingly, the effects of *Microcystis* on water exported to the SWP/CVP Export Service Areas could be lower under Alternative 6A relative to Alternative 1A.

Like Alternative 1A, elevated ambient water temperatures would occur in the Delta under Alternative 6A, which could lead to earlier occurrences of *Microcystis* blooms in the Delta, and increase the overall duration and magnitude of blooms. However, as described in Chapter 8, *Water Quality,* the increase in Delta water temperatures, and consequent potential increase in *Microcystis* blooms, would be driven entirely by climate change, not by operation of water conveyance facilities. There would be differences in the direction and magnitude of water residence time changes during the *Microcystis* bloom period due to operation of the water conveyance facilities under Alternative 6A compared to Alternative 1A, relative to the No Action Alternative. As a result, *Microcystis* blooms, and therefore microcystin, could increase in surface waters throughout the Delta, similar to Alternative 1A. Therefore, impacts on beneficial uses, including drinking water and recreational waters, could occur and public health could be affected. Although Mitigation Measure WQ-32a and WQ-32b are available to reduce the severity of degraded water quality in the Delta due to *Microcystis* blooms, this would be an adverse effect.

CEQA Conclusion: Under Alternative 6A, operation of the water conveyance facilities is not expected to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta. *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not due to water conveyance facility operations. Hydraulic residence times in the Export Service Area would not be affected by operations of CM1, and therefore conditions in those areas would not be more conducive to *Microcystis* bloom formation.

Water exported from the Delta to the Export Service Area is expected to be diverted entirely from the Sacramento River from the north Delta, which is not affected by *Microcystis*. Therefore, the effects of *Microcystis* on water exported to the SWP/CVP Export Service Areas could be lower under Alternative 6A relative to Alternative 1A.

Water temperatures and hydraulic residence times in the Delta are expected to increase, which could result in an increase in *Microcystis* blooms and therefore microcystin levels. However, the water temperature increases in the Delta would be due to climate change and not due to operation of the water conveyance facilities. Increases in Delta residence times would be due in small part to climate change and sea level rise, but due to a greater degree to operation of the water conveyance facilities and hydrodynamic impacts of restoration included in CM2 and CM4. Consequently, it is possible that increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms in the Delta would occur due to the operations and maintenance of the water conveyance facilities and the hydrodynamic impacts of restoration under CM2 and CM4. Accordingly, beneficial uses including drinking water and recreational waters would be impacted and, as a result, public health. Therefore, this impact would be significant.

Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time considerations be incorporated into restoration area site design for CM2 and CM4 using the best available science at the time of design. Mitigation Measure WQ-32b requires that the project proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods to determine whether increases in abundance are significant. This mitigation measure also requires that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will investigate and evaluate measures that could be taken to reduce hydraulic residence time in the affected areas of the Delta. However, because the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and CM4

NEPA Effects: The amount and location of habitat restoration and enhancement that would occur under Alternative 6A would be the same as that described under Alternative 1A. Restoration activities implemented under CM2 and CM4 that would create shallow backwater areas could result in local increases in water temperature that may encourage *Microcystis* growth during the summer bloom season. This would result in further degradation of water quality beyond the hydrodynamic effects of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase in *Microcystis* blooms with implementation of CM2 and CM4 could potentially result in adverse effects on public health through exposure via drinking water quality and recreational waters. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects related to *Microcystis* is uncertain. This would be an adverse effect.

CEQA Conclusion: The effects of CM2 and CM4 on *Microcystis* under Alternative 6A would be the same as those discussed for Alternative 1A. Restoration activities implemented under CM2 and CM4 that create shallow backwater areas could result in local increases in water temperature conducive to *Microcystis* growth during summer bloom season. This could compound the water quality degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact PH-8 and result in additional water quality degradation such that beneficial uses are affected. An increase in *Microcystis* blooms could potentially result in impacts on public health through exposure via drinking water quality and recreational waters. Therefore, this impact would be significant. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects is uncertain. Therefore, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

25.3.3.12 Alternative 6B—Isolated Conveyance with East Alignment and Intakes 1–5 (15,000 cfs; Operational Scenario D)

The operation of water supply facilities under Alternative 6B would generally be the same as the operation described above for 6A. The primary difference between the two alternatives is that water conveyance under Alternative 6B would be in a lined or unlined canal, instead of a pipeline/tunnel, and there would be no intermediate forebay or emergency inundation area. The conservation measures under Alternative 6B would be the same as those described under Alternative 1A.

Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of the Water Conveyance Facilities

***NEPA Effects*:** As described for Alternative 1A, Alternative 6B would involve construction and operation of five north Delta intakes, up to 15 solids lagoons, five sedimentation basins, and Byron Tract Forebay. These facilities have the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes) because of the large volumes of water that would be held within these areas. The depth, design, and operation of the sedimentation basins, solids lagoons and Byron Tract Forebay would prevent the development of suitable mosquito habitat (Figure 25-1). The sedimentation basins would be too deep and the constant movement of water would prevent mosquitoes from breeding and multiplying. Sedimentation basins would be 120 feet long by 40 feet wide by 55 feet deep, and solids lagoons would be 165 feet long by 86 feet wide by 10 feet deep.

Although the proposed Byron Tract Forebay would increase surface water within the study area, it is unlikely that the forebay would provide suitable breeding habitat for mosquitoes given that the water in this forebay would not be stagnant and would be too deep. However, the shallow edges of the forebay could potentially provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. However, as part of the regular maintenance of the forebay, floating vegetation such as pond weed would be harvested to maintain flow and forebay capacity.

To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes. These BMPs would be consistent with practices presented in *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). See Impact PH-1 under Alternative 1A. Therefore, as described for Alternative 1A, construction and operation of the water conveyance facilities under Alternative 6B would not substantially increase suitable vector habitat, and would not substantially increase vector-borne diseases. Accordingly, no adverse effects would result.

***CEQA Conclusion*:** As described for Alternative 1A, implementation of CM1 under Alternative 6B would involve construction and operation of solids lagoons, sedimentation basins, and the Byron Tract Forebay. These areas could provide suitable habitat for vectors (e.g., mosquitoes). During operations, water depth and circulation would prevent the areas from substantially increasing suitable vector habitat. However, the shallow edges on the periphery of Byron Tract Forebay could potentially provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes. See Impact PH-1 under Alternative 1A. These BMPs would be consistent with practices presented in *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). Therefore, construction and operation of the water conveyance facilities under Alternative 6B would not result in a substantial increase in vector-borne diseases and the impact on public health would be less than significant. No mitigation is required.

Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That There is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance Facilities

The description of water quality and public health effects related to DBPs, pesticides and trace metals for Alternative 6A also appropriately characterizes effects under this alternative.

NEPA Effects:

Disinfection Byproducts

Modeled long-term average DOC concentrations and, by extension, DBPs would decrease at Banks and Jones pumping plants; however, long-term average concentrations of DOC are estimated to substantially increase at Franks Tract, Rock Slough and Contra Costa Pumping Plant #1 relative to the No Action Alternative, as under Alternative 6A. Exceedances of water quality objectives would conflict with the Basin Plan because it would exceed Basin Plan requirements. These increases could potentially trigger substantial changes in drinking water treatment plant design or operations. In particular, assessment locations at Rock Slough and Contra Costa Pumping Plant #1 represent municipal intakes servicing existing drinking water treatment plants. Drinking water treatment plants obtaining water from these interior Delta locations would likely need to upgrade existing treatment systems in order to achieve EPA Stage 1 Disinfectants and Disinfection Byproduct Rule action thresholds.

Relative to the No Action Alternative, Alternative 6B would result in increases in long-term average bromide concentrations at Buckley Cove, Staten Island and the North Bay Aqueduct at Barker Slough. Increases would be greatest at Staten Island and at Barker Slough, as indicated under Alternative 6A. The long-term average increase predicted for Barker Slough could necessitate changes in water treatment plant operations or require treatment plant upgrades in order to maintain DBP compliance.

While treatment technologies sufficient to achieve the necessary DOC and bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken for these predicted increases in DOC and bromide for the affected Delta locations, a change of such magnitude in long-term average DOC and bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBPs. While Mitigation Measure WQ-17 is available to partially reduce the effect of DOC, the feasibility and effectiveness of this mitigation measure are uncertain, and, therefore, it is not known if its implementation would reduce the severity of this effect such that it would not be adverse. Similarly, Mitigation Measure WQ-5 is available to reduce the potential effects of increased bromide in drinking water sources at Barker Slough. Implementation of this measure along with a separate other commitment as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, relating to the potential increased treatment costs associated with bromide-related changes would reduce these effects. Further, as described for Impact PH-2 under Alternative 1A, the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be further minimized by implementation of the AIP. However, the overall effect on public health related to potential increases in DBPs (resulting from DOC and bromide increases) at the aforementioned Delta locations would still be considered adverse.

Trace Metals

Alternative 6B has the same diversion and conveyance operations as Alternative 6A. Because there would be no difference in operations, there would be no differences between these two alternatives in source fractions to various Delta locations, and hydrodynamics in the Delta. Therefore, trace metal concentrations are not expected to increase above conditions under the No Action Alternative and would not result in adverse impacts.

Pesticides

The change in source water (e.g., more San Joaquin River water) associated with Alternative 6B would be of sufficient magnitude to increase the existing pesticide concentrations in the Delta, resulting in an increased risk of toxicity to aquatic life at Buckley Cove, Franks Tract, Rock Slough, the San Joaquin River at Antioch, and Contra Costa Pumping Plant #1 during certain times of the year relative to the No Action Alternative. A conclusion regarding the risk to human health at these locations, based on the predicted adverse effects from pesticides on aquatic life cannot be made. The prediction of adverse effects of pesticides fundamentally assumes that the present pattern of pesticide incidence in surface water would continue at similar levels into the future. In reality, the use of chlorpyrifos and diazinon pesticides, the two pesticides that serve as the basis for concluding a substantially increased San Joaquin River source water fraction, is on the decline with their replacement by pyrethroids on the rise. Furthermore, water treatment plants are required to meet drinking water requirements set forth in the California Safe Drinking Water Act and the regulations adopted by CDPH. Therefore, it is not anticipated that there would be adverse effects on public health from pesticides in drinking water sources.

***CEQA Conclusion*:** The change in source water (e.g., more San Joaquin River water) associated with operation of the water conveyance facilities under Alternative 6B would be of sufficient magnitude to increase the existing pesticide concentrations in the Delta, according to water quality modeling results. This increase could result in an increased risk of toxicity to aquatic life at some locations in the study area (Buckley Cove, Franks Tract, Rock Slough, the San Joaquin River at Antioch, and Contra Costa Pumping Plant #1) during certain times of the year relative to Existing Conditions. A conclusion regarding the risk to human health at these locations, based on the predicted adverse effects from pesticides on aquatic life, cannot be made. However, the prediction of adverse effects of pesticides relative to Existing Conditions fundamentally assumes that the present pattern of pesticide incidence in surface water would continue at similar levels into the future. In reality, the use of chlorpyrifos and diazinon pesticides, the two pesticides that serve as the basis for concluding a substantially increased San Joaquin River source water fraction, is on the decline with their replacement by pyrethroids on the rise. Furthermore, water treatment plants are required to meet drinking water requirements set forth in the California Safe Drinking Water Act and the regulations adopted by CDPH. Thus, these potential increases in pesticide concentrations would not significantly impact public health. The change in source water would not alter trace metal concentrations in the study area to the degree that there would be a beneficial use impairment. Finally, under Alternative 6B, modeled increases in bromide concentrations at Barker Slough, and in DOC concentrations at Franks Tract, Rock Slough, and Contra Costa Pumping Plant #1 (described under Alternative 6A), may be substantial enough to necessitate water treatment plant upgrades or changes in plant operations in order to maintain DBP compliance. Should treatment plant upgrades not be undertaken for the affected Delta locations, a change of such magnitude in long-term average DOC and bromide concentrations in drinking water sources would represent an increased risk for effects on public health from DBPs, which would be a significant impact.

Implementation of the AIP may reduce water quality effects due to bromide increases at Barker Slough by allowing operators of the North Bay Aqueduct to largely avoid periods of poor water quality by using an alternative surface water intake on the Sacramento River. Assuming the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be avoided or minimized by implementation of the AIP, the potential adverse water quality effects on the municipal beneficial uses potentially provided in Barker Slough would remain significant. While Mitigation Measure WQ-5 may reduce this impact, the feasibility and effectiveness of this mitigation measure are uncertain

based on currently available information. Mitigation Measure WQ-17 would reduce the potential impacts associated with DOC; however, it is unknown if this mitigation would reduce impacts to a less-than-significant level.

In addition to and to supplement Mitigation Measure WQ-5, the BDCP proponents have incorporated into the BDCP, as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, a separate other commitment to address the potential increased water treatment costs that could result from bromide-related concentration effects on municipal water purveyor operations. Potential options for making use of this financial commitment include funding or providing other assistance towards implementation of the North Bay Aqueduct AIP, acquiring alternative water supplies, or other actions to indirectly reduce the effects of elevated bromide and DOC in existing water supply diversion facilities. Please refer to Appendix 3B, *Environmental Commitments, AMMs, and CMs*, for the full list of potential actions that could be taken pursuant to this commitment in order to reduce the water quality treatment costs associated with water quality effects relating to chloride, electrical conductivity, and bromide. Because the BDCP proponents cannot ensure that the results of coordinated actions with water treatment entities will be fully funded or implemented successfully prior to the project's contribution to the impact, the ability to fully mitigate this impact is uncertain. If a solution that is identified by the BDCP proponents and an affected water purveyor is not fully funded, constructed, or implemented before the project's contribution to the impact is made, a significant impact in the form of increased DBP in drinking water sources could occur. Accordingly, this impact would be significant and unavoidable. If, however, all financial contributions, technical contributions, or partnerships required to avoid significant impacts prove to be feasible and any necessary agreements are completed before the project's contribution to the effect is made, impacts would be less than significant.

Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality Conditions; Site and Design Restoration Sites to Reduce Bromide Increases in Barker Slough

Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

Mitigation Measure WQ-17: Consult with Delta Water Purveyors to Identify Means to Avoid, Minimize, or Offset Increases in Long-Term Average DOC Concentrations

Please see Mitigation Measure WQ-17 under Impact PH-2 in the discussion of Alternative 6A.

Impact PH-3: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Construction, Operation or Maintenance of the Water Conveyance Facilities

***NEPA Effects*:** As described for Alternative 1A, intermittent and/or short-term construction-related activities (as would occur for in-river construction) would not be anticipated to result in contaminant discharges of sufficient magnitude or duration to contribute to long-term bioaccumulation processes, or cause measureable long-term degradation. Legacy organochlorine pesticides typically bond to particulates, and do not mobilize easily. Construction and maintenance of Alternative 6B would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column. Additionally, water supply operations under any BDCP action alternative would not be expected to change total suspended solids or turbidity levels (highs, lows, typical conditions) to any substantial degree. Changes in the magnitude, frequency, and geographic distribution of legacy pesticides in water bodies of the affected environment that would result in new or more severe adverse effects on beneficial uses, relative to the No Action Alternative, would not be expected to occur.

Water quality modeling results indicate small, insignificant changes in total mercury and methylmercury levels in water resulting from Alternative 6B water operations, as described under Impact PH-3 for Alternative 6A (Chapter 8, *Water Quality*, Section 8.3.3.11). These changes are not expected to result in adverse effects on beneficial uses. Similarly, changes in methylmercury concentration are expected to be relatively small.

Fish tissue mercury concentrations showed substantial increases in some Delta locations modeled, as described under Impact PH-3 for Alternative 6A. These changes in fish tissue mercury concentrations would make existing mercury-related impairments in the Delta measurably worse. Relative to the No Action Alternative, body burdens of mercury in fish would be measurably higher, and could thereby substantially increase the health risks to people consuming those fish. Accordingly, the potential for Alternative 6B to create a public health effect from bioaccumulation of mercury would exist and this is considered an adverse effect.

As environmental commitments, DWR would develop and implement Erosion and Sediment Control Plans and SWPPPs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMPs implemented under the Erosion and Sediment Control Plans and the SWPPPs would help reduce turbidity and keep sediment that may contain legacy organochlorine pesticides and methylmercury within the area of disturbance during construction and maintenance. Additionally, OEHHA standards would continue to be implemented for the consumption of study area fish and thus would serve to protect people against the overconsumption of fish with increased body burdens of mercury.

CEQA Conclusion: Construction and maintenance of water conveyance facilities under Alternative 6B would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column based on the chemical properties of the pesticides. Therefore, construction and maintenance of Alternative 6B water conveyance facilities would not cause increased exposure of the public to these pesticides as a result of construction and maintenance. As environmental commitments, DWR would develop and implement Erosion and Sediment Control Plans and SWPPPs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMPs implemented under the Erosion and Sediment Control Plans and the SWPPPs would help reduce turbidity and keep sediment that may contain legacy organochlorine pesticides and methylmercury within the area of disturbance.

Based on water quality modeling results, changes in water concentrations of mercury and methlymercury would occur at some locations relative to Existing Conditions as a result of operations under Alternative 6B but would not alter beneficial uses of waters in the study area. However, relative to Existing Conditions, modeling results indicate that body burdens of mercury in fish would be measurably higher at certain locations in the Delta, which could increase the health risks to people consuming those fish. Accordingly, the potential for Alternative 6B to create a public health effect from bioaccumulation of mercury would exist and this is considered a significant and unavoidable impact. The estimated increases of mercury body burdens in fish are based on the changes expected from the modeled blending of source waters that define CM1 for Alternative 6B, and are therefore inherent to the Alternative. OEHHA standards would continue to be implemented for the consumption of study area fish and thus would serve to protect people against the overconsumption of fish with increased body burdens of mercury.

Impact PH-4: Expose Substantially More People to Transmission Lines Generating New Sources of EMFs as a Result of the Construction and Operation of the Water Conveyance Facilities

NEPA Effects: As described in Table 25-9, a total of 13.49 miles of new temporary 69 kV transmission lines; 36.79 miles of new permanent 69 kV transmission lines; and 16.35 miles of new permanent 230 kV transmission lines would be required for this alternative. The temporary and permanent transmission lines needed for Alternative 6B would be very similar in location and length to those for Alternative 1B because 6B would involve the construction and operation of five intakes and the primary conveyance would be a canal along the east side of the Delta, carrying water to an intermediate pumping plant located approximately 3 miles south of the point where the alignment crosses the San Joaquin River, on Lower Roberts Island. As with Alternative 1B, any new temporary and permanent transmission lines needed for Alternative 6B would be located in rights-of-way of existing transmission lines or in areas that are not densely populated and therefore would not expose substantially more people to transmission lines (Figure 25-2). Table 25-9 identifies only one potential new sensitive receptor (Stone Lakes National Wildlife Refuge) that is not currently within 300 feet of an existing transmission line; the majority of sensitive receptors are already located within 300 feet of an existing 69 kV or 230 kV transmission line. Stone Lakes National Wildlife Refuge would be within 300 feet of a proposed permanent 69 kV transmission line. Visitors to this area generally come for walks, water recreation, and hunting, and as such, it is unlikely that large groups of people would be staying in the area within 300 feet of this proposed transmission line, so any EMF exposure would be limited.

While the current scientific evidence does not show conclusively that EMF exposure increases health risks, the location and design of the new transmission lines would be conducted in accordance with CPUC's EMF Design Guidelines for Electrical Facilities, as described under Impact PH-4 for Alternative 1A (and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*). Measures implemented under these guidelines would reduce EMF exposure from the proposed transmission lines. Therefore, operation of the transmission line corridors would not expose substantially more people to transmission lines generating EMFs. Because the lines would be located in sparsely populated areas and would be within 300 feet of only two potential new sensitive receptors, the proposed temporary and permanent transmission lines would not substantially increase people's exposure to EMFs and there would be no adverse effect on public health.

CEQA Conclusion: Under Alternative 6B, the majority of temporary and permanent transmission lines would be located within the right-of-way of existing transmission lines and any new temporary or permanent transmission lines not within the right-of-way of existing transmission lines would be located in sparsely populated areas generally away from existing sensitive receptors. However, one sensitive receptor, Stone Lakes National Wildlife Refuge, would be within 300 feet of a proposed permanent 69 kV transmission line. Because visitors to this area generally come for walks, water recreation, and hunting, it is unlikely that large groups of people would be staying in the area within 300 feet of this proposed transmission line, so any EMF exposure would be limited. Design and implementation of new temporary or permanent transmission lines not within the right-of-way of existing transmission lines would follow CPUC's EMF Design Guidelines for Electrical Facilities and would implement shielding, cancelation or distance measures to reduce EMF exposure. Because construction and operation of Alternative 6B would not expose substantially more people to transmission lines that generate new sources of EMFs, impacts on public health would be less than significant, and no mitigation is required.

Impact PH-5: Increase in Vector-Borne Diseases as a Result of Implementing CM2-CM7, CM10 and CM11

NEPA Effects**:** The amount and location of habitat restoration and enhancement that would occur under Alternative 6B would be the same as that described for Alternative 1A. Although there would be an increase in restored and enhanced aquatic habitat in the study area as a result of implementing Alternative 6B, implementation of environmental commitments such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*) would reduce the potential for an increase in mosquito breeding habitat. Thus, a substantial increase in vector-borne diseases is unlikely to result. Furthermore, habitat would be restored in areas where potentially suitable habitat for mosquitoes already exists. Finally, mosquito predators (e.g., bats, spiders) would likely increase as a result of restoration and enhancement, which would keep mosquito populations in check. Therefore, effects would be the same under Alternative 6B as under Alternative 1A, and there would not be a substantial increase in the public's risk of exposure to vector-borne diseases with implementation of CM2-CM7, CM10 and CM11. Accordingly, there would be no adverse effect.

CEQA Conclusion**:** Habitat restoration and enhancement would result in an increased amount of land potentially suitable for vector habitat (e.g., mosquitoes). However, as described for Alternative 1A, Alternative 6B would require environmental commitments such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*) that would help control mosquitoes and reduce the potential for an increase in mosquito breeding habitat. Furthermore, habitat would be restored where potentially suitable vector habitat already exists and habitat restoration and enhancement would likely increase the number of mosquito predators. Therefore, as described for Alternative 1A, implementation of CM2-CM7, CM10 and CM11 under Alternative 6B would not substantially increase the public's risk of exposure to vector-borne diseases beyond what currently exists. Accordingly, this impact would be less than significant and no mitigation is required.

Impact PH-6: Substantial Increase in Recreationists' Exposure to Pathogens as a Result of Implementing the Restoration Conservation Measures

NEPA Effects**:** The amount and location of habitat restoration and enhancement that would occur under Alternative 6B would be the same as that described for Alternative 1A. Implementation of the restoration conservation measures would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). As exemplified by the Pathogen Conceptual Model, any potential increase in pathogens associated with the proposed habitat restoration would be localized and within the vicinity of the actual restoration. This would be similar for lands protected for agricultural uses. Depending on the level of recreational access granted by management plans, habitat restoration could increase or decrease opportunities for recreationists within the Delta region. However, effects associated with pathogens would be the same under Alternative 6B as under Alternative 1A. Recreationists would not experience a substantial increase in exposure to pathogens as a result of the restoration and no adverse effect would result.

CEQA Conclusion**:** Implementation of the restoration conservation measures under Alternative 6B would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). However, the localized nature of pathogen generation and the quick die-off of some types of pathogens once released into water bodies would generally prevent a substantial increase in pathogen exposure by recreationists. Therefore, impacts would be less than significant and no mitigation is required.

Impact PH-7: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Implementing CM2, CM4, CM5, and CM10

***NEPA Effects*:** The amount of habitat restoration would be the same under Alternative 6B as described for Alternative 1A. The primary concern with habitat restoration regarding constituents known to bioaccumulate (i.e., legacy organochlorine pesticides and methylmercury) is the potential for mobilizing contaminants sequestered in sediments of the newly inundated floodplains and marshes, as described under Alternative 1A. It is likely that the pesticide-bearing sediments would not be transported very far from the source area and would settle out with suspended particulates and be deposited close to the ROA. Further, CM2–CM21 do not include the use of pesticides known to be bioaccumulative in animals or humans.

Methylmercury generation rates are ultimately dependent on the concentrations of mercury in the soils, and on the specific biogeochemistry of the system. The biogeochemistry and fate and transport of mercury and methylmercury are very complex. Restoration would involve inundation of areas where mercury has been sequestered in soils, and, if methylation occurs, the methylmercury would be mobilized into the aquatic system. While there would likely be an increase in mobilization and bioaccumulation of methylmercury in the study area's aquatic systems (i.e., fish and water) during the near-term, *CM12 Methylmercury Management* and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Implementation of methylmercury management measures under CM12 would minimize conditions conducive to generation of methylmercury in restored areas.

Therefore, implementation of CM2, CM4, CM5, and CM10 under Alternative 6B would not result in the substantial mobilization or increase of constituents known to bioaccumulate and, as such, would not result in an adverse effect on public health with respect to pesticides or methylmercury.

***CEQA Conclusion*:** Implementation of CM2, CM4, CM5, and CM10 would have the potential to mobilize sediment with existing levels of legacy organochlorine pesticides as a result of disturbing sediment during habitat restoration construction. However, it is unlikely that the pesticide-bearing sediments would be transported very far from the source area and they would likely settle out with suspended particulates and be deposited close to the ROAs during habitat restoration construction. While there would likely be an increase in mobilization and bioaccumulation of methylmercury in the study area's aquatic systems (i.e., fish and water) during the near-term, measures implemented under *CM12 Methylmercury Management*, and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Therefore, implementation of CM2, CM4, CM5, and CM10 under Alternative 6B would not substantially mobilize or substantially increase the public's exposure to constituents known to bioaccumulate and this impact would be less than significant. No mitigation is required.

Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water Conveyance Facilities

NEPA Effects: Water operations under Alternative 6B would be the same as under Alternative 6A. Therefore, potential effects on public health due to changes in water quality and beneficial uses as a result of *Microcystis* blooms and microcystin levels would be the same.

Any modified reservoir operations under Alternative 6B are not expected to promote *Microcystis* production in waters upstream of the Delta. As described in Chapter 8, *Water* Quality, *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not due to water conveyance facility operations. Similarly, hydraulic residence times in the Export Service Area would not be affected by operations of CM1. Accordingly, conditions would not be more conducive to *Microcystis* bloom formation. Water diverted from the Sacramento River in the north Delta is expected to be unaffected by *Microcystis.* Under Alternative 6B, water exported to the SWP/CVP Export Service Areas will consist entirely of water from the Sacramento River from the north Delta, which is unaffected by *Microcystis*. Accordingly, the effects of *Microcystis* on water exported to the SWP/CVP Export Service Areas could be lower under Alternative 6B relative to Alternative 1A.

Ambient meteorological conditions would be the primary driver of Delta water temperatures, and climate warming, not water operations, would determine future water temperatures in the Delta. Increasing water temperatures could lead to earlier attainment of the water temperature threshold required to initiate *Microcystis* bloom formation, and therefore earlier occurrences of *Microcystis* blooms in the Delta, as well as increases in the duration and magnitude. However, these temperature-related changes would not be different from what would occur under the No Action Alternative. Siting and design of restoration areas would have a substantial influence on the magnitude of residence time increases under Alternative 6B. The modeled increase in hydraulic residence time in the Delta could result in an increase in the frequency, magnitude, and geographic extent of *Microcystis* blooms, and thus microcystin levels. Therefore, impacts on beneficial uses, including drinking water and recreational waters, could occur and public health could be affected. Accordingly, this would be considered an adverse effect.

Mitigation Measure WQ-32a and WQ-32b are available to reduce the effects of degraded water quality, and therefore potential public health effects, in the Delta due to *Microcystis*. However, because the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain, the effect would still be considered adverse.

CEQA Conclusion: Under Alternative 6B, operation of the water conveyance facilities is not expected to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta. *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not due to water conveyance facility operations. Hydraulic residence times in the Export Service Area would not be affected by operations of CM1, and therefore conditions in those areas would not be more conducive to *Microcystis* bloom formation. Water exported from the Delta to the Export Service Area is expected to be diverted entirely from the Sacramento River from the north Delta, which is not affected by *Microcystis*. Therefore, the effects of *Microcystis* on water exported to the SWP/CVP Export Service Areas could be lower under Alternative 6B relative to Alternative 1A.

Water temperatures and hydraulic residence times in the Delta are expected to increase, which could result in an increase in *Microcystis* blooms and therefore microcystin levels. However, the water temperature increases in the Delta would be due to climate change primarily and not due to operation of the water conveyance facilities. Increases in Delta residence times would be due in small part to climate change and sea level rise, but due to a greater degree to operation of the water conveyance facilities and hydrodynamic impacts of restoration included in CM2 and CM4. Consequently, it is possible that increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms in the Delta would occur due to the operations and maintenance of the water conveyance facilities and the hydrodynamic impacts of restoration under CM2 and CM4. Accordingly, beneficial uses including drinking water and recreational waters would be impacted and, as a result, there could be potential impacts on public health. Therefore, this impact would be significant.

Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time considerations be incorporated into restoration area site design for CM2 and CM4 using the best available science at the time of design. Mitigation Measure WQ-32b requires that the project proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods to determine whether increases in abundance are significant. This mitigation measure also requires that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will investigate and evaluate measures that could be taken to reduce residence time in the affected areas of the Delta. However, because the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and CM4

***NEPA Effects*:** The amount and location of habitat restoration and enhancement that would occur under Alternative 6B would be the same as that described under Alternative 1A. Restoration activities implemented under CM2 and CM4 that would create shallow backwater areas could result in local increases in water temperature that may encourage *Microcystis* growth during the summer bloom season. This would result in further degradation of water quality beyond the hydrodynamic effects of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase in *Microcystis* blooms with implementation of CM2 and CM4 could potentially result in adverse effects on public health through exposure via drinking water quality and recreational waters. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain. This would be an adverse effect.

CEQA Conclusion: The effects of CM2 and CM4 on *Microcystis* under Alternative 6B are the same as those discussed for Alternative 1A. Restoration activities implemented under CM2 and CM4 that create shallow backwater areas could result in local increases in water temperature conducive to *Microcystis* growth during summer bloom season. This could compound the water quality degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact PH-8 and result in additional water quality degradation such that beneficial uses are affected. An increase in *Microcystis* blooms could potentially result in impacts on public health through exposure via drinking water quality and recreational waters. Therefore, this impact would be significant. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality.*

25.3.3.13 Alternative 6C—Isolated Conveyance with West Alignment and Intakes W1–W5 (15,000 cfs; Operational Scenario D)

The operation of water supply facilities under Alternative 6C would generally be the same as the operation described above for 6A. The primary difference between the two alternatives is that under Alternative 6C, the five intakes would be located on the west bank of the Sacramento River between Clarksburg and Walnut Grove; and instead of a pipeline/tunnel, the water conveyance under Alternative 6C would be a lined or unlined canal on the western side of the Delta carrying water to an intermediate pumping plant, from where it would be pumped through a dual-bore tunnel to a continuing canal to the proposed Byron Tract Forebay immediately northwest of Clifton Court Forebay. The lined versus unlined canal is not expected to have an adverse effect on public health, as discussed below. The conservation measures under Alternative 6C would be the same as those described under Alternative 1A.

Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of the Water Conveyance Facilities

***NEPA Effects*:** As described for Alternative 1A, Alternative 6C would involve construction and operation of five north Delta intakes, up to 15 solids lagoons, five sedimentation basins, and the Bryon Tract Forebay. These facilities have the potential provide habitat for vectors that transmit diseases (e.g., mosquitoes) because of the large volumes of water that would be held within these areas. The depth, design, and operation of the sedimentation basins and solids lagoons would prevent the development of suitable mosquito habitat (Figure 25-1). Specifically, the basins would be too deep and the constant movement of water would prevent mosquitoes from breeding and multiplying. Sedimentation basins would be 120 feet long by 40 feet wide by 55 feet deep, and solids lagoons would be 165 feet long by 86 feet wide by 10 feet deep.

Although the proposed Byron Tract Forebay would increase surface water within the study area, it is unlikely that the forebay would provide suitable breeding habitat for mosquitoes given that the water in this forebay would not be stagnant and would be too deep. However, the shallow edges of the forebay could potentially provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. However, as part of the regular maintenance of the forebay, floating vegetation such as pond weed would be harvested to maintain flow and forebay capacity.

To minimize the potential for causing impacts related to increasing suitable mosquito habitat in the Plan Area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes. These BMPs would be consistent with practices presented in *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). See Impact PH-1 under Alternative 1A. Therefore, as described for Alternative 1A, construction and operation of the water conveyance facilities under Alternative 6C would not substantially increase suitable vector habitat, and would not substantially increase vector-borne diseases. Accordingly, there would be no adverse effects.

CEQA Conclusion: As described for Alternative 1A, implementation of CM1 under Alternative 6C would involve construction and operation of solids lagoons, sedimentation basins, and the Byron Tract Forebay could provide suitable habitat for vectors (e.g., mosquitoes). During operations, water depth and circulation would prevent the areas from substantially increasing suitable vector habitat. However, the shallow edges on the periphery of Byron Tract Forebay could potentially provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes. See Impact PH-1 under Alternative 1A. These BMPs would be consistent with practices presented in *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). Therefore, construction and operation of the water conveyance facilities under Alternative 6C would not result in a substantial increase in vector-borne diseases and the impact on public health would be less than significant. No mitigation is required.

Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That There is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance Facilities

The description of water quality and public health effects related to DBPs, pesticides and trace metals for Alternative 6A also appropriately characterizes effects under this alternative.

NEPA Effects:

Disinfection Byproducts

Modeled long-term average DOC concentrations and, by extension, DBPs would decrease at Banks and Jones pumping plants; however, long-term average concentrations of DOC are estimated to substantially increase at Franks Tract, Rock Slough and Contra Costa Pumping Plant #1 relative to the No Action Alternative, as described under Alternative 6B. Exceedances of water quality objectives would conflict with the Basin Plan because it would exceed Basin Plan requirements. These increases could potentially trigger substantial changes in drinking water treatment plant design or operations. In particular, assessment locations at Rock Slough and Contra Costa Pumping Plant #1 represent municipal intakes servicing existing drinking water treatment plants. Drinking water treatment plants obtaining water from these interior Delta locations would likely need to upgrade existing treatment systems in order to achieve EPA Stage 1 Disinfectants and Disinfection Byproduct Rule action thresholds.

Relative to the No Action Alternative, Alternative 6C would result in increases in long-term average bromide concentrations at Buckley Cove, Staten Island and the North Bay Aqueduct at Barker Slough. Increases would be greatest at Staten Island and at Barker Slough, as indicated under Alternative 6A. The long-term average increase predicted for Barker Slough could necessitate changes in water treatment plant operations or require treatment plant upgrades in order to maintain DBP compliance.

While treatment technologies sufficient to achieve the necessary DOC and bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken for these predicted increases in DOC and bromide for the affected Delta locations, a change of such magnitude in long-term average DOC and bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBPs. While Mitigation Measure WQ-17 is available to partially reduce the effect of DOC, the feasibility and effectiveness of this mitigation measure are uncertain, and, therefore, it is not known if its implementation would reduce the severity of this effect such that it would not be adverse. Similarly, Mitigation Measure WQ-5 is available to reduce the potential effects of increased bromide in drinking water sources at Barker Slough. Implementation of this measure along with a separate other commitment as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, relating to the potential increased treatment costs associated with bromide-related changes would reduce these effects. Further, as described for Impact PH-2 under Alternative 1A, the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be further minimized by implementation of the AIP. However, the overall effect on public health related to potential increases in DBPs (resulting from DOC and bromide increases) at the aforementioned Delta locations would still be considered adverse.

Trace Metals

Alternative 6C has the same diversion and conveyance operations as Alternative 6A. Because there would be no difference in operations, there would be no differences between these two alternatives in source fractions to various Delta locations, and hydrodynamics in the Delta. Accordingly, trace metal concentrations are not expected to increase above conditions under the No Action Alternative and would not result in adverse impacts on public health.

Pesticides

The change in source water (e.g., more San Joaquin River water) associated with Alternative 6C would be sufficient in magnitude to increase the existing pesticide concentrations in the Delta, resulting in an increased risk of toxicity to aquatic life at Buckley Cove, Franks Tract, Rock Slough, the San Joaquin River at Antioch, and Contra Costa Pumping Plant #1 during certain times of the year relative to the No Action Alternative. A conclusion regarding the risk to human health at these locations, based on the predicted adverse effects from pesticides on aquatic life cannot be made. The prediction of adverse effects of pesticides fundamentally assumes that the present pattern of pesticide incidence in surface water would continue at similar levels into the future. In reality, the use of chlorpyrifos and diazinon pesticides, the two pesticides that serve as the basis for concluding a substantially increased San Joaquin River source water fraction, is on the decline with their replacement by pyrethroids on the rise. Furthermore, water treatment plants are required to meet drinking water requirements set forth in the California Safe Drinking Water Act and the regulations adopted by CDPH. Therefore, it is not anticipated that there would be adverse effects on public health from pesticides in drinking water sources.

***CEQA Conclusion*:** The change in source water (e.g., more San Joaquin River water) associated with operation of the water conveyance facilities under Alternative 6C would be of sufficient magnitude to increase the existing pesticide concentrations in the Delta, according to water quality modeling results. This increase could result in an increased risk of toxicity to aquatic life at some locations in the study area (Buckley Cove, Franks Tract, Rock Slough, the San Joaquin River at Antioch, and Contra Costa Pumping Plant #1) during certain times of the year relative to Existing Conditions. A conclusion regarding the risk to human health at these locations, based on the predicted adverse effects from pesticides on aquatic life, cannot be made. However, the prediction of adverse effects of pesticides relative to Existing Conditions fundamentally assumes that the present pattern of pesticide incidence in surface water would continue at similar levels into the future. In reality, the use of chlorpyrifos and diazinon pesticides, the two pesticides that serve as the basis for concluding a substantially increased San Joaquin River source water fraction, is on the decline with their replacement by pyrethroids on the rise. Furthermore, water treatment plants are required to meet drinking water requirements set forth in the California Safe Drinking Water Act and the regulations adopted by CDPH. Thus, these potential increases in pesticide concentrations would not significantly impact public health. The change in source water would not alter trace metal concentrations in the study area to the degree that there would be a beneficial use impairment. Finally, under Alternative 6C, modeled increases in bromide concentrations at Barker Slough, and in DOC concentrations at Franks Tract, Rock Slough and Contra Costa Pumping Plant #1 (as described under Alternative 6A), may be substantial enough to necessitate water treatment plant upgrades or changes in plant operations in order to maintain DBP compliance. Should treatment plant upgrades not be undertaken for the affected Delta locations, a change of such magnitude in long-term average DOC and bromide concentrations in drinking water sources would represent an increased risk for effects on public health from DBPs, which would be a significant impact.

Implementation of the AIP may reduce water quality effects due to bromide increases at Barker Slough by allowing operators of the North Bay Aqueduct to largely avoid periods of poor water quality by using an alternative surface water intake on the Sacramento River. Assuming the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be avoided or minimized by implementation of the AIP, the potential adverse water quality effects on the municipal beneficial uses potentially provided in Barker Slough would remain significant. While Mitigation Measure WQ-5 may reduce this impact, the feasibility and effectiveness of this mitigation measure are uncertain

based on currently available information. Mitigation Measure WQ-17 would reduce the potential impacts associated with DOC; however, it is unknown if this mitigation would reduce impacts to a less-than-significant level.

In addition to and to supplement Mitigation Measure WQ-5, the BDCP proponents have incorporated into the BDCP, as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, a separate other commitment to address the potential increased water treatment costs that could result from bromide-related concentration effects on municipal water purveyor operations. Potential options for making use of this financial commitment include funding or providing other assistance towards implementation of the North Bay Aqueduct AIP, acquiring alternative water supplies, or other actions to indirectly reduce the effects of elevated bromide and DOC in existing water supply diversion facilities. Please refer to Appendix 3B for the full list of potential actions that could be taken pursuant to this commitment in order to reduce the water quality treatment costs associated with water quality effects relating to chloride, electrical conductivity, and bromide. Because the BDCP proponents cannot ensure that the results of coordinated actions with water treatment entities will be fully funded or implemented successfully prior to the project's contribution to the impact, the ability to fully mitigate this impact is uncertain. If a solution that is identified by the BDCP proponents and an affected water purveyor is not fully funded, constructed, or implemented before the project's contribution to the impact is made, a significant impact in the form of increased DBP in drinking water sources could occur. Accordingly, this impact would be significant and unavoidable. If, however, all financial contributions, technical contributions, or partnerships required to avoid significant impacts prove to be feasible and any necessary agreements are completed before the project's contribution to the effect is made, impacts would be less than significant.

Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality Conditions; Site and Design Restoration Sites to Reduce Bromide Increases in Barker Slough

Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

Mitigation Measure WQ-17: Consult with Delta Water Purveyors to Identify Means to Avoid, Minimize, or Offset Increases in Long-Term Average DOC Concentrations

Please see Mitigation Measure WQ-17 under Impact PH-2 in the discussion of Alternative 6A.

Impact PH-3: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Construction, Operation or Maintenance of the Water Conveyance Facilities

***NEPA Effects*:** As described for Alternative 1A, intermittent and/or short-term construction-related activities (as would occur for in-river construction) would not be anticipated to result in contaminant discharges of sufficient magnitude or duration to contribute to long-term bioaccumulation processes, or cause measureable long-term degradation. Legacy organochlorine pesticides typically bond to particulates, and do not mobilize easily. Construction and maintenance of Alternative 6C would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column. Water supply operations under any BDCP action alternative would not be expected to change total suspended solids or turbidity levels (highs, lows, typical conditions) to any substantial degree. Changes in the magnitude, frequency, and geographic distribution of legacy pesticides in water bodies of the affected environment that would result in new or more severe adverse effects on beneficial uses, relative to the No Action Alternative, would not be expected to occur.

Water quality modeling results indicate small, insignificant changes in total mercury and methylmercury levels in water resulting from Alternative 6C water operations (Chapter 8, *Water Quality*, Section 8.3.3.13), as described under Impact PH-3 for Alternative 6A. These changes are not expected to result in adverse effects on beneficial uses. Similarly, changes in methylmercury concentration are expected to be relatively small. However, fish tissue mercury concentrations showed substantial increases in some Delta locations modeled, as described under Impact PH-3 for Alternative 6A. These changes in fish tissue mercury concentrations would make existing mercury-related impairments in the Delta measurably worse. Relative to the No Action Alternative, body burdens of mercury in fish would be measurably higher, and could thereby substantially increase the health risks to people consuming those fish. Accordingly, the potential for Alternative 6C to create a public health effect from bioaccumulation of mercury would exist and this is considered an adverse effect.

As environmental commitments, DWR would develop and implement an Erosion and Sediment Control Plans and SWPPPs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMPs implemented under the Erosion and Sediment Control Plans and the SWPPPs would help reduce turbidity and keep sediment that may contain legacy organochlorine pesticides and methylmercury within the area of disturbance. Additionally, OEHHA standards would continue to be implemented for the consumption of study area fish and thus would serve to protect people against the overconsumption of fish with increased body burdens of mercury.

***CEQA Conclusion*:** Construction and maintenance of water conveyance facilities under Alternative 6C would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column based on the chemical properties of the pesticides. Therefore, construction and maintenance of Alternative 6C water conveyance facilities would not cause increased exposure of the public to these pesticides. As environmental commitments, DWR would develop and implement Erosion and Sediment Control Plans and SWPPPs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMPs implemented under the Erosion and Sediment Control Plans and the SWPPPs would help reduce turbidity and keep sediment that may contain legacy organochlorine pesticides and methylmercury within the area of disturbance.

Based on water quality modeling results, changes in water concentrations of mercury and methlymercury would occur at some locations relative to Existing Conditions as a result of operations under Alternative 6C but would not alter beneficial uses of waters in the study area. However, relative to Existing Conditions, modeling results indicate that body burdens of mercury in fish would be measurably higher at certain locations in the Delta, which could increase the health risks to people consuming those fish. Accordingly, the potential for Alternative 6C to create a public health effect from bioaccumulation of mercury would exist and this is considered a significant and unavoidable impact. The estimated increases of mercury body burdens in fish are based on the changes expected from the modeled blending of source waters that define CM1 for Alternative 6C and are therefore inherent to the alternative. OEHHA standards would continue to be implemented for the consumption of study area fish and thus would serve to protect people against the overconsumption of fish with increased body burdens of mercury.

Impact PH-4: Expose Substantially More People to Transmission Lines Generating New Sources of EMFs as a Result of the Construction and Operation of the Water Conveyance Facilities

NEPA Effects: As described in Table 25-9, a total of 13.73 miles of new temporary 69 kV transmission lines; 17.61 miles of new permanent 69 kV transmission lines; and 18.45 miles of new permanent 230 kV transmission lines would be required for this alternative. The temporary and permanent transmission lines needed for Alternative 6C would be very similar in location and length to those described under Alternative 1C (Table 25-9). This is because Alternative 6C would involve the construction and operation of five intakes on the western bank of the Sacramento River between Clarskburg and Walnut Grove, a canal on the western side of the Delta to convey water from intakes to the intermediate pumping plant, and a dual-bore tunnel to convey water to a continuing canal to the proposed Byron Tract Forebay immediately northwest of Clifton Court Forebay. The primary difference would be that Alternative 6C would eliminate the use of existing South Delta intakes. As with Alternative 1C, any new temporary and permanent transmission lines needed for Alternative 6C would be located in in existing rights-of-way or areas that are not densely populated and therefore would not expose substantially more people to transmission lines (Figure 25-2). Furthermore, the majority of sensitive receptors that would be within 300 feet of a new transmission line are already located within 300 feet of an existing transmission line. However, under this alternative, a proposed temporary 69 kV transmission line would be located within 300 feet of Fire Station 63 (in Walnut Grove) (Table 25-9).

While the current scientific evidence does not show conclusively that EMF exposure can increase health risks, the location and design of the new transmission lines would be conducted in accordance with CPUC's EMF Design Guidelines for Electrical Facilities, as described for Alternative 1A. Further, this temporary transmission line would be removed once construction of the water conveyance facilities for Alternative 6C is completed. Therefore, operation of the transmission line corridors would not expose substantially more people to transmission lines generating EMFs. Because the lines would be located in sparsely populated areas and would be within 300 feet of only one potential new sensitive receptor, the proposed temporary transmission line would not substantially increase people's exposure to EMFs and there would be no adverse effect on public health.

CEQA Conclusion: In general, the proposed temporary (69 kV) and permanent (69 kV and 230 kV) transmission lines would be located within the right-of-way of existing transmission lines and any new temporary or permanent transmission lines not within the right-of-way of existing transmission lines would, for the most part, be located in sparsely populated areas generally away from existing sensitive receptors. However, under this alternative, a temporary 69 kV transmission line would be located within 300 feet of Fire Station 63 (in Walnut Grove) (Table 25-9). While the current scientific evidence does not show conclusively that EMF exposure can increase health risks, design and implementation of new temporary or permanent transmission lines not within the right-of-way of existing transmission lines would follow CPUC's EMF Design Guidelines for Electrical Facilities and would implement shielding, cancelation, or district measures to reduce EMF exposure. Further, this temporary transmission line would be removed when construction of the water conveyance facilities for Alternative 6C is completed. Since construction and operation of Alternative 6C would not expose substantially more people to transmission lines that generate new sources of EMFs, impacts on public health would be less than significant, and no mitigation is required.

Impact PH-5: Increase in Vector-Borne Diseases as a Result of Implementing CM2-CM7, CM10 and CM11

***NEPA Effects*:** The amount and location of habitat restoration and enhancement that would occur under Alternative 6C would be the same as that described above for Alternative 1A. Although there would be an increase in restored and enhanced aquatic habitat in the study area as a result of implementing Alternative 6C, environmental commitments such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*), would reduce the potential for an increase in mosquito breeding habitat, and a substantial increase in vector-borne diseases is unlikely to result. Furthermore, habitat would be restored in areas where potentially suitable habitat for mosquitoes already exists. Finally, mosquito predators (e.g., bats, spiders) would likely increase as a result of restoration and enhancement, which would keep mosquito populations in check. Therefore, effects on public health would be the same under Alternative 6C as under Alternative 1A and there would not be a substantial increase in the public's risk of exposure to vector-borne diseases with implementation of CM2-CM7, CM10 and CM11. Accordingly, there would be no adverse effect.

***CEQA Conclusion*:** Habitat restoration and enhancement would result in an increased amount of land potentially suitable for vector habitat (e.g., mosquitoes). However, Alternative 6C would require environmental commitments such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*) that would help control mosquitoes and reduce the potential for an increase in mosquito breeding habitat. Furthermore, habitat would be restored where potentially suitable vector habitat already exists and habitat restoration and enhancement would likely increase the number of mosquito predators. Therefore, as described for Alternative 1A, implementation of CM2-CM7, CM10 and CM11 under Alternative 6C would not substantially increase the public's risk of exposure to vector-borne diseases beyond what currently exists. Accordingly, this impact would be less than significant and no mitigation is required.

Impact PH-6: Substantial Increase in Recreationists' Exposure to Pathogens as a Result of Implementing the Restoration Conservation Measures

***NEPA Effects*:** The amount and location of habitat restoration and enhancement that would occur under Alternative 6C would be the same as that described above for Alternative 1A. Implementation of the restoration conservation measures would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). As exemplified by the Pathogen Conceptual Model, any potential increase in pathogens associated with the proposed habitat restoration would be localized and within the vicinity of the actual restoration. This would be similar for lands protected for agricultural uses. Depending on the level of recreational access granted by management plans, habitat restoration could increase or decrease opportunities for recreationists within the Delta region. However, effects associated with pathogens would be the same under Alternative 6C as under Alternative 1A. Recreationists would not experience a substantial increase in exposure to pathogens as a result of the restoration and no adverse effect would result.

***CEQA Conclusion*:** Implementation of the restoration conservation measures under Alternative 6C would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). However, the localized nature of pathogen generation and the quick die off of pathogens once released into water bodies would generally prevent substantial pathogen exposure to recreationists. Accordingly, impacts on public health would be less than significant. No mitigation is required.

Impact PH-7: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Implementing CM2, CM4, CM5, and CM10

NEPA Effects: The amount of habitat restoration would be the same under Alternative 6C as described for Alternative 1A. The primary concern with habitat restoration regarding constituents known to bioaccumulate is the potential for mobilizing contaminants sequestered in sediments of the newly inundated floodplains and marshes, as described under Alternative 1A. It is likely that the pesticide-bearing sediments would not be transported very far from the source area and would settle out with suspended particulates and be deposited close to the ROA. Further, CM2–CM21 do not include the use of pesticides known to be bioaccumulative in animals or humans.

Methylmercury generation rates are ultimately dependent on the concentrations of mercury in the soils, and on the specific biogeochemistry of the system. The biogeochemistry and fate and transport of mercury and methylmercury are very complex. Restoration would involve inundation of areas where mercury has been sequestered in soils, and, if methylation occurs, the methylmercury would be mobilized into the aquatic system. While there would likely be an increase in mobilization and bioaccumulation of methylmercury in the study area's aquatic systems (i.e., fish and water) during the near-term, *CM12 Methylmercury Management* and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Therefore, implementation of CM2, CM4, CM5, and CM10 under Alternative 6C is not expected to result in an adverse effect on public health with respect to pesticides or methylmercury.

CEQA Conclusion: Implementation of CM2, CM4, CM5, and CM10 would have the potential to mobilize sediment with existing levels of legacy organochlorine pesticides as a result of disturbing sediment during habitat restoration construction. However, it is unlikely that the pesticide-bearing sediments would be transported very far from the source area and they would likely settle out with suspended particulates and be deposited close to the ROAs during habitat restoration construction. While there would likely be an increase in mobilization and bioaccumulation of methylmercury in the study area's aquatic systems (i.e., fish and water) during the near-term, measures implemented under *CM12 Methylmercury Management*, and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Therefore, implementation of CM2, CM4, CM5, and CM10 under Alternative 6C would not substantially mobilize or substantially increase the public's exposure to constituents known to bioaccumulate and this impact would be less than significant. No mitigation is required.

Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water Conveyance Facilities

NEPA Effects: Water operations under Alternative 6C would be the same as under Alternative 6A. Therefore, potential effects on public health due to changes in water quality and beneficial uses as a result of *Microcystis* blooms and microcystin levels would be the same.

Any modified reservoir operations under Alternative 6C are not expected to promote *Microcystis* production in waters upstream of the Delta. As described in Chapter 8, *Water Quality*, *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not due to water conveyance facility operations. Similarly, hydraulic residence times in the Export Service Area would not be affected by operations of CM1. Accordingly, conditions would not be more conducive to *Microcystis* bloom formation. Water diverted from the Sacramento River in the north Delta is expected to be unaffected by *Microcystis*. Under Alternative 6C, water exported to the SWP/CVP Export Service Areas will consist entirely of water from the Sacramento River from the north Delta, which is unaffected by *Microcystis*. Accordingly, the effects of *Microcystis* on water exported to the SWP/CVP Export Service Areas could be lower under Alternative 6C relative to Alternative 1A.

Ambient meteorological conditions would be the primary driver of Delta water temperatures, and climate warming, not water operations, would determine future water temperatures in the Delta. Increasing water temperatures could lead to earlier attainment of the water temperature threshold required to initiate *Microcystis* bloom formation, and therefore earlier occurrences of *Microcystis* blooms in the Delta, as well as increases in the duration and magnitude. However, these temperature-related changes would not be different from what would occur under the No Action Alternative. Siting and design of restoration areas would have a substantial influence on the magnitude of hydraulic residence time increases under Alternative 6C. The modeled increase in residence time in the Delta could result in an increase in the frequency, magnitude, and geographic extent of *Microcystis* blooms, and thus microcystin levels. Therefore, impacts on beneficial uses, including drinking water and recreational waters, could occur and public health could be affected. Accordingly, this would be considered an adverse effect.

Mitigation Measure WQ-32a and WQ-32b are available to reduce the effects of degraded water quality, and therefore potential public health effects, in the Delta due to *Microcystis*. However, because the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain, the effect would still be considered adverse.

CEQA Conclusion: Under Alternative 6C, operation of the water conveyance facilities is not expected to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta. *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not due to water conveyance facility operations. Hydraulic residence times in the Export Service Area would not be affected by operations of CM1, and therefore conditions in those areas would not be more conducive to *Microcystis* bloom formation. Water exported from the Delta to the Export Service Area is expected to be diverted entirely from the Sacramento River from the north Delta, which is not affected by *Microcystis*. Therefore, the effects of *Microcystis* on water exported to the SWP/CVP Export Service Areas could be lower under Alternative 6C relative to Alternative 1A.

Water temperatures and hydraulic residence times in the Delta are expected to increase, which could result in an increase in *Microcystis* blooms and therefore microcystin levels. However, the water temperature increases in the Delta would be due to climate change primarily and not due to operation of the water conveyance facilities. Increases in Delta residence times would be due in small part to climate change and sea level rise, but due to a greater degree to operation of the water conveyance facilities and hydrodynamic impacts of restoration included in CM2 and CM4. Consequently, it is possible that increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms in the Delta would occur due to the operations and maintenance of the water conveyance facilities and the hydrodynamic impacts of restoration under CM2 and CM4.

Accordingly, beneficial uses including drinking water and recreational waters would be impacted and, as a result, there could be potential impacts on public health. Therefore, this impact would be significant.

Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time considerations be incorporated into restoration area site design for CM2 and CM4 using the best available science at the time of design. Mitigation Measure WQ-32b requires that the project proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods to determine whether increases in abundance are significant. This mitigation measure also requires that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will investigate and evaluate measures that could be taken to reduce hydraulic residence time in the affected areas of the Delta. However, because the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and CM4

***NEPA Effects*:** The amount and location of habitat restoration and enhancement that would occur under Alternative 6C would be the same as that described under Alternative 1A. Restoration activities implemented under CM2 and CM4 that would create shallow backwater areas could result in local increases in water temperature that may encourage *Microcystis* growth during the summer bloom season. This would result in further degradation of water quality beyond the hydrodynamic effects of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase in *Microcystis* blooms with implementation of CM2 and CM4 could potentially result in adverse effects on public health through exposure via drinking water quality and recreational waters. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain. This would be an adverse effect.

CEQA Conclusion: The effects of CM2 and CM4 on *Microcystis* under Alternative 6C are the same as those discussed for Alternative 1A. Restoration activities implemented under CM2 and CM4 that create shallow backwater areas could result in local increases in water temperature conducive to *Microcystis* growth during summer bloom season. This could compound the water quality degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact PH-8 and result in additional water quality degradation such that beneficial uses are affected. An increase in *Microcystis* blooms could potentially result in impacts on public health through exposure via drinking water quality and recreational waters. Therefore, this impact would be significant. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality.*

25.3.3.14 Alternative 7—Dual Conveyance with Pipeline/Tunnel, Intakes 2, 3, and 5, and Enhanced Aquatic Conservation (9,000 cfs; Operational Scenario E)

The construction of the water conveyance facilities and implementation of CM2–CM21 under Alternative 7 would generally be the same as described under Alternative 1A. However, 20 additional linear miles of channel margin habitat would be enhanced for a total of 40 linear miles, and an additional 10,000 acres of seasonally inundated floodplain would be restored for a total of 20,000 acres of seasonally inundated floodplain. The locations of these habitat enhancements would be similar to those described in 1A, throughout the 11 different conservation zones and expanding on existing channel margin habitat and floodplain locations. Therefore, construction effects would be the same as under Alternative 1A and are summarized below for vector-borne diseases and water quality concerns.

Alternative 7 would have two fewer intakes than Alternative 1A would have. There would be fewer solids lagoons and sedimentation basins and fewer transmission lines. Water supply operations under Alternative 7 would be different from Alternative 1A and would adhere to Operational Scenario E criteria.

Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of the Water Conveyance Facilities

NEPA Effects: Alternative 7 would involve construction and operation of up to nine solids lagoons, three sedimentation basins, Byron Tract Forebay, and an intermediate forebay and associated 350-acre inundation area. The mechanisms for potential public health effects are similar to those these water conveyance features have the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes) because of the large volumes of water that would be held within these areas. The depth, design, and operation of the sedimentation basins and solids lagoons would prevent the development of suitable mosquito habitat (Figure 25-1). Specifically, the basins would be too deep and the constant movement of water would prevent mosquitoes from breeding and multiplying. Sedimentation basins would be 120 feet long by 40 feet wide by 55 feet deep, and solids lagoons would be 165 feet long by 86 feet wide by 10 feet deep. Furthermore, use of the inundation area would be limited to forebay emergency overflow situations and water would be pumped back to the intermediate forebay, creating circulation such that the inundation area would have a low potential for creating suitable vector habitat. Similarly, water in the Byron Tract Forebay would be circulated regularly and, with the exception of shallower areas around the periphery, would be too deep to provide suitable mosquito habitat. The shallower edges of the forebay could provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow.

To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes (see Impact PH-1 under Alternative 1A). These BMPs would be consistent with practices presented in *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). Implementation of these BMPs would reduce the likelihood that BDCP operations would require an increase in abatement activities by the local MVCDs. Therefore, as described under Alternative 1A, construction and operation of the intakes, solids lagoons, sedimentation basins, the forebays, and the intermediate forebay inundation area would not substantially increase suitable vector habitat, and would not substantially increase vector-borne diseases under Alternative 7. Accordingly, no adverse effects on public health would result.

***CEQA Conclusion*:** As described for Alternative 1A, implementation of CM1 under Alternative 7 would involve construction and operation of solids lagoons, sedimentation basins, intermediate forebay and associated 350-acre inundation area, and Byron Tract Forebay. While these areas could provide suitable habitat for vectors (e.g., mosquitoes), water depth and circulation would prevent the areas from substantially increasing suitable vector habitat. The inundation area would only be used during emergency overflow situations and water would be pumped back into the intermediate forebay, creating circulation that would discourage mosquito breeding. The shallower periphery of the intermediate forebay and Bryon Tract Forebay could provide suitable mosquito breeding habitat.

To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes. These BMPs would be consistent with practices presented in *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). See Impact PH-1 under Alternative 1A. Therefore, construction and operation of the water conveyance facilities under Alternative 7 would not result in a substantial increase in vector-borne diseases and the impact on public health would be less than significant. No mitigation is required.

Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That There is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance Facilities

NEPA Effects:

Disinfection Byproducts

Under Alternative 7, the geographic extent of effects pertaining to long-term average DOC concentrations and, by extension, DBPs in the study area would be similar to that described for

Alternative 1A. However, the magnitude of predicted long-term increase and relative frequency of concentration threshold exceedances would be substantially greater for Alternative 7. Exceedances of water quality objectives would conflict with the Basin Plan because it would exceed Basin Plan requirements. Modeled effects would be greatest at Franks Tract, Rock Slough, and Contra Costa Pumping Plant #1 relative to the No Action Alternative. Alternative 7 would lead to predicted improvements in long-term average DOC concentrations at Barker Slough, and Banks and Jones pumping plants. The increases in long-term average DOC concentrations estimated to occur at Franks Tract, Rock Slough, and Contra Costa Pumping Plant #1 (≤26% net increase) are considered substantial and could potentially trigger significant changes in drinking water treatment plant design or operations. In particular, assessment locations at Rock Slough and Contra Costa Pumping Plant No. 1 represent municipal intakes servicing existing drinking water treatment plants. Under Alternative 7, drinking water treatment plants obtaining water from these interior Delta locations would likely need to upgrade existing treatment systems in order to achieve EPA Stage 1 Disinfectants and Disinfection Byproduct Rule action thresholds.

In addition, relative to the No Action Alternative, Alternative 7 would result in increases in long-term average bromide concentrations at Buckley Cove, Staten Island and the North Bay Aqueduct at Barker Slough. Increases would be greatest at Staten Island (31%; 29% during the drought period) and at Barker Slough (1%; 34% during the drought period).The long-term average increase predicted for Barker Slough could necessitate changes in water treatment plant operations or require treatment plant upgrades in order to maintain DBP compliance. While the increase in long-term average bromide concentrations at Barker Slough is predicted to be relatively small when modeled over a representative 16-year hydrologic period, increases during the modeled drought period would represent a substantial change in source water quality during a season of drought. These predicted drought season related increases in bromide at Barker Slough could lead to adverse changes in the formation of disinfection byproducts at drinking water treatment plants such that considerable water treatment plant upgrades would be necessary to achieve equivalent levels of drinking water health protection.

While treatment technologies sufficient to achieve the necessary DOC and bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken for these predicted increases in DOC and bromide for the affected Delta locations, a change of such magnitude in long-term average DOC and bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBPs. While Mitigation Measure WQ-17 is available to partially reduce the effect of DOC, the feasibility and effectiveness of this mitigation measure are uncertain, and, therefore, it is not known if its implementation would reduce the severity of this effect such that it would not be adverse. Similarly, Mitigation Measure WQ-5 is available to reduce the potential effects of increased bromide in drinking water sources at Barker Slough. Implementation of this measure along with a separate other commitment as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, relating to the potential increased treatment costs associated with bromide-related changes would reduce these effects. Further, as described for Impact PH-2 under Alternative 1A, the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be further minimized by implementation of the AIP. However, the overall effect on public health related to potential increases in DBPs (resulting from DOC and bromide increases) at the aforementioned Delta locations would still be considered adverse.

Trace Metals

Alternative 7 would not result in substantial increases in trace metal (arsenic, iron, or manganese) concentrations in the Delta relative to conditions under the No Action Alternative. Throughout much of the south Delta, San Joaquin River water would replace Sacramento River water, with the future trace metals profile largely reflecting that of the San Joaquin River (see Appendix 8D, *Source Water Fingerprinting Results*). However, trace metal concentration profiles between the San Joaquin and Sacramento Rivers are very similar and currently meet Basin Plan objectives and CTR criteria. While the change in trace metal concentrations in the south Delta would likely be measurable, Alternative 7 would not be expected to substantially increase the frequency with which applicable Basin Plan objectives would be exceeded in the Delta or substantially degrade the quality of Delta waters with regard to trace metals. Accordingly, no adverse effect on public health related to the trace metals arsenic, iron, or manganese from drinking water sources is anticipated.

Pesticides

Under Alternative 7, the distribution and mixing of Delta source waters would change. Relative to the No Action Alternative, the change in source water (e.g., more San Joaquin River water) associated with Alternative 7 would be sufficient in magnitude to increase the existing pesticide concentrations in the Delta, resulting in an increased risk of toxicity to aquatic life in certain areas (Franks Tract, Rock Slough, the San Joaquin River at Antioch, and Contra Costa Pumping Plant #1) during certain times of the year. Further, there would be modeled increases in risk of toxicity to aquatic life at Buckley Cove during July and August; however, these changes are not considered to be substantial.

A conclusion regarding the risk to human health at these locations, based on the predicted adverse effects from pesticides on aquatic life, cannot be made. The prediction of adverse effects of pesticides fundamentally assumes that the present pattern of pesticide incidence in surface water would continue at similar levels into the future. In reality, the use of chlorpyrifos and diazinon pesticides, the two pesticides that serve as the basis for concluding a substantially increased San Joaquin River source water fraction, is on the decline with their replacement by pyrethroids on the rise. Furthermore, water treatment plants are required to meet drinking water requirements set forth in the California Safe Drinking Water Act and the regulations adopted by CDPH. Therefore, it is not anticipated that there would be adverse effects on public health from pesticides in drinking water sources.

CEQA Conclusion: The change in source water (e.g., more San Joaquin River water) associated with operation of the water conveyance facilities under Alternative 7 would be of sufficient magnitude to increase the existing pesticide concentrations in the Delta, according to water quality modeling results. This increase could result in an increased risk of toxicity to aquatic life at some locations in the study area relative to Existing Conditions (Franks Tract, Rock Slough, the San Joaquin River at Antioch, and Contra Costa Pumping Plant #1) during certain times of the year relative to Existing Conditions. A conclusion regarding the risk to human health at these locations, based on the predicted adverse effects from pesticides on aquatic life, cannot be made. However, the prediction of adverse effects of pesticides relative to Existing Conditions fundamentally assumes that the present pattern of pesticide incidence in surface water would continue at similar levels into the future. In reality, the use of chlorpyrifos and diazinon pesticides, the two pesticides that serve as the basis for concluding a substantially increased San Joaquin River source water fraction, is on the decline with their replacement by pyrethroids on the rise. Furthermore, water treatment plants are required to meet drinking water requirements set forth in the California Safe Drinking Water Act and the regulations adopted by CDPH. Thus, these potential increases in pesticide concentrations would not significantly impact public health. The change in source water would not alter trace metal concentrations in the study area to the degree that there would be a beneficial use impairment. Finally, under Alternative 7, modeled increases in bromide concentrations (34% relative increase) at Barker Slough (during the drought period only), and in DOC concentrations at Franks Tract, Rock Slough, and Contra Costa Pumping Plant #1 (≤30% increase), may be substantial enough to necessitate water treatment plant upgrades or changes in plant operations in order to maintain DBP compliance. Should treatment plant upgrades not be undertaken for the affected Delta locations, a change of such magnitude in long-term average DOC and bromide concentrations in drinking water sources would represent an increased risk for effects on public health from DBPs, which would be a significant impact.

Implementation of the AIP may reduce water quality effects due to bromide increases at Barker Slough by allowing operators of the North Bay Aqueduct to largely avoid periods of poor water quality by using an alternative surface water intake on the Sacramento River. Assuming the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be avoided or minimized by implementation of the AIP, the potential adverse water quality effects on the municipal beneficial uses potentially provided in Barker Slough would remain significant. While Mitigation Measure WQ-5 may reduce this impact, the feasibility and effectiveness of this mitigation measure are uncertain based on currently available information. Mitigation Measure WQ-17 would reduce the potential impacts associated with DOC; however, it is unknown if this mitigation would reduce impacts to a less-than-significant level. Additionally,

In addition to and to supplement Mitigation Measure WQ-5, the BDCP proponents have incorporated into the BDCP, as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, a separate other commitment to address the potential increased water treatment costs that could result from bromide-related concentration effects on municipal water purveyor operations. Potential options for making use of this financial commitment include funding or providing other assistance towards implementation of the North Bay Aqueduct AIP, acquiring alternative water supplies, or other actions to indirectly reduce the effects of elevated bromide and DOC in existing water supply diversion facilities. Please refer to Appendix 3B for the full list of potential actions that could be taken pursuant to this commitment in order to reduce the water quality treatment costs associated with water quality effects relating to chloride, electrical conductivity, and bromide. Because the BDCP proponents cannot ensure that the results of coordinated actions with water treatment entities will be fully funded or implemented successfully prior to the project's contribution to the impact, the ability to fully mitigate this impact is uncertain. If a solution that is identified by the BDCP proponents and an affected water purveyor is not fully funded, constructed, or implemented before the project's contribution to the impact is made, a significant impact in the form of increased DBP in drinking water sources could occur. Accordingly, this impact would be significant and unavoidable. If, however, all financial contributions, technical contributions, or partnerships required to avoid significant impacts prove to be feasible and any necessary agreements are completed before the project's contribution to the effect is made, impacts would be less than significant.

Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality Conditions; Site and Design Restoration Sites to Reduce Bromide Increases in Barker Slough

Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

Mitigation Measure WQ-17: Consult with Delta Water Purveyors to Identify Means to Avoid, Minimize, or Offset Increases in Long-Term Average DOC Concentrations

Please see Mitigation Measure WQ-17 under Impact PH-2 in the discussion of Alternative 6A.

Impact PH-3: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Construction, Operation or Maintenance of the Water Conveyance Facilities

NEPA Effects**:** Alternative 7 would have the two fewer intakes than Alternative 1A would have, for a total of three intakes; however, they would be constructed and operated in a similar manner to intakes under Alternative 1A.

As described under Alternative 1A, sediment-disturbing activities during construction and maintenance of the water conveyance facilities under Alternative 7 could result in the disturbance of existing constituents, such as legacy organochlorine pesticides or methylmercury, in sediment. Therefore, the public health effects associated with pesticides and methylmercury for construction and maintenance of the water conveyance facilities under this alternative would be similar, although, slightly less, than those associated with Alternative 1A. Intermittent and/or short-term construction-related activities (as would occur for in-river construction) would not be anticipated to result in contaminant discharges of sufficient magnitude or duration to contribute to long-term bioaccumulation processes, or cause measureable long-term degradation, as described under Alternative 1A. Legacy organochlorine pesticides typically bond to particulates, and do not mobilize easily. Construction and maintenance of Alternative 7 would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column, as described for Alternative 1A. Water supply operations under any BDCP action alternative would not be expected to change total suspended solids or turbidity levels (highs, lows, typical conditions) to any substantial degree. Changes in the magnitude, frequency, and geographic distribution of legacy pesticides in water bodies of the affected environment that would result in new or more severe adverse effects on beneficial uses, relative to the No Action Alternative, would not be expected to occur.

Water quality modeling results indicate that the percentage change in assimilative capacity of waterborne total mercury relative to the 25 ng/L Ecological Risk Benchmark for this alternative would decrease by 6.6% at Old River at Rock Slough and Contra Costa Pumping Plant relative to the No Action Alternative. These changes are not expected to result in adverse effects on beneficial uses. Similarly, changes in methylmercury concentration are expected to be relatively small.

Fish tissue estimates showed substantial increases in exceedance quotients at some Delta locations modeled. The greatest change in exceedance quotients relative to the No Action Alternative would occur at the Contra Costa Pumping Plant (30-39% increase) and Old River at Rock Slough (32-45% increase). These changes in fish tissue mercury concentrations would make existing mercury-related impairments in the Delta measurably worse. Relative to the No Action Alternative, body burdens of mercury in fish would be measurably higher, and could thereby substantially increase the health risks to people consuming those fish. Accordingly, the potential for Alternative 7 to create a public health effect from bioaccumulation of mercury would exist and this is considered an adverse effect.

As environmental commitments, DWR would develop and implement Erosion and Sediment Control Plans and SWPPPs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMPs implemented under the Erosion and Sediment Control Plans and the SWPPPs would help reduce turbidity and keep sediment that may contain legacy organochlorine pesticides and methylmercury within the area of disturbance during construction and maintenance. Additionally, OEHHA standards would continue to be implemented for the consumption of study area fish and thus would serve to protect people against the overconsumption of fish with increased body burdens of mercury.

CEQA Conclusion: Construction and maintenance of water conveyance facilities under Alternative 7 would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column based on the chemical properties of the pesticides. Therefore, there would be no increased exposure of the public to these pesticides as a result of construction and maintenance. As environmental commitments, DWR would develop and implement Erosion and Sediment Control Plans and SWPPPs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMPs implemented under the Erosion and Sediment Control Plans and the SWPPPs would help reduce turbidity and keep sediment that may contain legacy organochlorine pesticides and methylmercury within the area of disturbance.

Based on water quality modeling results, changes in water concentrations of mercury and methlymercury would occur at some locations relative to Existing Conditions as a result of operations under Alternative 7. Specifically, the analysis of percentage change in assimilative capacity of waterborne total mercury of Alternative 7 relative to the 25 ng/L ecological risk benchmark as compared to Existing Conditions showed a 6.7% reduction at Old River at Rock Slough and Contra Costa Pumping Plant. Changes in methylmercury concentrations are expected to be small. The beneficial uses of waters in the study area would not be adversely affected by these changes. However, relative to Existing Conditions, modeling results indicate that body burdens of mercury in fish would be measurably higher at the Contra Costa Pumping Plant (30-39% increase) and in Old River at Rock Slough (32-45% increase).This could increase the health risks to people consuming those fish. Accordingly, the potential for Alternative 7 to create a public health effect from bioaccumulation of mercury would exist and this is considered a significant and unavoidable impact. The estimated increases of mercury body burdens in fish are based on the changes expected from the modeled blending of source waters that define CM1 for Alternative 7 and are therefore inherent to the Alternative. OEHHA standards would continue to be implemented for the consumption of study area fish and thus would serve to protect people against the overconsumption of fish with increased body burdens of mercury.

Impact PH-4: Expose Substantially More People to Transmission Lines Generating New Sources of EMFs as a Result of the Construction and Operation of the Water Conveyance Facilities

NEPA Effects: As described in Table 25-9, a total of 24.71 miles of new temporary 69 kV transmission lines; 7.03 miles of new permanent 69 kV transmission lines; and 42.68 miles of new permanent 230 kV transmission lines would be required for this alternative. The new temporary and permanent transmission lines needed for Alternative 7 would be in locations similar to those in Alternative 1A as depicted in Mapbook Figure M3-1in Chapter 3, *Description of Alternatives*. As with Alternative 1A, any new temporary and permanent transmission lines needed for Alternative 7 would be located in rights-of-way of existing transmission lines or in areas that are not densely populated and, therefore, would not expose substantially more people to transmission lines (Figure 25-2). Furthermore, the majority of sensitive receptors that would be within 300 feet of a new transmission line are already located within 300 feet of an existing transmission line. However, as indicated in Table 25-9, Stone Lakes National Wildlife Refuge would be within 300 feet of a proposed temporary 69 kV transmission line. Visitors to this area generally come for walks, water recreation, and hunting, and as such, it is unlikely that large groups of people would be staying in the area within 300 feet of this proposed transmission line, so any EMF exposure would be limited. Further, this line would be removed when construction of the water conveyance facility features near this area is completed, so there would be no potential permanent effects. Therefore, this temporary transmission line would not substantially increase people's exposure to EMFs.

While the current scientific evidence does not show conclusively that EMF exposure can increase health risks, the location and design of the new transmission lines would be conducted in accordance with CPUC's EMF Design Guidelines for Electrical Facilities to minimize health risks associated with power lines. Therefore, operation of the transmission line corridors would not expose substantially more people to transmission lines generating EMFs. Because the lines would be located in sparsely populated areas and would be within 300 feet of only one potential new sensitive receptor, the proposed temporary and permanent transmission lines would not substantially increase people's exposure to EMFs, and there would be no adverse effect on public health.

***CEQA Conclusion*:** In general, the proposed temporary (69 kV) and permanent (69 kV and 230 kV) transmission lines would be located in rights-of-way of existing transmission lines or in sparsely populated areas generally away from existing sensitive receptors. One sensitive receptor, Stone Lakes National Wildlife Refuge, would be within 300 feet of a proposed temporary 69 kV transmission line. Because visitors to this area generally come for walks, water recreation, and hunting, it is unlikely that large groups of people would be staying in the area within 300 feet of this proposed transmission line, so any EMF exposure would be limited. Further, this line would be removed when construction of the water conveyance facility features near this area is completed, so there would be no potential permanent effects. Therefore, this temporary transmission line would not substantially increase people's exposure to EMFs. Design and implementation of new temporary or permanent transmission lines not within the right-of-way of existing transmission lines would follow CPUC's EMF Design Guidelines for Electrical Facilities and would implement shielding, cancelation, or distance measures to reduce EMF exposure. Because construction and operation of Alternative 7 would not expose substantially more people to transmission lines that provide new sources of EMFs, impacts on public health would be less than significant, and no mitigation is required.

Impact PH-5: Increase in Vector-Borne Diseases as a Result of Implementing CM2-CM7, CM10 and CM11

***NEPA Effects*:** The amount and location of habitat restoration and enhancement that would occur under Alternative 7 would be similar to that described above for Alternative 1A. However, under Alternative 7 there would be an additional 10,000 acres of seasonally inundated floodplain (CM5). Although there would be an increase in restored and enhanced aquatic habitat in the study area as a result of implementing Alternative 7, implementation of environmental commitments such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*) reduce the potential for an increase in mosquito breeding habitat, and a substantial increase in vector-borne diseases is unlikely to result. Furthermore, habitat would be restored in areas where potentially suitable habitat for mosquitoes already exists. Finally, mosquito predators (e.g., bats, spiders) would likely increase as a result of restoration and enhancement, which would keep mosquito populations in check. Therefore, effects would be the same under Alternative 7 as under Alternative 1A and there would not be a substantial increase in the public's risk of exposure to vector-borne diseases with implementation of CM2-CM7, CM10 and CM11. Accordingly, there would be no adverse effect.

CEQA Conclusion**:** Habitat restoration and enhancement would result in an increased amount of land potentially suitable for vector habitat (e.g., mosquitoes). However, as described in Alternative 1A, Alternative 7 would require environmental commitments, such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*) that would help control mosquitoes and reduce the potential for an increase in mosquito breeding habitat. Furthermore, habitat would be restored where potentially suitable vector habitat already exists and habitat restoration and enhancement would likely increase the number of mosquito predators. Therefore, as described for Alternative 1A, implementation CM2-CM7, CM10 and CM11 under Alternative 7 would not substantially increase the public's risk of exposure to vector-borne diseases beyond what currently exists. Accordingly, this impact would be less than significant and no mitigation is required.

Impact PH-6: Substantial Increase in Recreationists' Exposure to Pathogens as a Result of Implementing the Restoration Conservation Measures

NEPA Effects**:** The amount and location of habitat restoration and enhancement that would occur under Alternative 7 would be the similar to that described above for Alternative 1A. However, under Alternative 7 there would be an additional 10,000 acres of seasonally inundated floodplain (CM5). Implementation of the restoration conservation measures would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). As exemplified by the Pathogen Conceptual Model, any potential increase in pathogens associated with the habitat restoration would be localized and within the vicinity of the actual restoration. This would be similar for lands protected for agricultural uses. Depending on the level of recreational access granted by management plans, habitat restoration could increase or decrease opportunities for recreationists within the Delta region. However, effects associated with pathogens would be the same under Alternative 7 as under Alternative 1A. Recreationists would not experience a substantial increase in exposure to pathogens as a result of the restoration and no adverse effect on public health would result.

CEQA Conclusion**:** Implementation of the restoration conservation measures under Alternative 7 would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). However, the localized nature of pathogen generation and the quick die-off of some types of pathogens once released into water bodies would generally prevent substantial pathogen exposure to recreationists. Accordingly, impacts on public health would be less than significant and no mitigation is required.

Impact PH-7: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Implementing CM2, CM4, CM5, and CM10

NEPA Effects**:** The amount of habitat restoration under Alternative 7 would be similar to Alternative 1A. However, under Alternative 7 there would be an additional 10,000 acres of seasonally inundated floodplain (CM5). The primary concern with habitat restoration regarding constituents known to bioaccumulate is the potential for mobilizing contaminants sequestered in sediments of the newly inundated floodplains and marshes, as described under Alternative 1A. It is likely that the pesticide-bearing sediments would not be transported very far from the source area and would settle out with suspended particulates and be deposited close to the ROA. Further, CM2–CM21 do not include the use of pesticides known to be bioaccumulative in animals or humans.

Methylmercury generation rates are ultimately dependent on the concentrations of mercury in the soils, and on the specific biogeochemistry of the system. The biogeochemistry and fate and transport of mercury and methylmercury are very complex. Restoration would involve inundation of areas where mercury has been sequestered in soils, and, if methylation occurs, the methylmercury would be mobilized into the aquatic system. While there would likely be an increase in mobilization and bioaccumulation of methylmercury in the study area's aquatic systems (i.e., fish and water) during the near-term, *CM12 Methylmercury Management* and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Therefore, implementation of CM2, CM4, CM5, and CM10 under Alternative 7 is not expected to result in an adverse effect on public health with respect to pesticides or methylmercury.

CEQA Conclusion**:** Implementation of CM2, CM4, CM5, and CM10 would have the potential to mobilize sediment with existing levels of legacy organochlorine pesticides as a result of disturbing sediment during habitat restoration construction. However, it is unlikely that the pesticide-bearing sediments would be transported very far from the source area and they would likely settle out with suspended particulates and be deposited close to the ROAs during habitat restoration construction. While there would likely be an increase in mobilization and bioaccumulation of methylmercury in the study area's aquatic systems (i.e., fish and water) during the near-term, measures implemented under *CM12 Methylmercury Management*, and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Therefore, implementation of CM2, CM4, CM5, and CM10 of Alternative 7 would not substantially mobilize or substantially increase the public's exposure to constituents known to bioaccumulate and this impact would be less than significant. No mitigation is required.

Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water Conveyance Facilities

NEPA Effects**:** Because factors that affect *Microcystis* abundance in waters upstream of the Delta, in the Delta, and in the SWP/CVP Export Services Areas under Alternative 1A would similarly change under Alternative 7, *Microcystis* abundance, and thus microcystins concentrations, in water bodies of the affected environment under Alternative 7 would be very similar to those discussed for Alternative 1A.

As described in Chapter 8, *Water Quality*, *although Microcystis* blooms have not occurred in the Export Service Areas, conditions in the Export Service Areas under Alternative 7 may become more conducive to *Microcystis* bloom formation because water temperatures will increase in the Export Service Areas due to the expected increase in ambient air temperatures resulting from climate change, but not from operation of the water conveyance facilities. Under Alternative 7, relative to No

Action Alternative, water exported to the SWP/CVP Export Service Area will be a mixture of *Microcystis*-affected source water from the south Delta intakes and unaffected source water from the Sacramento River, diverted at the north Delta intakes. It cannot be determined whether operations and maintenance under Alternative 7 will result in increased or decreased levels of *Microcystis* and microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Like Alternative 1A, elevated ambient water temperatures would occur in the Delta under Alternative 7, which could lead to earlier occurrences of *Microcystis* blooms in the Delta, and increase the overall duration and magnitude of blooms. However, as described in Chapter 8, *Water Quality,* the increase in Delta water temperatures, and consequent potential increase in *Microcystis* blooms, would be driven entirely by climate change, not by operation of water conveyance facilities. There would be differences in the direction and magnitude of water residence time changes during the *Microcystis* bloom period due to operation of the water conveyance facilities under Alternative 7 compared to Alternative 1A, relative to the No Action Alternative. As a result, *Microcystis* blooms, and therefore microcystin, could increase in surface waters throughout the Delta. Therefore, impacts on beneficial uses, including drinking water and recreational waters, could occur and public health could be affected. Accordingly, this would be considered an adverse effect.

Mitigation Measure WQ-32a and WQ-32b are available to reduce the effects of degraded water quality in the Delta. Although there is uncertainty regarding this impact, the effects on *Microcystis* from implementing CM1 is determined to be adverse.

CEQA Conclusion: Under Alternative 7, operation of the water conveyance facilities is not expected to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta. *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not due to water conveyance facility operations. Hydraulic Residence times in the Export Service Area would not be affected by operations of CM1, and therefore conditions in those areas would not be more conducive to *Microcystis* bloom formation. Water exported from the Delta to the Export Service Area is expected to be a mixture of *Microcystis*-affected source water from the south Delta intakes and unaffected source water from the Sacramento River. Because of this, it cannot be determined whether operations and maintenance under Alternative 7 would result in increased or decreased levels of *Microcystis* and microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Water temperatures and hydraulic residence times in the Delta are expected to increase, which could result in an increase in *Microcystis* blooms and therefore microcystin levels. However, the water temperature increases in the Delta would be due to climate change and not due to operation of the water conveyance facilities. Increases in Delta residence times would be due in small part to climate change and sea level rise, but due to a greater degree to operation of the water conveyance facilities and hydrodynamic impacts of restoration included in CM2 and CM4. Consequently, it is possible that increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms in the Delta would occur due to the operations and maintenance of the water conveyance facilities and the hydrodynamic impacts of restoration under CM2 and CM4. Accordingly, beneficial uses including drinking water and recreational waters would be impacted and, as a result, public health. Therefore, this impact would be significant.

Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time considerations be incorporated into restoration area site design for CM2 and CM4 using the best available science at the time of design. Mitigation Measure WQ-32b requires that the project proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods to determine whether increases in abundance are significant. This mitigation measure also requires that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will investigate and evaluate measures that could be taken to reduce residence time in the affected areas of the Delta. However, because the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and CM4

NEPA Effects: The amount and location of habitat restoration and enhancement that would occur under Alternative 7 would be the same as that described under Alternative 1A. Restoration activities implemented under CM2 and CM4 that would create shallow backwater areas could result in local increases in water temperature that may encourage *Microcystis* growth during the summer bloom season. This would result in further degradation of water quality beyond the hydrodynamic effects of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase in *Microcystis* blooms with implementation of CM2 and CM4 could potentially result in adverse effects on public health through exposure via drinking water quality and recreational waters. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects related to *Microcystis* is uncertain. This would be an adverse effect.

CEQA Conclusion: The effects of CM2 and CM4 on *Microcystis* under Alternative 7 are the same as those discussed for Alternative 1A. Restoration activities implemented under CM2 and CM4 that create shallow backwater areas could result in local increases in water temperature conducive to *Microcystis* growth during summer bloom season. This could compound the water quality degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact PH-8 and result in additional water quality degradation such that beneficial uses are affected. An increase in *Microcystis* blooms could potentially result in impacts on public health through exposure via drinking water quality and recreational waters. Therefore, this impact would be significant. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

25.3.3.15 Alternative 8—Dual Conveyance with Pipeline/Tunnel, Intakes 2, 3, and 5, and Increased Delta Outflow (9,000 cfs; Operational Scenario F)

Alternative 8 water conveyance facilities would be structurally identical to those in Alternative 7, but the operational guidelines under Operational Scenario F would ensure a greater Delta outflow. The amount and location of habitat restoration and enhancement that would occur under Alternative 8 would generally be the same as that described above for Alternative 1A. However, it may result in different acreages of restored, protected and enhanced habitat, as described in Chapter 3, *Description of Alternatives*, Section 3.5.15. The location of these areas would be similar to those described in 1A throughout the 11 different conservation zones and expanding on existing channel margin habitat and floodplain locations.

Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of the Water Conveyance Facilities

NEPA Effects**:** Alternative 8 would involve CM1 construction and operation of three intakes, up to nine solids lagoons, three sedimentation basins, Byron Tract Forebay, and an intermediate forebay and associated 350-acre inundation area. Alternative 8 would have two fewer intakes than Alternative 1A would have. Accordingly, there would be fewer solids lagoons and sedimentation basins.

Sedimentation basins, solids lagoons, Byron Tract Forebay, and the intermediate forebay and inundation area have the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes) because of the large volumes of water that would be held within these areas. The depth, design, and operation of the sedimentation basins and solids lagoons would prevent the development of suitable mosquito habitat (Figure 25-1). Specifically, the basins would be too deep and the constant movement of water would prevent mosquitoes from breeding and multiplying. Sedimentation basins would be 120 feet long by 40 feet wide by 55 feet deep, and solids lagoons would be 165 feet long by 86 feet wide by 10 feet deep. Furthermore, use of the inundation area adjacent to the intermediate forebay would be limited to forebay emergency overflow situations and water would be pumped back to the intermediate forebay, creating circulation such that the inundation area would have a low potential for creating suitable vector habitat. Similarly, water in the Byron Tract Forebay would be circulated regularly and, with the exception of shallower areas around the periphery, would be too deep to provide suitable mosquito habitat. The shallower edges of the forebay could provide suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow.

To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes (see Impact PH-1 under Alternative 1A). These BMPs would be consistent with practices presented in *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). Implementation of these BMPs would reduce the likelihood that BDCP operations would require an increase in abatement activities by the local MVCDs. Therefore, construction and operation of the intakes, solids lagoons, and/or sedimentation basins under Alternative 8 would not substantially increase suitable vector habitat, and would not substantially increase vector-borne diseases. Accordingly, no adverse effects would result.

***CEQA Conclusion*:** As described for Alternative 7 and Alternative 1A, implementation of CM1 under Alternative 8 would involve construction and operation of solids lagoons, sedimentation basins, Byron Tract Forebay, and an intermediate forebay and associated 350-acre inundation area. While these facilities could provide suitable habitat for vectors (e.g., mosquitoes), water depth and circulation would prevent the areas from substantially increasing suitable vector habitat. The inundation area would only be used during emergency overflow situations and water would be pumped back into the intermediate forebay, creating circulation that would discourage mosquito breeding. The shallower periphery of the intermediate forebay and Bryon Tract Forebay could provide suitable mosquito breeding habitat.

To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes. These BMPs would be consistent with practices presented in *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). See Impact PH-1 under Alternative 1A. Therefore, construction and operation of the water conveyance facilities under Alternative 8 would not result in a substantial increase in vector-borne diseases and the impact on public health would be less than significant. No mitigation is required.

Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That There is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance Facilities

NEPA Effects:

Disinfection Byproducts

Under Alternative 8, the geographic extent of effects pertaining to long-term average DOC concentrations and, by extension, DBPs in the study area would be similar to that described for Alternative 1A. However, the magnitude of predicted long-term increase and relative frequency of concentration threshold exceedances would be substantially greater for Alternative 8. Exceedances of water quality objectives would conflict with the Basin Plan because it would exceed Basin Plan requirements. Modeled effects would be greatest at Franks Tract, Rock Slough, and Contra Costa Pumping Plant #1 relative to the No Action Alternative. The increases in long-term average DOC concentrations (≤ 27%%) estimated to occur at Franks Tract, Rock Slough, and Contra Costa Pumping Plant #1 are considered substantial and could potentially trigger significant changes in drinking water treatment plant design or operations. In particular, assessment locations at Rock Slough and Contra Costa Pumping Plant No. 1 represent municipal intakes servicing existing drinking water treatment plants. Under Alternative 8, drinking water treatment plants obtaining water from these interior Delta locations would likely need to upgrade existing treatment systems in order to achieve EPA Stage 1 Disinfectants and Disinfection Byproduct Rule action thresholds.

Relative to the No Action Alternative, Alternative 6A would result in increases in long-term average bromide concentrations at Buckley Cove, Staten Island and the North Bay Aqueduct at Barker Slough. Increases would be greatest at Staten Island (33%; 30% during the drought period) and at Barker Slough (8%; 50% during the drought period).The long-term average increase predicted for Barker Slough could necessitate changes in water treatment plant operations or require treatment plant upgrades in order to maintain DBP compliance. Operation and maintenance activities, the increases in bromide concentrations at Barker Slough, source of the North Bay Aqueduct, would cause substantial degradation to water quality; resultant substantial change in long-term average bromide at Barker Slough could necessitate changes in water treatment plant operations or require treatment plant upgrades to maintain DBP compliance.

While treatment technologies sufficient to achieve the necessary DOC and bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken for these predicted increases in DOC and bromide for the affected Delta locations, a change of such magnitude in long-term average DOC and bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBPs. Mitigation Measure WQ-17 is available to partially reduce the effect of DOC, the feasibility and effectiveness of this mitigation measure are uncertain, and, therefore, it is not known if its implementation would reduce the severity of this effect such that it would not be adverse. Similarly, Mitigation Measure WQ-5 is available to reduce the potential effects of increased bromide in drinking water sources at Barker Slough. Implementation of this measure along with a separate other commitment as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, relating to the potential increased treatment costs associated with bromide-related changes would reduce these effects. Further, as described for Impact PH-2 under Alternative 1A, the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be further minimized by implementation of the AIP. However, the overall effect on public health related to potential increases in DBPs (resulting from DOC and bromide increases) at the aforementioned Delta locations would still be considered adverse.

Trace Metals

Under Alternative 8, throughout much of the south Delta, San Joaquin River water would replace Sacramento River water, with the future trace metals profile largely reflecting that of the San Joaquin River. Trace metal concentration profiles between the San Joaquin and Sacramento Rivers are very similar and currently meet Basin Plan objectives and CTR criteria. While the change in trace metal concentrations in the south Delta relative to the No Action Alternative would likely be measurable under Alternative 8, it would not be expected to substantially increase the frequency with which applicable Basin Plan objectives or CTR criteria would be exceeded in the Delta, or substantially degrade the quality of Delta waters with regard to trace metals. Accordingly, no adverse effect on public health related to the trace metals arsenic, iron, or manganese from drinking water sources is anticipated.

Pesticides

Under Alternative 8, the distribution and mixing of Delta source waters would change. Relative to the No Action Alternative, the change in source water (e.g., more San Joaquin River water) associated with Alternative 8 would be sufficient in magnitude to increase the existing pesticide concentrations in the Delta, resulting in an increased risk of toxicity to aquatic life in certain areas (Franks Tract, Rock Slough, and Contra Costa Pumping Plant #1) during certain times of the year. A conclusion regarding the risk to human health at these locations, based on the predicted adverse effects from pesticides on aquatic life, cannot be made. The prediction of adverse effects of pesticides fundamentally assumes that the present pattern of pesticide incidence in surface water would continue at similar levels into the future. In reality, the use of chlorpyrifos and diazinon pesticides, the two pesticides that serve as the basis for concluding a substantially increased San Joaquin River source water fraction, is on the decline with their replacement by pyrethroids on the rise. Furthermore, water treatment plants are required to meet drinking water requirements set forth in the California Safe Drinking Water Act and the regulations adopted by CDPH. Therefore, it is not anticipated that there would be adverse effects on public health from pesticides in drinking water sources.

CEQA Conclusion: The change in source water (e.g., more San Joaquin River water) associated with operation of the water conveyance facilities under Alternative 8 would be of sufficient magnitude to increase the existing pesticide concentrations in the Delta, according to water quality modeling results. This increase could result in an increased risk of toxicity to aquatic life at some locations in the study area (Franks Tract, Rock Slough, and Contra Costa Pumping Plant #1) during certain times of the year relative to Existing Conditions. A conclusion regarding the risk to human health at these locations, based on the predicted adverse effects from pesticides on aquatic life, cannot be made. However, the prediction of adverse effects of pesticides relative to Existing Conditions fundamentally assumes that the present pattern of pesticide incidence in surface water would continue at similar levels into the future. In reality, the use of chlorpyrifos and diazinon pesticides, the two pesticides that serve as the basis for concluding a substantially increased San Joaquin River source water fraction, is on the decline with their replacement by pyrethroids on the rise. Furthermore, water treatment plants are required to meet drinking water requirements set forth in the California Safe Drinking Water Act and the regulations adopted by CDPH. Thus, these potential increases in pesticide concentrations would not significantly impact public health. The change in source water would not alter trace metal concentrations in the study area to the degree that there would be a beneficial use impairment. Finally, under Alternative 8, modeled long-term average bromide concentrations would increase at Staten Island (29%; 26% during the drought period) and Barker Slough (4%; 50% during the drought period) relative to Existing Conditions. Modeled long-term average DOC concentrations would increase by ≤32% at Franks Tract, Rock Slough and Contra Costa Pumping Plant #1 relative to Existing Conditions. These increases in bromide and DOC at these locations may be substantial enough to necessitate water treatment plant upgrades or changes in plant operations in order to maintain DBP compliance. Should treatment plant upgrades not be undertaken for the affected Delta locations, a change of such magnitude in long-term average DOC and bromide concentrations in drinking water sources would represent an increased risk for effects on public health from DBPs, which would be a significant impact.

Implementation of the AIP may reduce water quality effects due to bromide increases at Barker Slough by allowing operators of the North Bay Aqueduct to largely avoid periods of poor water quality by using an alternative surface water intake on the Sacramento River. Assuming the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be avoided or minimized by implementation of the AIP, the potential adverse water quality effects on the municipal beneficial uses potentially provided in Barker Slough would remain significant. While Mitigation Measure WQ-5 may reduce this impact, the feasibility and effectiveness of this mitigation measure are uncertain

based on currently available information. Mitigation Measure WQ-17 would reduce the potential impacts associated with DOC; however, it is unknown if this mitigation would reduce impacts to a less-than-significant level.

In addition to and to supplement Mitigation Measure WQ-5, the BDCP proponents have incorporated into the BDCP, as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, a separate other commitment to address the potential increased water treatment costs that could result from bromide-related concentration effects on municipal water purveyor operations. Potential options for making use of this financial commitment include funding or providing other assistance towards implementation of the North Bay Aqueduct AIP, acquiring alternative water supplies, or other actions to indirectly reduce the effects of elevated bromide and DOC in existing water supply diversion facilities. Please refer to Appendix 3B for the full list of potential actions that could be taken pursuant to this commitment in order to reduce the water quality treatment costs associated with water quality effects relating to chloride, electrical conductivity, and bromide. Because the BDCP proponents cannot ensure that the results of coordinated actions with water treatment entities will be fully funded or implemented successfully prior to the project's contribution to the impact, the ability to fully mitigate this impact is uncertain. If a solution that is identified by the BDCP proponents and an affected water purveyor is not fully funded, constructed, or implemented before the project's contribution to the impact is made, a significant impact in the form of increased DBP in drinking water sources could occur. Accordingly, this impact would be significant and unavoidable. If, however, all financial contributions, technical contributions, or partnerships required to avoid significant impacts prove to be feasible and any necessary agreements are completed before the project's contribution to the effect is made, impacts would be less than significant.

Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality Conditions; Site and Design Restoration Sites to Reduce Bromide Increases in Barker Slough

Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

Mitigation Measure WQ-17: Consult with Delta Water Purveyors to Identify Means to Avoid, Minimize, or Offset Increases in Long-Term Average DOC Concentrations

Please see Mitigation Measure WQ-17 under Impact PH-2 in the discussion of Alternative 6A.

Impact PH-3: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Construction, Operation or Maintenance of the Water Conveyance Facilities

***NEPA Effects*:** As described under Alternative 1A, sediment-disturbing activities during construction and maintenance of the water conveyance facilities under Alternative 8 could result in the disturbance of existing constituents, such as legacy pesticides or methylmercury, in sediment. Therefore, the public health effects associated with pesticides and methylmercury under Alternative 8 would be similar to, although slightly less than, those associated with Alternative 1A. Intermittent and/or short-term construction-related activities (as would occur for in-river construction) would not be anticipated to result in contaminant discharges of sufficient magnitude or duration to contribute to long-term bioaccumulation processes, or cause measureable long-term degradation, as described under Alternative 1A. Legacy organochlorine pesticides typically bond to particulates, and do not mobilize easily. Construction and maintenance of Alternative 8 would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column, as described for Alternative 1A. Water supply operations under any BDCP action alternative would not be expected to change total suspended solids or turbidity levels (highs, lows, typical conditions) to any substantial degree. Changes in the magnitude, frequency, and geographic distribution of legacy pesticides in water bodies of the affected environment that would result in new or more severe adverse effects on beneficial uses, relative to the No Action Alternative, would not be expected to occur.

Water quality modeling results indicate that the percentage change in assimilative capacity of waterborne total mercury relative to the 25 ng/L Ecological Risk Benchmark for this alternative showed the greatest decrease (6.9%) at the Contra Costa Pumping Plant relative to the No Action Alternative. These changes are not expected to result in adverse effects on beneficial uses. Similarly, changes in methylmercury concentration are expected to be relatively small.

Fish tissue estimates showed a substantial increase concentration and exceedance quotients at the North Bay Aqueduct pump site at Barker Slough relative to the No Action Alternative (221–224%). The Sacramento River at Emmaton site also shows a relatively large percentage increase (122–124%) in tissue mercury concentrations over conditions under the No Action Alternative. Thus, relative to the No Action Alternative, body burdens of mercury in fish would be measurably higher, and could thereby substantially increase the health risks to people consuming those fish. Accordingly, the potential for Alternative 8 to create a public health effect from bioaccumulation of mercury would exist and this is considered an adverse effect.

As environmental commitments, DWR would develop and implement Erosion and Sediment Control Plans and SWPPPs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMPs implemented under the Erosion and Sediment Control Plans and the SWPPPs would help reduce turbidity and keep sediment that may contain legacy organochlorine pesticides and methylmercury within the area of disturbance, as described under Alternative 1A for Impact PH-3. Additionally, OEHHA standards would continue to be implemented for the consumption of study area fish and thus would serve to protect people against the overconsumption of fish with increased body burdens of mercury.

***CEQA Conclusion*:** Construction and maintenance of water conveyance facilities under Alternative 8 would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column based on the chemical properties of the pesticides. Therefore, construction and maintenance of Alternative 8 water conveyance facilities would not cause increased exposure of the public to these pesticides. As environmental commitments, DWR would develop and implement Erosion and Sediment Control Plans and SWPPPs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMPs implemented under the Erosion and Sediment Control Plans and the SWPPPs would help reduce turbidity and keep sediment that may contain legacy organochlorine pesticides and methylmercury within the area of disturbance.

Based on water quality modeling results, changes in water concentrations of mercury and methlymercury would occur at some locations relative to Existing Conditions as a result of operations under Alternative 8. Specifically, the analysis of percentage change in assimilative capacity of waterborne total mercury of Alternative 8 relative to the 25 ng/L ecological risk benchmark as compared to Existing Conditions showed the greatest decrease of 7% for the Contra Costa Pumping Plant. Similarly, changes in methylmercury concentrations are expected to be relatively small. Beneficial uses of waters in the study area would not be adversely affected due to these changes. However, relative to Existing Conditions, modeling results indicate that body burdens of mercury in fish would be measurably higher at the North Bay Aqueduct pump site at Barker Slough (221–224%) and the Sacramento River at Emmaton (122–124%).This could increase the health risks to people consuming those fish. Accordingly, the potential for this alternative to create a public health effect from bioaccumulation of mercury would exist and this is considered a significant and unavoidable impact. The estimated increases of mercury body burdens in fish are based on the changes expected from the modeled blending of source waters that define CM1 for Alternative 8 and are therefore inherent to the Alternative. OEHHA standards would continue to be implemented for the consumption of study area fish and thus would serve to protect people against the overconsumption of fish with increased body burdens of mercury.

Impact PH-4: Expose Substantially More People to Transmission Lines Generating New Sources of EMFs as a Result of the Construction and Operation of the Water Conveyance Facilities

NEPA Effects**:** As described in Table 25-9, a total of 24.71 miles of new temporary 69 kV transmission lines; 7.03 miles of new permanent 69 kV transmission lines; and 42.68 miles of new permanent 230 kV transmission lines would be required for this alternative. New temporary and permanent transmission lines needed for Alternative 8 would be the same as those for Alternative 7. Any new temporary and permanent transmission lines needed for Alternative 8 would be located in rights-of-way of existing transmission lines or in areas that are not densely populated and, therefore, would not expose substantially more people to transmission lines (Figure 25-2). Furthermore, the majority of sensitive receptors that would be within 300 feet of a new transmission line are already located within 300 feet of an existing transmission line. However, as indicated in Table 25-9, Stone Lakes National Wildlife Refuge would be within 300 feet of a proposed temporary 69 kV transmission line. Visitors to this area generally come for walks, water recreation, and hunting, and as such, it is unlikely that large groups of people would be staying in the area within 300 feet of this proposed transmission line, so any EMF exposure would be limited. Further, this line would be removed when construction of the water conveyance facility features near this area is completed, so there would be no potential permanent effects. Therefore, this temporary transmission line would not substantially increase people's exposure to EMFs. While the current scientific evidence does not show conclusively that EMF exposure can increase health risks, the location and design of the new transmission lines would be conducted in accordance with CPUC's EMF Design Guidelines for Electrical Facilities to minimize health risks associated with power lines. Therefore, operation of the transmission line corridors would not expose substantially more people to transmission lines generating EMFs. Because the lines would be located in sparsely populated areas and would be within 300 feet of only one potential new sensitive receptor, the proposed temporary and permanent transmission lines would not substantially increase people's exposure to EMFs, and there would be no adverse effect on public health.

CEQA Conclusion**:** In general, the proposed temporary (69 kV) and permanent (69 kV and 230 kV) transmission lines would be located in rights-of-way of existing transmission lines or in sparsely populated areas generally away from existing sensitive receptors. However, one sensitive receptor, Stone Lakes National Wildlife Refuge, would be within 300 feet of a proposed temporary 69 kV transmission line. Because visitors to this area generally come for walks, water recreation, and hunting, it is unlikely that large groups of people would be staying in the area within 300 feet of this proposed transmission line, so any EMF exposure would be limited. Further, this line would be removed when construction of the water conveyance facility features near this area is completed, so there would be no potential permanent effects. Therefore, this temporary transmission line would not substantially increase people's exposure to EMFs. Design and implementation of new temporary or permanent transmission lines not within the right-of-way of existing transmission lines would follow CPUC's EMF Design Guidelines for Electrical Facilities and would implement shielding, canceling, or distance measures to reduce EMF exposure. Because construction and operation of Alternative 8 would not expose substantially more people to transmission lines that provide new sources of EMFs, impacts would be less than significant, and no mitigation is required.

Impact PH-5: Increase in Vector-Borne Diseases as a Result of Implementing CM2-CM7, CM10 and CM11

NEPA Effects: The amount and location of habitat restoration and enhancement that would occur under Alternative 8 would be similar to that described for Alternative 1A. Although there would be an increase in restored and enhanced habitat in the study area as a result of implementing Alternative 8, implementation of environmental commitments such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*) would reduce the potential for an increase in mosquito breeding habitat, and a substantial increase in vector-borne diseases is unlikely to result. Furthermore, habitat would be restored in areas where potentially suitable habitat for mosquitoes already exists. Finally, mosquito predators (e.g., bats, spiders) would likely increase as a result of restoration and enhancement, which would keep mosquito populations in check. Therefore, effects would be the same under Alternative 8 as under Alternative 1A and there would not be a substantial increase in the public's risk of exposure to vector-borne diseases with implementation of CM2–CM7, CM10 and CM11. Accordingly, there would be no adverse effect.

CEQA Conclusion: Habitat restoration and enhancement would result in an increased amount of land potentially suitable for vector habitat (e.g., mosquitoes). However, as described in Alternative 1A, Alternative 8 would require environmental commitments, such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*) that would help control mosquitoes and reduce the potential for an increase in mosquito breeding habitat. Furthermore, habitat would be restored where potentially suitable vector habitat already exists and habitat restoration and enhancement would likely increase the number of mosquito predators. Therefore, as described for Alternative 1A, implementation of CM2-CM7, CM10 and CM11 under Alternative 8 would not substantially increase the public's risk of exposure to vector-borne diseases beyond what currently exists. Accordingly, this impact would be less than significant and no mitigation is required.

Impact PH-6: Substantial Increase in Recreationists' Exposure to Pathogens as a Result of Implementing the Restoration Conservation Measures

NEPA Effects: The amount and location of habitat restoration and enhancement that would occur under Alternative 8 would be the similar to that described above for Alternative 1A. Implementation of the restoration conservation measures would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). As exemplified by the Pathogen Conceptual Model, any potential increase in pathogens associated with the habitat restoration would be localized and within the vicinity of the actual restoration. This would be similar for lands protected for agricultural uses. Depending on the level of recreational access granted by management plans, habitat restoration could increase or decrease opportunities for recreationists within the Delta region. However, effects associated with pathogens would be the same under Alternative 8 as under Alternative 1A. Recreationists would not experience a substantial increase in exposure to pathogens as a result of the restoration and no adverse effect on public health would result.

CEQA Conclusion: Implementation of the restoration conservation measures under Alternative 8 would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). However, the localized nature of pathogen generation and the quick die-off of some types of pathogens once released into water bodies would generally prevent substantial pathogen exposure to recreationists. Accordingly, impacts on public health would be less than significant and no mitigation is required.

Impact PH-7: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Implementing CM2, CM4, CM5, and CM10

NEPA Effects: The amount of habitat restoration under Alternative 8 would be the same as Alternative 1A. The primary concern with habitat restoration regarding constituents known to bioaccumulate is the potential for mobilizing contaminants sequestered in sediments of the newly inundated floodplains and marshes, as described under Alternative 1A. It is likely that the pesticide-bearing sediments would not be transported very far from the source area and would settle out with suspended particulates and be deposited close to the ROA. Further, CM2–CM21 do not include the use of pesticides known to be bioaccumulative in animals or humans.

Methylmercury generation rates are ultimately dependent on the concentrations of mercury in the soils, and on the specific biogeochemistry of the system. The biogeochemistry and fate and transport of mercury and methylmercury are very complex. Restoration would involve inundation of areas where mercury has been sequestered in soils, and, if methylation occurs, the methylmercury would be mobilized into the aquatic system. While there would likely be an increase in mobilization and bioaccumulation of methylmercury in the study area's aquatic systems (e.g., fish and water) during the near-term, *CM12 Methylmercury Management* and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Therefore, implementation of CM2, CM4, CM5, and CM10 under Alternative 8 is not expected to result in an adverse effect on public health with respect to pesticides or methylmercury.

CEQA Conclusion: Implementation of CM2, CM4, CM5, and CM10 would have the potential to mobilize sediment with existing levels of legacy organochlorine pesticides as a result of disturbing sediment during habitat restoration construction. However, it is unlikely that the pesticide-bearing sediments would be transported very far from the source area and they would likely settle out with suspended particulates and be deposited close to the ROAs during habitat restoration construction. While there would likely be an increase in mobilization and bioaccumulation of methylmercury in the study area's aquatic systems (i.e., fish and water) during the near-term, measures implemented under *CM12 Methylmercury Management*, and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Therefore, implementation of CM2, CM4, CM5, and CM10 under Alternative 8 would not substantially mobilize or substantially increase the public's exposure to constituents known to bioaccumulate and this impact would be less than significant. No mitigation is required.

Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water Conveyance Facilities

***NEPA Effects*:** Because factors that affect *Microcystis* abundance in waters upstream of the Delta, in the Delta, and in the SWP/CVP Export Services Areas under Alternative 1A would similarly change under Alternative 8, *Microcystis* abundance, and thus microcystins concentrations, in water bodies of the affected environment under Alternative 8 would be very similar to those discussed for Alternative 1A.

As described in Chapter 8, *Water Quality*, although *Microcystis* blooms have not occurred in the Export Service Areas, conditions in the Export Service Areas under Alternative 8 may become more conducive to *Microcystis* bloom formation because water temperatures will increase in the Export Service Areas due to the expected increase in ambient air temperatures resulting from climate change, but not from operation of the water conveyance facilities. Under Alternative 8, relative to No Action Alternative, water exported to the SWP/CVP Export Service Area will be a mixture of *Microcystis*-affected source water from the south Delta intakes and unaffected source water from the Sacramento River, diverted at the north Delta intakes. It cannot be determined whether operations and maintenance under Alternative 8 will result in increased or decreased levels of *Microcystis* and microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Like Alternative 1A, elevated ambient water temperatures would occur in the Delta under Alternative 8, which could lead to earlier occurrences of *Microcystis* blooms in the Delta, and increase the overall duration and magnitude of blooms. However, as described in Chapter 8, *Water Quality,* the increase in Delta water temperatures, and consequent potential increase in *Microcystis* blooms, would be driven entirely by climate change, not by operation of water conveyance facilities. There would be differences in the direction and magnitude of water residence time changes during the *Microcystis* bloom period due to operation of the water conveyance facilities under Alternative 8 compared to Alternative 1A, relative to the No Action Alternative. As a result, *Microcystis* blooms, and therefore microcystin, could increase in surface waters throughout the Delta. Therefore, impacts on beneficial uses, including drinking water and recreational waters, could occur and public health could be affected. Accordingly, this would be considered an adverse effect.

Mitigation Measure WQ-32a and WQ-32b are available to reduce the effects of degraded water quality in the Delta. Although there is uncertainty regarding this impact, the effects on *Microcystis* from implementing CM1 is determined to be adverse.

CEQA Conclusion: Under Alternative 8, operation of the water conveyance facilities is not expected to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta. *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not due to water conveyance facility operations. Hydraulic residence times in the Export Service Area would not be affected by operations of CM1, and therefore conditions in those areas would not be more conducive to *Microcystis* bloom formation. Water exported from the Delta to the Export Service Area is expected to be a mixture of *Microcystis*-affected source water from the south Delta intakes and unaffected source water from the Sacramento River. Because of this, it cannot be determined whether operations and maintenance under Alternative 8 would result in increased or decreased levels of *Microcystis* and microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Water temperatures and hydraulic residence times in the Delta are expected to increase, which could result in an increase in *Microcystis* blooms and therefore microcystin levels. However, the water temperature increases in the Delta would be due to climate change and not due to operation of the water conveyance facilities. Increases in Delta residence times would be due in small part to climate change and sea level rise, but due to a greater degree to operation of the water conveyance facilities and hydrodynamic impacts of restoration included in CM2 and CM4. Consequently, it is possible that increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms in the Delta would occur due to the operations and maintenance of the water conveyance facilities and the hydrodynamic impacts of restoration under CM2 and CM4. Accordingly, beneficial uses including drinking water and recreational waters would be impacted and, as a result, public health. Therefore, this impact would be significant.

Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time considerations be incorporated into restoration area site design for CM2 and CM4 using the best available science at the time of design. Mitigation Measure WQ-32b requires that the project proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods to determine whether increases in abundance are significant. This mitigation measure also requires that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will investigate and evaluate measures that could be taken to reduce residence time in the affected areas of the Delta. However, because the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects is uncertain, and therefore potential public health effects, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and CM4

NEPA Effects: The amount and location of habitat restoration and enhancement that would occur under Alternative 8 would be the same as that described under Alternative 1A. Restoration activities implemented under CM2 and CM4 that would create shallow backwater areas could result in local increases in water temperature that may encourage *Microcystis* growth during the summer bloom season. This would result in further degradation of water quality beyond the hydrodynamic effects of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase in *Microcystis* blooms with implementation of CM2 and CM4 could potentially result in adverse effects on public health through exposure via drinking water quality and recreational waters. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects related to *Microcystis* is uncertain. This would be an adverse effect.

CEQA Conclusion: The effects of CM2 and CM4 on *Microcystis* under Alternative 8 are the same as those discussed for Alternative 1A. Restoration activities implemented under CM2 and CM4 that create shallow backwater areas could result in local increases in water temperature conducive to *Microcystis* growth during summer bloom season. This could compound the water quality degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact PH-8 and result in additional water quality degradation such that beneficial uses are affected. An increase in *Microcystis* blooms could potentially result in impacts on public health through exposure via drinking water quality and recreational waters. Therefore, this impact would be significant. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

25.3.3.16 Alternative 9—Through Delta/Separate Corridors (15,000 cfs; Operational Scenario G)

While operation of Alternative 9 would be very similar to Alternative 1A with respect to water exports, Alternative 9 does not involve construction of major new water conveyance facilities. Rather, there would be four basic corridors utilizing existing channels, two dedicated to water conveyance and two to fish migration: (1) the north Delta separate water supply corridor that conveys water from the Sacramento River to Middle River; (2) the south Delta separate water supply corridor along Middle River and Victoria Canal that conveys water from San Joaquin River to Clifton Court Forebay; (3) the San Joaquin separate fish movement corridor that provides for fish migration from upper San Joaquin River to the lower San Joaquin River downstream of Franks Tract; and (4) the Mokelumne separate fish movement corridor that diverts from the Mokelumne River through Lost Slough and Meadows Slough to the Sacramento River. Alternative 9 includes construction of two new fish-screened intakes without pumping plants, operable barriers (several with boat locks), approximately 2 miles of canals, and approximately 1 mile of new levees. Temporary cofferdams would be needed during construction. A detailed description of the alternative is provided in Chapter 3, *Description of the Alternatives*, Section 3.5.16; a depiction of the physical components is provided in Mapbook Figure M3-5 in Chapter 3.

With respect to public health, there are three main differences between Alternative 9 and Alternative 1A.

- Conveyance facilities would consist of operable barriers in existing channels, and channel enlargement.

- One intake would be located at Delta Cross Channel, and one intake at Georgiana Slough.
- There would be potentially different amounts and types of restoration to accommodate the proposed operable barriers and channel enlargements.

The amount and location of habitat restoration and enhancement that would occur under Alternative 9 would generally be the same as that described under Alternative 1A. However, under Alternative 9, changes in the south Delta would be made to accommodate the modified corridors. The location of these habitat restoration and enhancement areas would be similar to those described in 1A throughout the 11 different conservation zones and would expand on existing channel margin habitat and floodplain locations.

Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of the Intakes, Solids Lagoons, and/or Sedimentation Basins Associated with the Water Conveyance Facilities

***NEPA Effects*:** Alternative 9 would not have solids lagoons or sedimentation basins. Should construction activities create temporary areas of standing water that could provide suitable habitat for mosquitoes to breed, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes (see Impact PH-1 under Alternative 1A). These BMPs would be consistent with practices presented in *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). Activities would include, but not be limited to: testing for mosquito larvae during the high mosquito season (June through September); introducing biological controls such as mosquitofish if mosquitoes are present; reducing or eliminating emergent vegetation; and introducing physical controls (e.g., discharging water more frequently or increasing circulation) if mosquitoes are present. Therefore, Alternative 9 would not significantly increase the public's risk of exposure to vector-borne diseases. Accordingly, adverse effects on public health would not result.

***CEQA Conclusion*:** Because solid lagoons or sedimentation basins would not be constructed or operated, there would be no impacts. If necessary, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes (see Impact PH-1 under Alternative 1A). These BMPs would be consistent with practices presented in CDPH's *Best Management Practices for Mosquito Control in California*. Therefore, construction and operation of the water conveyance facilities under Alternative 9 would not result in a substantial increase in vector-borne diseases and the impact on public health would be less than significant. No mitigation is required.

Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That There is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance Facilities

NEPA Effects:

Disinfection Byproducts

Under Alternative 9, the geographic extent of effects pertaining to long-term average DOC and bromide concentrations and, by extension, DBPs in the study area would be similar to that described for Alternative 1A. However, the magnitude of predicted long-term increase and relative frequency of concentration threshold exceedances would be substantially greater. Modeled effects would be greatest at Franks Tract, Rock Slough, and Contra Costa Pumping Plant #1 for Alternative 9 relative to the No Action Alternative. Maximum net increases would be ≤ 24% at these locations relative to the No Action Alternative. Exceedances of water quality objectives would conflict with the Basin Plan because it would exceed Basin Plan requirements. Drinking water treatment plants obtaining water from these interior Delta locations would likely need to upgrade existing treatment systems in order to achieve EPA Stage 1 Disinfectants and Disinfection Byproduct Rule action thresholds.

In addition, relative to the No Action Alternative, Alternative 9 would result in increases in long-term average bromide concentrations at Buckley Cove (during the drought period only), Emmaton, and Barker Slough (Chapter 8, *Water Quality*, Section 8.3.3.16). The increase in long-term average bromide concentrations at Barker Slough (23%; 87% increase during the drought period) would be substantial enough to potentially necessitate changes in water treatment plant operations or require treatment plant upgrades in order to maintain DBP compliance.

While treatment technologies sufficient to achieve the necessary DOC and bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken for these predicted increases in DOC and bromide for the affected Delta locations, a change of such magnitude in long-term average DOC and bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBPs. While Mitigation Measure WQ-17 is available to partially reduce the effect of DOC, the feasibility and effectiveness of this mitigation measure are uncertain, and, therefore, it is not known if its implementation would reduce the severity of this effect such that it would not be adverse. Similarly, Mitigation Measure WQ-5 is available to reduce the potential effects of increased bromide in drinking water sources at Barker Slough. Implementation of this measure along with a separate other commitment as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, relating to the potential increased treatment costs associated with bromide-related changes would reduce these effects. Further, as described for Impact PH-2 under Alternative 1A, the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be further minimized by implementation of the AIP. However, the overall effect on public health related to potential increases in DBPs (resulting from DOC and bromide increases) at the aforementioned Delta locations would still be considered adverse.

Trace Metals

Alternative 9 would not result in substantial increases in trace metal concentrations in the Delta relative to the No Action Alternative. However, substantial changes in source water fraction would occur in the south Delta. Throughout much of the south Delta, San Joaquin River water would replace Sacramento River water, with the future trace metals profile largely reflecting that of the San Joaquin River. Alternative 9 would not be expected to substantially increase the frequency with which applicable Basin Plan objectives or CTR criteria would be exceeded in the Delta or substantially degrade the quality of Delta waters with regard to trace metals. Therefore, adverse effects on public health would not result.

Pesticides

Locations in the Delta that would receive a substantially greater fraction of San Joaquin River water under Alternative 9, such as Franks Tract, Rock Slough and Contra Costa Pumping Plant #1, would change considerably over the calendar year. As a result, the long-term risk of pesticide-related toxicity to aquatic life at these locations during certain times of the year could substantially increase relative to the No Action Alternative (Chapter 8, *Water Quality*, Section 8.3.3.16). Additionally, the potential for increased incidence of pesticide-related toxicity could include pesticides such as chlorpyrifos and diazinon for which 303(d) listings exist for the Delta, and, thus, existing beneficial use impairment could be made discernibly worse. The prediction of adverse effects of pesticides relative to the No Action Alternative fundamentally assumes that the present pattern of pesticide incidence in surface water would continue at similar levels into the future. In reality the makeup and character of the pesticide use market during the late long-term would not be exactly as it is today. Use of chlorpyrifos and diazinon is on the decline with their replacement by pyrethroids on the rise. Yet, in this assessment it is the apparent greater incidence of diazinon and chlorpyrifos in the San Joaquin River that serves as the basis for concluding that substantially increased San Joaquin River source water fraction would correspond to an increased risk of pesticide-related toxicity to aquatic life. However, water treatment plants are required to meet drinking water requirements set forth in the California Safe Drinking Water Act and the regulations adopted by CDPH. Therefore, it is not anticipated that there would be adverse effects on public health from pesticides.

CEQA Conclusion: The change in source water (e.g., more San Joaquin River water) associated with operation of the water conveyance facilities under Alternative 9 would be of sufficient magnitude to increase the existing pesticide concentrations in the Delta, according to water quality modeling results. This increase could result in an increased risk of toxicity to aquatic life at some locations in the study area (Franks Tract, Rock Slough, and Contra Costa Pumping Plant #1) during certain times of the year relative to Existing Conditions. A conclusion regarding the risk to human health at these locations, based on the predicted adverse effects from pesticides on aquatic life, cannot be made. However, the prediction of adverse effects of pesticides relative to Existing Conditions fundamentally assumes that the present pattern of pesticide incidence in surface water would continue at similar levels into the future. In reality, the use of chlorpyrifos and diazinon pesticides, the two pesticides that serve as the basis for concluding a substantially increased San Joaquin River source water fraction, is on the decline with their replacement by pyrethroids on the rise. Furthermore, water treatment plants are required to meet drinking water requirements set forth in the California Safe Drinking Water Act and the regulations adopted by CDPH. Thus, these potential increases in pesticide concentrations would not significantly impact public health. The change in source water would not alter trace metal concentrations in the study area to the degree that there would be a beneficial use impairment. Finally, under Alternative 9, modeled average long-term bromide concentrations would increase at Buckley Cove (during the drought period only [21%]), Emmaton (≤30%), and Barker Slough (19%; 88% during the drought period) relative to Existing Conditions. Modeled long-term DOC concentrations would increase to the greatest extent at Franks Tract, Rock Slough, and Contra Costa Pumping Plant #1 (≤28% net increase). These increases in bromide and DOC at these locations may be substantial enough to necessitate water treatment plant upgrades or changes in plant operations in order to maintain DBP compliance. Should treatment plant upgrades not be undertaken for the affected Delta locations, a change of such magnitude in long-term average DOC and bromide concentrations in drinking water sources would represent an increased risk for effects on public health from DBPs, which would be a significant impact.

Implementation of the AIP may reduce water quality effects due to bromide increases at Barker Slough by allowing operators of the North Bay Aqueduct to largely avoid periods of poor water quality by using an alternative surface water intake on the Sacramento River. Assuming the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be avoided or minimized by implementation of the AIP, the potential adverse water quality effects on the municipal beneficial uses potentially provided in Barker Slough would remain significant. While Mitigation Measure WQ-5 may reduce this impact, the feasibility and effectiveness of this mitigation measure are uncertain based on currently available information. Mitigation Measure WQ-17 would reduce the potential impacts associated with DOC; however, it is unknown if this mitigation would reduce impacts to a less-than-significant level.

In addition to and to supplement Mitigation Measure WQ-5, the BDCP proponents have incorporated into the BDCP, as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, a separate other commitment to address the potential increased water treatment costs that could result from bromide-related concentration effects on municipal water purveyor operations. Potential options for making use of this financial commitment include funding or providing other assistance towards implementation of the North Bay Aqueduct AIP, acquiring alternative water supplies, or other actions to indirectly reduce the effects of elevated bromide and DOC in existing water supply diversion facilities. Please refer to Appendix 3B for the full list of potential actions that could be taken pursuant to this commitment in order to reduce the water quality treatment costs associated with water quality effects relating to chloride, electrical conductivity, and bromide. Because the BDCP proponents cannot ensure that the results of coordinated actions with water treatment entities will be fully funded or implemented successfully prior to the project's contribution to the impact, the ability to fully mitigate this impact is uncertain. If a solution that is identified by the BDCP proponents and an affected water purveyor is not fully funded, constructed, or implemented before the project's contribution to the impact is made, a significant impact in the form of increased DBP in drinking water sources could occur. Accordingly, this impact would be significant and unavoidable. If, however, all financial contributions, technical contributions, or partnerships required to avoid significant impacts prove to be feasible and any necessary agreements are completed before the project's contribution to the effect is made, impacts would be less than significant.

Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality Conditions; Site and Design Restoration Sites to Reduce Bromide Increases in Barker Slough

Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

Mitigation Measure WQ-17: Consult with Delta Water Purveyors to Identify Means to Avoid, Minimize, or Offset Increases in Long-Term Average DOC Concentrations

Please see Mitigation Measure WQ-17 under Impact PH-2 in the discussion of Alternative 6A.

Impact PH-3: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Construction, Operation or Maintenance of the Water Conveyance Facilities

NEPA Effects: Under Alternative 9, intermittent and/or short-term construction-related activities (as would occur for in-river construction) would not be anticipated to result in contaminant discharges of sufficient magnitude or duration to contribute to long-term bioaccumulation processes, or cause measureable long-term degradation, as described under Alternative 1A. Legacy organochlorine pesticides typically bond to particulates, and do not mobilize easily. Construction and maintenance of Alternative 5 would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column as described for Alternative 1A. Water supply operations under any BDCP action alternative would not be expected to change total suspended solids or turbidity levels (highs, lows, typical conditions) to any substantial degree. Changes in the magnitude, frequency, and geographic distribution of legacy pesticides in water bodies of the affected environment that would result in new or more severe adverse effects on beneficial uses, relative to the No Action Alternative, would not be expected to occur.

Furthermore, based on water quality modeling results presented in Chapter 8, *Water Quality*, Section 8.3.3.16, operation of water conveyance facilities under Alternative 9 would not substantially alter mercury or methylmercury concentrations in the Sacramento River or San Joaquin River. The analysis of percentage change in assimilative capacity of waterborne total mercury of Alternative 9 relative to the 25 ng/L Ecological Risk Benchmark Conditions showed the greatest decrease (10.1%) at Old River at Rock Slough, relative to the No Action Alternative. Similarly, increases in long term annual average methylmercury concentration are expected to be greatest at the Contra Costa Pumping Plant relative to the No Action Alternative.

Fish tissue mercury estimates show some substantial percentage increases in concentration and exceedance quotients at some Delta locations; the greatest change (59% increase) would be at Old River at Rock Slough relative to the No Action Alternative. Similar, but changes are predicted at the Contra Costa Pumping Plant. Therefore, body burdens of mercury in fish would be measurably higher, and could thereby substantially increase the health risks to people consuming those fish. Accordingly, the potential for Alternative 9 to create a public health effect from bioaccumulation of mercury would exist and this is considered an adverse effect.

CEQA Conclusion: Construction and maintenance of water conveyance facilities under Alternative 9 would not cause legacy organochlorine pesticides to be transported far from the source or to partition into the water column based on the chemical properties of the pesticides. Therefore, construction and maintenance of Alternative 9 water conveyance facilities would not cause increased exposure of the public to these pesticides as a result of construction and maintenance. As environmental commitments, DWR would develop and implement Erosion and Sediment Control Plans and SWPPPs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMPs implemented under the Erosion and Sediment Control Plans and the SWPPPs would help reduce turbidity and keep sediment that may contain legacy organochlorine pesticides and methylmercury within the area of disturbance.

Based on water quality modeling results, changes in water concentrations of mercury and methlymercury would occur at some locations relative to Existing Conditions as a result of operations under Alternative 9. Specifically, the analysis of percentage change in assimilative capacity of waterborne total mercury of Alternative 9 relative to the 25 ng/L Ecological Risk Benchmark as compared to Existing Conditions showed the greatest decrease of 10.2% at Old River at Rock Slough. This change would not alter beneficial uses of waters in the study area. However, relative to Existing Conditions, modeling results indicate that body burdens of mercury in fish would be measurably higher at Old River at Rock Slough (66% increase) and at the Contra Costa Pumping Plant (62% increase). This could increase the health risks to people consuming those fish. Accordingly, the potential for Alternative 9 to create a public health effect from bioaccumulation of mercury would exist and this is considered a significant and unavoidable impact. The estimated increases of mercury body burdens in fish are based on the changes expected from the modeled blending of source waters that define CM1 for Alternative 9 and are therefore inherent to the alternative. OEHHA standards would continue to be implemented for the consumption of study area fish and thus would serve to protect people against the overconsumption of fish with increased body burdens of mercury.

Impact PH-4: Expose Substantially More People to Transmission Lines Generating New Sources of EMFs as a Result of the Construction and Operation of the Water Conveyance Facilities

***NEPA Effects*:** As described in Table 25-9, Alternative 9 would not require the construction of any new 69 kV or 230 kV transmission lines. Therefore, substantially more people would not be exposed to transmission lines generating new sources of EMFs under this alternative. There would be no effects.

***CEQA Conclusion*:** Since Alternative 9 does not require the construction of new temporary or permanent transmission lines, there would be no impacts on public health from new sources of EMFs, and no mitigation is required.

Impact PH-5: Increase in Vector-Borne Diseases as a Result of Implementing CM2-CM7, CM10 and CM11

***NEPA Effects*:** The amount and location of habitat restoration and enhancement that would occur under Alternative 9 would be similar to that described for Alternative 1A. Although there would be an increase in restored and enhanced aquatic habitat in the study area as a result of implementing Alternative 9, implementation of environmental commitments such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*) would reduce the potential for an increase in mosquito breeding habitat, and a substantial increase in vector-borne diseases is unlikely to result. Furthermore, habitat would be restored in areas where potentially suitable habitat for mosquitoes already exists. Finally, mosquito predators (e.g., bats, spiders, etc.) would likely increase as a result of restoration and enhancement, which would keep mosquito populations in check. Therefore, effects would be the same under Alternative 9 as under Alternative 1A there would not be a substantial increase in the public's risk of exposure to vector-borne diseases with implementation of CM2-CM7, CM10 and CM11. Accordingly, there would be no adverse effect.

***CEQA Conclusion*:** Habitat restoration and enhancement would result in an increased amount of land potentially suitable for vector habitat (e.g., mosquitoes). However, as described above in Alternative 1A, Alternative 9 would require environmental commitments such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*) that would help control mosquitoes and reduce the potential for an increase in mosquito breeding habitat. Furthermore, habitat would be restored where potentially suitable vector habitat already exists and habitat restoration and enhancement would likely increase the number of mosquito predators. Therefore, as described under Alternative 1A, implementation of CM2-CM7, CM10 and CM11 under Alternative 9 would not substantially increase the public's risk of exposure to vector-borne diseases beyond what currently exists. Accordingly, this impact would be less than significant and no mitigation is required.

Impact PH-6: Substantial Increase in Recreationists' Exposure to Pathogens as a Result of Implementing the Restoration Conservation Measures

***NEPA Effects*:** The amount and location of habitat restoration and enhancement that would occur under Alternative 9 would be the similar to that described above for Alternative 1A. Implementation of the restoration conservation measures would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). As exemplified by the Pathogen Conceptual Model, any potential increase in pathogens associated with the habitat restoration would be localized and within the vicinity of the actual restoration. This would be similar for lands protected for agricultural uses. Depending on the level of recreational access granted by management plans, habitat restoration could increase or decrease opportunities for recreationists within the Delta region. However, effects associated with pathogens would be the same under Alternative 9 as under Alternative 1A. Recreationists would not experience a substantial increase of exposure to pathogens as a result of the restoration and no adverse effect on public health would result.

CEQA Conclusion: Implementation of the restoration conservation measures under Alternative 9 would support habitat types, such as wetlands and agricultural areas, that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). However, the localized nature of pathogen generation and the quick die-off of some types of pathogens once released into water bodies would generally prevent substantial pathogen exposure to recreationists. Therefore, impacts would be less than significant and no mitigation is required.

Impact PH-7: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Implementing CM2, CM4, CM5, and CM10

NEPA Effects: The amount of habitat restoration under Alternative 9 would be the same as Alternative 1A. However, it is expected that different locations for restoration or enhancement activities could be chosen in the south Delta based on the creation of separate corridors with differing purposes. The primary concern with habitat restoration regarding constituents known to bioaccumulate is the potential for mobilizing contaminants sequestered in sediments of the newly inundated floodplains and marshes, as described under Alternative 1A. It is likely that the pesticide-bearing sediments would not be transported very far from the source area and would settle out with suspended particulates and be deposited close to the ROA. Further, CM2–CM21 do not include the use of pesticides known to be bioaccumulative in animals or humans.

Methylmercury generation rates are ultimately dependent on the concentrations of mercury in the soils, and on the specific biogeochemistry of the system. The biogeochemistry and fate and transport of mercury and methylmercury are very complex. Restoration would involve inundation of areas where mercury has been sequestered in soils, and, if methylation occurs, the methylmercury would be mobilized into the aquatic system. While there would likely be an increase in mobilization and bioaccumulation of methylmercury in the study area's aquatic systems (i.e., fish and water) during the near-term, *CM12 Methylmercury Management* and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Therefore, implementation of CM2, CM4, CM5, and CM10 under Alternative 9 is not expected to result in an adverse effect on public health with respect to pesticides or methylmercury.

CEQA Conclusion: Implementation of CM2, CM4, CM5, and CM10 would have the potential to mobilize sediment with existing levels of legacy organochlorine pesticides as a result of disturbing sediment during habitat restoration construction. However, it is unlikely that the pesticide-bearing sediments would be transported very far from the source area and they would likely settle out with suspended particulates and be deposited close to the ROAs during habitat restoration construction. While there would likely be an increase in mobilization and bioaccumulation of methylmercury in the study area's aquatic systems (i.e., fish and water) during the near-term, measures implemented under *CM12 Methylmercury Management*, and existing OEHHA standards would serve to reduce the public's exposure to contaminated fish. Therefore, implementation of CM2, CM4, CM5, and CM10 of Alternative 9 would not substantially mobilize or substantially increase the public's exposure to constituents known to bioaccumulate and this impact would be less than significant. No mitigation is required.

Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water Conveyance Facilities

NEPA Effects: Because factors that affect *Microcystis* abundance in waters upstream of the Delta, in the Delta, and in the SWP/CVP Export Services Areas under Alternative 1A would similarly change under Alternative 8, *Microcystis* abundance, and thus microcystins concentrations, in water bodies of the affected environment under Alternative 9 would be very similar to those discussed for Alternative 1A.

As described in Chapter 8, *Water Quality*, although *Microcystis* blooms have not occurred in the Export Service Areas, conditions in the Export Service Areas under Alternative 9 may become more conducive to *Microcystis* bloom formation because water temperatures will increase in the Export Service Areas due to the expected increase in ambient air temperatures resulting from climate change, but not from operation of the water conveyance facilities. Under Alternative 9, relative to No Action Alternative, water exported to the SWP/CVP Export Service Area would be a mixture of *Microcystis*-affected source water from the south Delta intakes and unaffected source water from the Sacramento River, diverted at the north Delta intakes. It cannot be determined whether operations and maintenance under Alternative 9 will result in increased or decreased levels of *Microcystis* and microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Like Alternative 1A, elevated ambient water temperatures relative would occur in the Delta under Alternative 9, which could lead to earlier occurrences of *Microcystis* blooms in the Delta, and increase the overall duration and magnitude of blooms. However, as described in Chapter 8, *Water Quality,* the increase in Delta water temperatures, and consequent potential increase in *Microcystis* blooms, would be driven entirely by climate change, not by operation of water conveyance facilities. There would be differences in the direction and magnitude of water residence time changes during the *Microcystis* bloom period due to operation of the water conveyance facilities under Alternative 9 compared to Alternative 1A, relative to the No Action Alternative. As a result, *Microcystis* blooms, and therefore microcystin, could increase in surface waters throughout the Delta. Therefore, impacts on beneficial uses, including drinking water and recreational waters, could occur and public health could be affected. Accordingly, this would be considered an adverse effect.

Mitigation Measure WQ-32a and WQ-32b are available to reduce the effects of degraded water quality in the Delta. Although there is uncertainty regarding this impact, the effects on *Microcystis* from implementing CM1 is determined to be adverse.

CEQA Conclusion: Under Alternative 9, operation of the water conveyance facilities is not expected to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta. *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not due to water conveyance facility operations. Hydraulic residence times in the Export Service Area would not be affected by operations of CM1, and therefore conditions in those areas would not be more conducive to *Microcystis* bloom formation. Water exported from the Delta to the Export Service Area is expected to be a mixture of *Microcystis*-affected source water from the south Delta intakes and unaffected source water from the

Sacramento River. Because of this, it cannot be determined whether operations and maintenance under Alternative 9 would result in increased or decreased levels of *Microcystis* and microcystins in the mixture of source waters exported from Banks and Jones pumping plants.

Water temperatures and hydraulic residence times in the Delta are expected to increase, which could result in an increase in *Microcystis* blooms and therefore microcystin levels. However, the water temperature increases in the Delta would be due to climate change and not due to operation of the water conveyance facilities. Increases in Delta residence times would be due in small part to climate change and sea level rise, but due to a greater degree to operation of the water conveyance facilities and hydrodynamic impacts of restoration included in CM2 and CM4. Consequently, it is possible that increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms in the Delta would occur due to the operations and maintenance of the water conveyance facilities and the hydrodynamic impacts of restoration under CM2 and CM4. Accordingly, beneficial uses including drinking water and recreational waters would be impacted and, as a result, public health. Therefore, this impact would be significant.

Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water quality due to *Microcystis*. Mitigation Measure WQ-32a requires that hydraulic residence time considerations be incorporated into restoration area site design for CM2 and CM4 using the best available science at the time of design. Mitigation Measure WQ-32b requires that the project proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods to determine whether increases in abundance are significant. This mitigation measure also requires that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will investigate and evaluate measures that could be taken to reduce residence time in the affected areas of the Delta. However, because the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing CM2 and CM4

NEPA Effects: The amount of habitat restoration and enhancement that would occur under Alternative 9 would be the same as that described under Alternative 1A. However, different locations for restoration or enhancement activities could be chosen in the south Delta based on the creation of separate corridors with differing purposes.

Restoration activities implemented under CM2 and CM4 that would create shallow backwater areas could result in local increases in water temperature that may encourage *Microcystis* growth during the summer bloom season. This would result in further degradation of water quality beyond the hydrodynamic effects of CM2 and CM4 on *Microcystis* blooms identified in Impact PH-8. An increase in *Microcystis* blooms with implementation of CM2 and CM4 could potentially result in adverse effects on public health through exposure via drinking water quality and recreational waters. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects related to *Microcystis* is uncertain. This would be an adverse effect.

CEQA Conclusion: The effects of CM2 and CM4 on *Microcystis* under Alternative 9 are the same as those discussed for Alternative 1A. Restoration activities implemented under CM2 and CM4 that create shallow backwater areas could result in local increases in water temperature conducive to *Microcystis* growth during summer bloom season. This could compound the water quality degradation that may result from the hydrodynamic impacts from CM2 and CM4 discussed in Impact PH-8 and result in additional water quality degradation such that beneficial uses are affected. An increase in *Microcystis* blooms could potentially result in impacts on public health through exposure via drinking water quality and recreational waters. Therefore, this impact would be significant. Mitigation Measures WQ-32a and WQ-32b may reduce the combined effect on *Microcystis* from increased local water temperatures and water residence time. The effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain. Therefore, this impact would be significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

25.3.4 Effects and Mitigation Approaches—Alternatives 4A, 2D, and 5A

25.3.4.1 No Action Alternative Early Long-Term

The effects of the No Action Alternative (ELT) as considered for the purposes of Alternatives 4A, 2D, and 5A would be expected to be similar to those effects described for the No Action Alternative Late Long-Term (LLT) in Section 25.3.3.1.

New water supply facilities would be constructed under the No Action Alternative (ELT) as listed in Table 25-10; therefore, there could be a disruption to existing sources of methylmercury associated with this type of construction. Water supply operations under the No Action Alternative (ELT) likely would not involve the operation of solids lagoons or sedimentation basins; therefore, there would be no increase in the public's risk of exposure to vector-borne diseases. Under the No Action Alternative (ELT), there would be a change in various source waters throughout the Delta (i.e., upstream water, Bay water, agricultural return flow), due to potential changes in inflows, particularly from the Sacramento River watershed because of increased water demands or changes to climate and precipitation levels. Water supply operations under the No Action Alternative (ELT) would continue to use the existing source(s) of drinking water from the study area. These sources generally meet regulatory standards for most constituents. However, under the No Action Alternative (ELT), existing exceedances would not increase above baseline conditions (see Chapter 8, *Water Quality*) to levels that adversely affect any beneficial uses or substantially degrade water quality. Furthermore, drinking water from the study area would continue to be treated prior to distribution into the drinking water system.

Any modified reservoir operations under the No Action Alternative (ELT) are not expected to promote *Microcystis* production upstream of the Delta since large reservoirs upstream of the Delta are typically low in nutrient concentrations and phytoplankton outcompete cyanobacteria, including *Microcystis*. As described in Chapter 8, *Water Quality*, hydrodynamic changes due to enhancements to the Yolo Bypass and 8,000 acres of tidal habitat would increase hydraulic residence times in the Delta, which would create conditions conducive to the formation of *Microcystis* blooms. Projected future water temperature changes in the Delta under the No Action Alternative (ELT) indicate that water temperatures would increase due to climate change. These temperature increases could lead to earlier attainment of the water temperature threshold of 19°C required to initiate *Microcystis* bloom formation, and thus earlier occurrences of *Microcystis* blooms in the Delta.

Therefore, the combination of increased water residence times in the Delta, due to assumed restoration activities, and increased water temperatures, due to climate change could result in increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms in the Delta under the No Action Alternative (ELT). As such, impacts on beneficial uses, including drinking water and recreational waters, could occur and public health could be affected. Accordingly, this would be considered an adverse effect.

The No Action Alternative (ELT) may involve the operation of new transmission lines should additional sources of electricity be needed by either the water supply projects or as part of a general plan buildout. It is likely that with population growth projected by various general plans and regional plans would also result in an additional need for electricity and the construction and operation of new transmission lines. Furthermore, as more renewable energy sources such as solar power are developed, new transmission lines will likely be needed to convey power from the renewable energy source to users. Although, it is unknown where new transmission lines would be and if they would be located within close proximity to sensitive receptors (e.g., hospitals, schools, parks), it is likely some of them would be within close proximity to sensitive receptors and present new sources of EMFs. However, the utilities will implement the CPUC design criteria and guidelines regarding EMFs, and CPUC reviews proposals for transmission lines if feasible. Investor-owned utilities are required to obtain a permit from CPUC for construction of certain specified infrastructure (including transmission lines) listed under Public Utilities Code Section 1001 (California Public Utilities Commission 2011). CPUC reviews permit applications under two concurrent processes: (1) an environmental review pursuant to CEQA, and (2) the review of project need and costs pursuant to Public Utilities Code Sections 1001 et seq. and General Order 131-D (CPCN or PTC) (California Public Utilities Commission 2011). Therefore, the No Action Alternative (ELT) is not likely to result in adverse effects on public health with respect to EMFs.

Habitat restoration activities in the study area already approved, such as those associated with the Suisun Marsh Habitat Management, Preservation, and Restoration Plan, could be implemented under the No Action Alternative (ELT) timeframe. These habitat restoration activities would generally be located in areas that are already potential sources of vectors, such as existing channels or agricultural areas. Furthermore, activities would be designed to maximize water exchange and flow, thereby minimize stagnant water and the production of mosquitoes. Finally, all of the restoration activities would occur in consultation with existing MVCDs. Therefore, it is not expected that habitat restoration under the No Action Alternative (ELT) would result in a substantial increase in the public's risk of exposure to vector-borne diseases.

Under the No Action Alternative (ELT), as described in Appendix 3D, *Defining Existing Conditions, No Action Alternative, No Project Alternative, and Cumulative Impact Conditions*, there would be some change in inflows from the Sacramento River due to climate change-related changes in precipitation patterns; therefore, the amount of Delta waters consisting of agricultural return flow would increase slightly. Approximately 5% of the in-Delta agricultural use is livestock, the primary type of agricultural use that generates pathogens. The relatively small increase in the percentage of Delta waters consisting of agricultural return flow is not expected to cause a measureable change in the pathogen concentrations in the Delta waters because livestock is a small percentage of the overall agricultural use and none of the assumed No Action Alternative (ELT) conditions would substantially change the amount of livestock in the study area. Therefore, under the No Action Alternative (ELT), the concentrations of pathogens would remain relatively similar to existing concentrations and recreationists would not experience a substantial increase in exposure.

Construction of habitat restoration projects that are reasonably foreseeable or approved and/or under construction under the No Action Alternative (ELT) would likely temporarily mobilize existing constituents within sediments known to bioaccumulate, such as methylmercury or pesticides. This potential effect is expected in varying degrees depending on the location of restoration projects because the study area is generally known to be out of compliance with methylmercury levels. Construction effects would not be adverse because the mobilization would occur during a limited time and would be localized around the area of construction. Once operational, other habitat restoration projects could result in an increase of methylmercury as a result of biogeochemical processes and sediment conditions established in tidal wetlands. However, it is expected these projects either have, or would evaluate the potential for, methylmercury production and would implement measures to monitor and adaptively manage methylmercury production. For example, the Suisun Marsh Plan EIS/EIR evaluated the potential for methylmercury production due to tidal restoration and determined it would result in less than significant impacts and that monitoring and other measures would be incorporated into the adaptive management plan to manage methylmercury concerns. Therefore, the habitat restoration projects that would occur under the No Action Alternative (ELT) are not likely to adversely affect public health.

***CEQA Conclusion*:** It is expected that implementation of existing plans, or existing and reasonably foreseeable habitat restoration projects, would not result in a substantial increase in the public's risk of exposure to vector-borne diseases because of the location of existing vector habitat, restoration design, and consultation with MVCDs. This is because habitat restoration would be located in areas that are already potential sources of vectors, such as existing channels or agricultural areas. Furthermore, activities would be designed to maximize water exchange and flow, thereby minimizing stagnant water and the production of mosquitoes. Finally, all of the restoration activities would occur in consultation with existing MVCDs. Therefore, it is not expected that habitat restoration under the No Action Alternative (ELT) would result in a substantial increase in the public's risk of exposure to vector-borne diseases. As such, this impact is less than significant.

Construction impacts associated with No Action Alternative (ELT) habitat restoration projects would be less than significant because the mobilization of existing sediment-bound contaminants (e.g., methylmercury) would occur during a limited time and would be localized around the area of construction. Once operational, other habitat restoration projects could result in an increase of methylmercury as a result of biogeochemical processes and sediment conditions established in tidal wetlands. However, it is expected these projects either have, or would evaluate the potential for, methylmercury production and would implement measures to monitor and adaptively manage methylmercury production.

Water supply operations under the No Action Alternative (ELT) would continue to use the existing source(s) of drinking water from the study area. These sources generally meet regulatory standards for most constituents or experience some exceedances for constituents such as arsenic (see Chapter 8, *Water Quality*). Under the No Action Alternative (ELT), existing exceedances would not increase above baseline conditions and, therefore, this impact would be less than significant.

It is unknown where new transmission lines would be in the ELT period and whether they would be located in close proximity to sensitive receptors (e.g., hospitals, schools, parks); however, it is likely some of them would be within close proximity to sensitive receptors and present new sources of EMFs. Utilities will implement the CPUC design criteria and guidelines regarding EMFs, and CPUC reviews proposals for transmission lines if feasible. Accordingly, this impact would be less than significant

Because it is possible that under the No Action Alternative (ELT) increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms in the Delta would occur due to increased water temperatures associated with climate change, as well as increased water residence times related to restoration activities, long-term water quality degradation may occur in the Delta and water exported from the Delta to the SWP/CVP Export Service Areas. Thus, impacts on beneficial uses could occur, and therefore this impact would be significant.

25.3.4.2 Alternative 4A—Dual Conveyance with Modified Pipeline/Tunnel and Intakes 2, 3, and 5 (9,000 cfs; Operational Scenario H)

Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of the Water Conveyance Facilities

NEPA Effects: The potential for Alternative 4A construction and operation to increase vector-borne diseases would be the same as described for Alternative 4 because all aspects of the water conveyance facility design, construction, and operation (excluding water supply operations) and maintenance of Alt 4A would be identical to Alt 4. Although the proposed conveyance facilities will increase surface water within the study area at the intakes, intermediate forebay, and Clifton Court Forebay, it is unlikely that these water bodies would provide suitable breeding habitat for mosquitoes given that the water in these forebays would not be stagnant and would generally be too deep to support substantial mosquito habitat. Shallow edges of the forebays could provide some suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. However, as part of the regular maintenance of these forebay areas, floating vegetation such as pond weed would be harvested to maintain flow and forebay capacity. To further minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County

MVCDs and prepare and implement MMPs, as necessary, to control mosquitoes and reduce the likelihood that construction and operation of the water conveyance facilities would require an increase in mosquito abatement activities by the local MVCDs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMP activities would be consistent with the CDPH's *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). Accordingly, Alternative 4A would not substantially increase suitable vector habitat, and would not substantially increase vector-borne diseases. No adverse effects on public health would result because conditions for mosquito breeding at conveyance facilities would be minimized and standard practices to control mosquitos would be implemented.

CEQA Conclusion: The potential for construction and operation of conveyance facilities under Alternative 4A to result in an increase in exposure of people to vector-borne diseases would be identical to the impacts described for Alternative 4. Alternative 4A conveyance facilities that could create new water bodies at the intakes, intermediate forebay, and Clifton Court Forebay have the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes) because of the large volumes of water that would be held within these areas. However, during operations, the depth, design, and operation of conveyance facilities would prevent the development of suitable mosquito habitat. Specifically, the water bodies would be too deep and the constant movement of water would prevent mosquitoes from breeding and multiplying. To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes during construction and operation of the sedimentation basins, solids lagoons, the expanded Clifton Court Forebay, the intermediate forebay, and the intermediate forebay inundation area. These BMPs would be consistent with practices presented in *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). Therefore, construction and operation of Alternative 4 would not result in a substantial increase in vector-borne diseases. This impact is considered to be less than significant because conditions for mosquito breeding at conveyance facilities would be minimized and standard practices to control mosquitos would be implemented. No mitigation is required.

Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That There is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance Facilities

As described in Chapter 8, *Water Quality*, water quality changes described for Alternative 4A are most notably affected by the extent of habitat restoration to be implemented. As described Chapter 3, *Description of Alternatives*, Alternative 4A does not include the full suite of conservation actions included in Alternative 4. Environmental Commitment 4 under Alternative 4A would restore approximately 295 acres of tidal wetlands, as opposed to the 65,000 acres contemplated under CM4 under Alternative 4. The modeling of Alternative 4A and the No Action Alternative (ELT) included Yolo Bypass Improvements, but no tidal habitat restoration. Therefore, comparison of modeling results for Alternative 4A to No Action Alternative (ELT) results allows for isolating and identifying effects solely due to implementation of Alternative 4A in the ELT.

Modeling for Alternative 4A was conducted for Operational Scenario H3+, a point that generally falls between Scenario H3 and H4 operations, as the initial conveyance facilities operational scenario. As specified in Chapter 3, *Description of Alternatives*, Section 3.6.4, the Delta outflow criteria under Scenario H for Alternative 4A would be determined by the ESA and California Endangered Species

Act Section 2081 permits, and operations to obtain such outflow would likely be between Scenarios H3 and H4. Modeling results for Scenarios H3 and H4 using the 2010 CALSIM II model are shown in Appendix 5E, *Supplemental Modeling Requested by the State Water Resources Control Board Related to Increased Delta Outflows*, Attachment 1. In addition, following the initial operations, the adaptive management and monitoring program could be used to make long-term changes in initial operations criteria to address uncertainties about spring outflow for longfin smelt and fall outflow for delta smelt, among other species.

Future conveyance facilities operational changes may also be made as a result of adaptive management to respond to advances in science and understanding on how operations affect species. Conveyance facilities would be operated under an adaptive management range represented by Boundary 1 and Boundary 2 (see Section 5E.2 of Appendix 5E for additional information on Boundary 1 and Boundary 2). Impacts as a result of operations within this range would be consistent with the impacts discussed for the range of alternatives considered in this EIR/EIS. As shown in Appendix 5F, water supply modeling results for H3+ are within the range of results for Scenarios H3 and H4, and are consistent with the impacts discussed in the RDEIR/SDEIS. The following analysis of Alternative 4A impacts reflects modeling results of Operational Scenario H3+.

NEPA Effects:

Disinfection Byproducts

The effects on long-term average DOC concentrations in the Delta under Alternative 4A would be similar to Alternative 4.

The geographic extent of effects related to long-term average DOC concentrations within Delta waters would be similar to that described for Alternative 4 but the magnitude of predicted change and relative frequency of concentration exceedances would be lower. Relative to the No Action Alternative (ELT), operations and maintenance of the water conveyance facilities under Alternative 4A would result in small increases (up to 0.2 mg/L) in long-term average DOC concentrations for the modeled 16-year period and drought period at the South Fork Mokelumne River at Staten Island, Franks Tract, Old River at Rock Slough, and Contra Costa Pumping Plant #1. The increases in average DOC concentrations would correspond to more frequent concentration threshold exceedances, with the greatest change occurring at Contra Costa Pumping Plant #1. The change in frequency of threshold concentration exceedances at other assessment locations would be similar or lower. In general, a substantial change in ambient DOC concentrations would need to occur before significant changes in drinking water treatment plant design or operations are triggered. The increases in long-term average DOC concentrations estimated to occur at various Delta locations under Alternative 4A are of sufficiently small magnitude that they would not require existing drinking water treatment plants to substantially upgrade treatment for DOC removal above levels currently employed.

In the LLT, the Delta source water fractions may be different from those occurring in the ELT due to changes in upstream hydrology and Delta hydrodynamics from climate change and sea level rise. These effects would occur regardless of the implementation of Alternative 4A. Therefore, in the LLT, the effects of the alternative on DOC are expected to be similar to those described above. In addition, modeling results for Alternative 4A indicate that there would be predicted improvements in long-term average DOC concentrations at Barker Slough relative to the No Action Alternative (ELT and LLT) (see Chapter 8, *Water Quality*). Therefore, changes in DOC concentrations in the Delta resulting from operation of the water conveyance facilities under Alternative 4A are not anticipated to contribute to increases in disinfection byproducts (DBPs).

As described in Chapter 8, *Water Quality*, operations and maintenance of the water conveyance facilities under Alternative 4A, relative to the No Action Alternative (ELT), would result in an increased frequency of exceedance of the 50 μg/L and 100 μg/L bromide thresholds for protecting against the formation of disinfection byproducts in treated drinking water. At the South Fork Mokelumne River at Staten Island, Franks Tract, San Joaquin River at Antioch, and Sacramento River at Emmaton there would be small increases (1 – 5% in non-drought years) in exceedances of the 50 μg/L threshold. The greatest increase in frequency of exceedance of the 50 μg/L threshold would occur in the North Bay Aqueduct at Barker Slough, as described in Chapter 8. The 100 μg/L bromide threshold would be exceeded at South Fork Mokelumne River at Staten Island, Franks Tract, San Joaquin River at Antioch, Sacramento River at Mallard Island, Old River at Rock Slough, and at the Contra Costa Pumping Plant #1 (Appendix 8E, *Bromide*, Table 22) by by 2% or less. The greatest increase in frequency of exceedance of 100 μg/L would occur at Sacramento River at Mallard Island and Franks Tract.

Long-term average bromide concentrations in the San Joaquin River at Buckley Cove and the North Bay Aqueduct at Barker Slough would increase under Alternative 4A, although the increases would be relatively small (<1%).

The magnitude of bromide concentration increases at Mallard Slough and in the San Joaquin River at Antioch during their historical months of use, relative to the No Action Alternative (ELT) would be generally similar to those described for Alternative 4 (Appendix 8E, *Bromide*, Table 25), and the frequency of exceedance of bromide thresholds would be similar (Appendix 8E, *Bromide*, Table 22). As described for Alternative 4, the use of seasonal intakes at these locations is largely driven by acceptable water quality, and thus has historically been opportunistic. Opportunity to use these intakes would remain, and the predicted increases in bromide concentrations at Antioch and Mallard Slough would not be expected to adversely affect MUN beneficial uses, or any other beneficial use, at these locations.

Thus, these increased bromide concentrations are not expected to result in adverse effects to MUN beneficial uses, or any other beneficial use, at these locations, and are not anticipated to contribute to increases in DBPs.

Trace Metals

The changes in modeled trace metal concentrations of primarily human health and drinking water concern (arsenic, iron, manganese) in the Delta would be similar to those described for Alternative 4 (see Chapter 8, *Water Quality,* Section 8.3.3.9).

The arsenic criterion was established to protect human health from the effects of long-term chronic exposure, while secondary MCLs for iron and manganese were established as reasonable federal regulatory goals for drinking water quality, and enforceable standards in California. Average concentrations for arsenic, iron, and manganese in the primary source water (Sacramento River, San Joaquin River, and the bay at Martinez) are below these criteria. No mixing of these three source waters could result in a metal concentration greater than the highest source water concentration, and, given that the modeled average water concentrations for arsenic, iron, and manganese do not exceed water quality criteria, more frequent exceedances of drinking water criteria in the Delta would not be an expected result under this alternative. Accordingly, no adverse effect on public health related to the trace metals arsenic, iron, or manganese from drinking water sources is anticipated.

Pesticides

The changes in modeled pesticide concentrations in the Delta under Alternative 4A would be similar to those described for Alternative 4 because the changes in average winter and summer flow rates relative to the No Action Alternative (ELT and LLT) are expected to be similar to or less than changes in flow rates under Alternative 4 in the Sacramento River at Freeport, American River at Nimbus, Feather River at Thermalito and the San Joaquin River at Vernalis. The modeled changes in the source water fractions of Sacramento River, San Joaquin River, and Delta agriculture water under Alternative 4A would not be of sufficient magnitude to substantially affect beneficial uses of the Delta. Based on the general observation that San Joaquin River, in comparison to the Sacramento River, is a greater contributor of organophosphate insecticides in terms of greater frequency of incidence and presence at concentrations exceeding water quality benchmarks, modeled increases in Sacramento River fraction at Banks and Jones would generally represent an improvement in export water quality respective to pesticides. Similarly, the flow changes in the LLT under Alternative 4A would not be expected to result in effects on beneficial uses of water in the Delta due to pesticides.

Therefore, it is not anticipated that there would be adverse effects on public health related to pesticides from drinking water sources.

Because there would be no increases in DBPs due to increases in bromide or DOC in Delta surface waters, and because the modeled changes in pesticide concentrations would not increase substantially in magnitude or frequency in the Delta, there would be no adverse effect on public health as a result of operation of the water conveyance facilities.

CEQA Conclusion: Under Alternative 4A, modeled long-term average pesticide levels in the Delta would be similar to or slightly less that described under Alternative 4 and would not be expected to increase substantially such that beneficial use impairments are made measurably worse. Average concentrations of trace metals in the Delta are not expected to increase substantially under Alternative 4A in the primary source water.

There would be an increased frequency of exceedance of the 50 µg/L and 100 µg/L bromide thresholds for protecting against the formation of disinfection byproducts in treated drinking water. Exceedances of the 50 µg/L threshold would occur at South Fork Mokelumne River at Staten Island, Franks Tract, Old River at Rock Slough, Sacramento River at Emmaton, San Joaquin River at Antioch, and Sacramento River at Mallard Island. The greatest increase in frequency of exceedance of the CALFED Drinking Water Program long-term goal of 50 µg/L would occur in the S. Fork Mokelumne River (7% increase) and Sacramento River at Emmaton (4% increase). As described for Alternative 4, the use of seasonal intakes at Mallard Slough and in the San Joaquin River at Antioch is largely driven by acceptable water quality, and thus has historically been opportunistic. Opportunity to use these intakes would remain, and the predicted increases in bromide concentrations at Antioch and Mallard Slough would not be expected to adversely affect MUN beneficial uses, or any other beneficial use, at these locations. South Fork Mokelumne River at Staten Island, Franks Tract, Old River at Rock Slough, Sacramento River at Emmaton, San Joaquin River at Antioch, Sacramento River at Mallard Island, and the Contra Costa Pumping Plant #1 would have an increased frequency of exceedance of 100 µg/L, which is the concentration believed to be sufficient to meet currently established drinking water criteria for disinfection byproducts (Appendix 8E, *Bromide*, Table 22).

The greatest increase in frequency of exceedance of 100 µg/L would occur at Sacramento River at Emmaton (5% increase) and San Joaquin River at Antioch and Franks Tract (4% increase).

The long-term average bromide concentration relative to Existing Conditions would increase in the South Fork Mokelumne River at Staten Island and decrease at all other assessment locations.

Therefore, Alternative 4A would not cause exceedance of applicable state or federal numeric or narrative water quality objectives/criteria because none exist for bromide. Alternative 4A would not result in any substantial change in long-term average bromide concentration or exceed 50 and 100 µg/L assessment threshold concentrations by frequency, magnitude, and geographic extent that would result in adverse effects on any beneficial uses within affected water bodies. Accordingly, any increases in bromide would not be expected to contribute substantially to DBP formation.

Relative to Existing Conditions, operations and maintenance activities under Alternative 4A would not cause a substantial long-term change in DOC concentrations in the Delta, although there would be relatively small increases in long-term average DOC concentrations at South Fork Mokelumne River at Staten Island, Franks Tract, Old River at Rock Slough, and Contra Costa Pumping Plant #1 (Appendix 8K, *Organic Carbon*, Table DOC-11). The increases in average DOC concentrations would correspond to more frequent concentration threshold exceedances, with the greatest change occurring at the Contra Costa Pumping Plant #1 location for the modeled 16-year period). However, the increases are of sufficiently small magnitude that they would not require existing drinking water treatment plants to substantially upgrade treatment for DOC above levels currently employed, and therefore these increases would not be expected to contribute substantially to DBP formation. Further, there would be predicted improvements in long-term average DOC concentrations at Barker Slough relative to Existing Conditions.

Because there would be no increases in DBPs due to increases in bromide or DOC in Delta surface waters, and because the modeled changes in trace metals and pesticide concentrations would not increase substantially in magnitude or frequency in the Delta, there would be no significant impact on public health as a result of operation of the water conveyance facilities.

Impact PH-3: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Construction, Operation or Maintenance of the Water Conveyance Facilities

NEPA Effects: As described in Chapter 8, *Water Quality*, modeling scenarios included assumptions regarding how certain habitat restoration activities (CM2 and CM4) would affect Delta hydrodynamics. The amount of tidal habitat restoration completed under Alternative 4A (Environmental Commitment 4) would be substantially less than under Alternative 4 CM4. To the extent that restoration actions alter hydrodynamics within the Delta region, which affects mixing of source waters, these effects are included in this assessment of operations-related water quality changes due to operation of the water conveyance facilities.

Three intakes would be constructed and operated under Alternative 4A. Sediment-disturbing activities during construction and maintenance of these intakes and other water conveyance facilities proposed near or in surface waters under this alternative could result in the disturbance of existing constituents in sediment, such as pesticides or methylmercury. In-channel construction activities, such as pile driving during the construction of cofferdams at the intakes and pier construction at the barge unloading facilities, which would occur over a period of 5 months, would result in the localized disturbance of river sediment. In addition, maintenance of the three proposed north Delta intakes and the intermediate forebay would entail periodic dredging for sediment removal at these locations. Sediment accumulation in both the northern and southern portion of the expanded Clifton Court Forebay is expected to be minimal in the ELT period as the need for dredging is anticipated to be every 50 years given the design. However, it is anticipated that there may be some sediment accumulation at the inlet structure of the northern portion of Clifton Court Forebay. Therefore, while overall sediment accumulation in this forebay is not expected to be substantial, some dredging may be required at the inlet structure to maintain an even flow path.

Pesticides

Legacy pesticides, such as organochlorines, have low water solubility; they do not readily volatilize and have a tendency to bond to particulates (e.g., soil and sediment), settle out into the sediment, and not be transported far from the source. If present in sediment within in-water construction areas, legacy pesticides would be disturbed locally and would not be expected to partition into the water column to any substantial degree. Therefore, no significant adverse effect on public health would result from construction.

Numerous pesticides are currently used throughout the affected environment. While some of these pesticides may be bioaccumulative, those present-use pesticides for which there is sufficient evidence of their presence in waters affected by SWP and CVP operations (i.e., organophosphate pesticides, such as diazinon, chlorpyrifos, diuron, and pyrethroids) are not considered bioaccumulative. Thus, changes in their concentrations would not directly cause bioaccumulative problems in aquatic life or humans. The effects of Alternative 4A on pesticide levels in surface Delta surface water relative to Existing Conditions and the No Action Alternative (ELT and LLT) would be similar to or slightly less than those described for the Alternative 4. Alternative 4A would not result in increased tributary flows that would mobilize organochlorine pesticides in sediments. Thus, the change in source water in the Delta associated with the change in water supply operations is not expected to adversely affect public health with respect to bioaccumulation of pesticides.

Methylmercury

If mercury is sequestered in sediments at water facility construction sites, it could become suspended in the water column during construction activities, opening up a new pathway into the food chain. Construction activities (e.g., pile driving and cofferdam installation) at intake sites or barge landing locations would result in a localized, short-term resuspension of sediment and an increase in turbidity that may contain elemental or methylated forms of mercury. Please see Chapter 8, Section 8.1.3.9, *Mercury*, for a discussion of methylmercury concentrations in sediments.

Changes in methylmercury concentrations under Alternative 4A are expected to be small. The greatest annual average methylmercury concentration for drought conditions would be 0.166 ng/L for the San Joaquin River at Buckley Cove, which was slightly lower than the No Action Alternative (ELT) (0.168 ng/L). All methylmercury concentrations in water were estimated to exceed the TMDL guidance objective of 0.06 ng/L under Existing Conditions and, therefore, no assimilative capacity exists.

Fish tissue estimates show small or no increases in mercury concentrations under Alternative 4A relative to the No Action Alternative (ELT) based on long-term annual average concentrations for mercury (Appendix 8I, *Mercury*, Tables I-20a and I-20b). As indicated in Chapter 8, *Water Quality*, in the LLT, the Delta source water fractions may be different from those occurring in the ELT due to changes in upstream hydrology and Delta hydrodynamics from additional climate change and sea level rise. These effects would occur independent of the alternative and, thus, the alternative-specific effects on mercury in the LLT are expected to be similar to those described above.

Because any changes in methylmercury concentrations in water and fish tissue under Alternative 4A would not be substantially different from the No Action Alternative (ELT and LLT), there would be no adverse effect on public health related to mercury.

In summary, operation of the water conveyance facilities under Alternative 4A would not alter bioaccumulative pesticide concentrations or mercury concentrations in the Delta such that there was an effect on public health. As such, there would be no adverse effect.

CEQA Conclusion: Operation of the water conveyance facilities under Alternative 4A is not expected to cause additional exceedance of applicable water quality objectives/criteria by frequency, magnitude, and geographic extent that would cause adverse effects on any beneficial uses of waters in the affected environment. Methylmercury concentrations exceed criteria at all locations in the Delta and no assimilative capacity exists. However, monthly average waterborne concentrations of methylmercury, over the period of record under Alternative 4A would be very similar to Existing Conditions. Similarly, estimates of fish tissue mercury concentrations show small differences would occur among sites for Alternative 4A as compared to Existing Conditions for Delta locations modeled (see Chapter 8, *Water Quality*). Because any changes in methylmercury concentrations are not likely to be measurable, changes in mercury concentrations or fish tissue mercury concentrations would not make any existing mercury-related impairment measurably worse.

The effects of Alternative 4A on bioaccumulative pesticide levels in the Delta would be similar to or slightly less than those described for the Alternative 4. Alternative 4A would not result in increased tributary flows that would mobilize organochlorine pesticides in sediments. Thus, the change in source water in the Delta associated with the change in water supply operations is not expected to adversely affect public health with respect to bioaccumulation of pesticides. If present in sediment within in-water construction areas, legacy pesticides would be disturbed locally and would not be expected to partition into the water column to any substantial degree.

For these reasons, there would be no significant impact on public health due to mercury or bioaccumulative pesticides as a result of construction of or operation of the water conveyance facilities under Alternative 4A.

Impact PH-4: Expose Substantially More People to Transmission Lines Generating New Sources of EMFs as a Result of the Construction and Operation of the Water Conveyance Facilities

NEPA Effects: The potential for Alternative 4A transmission line construction and operation to expose people to new sources of EMFs would be identical to impacts described under Alternative 4. As described in Table 25-9, a total of 6.08 miles of new temporary 69 kV transmission lines; 14.96 miles of new permanent 230 kV transmission lines; 18.72 miles of new temporary 230 kV transmission lines; 1.00 mile of new permanent 230 kV/34.5 kV (underbuild) transmission lines; 11.28 miles of new permanent 230 kV/34.5 kV (underbuild) transmission lines; and the relocation of 1.19 miles of existing 500 kV transmission line would be required for this alternative. Four potential new sensitive receptors (Stone Lakes National Wildlife Refuge, Courtland Fire Station 92, Cosumnes River Ecological Reserve, and Clifton Court Forebay) associated with the pipeline/tunnel alignment that are not currently within 300 feet of an existing transmission line; the majority of sensitive receptors are already located within 300 feet of an existing 69 kV or 230 kV transmission line. Accordingly, new temporary or new permanent transmission lines would not expose substantially more potential sensitive receptors or substantially more people to EMFs than they are not already experiencing. Stone Lakes National Wildlife Refuge and Cosumnes River Ecological Reserve would be within 300 feet of a proposed temporary 230 kV transmission line and Clifton Court Forebay would be within 300 feet of a proposed permanent 230 kV transmission line and a 230 kV/34.5 kV (underbuild) transmission line. Visitors to these areas generally come for walks, water recreation, fishing and hunting, and as such, it is unlikely that large groups of people would be staying in the area within 300 feet of this proposed transmission line, so any EMF exposure would be limited. Courtland Fire Station 92 would be within 300 feet of a temporary 69 kV transmission line. These temporary transmission lines would be removed following completion of construction of the water conveyance facility features near this area so there would be no potential permanent effects. CPUC's EMF design guidelines would be implemented for any new temporary or new permanent transmission lines constructed and operated under Alternative 4A.

CEQA Conclusion: The potential for Alternative 4A transmission line construction and operation to expose people to new sources of EMFs would be identical to impacts described under Alternative 4. Under Alternative 4A, the majority of proposed new temporary (69 kV and 230 kV) and new permanent (230 kV and 230 kV/34.5 kV) transmission lines, and the permanent relocation of an existing 500 kV transmission line would be located within the rights-of-way of existing transmission lines; any new temporary or permanent transmission lines not within the right-of-way of existing transmission lines would, for the most part, be located in sparsely populated areas generally away from existing sensitive receptors. Four potential new sensitive receptors (Stone Lakes National Wildlife Refuge, Courtland Fire Station 92, Cosumnes River Ecological Reserve, and Clifton Court Forebay) associated with the pipeline/tunnel alignment that are not currently within 300 feet of an existing transmission line; the majority of sensitive receptors are already located within 300 feet of an existing 69 kV or 230 kV transmission line. Accordingly, new temporary or new permanent transmission lines would not expose substantially more potential sensitive receptors or substantially more people to EMFs that they are not already experiencing. Stone Lakes National Wildlife Refuge and Cosumnes River Ecological Reserve would be within 300 feet of a proposed temporary 230 kV transmission line and Clifton Court Forebay would be within 300 feet of a proposed permanent 230 kV transmission line and a 230 kV/34.5 kV (underbuild) transmission line. Visitors to these areas generally come for walks, water recreation, and hunting, and as such, it is unlikely that large groups of people would be staying in the area within 300 feet of this proposed transmission line, so any EMF exposure would be limited. Courtland Fire Station 92 would be within 300 feet of a temporary 69 kV transmission line. These temporary transmission lines would be removed following completion of construction of the water conveyance facility features near this area so there would be no potential permanent effects. The temporary transmission lines would be removed when construction of the water conveyance facility features is completed, so there would be no potential permanent effects. Therefore, these transmission lines would not substantially increase people's exposure to EMFs. This impact is considered to be less than significant because transmission lines would generally not be located in populated areas or within 300 feet of sensitive receptors and CPUC's EMF design guidelines would be implemented for any new temporary or permanent transmission lines constructed and operated under Alternative 4A. No mitigation is required.

Impact PH-5: Increase in Vector-Borne Diseases as a Result of Implementing Environmental Commitments 3, 4, 7-10

Effects of Alternative 4A related to the potential for increase in vector-borne diseases from implementing these Environmental Commitments would be similar to those described for Alternative 4. However, as described in Chapter 3, *Description of Alternatives*, Alternative 4A would restore up to 15,836 acres of habitat under Environmental Commitments 3, 4, and 7–10 as compared with approximately 83,800 acres under Alternative 4. Conservation Measures 2 and 5 would not be implemented as part of this alternative. Therefore, the potential for vector-borne disease effects under Alternative 4A would likely be substantially less than the potential associated with Alternative 4.

NEPA Effects: Implementation of portions of Environmental Commitments 3, 4, and 7-10 under Alternative 4A would involve protecting and restoring aquatic habitat that could potentially increase suitable mosquito habitat within the study area. This potential effect would not be adverse because the total acreage of aquatic habitat restored under Alternative 4A would be substantially less than under Alternative 4, habitat creation would generally not be located near densely populated areas, and management plans under Environmental Commitment 11, *Natural Communities Enhancement and Management*, would be performed in consultation with the appropriate MVCDs to ensure MMPs are implemented to reduce mosquito breeding. Additionally, BMPs from the guidelines outlined in Appendix 3B, *Environmental Commitments, AMMs, and CMs*, would be incorporated into Alternative 4A and executed to maintain proper water circulation and flooding during appropriate times of the year (e.g., fall) to prevent stagnant water and habitat for mosquitoes. This consultation would occur when specific restoration and enhancement projects and locations are identified.

CEQA Conclusion: The potential for impacts related to increases of vector-borne disease from mosquitos during construction, operation, and maintenance of portions of Environmental Commitment 3, 4, and 7–10 is considered less than significant because the total acreage of aquatic habitat restored under Alternative 4A would be substantially less than under Alternative 4, habitat creation would generally not be located near densely populated areas, and management plans under Environmental Commitment 11 *Natural Communities Enhancement and Management*, would be performed in consultation with the appropriate MVCDs to ensure MMPs are implemented to reduce mosquito breeding. Additionally, BMPs from the guidelines outlined in Appendix 3B, *Environmental Commitments, AMMs, and CMs*, would be incorporated into Alternative 4A and executed to maintain proper water circulation and flooding during appropriate times of the year (e.g., fall) to prevent stagnant water and habitat for mosquitoes. No mitigation is required.

Impact PH-6: Substantial Increase in Recreationists' Exposure to Pathogens as a Result of Implementing the Restoration Environmental Commitments

Effects of Alternative 4A related to the potential for increase in recreationists' exposure to pathogens from implementing portions of the habitat restoration Environmental Commitments would be similar to those described for Alternative 4. However, as described in Chapter 3, *Description of Alternatives*, Alternative 4A would restore up to 15,836 acres of habitat under Environmental Commitments 3, 4, and 7–10 as compared with 83,800 acres under Alternative 4. Conservation Measures 2 and 5 would not be implemented as part of this alternative. Therefore, the potential for exposure of recreationists to pathogens under Alternative 4A would likely be substantially less than the potential associated with Alternative 4.

NEPA Effects: The study area currently supports habitat types, such as tidal habitat, upland wetlands, and agricultural lands that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). The study area, with the exception of the CWA Section 303(d) listing for the Stockton Deep Water Ship Channel, does not currently have pathogen concentrations that rise to the level of adversely affecting beneficial uses of recreation. Specific locations of restoration areas for this alternative have not yet been established. However, most low-lying land suitable for restoration is unsuitable for livestock. Therefore, it is likely that the majority of land to be converted to wetlands would be crop-based agriculture or fallow/idle land. However, as described for Alternative 4, any potential increase in pathogens associated with the proposed habitat restoration and enhancement would be localized and within the vicinity of the actual restoration. This localized increase is not expected to be of sufficient magnitude and duration to result in adverse effects on recreationists because these areas would generally not support livestock and most areas would not have public access.

CEQA Conclusion: The potential for an increase in recreationists' exposure to pathogens under Alternative 4A is considered less than significant because of the reduced amount of restored habitat conducive to pathogens that would be implemented under this alternative compared to Alternative 4 and the localized nature of pathogens (i.e., pathogen concentrations are greatly influenced by proximity to the source), and because the rapid die-off of some types of pathogens in water would not create sufficient magnitudes of pathogen generation that could affect recreational beneficial uses. No mitigation is required.

Impact PH-7: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Implementing Environmental Commitments 3, 4, and 10

Effects of Alternative 4A related to the potential to mobilize contaminants known to bioaccumulate (pesticides and methylmercury) from implementing portions of the restoration Environmental Commitments would be similar to those described for Alternative 4. However, as described in Chapter 3, *Description of Alternatives*, Alternative 4A would restore up to 14,467 acres of habitat under Environmental Commitments 3, 4 and 10 as compared with 66,200 acres under Alternative 4 (CM4 and CM10). Therefore, the potential for mobilization of contaminants under Alternative 4A would likely be substantially less than the potential associated with Alternative 4.

NEPA Effects: The primary concern with habitat restoration regarding constituents known to bioaccumulate is the potential for mobilizing contaminants sequestered in sediments of the newly inundated floodplains and marshes. The mobilization depends on the presence of the constituent and the biogeochemical behavior of the constituent to determine whether it could re-enter the water column or be reintroduced into the food chain. Habitat restoration under Alternative 4A may occur on lands in the Delta formerly used for irrigated agriculture. The proposed habitat restoration has the potential to increase water residence times and increase accumulation of organic sediments that are known to enhance methylmercury bioaccumulation in biota in the vicinity of the restored habitat areas. Environmental Commitment 12, which requires development of site-specific mercury management plans as restoration actions are implemented, would guide the design of restoration sites. This potential effect would not be adverse because the total tidal and nontidal habitat restoration acreage implemented under Alternative 4A would be substantially less than under Alternative 4; bioaccumulation of pesticides and/or methylmercury in the tidal and nontidal restoration areas are not expected to substantially affect public health because of the limited extent of restored habitat under Alternative 4A; the localized nature of pesticide bioaccumulation; and because current OEHHA standards would continue to be implemented for the consumption of study area fish and thus would serve to protect people against the overconsumption of fish with increased body burdens of mercury. Environmental Commitment 12, *Methylmercury Management*, would be implemented to reduce methylmercury production in restored habitats.

CEQA Conclusion: Although the potential for public health impacts related to mobilization of pesticides and methylmercury would be lower than under Alternative 4 because there would be fewer acres of habitat restored under Alternative 4A, relative to Existing Conditions, due to the small amount of tidal restoration areas proposed, in the Delta uptake of mercury from water and/or methylation of inorganic mercury may increase in localized areas as part of the creation of new, marshy, shallow, or organic-rich restoration areas. Water-borne mercury or methylmercury that could occur in some areas in the Delta could bioaccumulate to somewhat greater levels in aquatic organisms and would, in turn, pose potential health risks. However, design of restoration sites would be guided by Environmental Commitment 12, *Methylmercury Management,* which would require development of site-specific mercury management plans for implementation of restoration. Additionally, existing OEHHA standards would serve to reduce the public's exposure to contaminated fish.The potential for public health impacts related to mobilization of pesticides and methylmercury in habitat restoration areas related to Environmental Commitments 4 and 10 is considered less than significant because the total wetland restoration acreage implemented under Alternative 4A would be substantially less than under Alternative 4.Bioaccumulation of pesticides and/or methylmercury in the tidal and nontidal restoration areas are not expected to substantially affect public health because of the limited extent of restored habitat under Alternative 4A; the localized nature of pesticide bioaccumulation; and because current OEHHA standards would be enforced. Environmental Commitment 12, *Methylmercury Management*, would be implemented to reduce methylmercury production in restored habitats. No mitigation is required.

Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water Conveyance Facilities

NEPA Effects: Any modified reservoir operations under Alternative 4A are not expected to promote *Microcystis* production upstream of the Delta relative to the No Action Alternative (ELT and LLT) since large reservoirs upstream of the Delta are typically low in nutrient concentrations and phytoplankton outcompete cyanobacteria, including *Microcystis*. Further, in the rivers and streams of the Sacramento River watershed, watersheds of the eastern tributaries (Cosumnes, Mokelumne, and Calaveras Rivers), and the San Joaquin River upstream of the Delta, bloom development would be limited by high water velocity and low hydraulic residence times. These conditions would not be expected to change under Alternative 4A relative to the No Action Alternative (ELT and LLT)

Conditions in the Export Service Areas with implementation of water supply operations under Alternative 4A are not expected to become more conducive to *Microcystis* bloom formation relative to the No Action Alternative (ELT and LLT) because the fraction of water flowing through the Delta that would reach the existing south Delta intakes is not expected to be adversely affected by *Microcystis* blooms*.*

Under Alternative 4A, a portion of the Sacramento River water which would be conveyed through the Delta to the south Delta intakes under the No Action Alternative (ELT and LLT) would be replaced at various locations throughout the Delta by other source water due to diversion of Sacramento River water at the north Delta intake. The change in flow paths of water through the Delta that would occur due to facilities operations and maintenance of Alternative 4A could result in localized increases in residence time in various Delta sub-regions, and decreases in residence time in other areas. As indicated in Chapter 8, *Water Quality*, in addition to the effects of operations and maintenance of Alternative 4A, increases in water residence times are expected occur due to separate factors and actions concurrent with the alternative, including habitat restoration (8,000 acres of tidal habitat and enhancements to the Yolo Bypass) and sea level rise due to climate change.

Residence times in 19 Delta sub-regions during the *Microcystis* bloom season of July through October was modeled for the Biological Assessment for the California WaterFix (ICF 2016). The Proposed Action modeled in the Biological Assessment is Alternative 4A. Modeling results show varying levels of change in residence time, depending on sub-region, month and water year type (Tables 6.6-5 through 6.6-25 [ICF 2016]). The largest increases in residence time were modeled for the sub-regions of Mildred Island, Holland Cut, Rock Slough and Discovery Bay, Old River, Middle River and Victoria Canal, located in the south Delta and the middle to upper portions of the west/central Delta. Depending on month (July through October) and water year type, modeled residence times at some locations indicated substantial residence time changes could occur compared to the No Action Alternative (ELT). As explained in Chapter 8, the changes in residence time are driven by a number of factors accounted for in the modeling, including diversion of Sacramento River water at the proposed north Delta intake facilities, which does not account for the flexibility of operations of the north and south Delta intakes or real-time management of reservoir releases.

Water flow through Delta channels would be managed through real-time operations to ensure project operations do not create increased *Microcystis* blooms in the Delta. The north and south Delta intakes would be operated with increased reliance on the south Delta pumps when Delta channels exhibit conditions favorable to the formation of *Microcystis* blooms. By operating the south Delta pumps more frequently during periods conducive to increased *Microcystis* blooms, residence times would be substantially reduced from those modeled for Alternative 4A. Reducing residence times would decrease the potential for blooms to develop, and thus decrease potential microcystin increases due to project operations. As such, effects of Alternative 4A on *Microcystis* levels, and thus microcystin concentrations in the Delta, would not be made more adverse relative to the No Action Alternative (ELT and LLT).

CEQA Conclusion: Relative to Existing Conditions, operation of the water conveyance facilities under Alternative 4A is not expected to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta because large reservoirs upstream are typically low in nutrient concentrations and phytoplankton outcompete cyanobacteria, including *Microcystis*, and high water velocity and low hydraulic residence times in the upstream area limit the development of *Microcystis* blooms.

Source waters to the south Delta intakes could be affected by *Microcystis* due to an increase in Delta water temperatures associated with climate change and from an increase in water residence times. The impacts from increased water residence times in the Delta would be mostly related to habitat restoration, as well as to climate change and sea level rise. The combined effect of these factors on increasing *Microcystis* in source waters to the south Delta intakes would likely be a greater influence than that of Alternative 4A operations.

Increased frequency and magnitude of *Microcystis* blooms may occur in the Delta in the future, relative to Existing Conditions, due to increased residence times resulting from restoration activities unrelated to the project alternative, as well as climate change and sea level rise that are expected to increase Delta water temperatures. Such increases in residence time and water temperatures would not be caused by implementation of Alternative 4A. Operations and maintenance of Alternative 4A, including the use of real-time operations, is not expected to result in flow and temperature conditions in the Delta, including at the Banks and Jones pumping plants, that would cause substantial increases in the frequency, magnitude, and geographic extent of *Microcystis* blooms.

Microcystis and microcystins are not CWA Section 303(d) listed within the affected environment and thus any increases that could occur in some areas of the Delta would not make any existing *Microcystis* impairment measurably worse because no such impairments currently exist. Microcystinis bioaccumulative in the Delta Foodweb (Lehman 2010). Thus, potential increases in *Microcystis* occurrences due to climate change and sea level rise may lead to increased microcystin presence in the Delta, relative to Existing Conditions. This has potential to cause microcystins to bioaccumulate to greater levels in aquatic organisms that would, in turn, pose public health risks. While long-term water quality degradation related to microcystin levels may occur and, thus, impacts on beneficial uses could occur, these impacts are not related to implementation of Alternative 4A. Although there is uncertainty regarding this impact, the effects on public health related to *Microcystis* from implementing water conveyance facilities are determined to be less than significant. No mitigation is required.

Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing Environmental Commitment 4

***NEPA Effects*:** Under Alternative 4A, Yolo Bypass Fisheries Enhancement would not occur, unlike under Alternative 4. However, improvements in the Yolo Bypass, as well as restoration of 8,000 acres of tidal habitat in the ELT, would be implemented under a plan separate and distinct from Alternative 4A under the No Action Alternative (see Chapter 3, *Description of Alternatives*). These activities would create shallow backwater areas that could result in local warmer water and increased water residence time of magnitude and extent that would result in measurable changes on *Microcystis* levels in the Delta. Similar to Alternative 4 (under CM 4), there would be tidal habitat restoration in the Delta under Alternative 4A with implementation of Environmental Commitment 4. However, the 295 acres of tidal habitat restored under this alternative would be substantially fewer than under Alternative 4. As discussed in Chapter 8, *Water Quality*, implementation of Environmental Commitment 4 under Alternative 4A would have negligible effects in terms of the potential for creating conditions conducive to *Microcystis* bloom in the Delta relative to what could result from the development of 8,000 acres of tidal habitat and improvements in the Yolo Bypass in the ELT. Therefore, implementation of Environmental Commitment 4 under Alternative 4A would not be adverse because it would not increase *Microcystis* bloom formation.

CEQA Conclusion: Implementation of Environmental Commitment 4: Tidal Natural Communities Restoration under Alternative 4A would result in 295 acres of tidal restoration within the Delta. This would have a negligible effect on creating conditions conducive to *Microcystis* bloom formation, particularly relative to the development of 8,000 acres of tidal habitat and improvements to the Yolo Bypass in the ELT—activities separate and distinct from Alternative 4A. These activities would create shallow backwater areas that could result in a measureable increase in water temperatures and water residence times in the Delta, and therefore *Microcystis*, relative to Existing Conditions. Thus, implementation of Environmental Commitment 4 under Alternative 4A would be less than significant. No mitigation is required.

25.3.4.3 Alternative 2D—Dual Conveyance with Modified Pipeline/Tunnel and Intakes 1, 2, 3, 4, and 5 (15,000 cfs; Operational Scenario B)

Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of the Water Conveyance Facilities

NEPA Effects: The potential for Alternative 2D construction and operation of the water conveyance facilities to increase vector-borne diseases would be similar to that for Alternative 4. Like Alternative 4, Alternative 2D will increase surface water within the study area at an intermediate forebay on Glannvale Tract, and at an expanded Clifton Court Forebay; however, unlike Alternative 4, Alternative 2D has five intakes rather than three intakes (Intakes 2, 3, and 5). Therefore, there would be a greater number of sedimentation basins and solids lagoons under Alternative 2D relative to Alternative 4. These features could provide breeding habitat for mosquitos. However, as described for Alternative 4, the depth, design, and operation of the sedimentation basin and solids lagoons would prevent the development of suitable mosquito habitat. Specifically, the basins would be too deep and the constant movement/circulation of water would prevent mosquitoes from breeding and multiplying. It is unlikely that forebays would provide suitable breeding habitat for mosquitoes given that the water in the forebays would not be stagnant and would generally be too deep to support substantial mosquito habitat. Shallow edges of the forebays could provide some suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. However, as part of the regular maintenance of these forebay areas, floating vegetation such as pond weed would be harvested to maintain flow and forebay capacity. To further minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs, as necessary, to control mosquitoes and reduce the likelihood that construction and operation of the water conveyance facilities would require an increase in mosquito abatement activities by the local MVCDs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMP activities would be consistent with the CDPH's *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). Accordingly, Alternative 2D would not substantially increase suitable vector habitat, and would not substantially increase vector-borne diseases. No adverse effects on public health would result because conditions for mosquito breeding at conveyance facilities would be minimized and standard practices to control mosquitos would be implemented.

CEQA Conclusion: The potential for construction and operation of conveyance facilities under Alternative 2D to result in an increase in exposure of people to vector-borne diseases would be similar in nature to the impacts described for Alternative 4. However, because Alternative 2D has 2 more intakes and a greater number of associated sedimentation basins and solids lagoons than Alternative 4, there would be more surface water created under this alternative relative to Alternative 4. Alternative 2D conveyance facilities could create new and increased surface water areas (relative to baseline) at the intakes, intermediate forebay, and the expanded Clifton Court Forebay, and these areas have the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes) because of the large volumes of water that would be held there. However, during operations, the depth, design, and operation of conveyance facilities would prevent the development of suitable mosquito habitat. Specifically, the water bodies would be too deep to provide suitable mosquito habitat, and the constant movement of water would prevent mosquitoes from breeding and multiplying. To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes during construction and operation of the sedimentation basins, solids lagoons, the expanded Clifton Court Forebay, the intermediate forebay, and the intermediate forebay inundation area. These BMPs would be consistent with practices presented in *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). Therefore, construction and operation of Alternative 2D would not result in a substantial increase in vector-borne diseases in the study area. This impact is considered to be less than significant because conditions for mosquito breeding at conveyance facilities would be minimized and standard practices to control mosquitos would be implemented. No mitigation is required.

Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That There is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance Facilities

NEPA Effects:

Disinfection Byproducts

The geographic extent of effects related to long-term average DOC concentrations within Delta waters with water supply operations under Alternative 2D would be less extensive than Alternative 4 and the magnitude of predicted long-term change and relative frequency of DOC concentration exceedances would be lower than Alternative 4. Relative to the No Action Alternative (ELT), Alternative 2D would result in small increases in long-term average DOC concentrations for the modeled 16-year period and drought period at the South Fork Mokelumne River at Staten Island, Franks Tract, Old River at Rock Slough, and Contra Costa Pumping Plant #1. The increases in average DOC concentrations would correspond to more frequent concentration threshold exceedances, with the greatest change occurring at Contra Costa Pumping Plant #1 associated with the 0.3 mg/L threshold, as discussed in Chapter 8, *Water Quality*.

While Alternative 2D would lead to slightly higher long-term average DOC concentrations at some municipal water intakes and Delta interior locations, the predicted change would not be expected to adversely affect MUN beneficial uses, or any other beneficial use. The change in frequency of threshold concentration exceedances at other assessment locations would be similar or lower. In general, substantial change in ambient DOC concentrations would need to occur before significant changes in drinking water treatment plant design or operations are triggered. The increases in long-term average DOC concentrations estimated to occur at various Delta locations under Alternative 2D are of sufficiently small magnitude that they would not require existing drinking water treatment plants to substantially upgrade treatment for DOC removal above levels currently employed.

In the LLT, the primary difference will be changes in the Delta source water fractions due to hydrologic effects from climate change and higher water demands. These effects would occur regardless of the implementation of the alternative and, thus, at the LLT the effects of the alternative on DOC are expected to be similar to those described above. Therefore, changes in DOC concentrations in the Delta resulting from operation of the water conveyance facilities under Alternative 2D are not anticipated to contribute to increases in disinfection byproducts (DBPs).

As described in Chapter 8, *Water Quality*, operations and maintenance of the water conveyance facilities under Alternative 2D, relative to the No Action Alternative (ELT and LLT), would result in increases in long-term average bromide concentrations in the South Fork Mokelumne River at Staten Island, North Bay Aqueduct at Barker Slough, and San Joaquin River at Buckley Cove; long-term average bromide concentrations at the other assessment locations would be the same or decrease. However, at South Fork Mokelumne River at Staten Island, Franks Tract, Old River at Rock Slough, Sacramento River at Emmaton, San Joaquin River at Antioch, Sacramento River at Mallard Island, and North Bay Aqueduct at Barker Slough there would be an increased frequency of exceedance of the 50 µg/L and 100 µg/L bromide threshold (for protecting against the formation of DBPs in treated drinking water. As described for Alternative 4, the use of seasonal intakes at Antioch and Mallard Slough is largely driven by acceptable water quality, and thus has historically been opportunistic. Opportunity to use these intakes would remain, and the predicted increases in bromide concentrations at Antioch and Mallard Slough would not be expected to adversely affect MUN beneficial uses, or any other beneficial use, at these locations. These changes in bromide concentrations are not expected to result in adverse effects to any beneficial uses at these locations and, therefore, changes in bromide concentrations in the Delta resulting from operation of the water conveyance facilities under Alternative 2D are not anticipated to contribute to increases in DBPs.

Trace Metals

The changes in modeled trace metal concentrations of primarily human health and drinking water concern (arsenic, iron, manganese) in the Delta under Alternative 2D would be similar to those described for Alternative 4A because the factors that would affect trace metal concentrations in Delta waters would be the same in the ELT and LLT. Alternative 2D would not result in substantial increases in trace metal concentrations in the water exported from the Delta or diverted from the Sacramento River through the proposed conveyance facilities. No mixing of Delta source waters could result in a metal concentration greater than the highest source water concentration, and given that the average water concentrations for arsenic, iron, and manganese do not exceed water quality criteria, more frequent exceedances of drinking water criteria in the Delta would not be expected to occur.

In the LLT, the primary difference will be changes in the Delta source water fractions due to hydrologic effects from climate change and sea level rise. These effects would occur regardless of the implementation of the alternative and, thus, at the LLT the effects of the alternative on trace metals are expected to be similar to those described above.

The arsenic criterion was established to protect human health from the effects of long-term chronic exposure, while secondary MCLs for, iron and manganese were established as reasonable federal regulatory goals for drinking water quality, and enforceable standards in California. Average concentrations for arsenic, iron, and manganese in the primary source water (Sacramento River, San Joaquin River, and the bay at Martinez) are below these criteria. No mixing of these three source waters could result in a metal concentration greater than the highest source water concentration, and, given that the modeled average water concentrations for arsenic, iron, and manganese do not exceed water quality criteria, more frequent exceedances of drinking water criteria in the Delta would not be an expected result under this alternative. Accordingly, no adverse effect on public health related to the trace metals arsenic, iron, or manganese from drinking water sources is anticipated.

Pesticides

The changes in modeled pesticide concentrations in the Delta under Alternative 2D would be similar to those described for Alternative 4. The average winter and summer flow rates, relative to the No

Action Alternative (ELT) are expected to be similar to or less than changes in flow rates under Alternative 4 in the Sacramento River at Freeport, American River at Nimbus, Feather River at Thermalito and the San Joaquin River at Vernalis. The main factor influencing pesticide concentrations in Delta waters (i.e., changes in San Joaquin River, Sacramento River and Delta agriculture source water fractions at various Delta locations) is expected to change by a similar degree. As described in Chapter 84, *Water Quality*, the percent change in monthly average source water fractions under Alternative 2D would be similar to changes expected under Alternative 4. Modeled changes in the source water fractions of Sacramento River, San Joaquin River, and Delta agriculture water under Alternative 2D would not be of sufficient magnitude to substantially alter beneficial uses of the Delta. Therefore, it is not anticipated that there would be adverse effects on public health related to pesticides from drinking water sources.

The flow changes in the LLT would be expected in the ranges similar to those in the ELT relative to the No Action Alternative (ELT), and to that described for Alternative 4 relative to the No Action Alternative (LLT). Accordingly, the flow changes that would occur in the LLT under Alternative 2D, relative to the No Action Alternative (LLT), would not be expected to result in changes in dilution of pesticides of sufficient magnitude to adversely affect beneficial uses in the Delta.

Because there would be no increases in DBPs due to increases in bromide or DOC in Delta surface waters, and because the modeled changes in trace metals and pesticide concentrations would not increase substantially in magnitude or frequency in the Delta under Alternative 2D relative to the No Action Alternative (ELT and LLT), there would be no adverse effect on public health as a result of operation of the water conveyance facilities.

CEQA Conclusion: Under Alternative 2D, modeled long-term average pesticide levels in the Delta would be similar to or slightly less that described under Alternative 4 and would not be expected to increase substantially, relative to Existing Conditions, such that beneficial use impairments are made measurably worse. Long-term average bromide concentrations would increase in the South Fork Mokelumne River at Staten Island and decrease at all other assessment locations relative to Existing Conditions. The long-term bromide concentration in the South Fork Mokelumne River at Staten Island would be less than the 100 µg/L believed to be sufficient to meet currently established drinking water criteria for disinfection byproducts. There would be an increased frequency of exceedance of the 50 µg/L and 100 µg/L bromide thresholds for protecting against the formation of DBPs in treated drinking water at the South Fork Mokelumne River at Staten Island, Franks Tract, Old River at Rock Slough, Sacramento River at Emmaton, San Joaquin River at Antioch, and Sacramento River at Mallard Island. The North Bay Aqueduct at Barker Slough would have an increased exceedance of the 100 µg/L threshold. The effects of Alternative 2D in the LLT in the Delta relative to Existing Conditions would be expected to be similar. There may be higher bromide concentrations in the LLT in the western Delta, but this would be associated with sea level rise, not the project alternative, because the primary source of bromide to the Delta is sea water intrusion. The use of seasonal intakes at Antioch and Mallard Island is largely driven by acceptable water quality, and therefore has historically been opportunistic, and the opportunity to use these intakes would remain. Thus, the increased bromide concentrations would not be expected to adversely affect municipal beneficial uses, or any other beneficial use, at these locations, and therefore would not be expected to contribute substantially to DBP formation. Operations and maintenance activities under Alternative 2D would not cause a substantial long-term change in DOC concentrations in the Delta, although there would be relatively small increases in long-term average DOC concentrations at some interior Delta locations. However, the increases are of sufficiently small magnitude that they would not require existing drinking water treatment plants to substantially upgrade treatment for

DOC above levels currently employed, and therefore these increases would not be expected to contribute substantially to DBP formation. Further, there would be predicted improvements in long-term average DOC concentrations at Barker Slough relative to Existing Conditions. Average concentrations of trace metals are not expected to increase substantially under Alternative 2D in the primary source water. Therefore, this alternative is not expected to cause additional exceedances of applicable water quality objectives by frequency, magnitude, and geographic extent that would cause significant impacts on any beneficial uses of waters in the affected environment.

Because there would be no increases in DBPs due to increases in bromide or DOC in Delta surface waters, and because the modeled changes in trace metals and pesticide concentrations would not increase substantially in magnitude or frequency in the Delta with implementation of water supply operations under Alternative 2D relative to Existing Conditions, there would be no significant impact on public health as a result of operation of the water conveyance facilities. No mitigation is required.

Impact PH-3: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Construction, Operation or Maintenance of the Water Conveyance Facilities

NEPA Effects: As described in Chapter 8, *Water Quality*, modeling scenarios included assumptions regarding how certain habitat restoration activities would affect Delta hydrodynamics. The amount of habitat restoration completed under Alternative 2D would be substantially less than under Alternative 4. To the extent that restoration actions would alter hydrodynamics within the Delta region, which affects mixing of source waters, these effects are included in this assessment of water quality changes due to water conveyance facilities operations and maintenance.

Five intakes would be constructed and operated under Alternative 2D. Sediment-disturbing activities during construction and maintenance of these intakes and other water conveyance facilities proposed near or in surface waters under this alternative could result in the disturbance of existing constituents in sediment, such as pesticides or methylmercury. In-channel construction activities, such as pile driving during the construction of cofferdams at the intakes and pier construction at the barge unloading facilities, which would occur over a period of 5 months, would result in the localized disturbance of river sediment. In addition, maintenance of the five proposed north Delta intakes and the intermediate forebay would entail periodic dredging for sediment removal at these locations. Sediment accumulation in both the northern and southern portion of the expanded Clifton Court Forebay is expected to be minimal in the ELT period as the need for dredging is anticipated to be every 50 years given the design. However, it is anticipated that there may be some sediment accumulation at the inlet structure of the northern portion of Clifton Court Forebay. Therefore, while overall sediment accumulation in this forebay is not expected to be substantial, some dredging may be required at the inlet structure to maintain an even flow path.

Pesticides

Legacy pesticides, such as organochlorines, have low water solubility; they do not readily volatilize and have a tendency to bond to particulates (e.g., soil and sediment), settle out into the sediment, and not be transported far from the source. If present in sediment within in-water construction areas, legacy pesticides would be disturbed locally and would not be expected to partition into the water column to any substantial degree. Therefore, no significant adverse effect on public health would result from construction.

Numerous pesticides are currently used throughout the affected environment. While some of these pesticides may be bioaccumulative, those present-use pesticides for which there is sufficient evidence of their presence in waters affected by SWP and CVP operations (i.e., organophosphate pesticides, such as diazinon, chlorpyrifos, diuron, and pyrethroids) are not considered bioaccumulative. Thus, changes in their concentrations would not directly cause bioaccumulative problems in aquatic life or humans. The effects of Alternative 2D on pesticide levels in surface waters upstream of the Delta, in the Delta, and in the SWP/CVP Export Service Areas relative to Existing Conditions and the No Action Alternative (ELT) would be similar to or slightly less than those described for the Alternative 4. Alternative 2D would not result in increased tributary flows that would mobilize organochlorine pesticides in sediments. Thus, the change in source water in the Delta associated with the change in water supply operations is not expected to adversely affect public health with respect to bioaccumulation of pesticides.

Methylmercury

If mercury is sequestered in sediments at water facility construction sites, it could become suspended in the water column during construction activities, opening up a new pathway into the food chain. Construction activities (e.g., pile driving and cofferdam installation) at intake sites or barge landing locations would result in a localized, short-term resuspension of sediment and an increase in turbidity that may contain elemental or methylated forms of mercury. Please see Chapter 8, Section 8.1.3.9, *Mercury,* for a discussion of methylmercury concentrations in sediments.

Changes in methylmercury concentrations under Alternative 2D are expected to be small. As described in Chapter 8, *Water Quality,* the greatest annual average methylmercury concentration for drought conditions under Alternative 2D would be 0.166 ng/L for the San Joaquin River at Buckley Cove, which would be slightly lower than the No Action Alternative (ELT) (0.168 ng/L). Fish tissue estimates show only small or no increases for mercury concentrations relative to the No Action Alternative (ELT) based on long-term annual average concentrations in the Delta. Mercury concentrations in fish tissue expected for Alternative 2D (with Equation 1—see Chapter 8, *Water Quality,* Section 8.3.1 for details), show increases of 7 percent or less, relative to the No Action Alternative (ELT), in all modeled years. Mercury concentrations in fish tissue expected for Alternative 2D (with Equation 2—see Chapter 8, *Water Quality,* Section 8.3.1 for details), are estimated to increase of 10 percent or less relative to the No Action Alternative (ELT), in all modeled years. Because these increases are relatively small, and because it is not apparent that substantive increases are expected throughout the Delta, these estimated changes in mercury concentrations in fish tissue under Alternative 2D are expected to be within the uncertainty inherent in the modeling approach and would not likely be measureable in the environment. See Appendix 8I, *Mercury*, for a discussion of the uncertainty associated with fish tissue estimates of mercury. Therefore, modeled changes in mercury in the Delta and in fish tissues due to operation of Alternative 2D would not be expected to adversely affect public health.

In summary, operation of the water conveyance facilities under Alternative 2D would not alter bioaccumulative pesticide concentrations or mercury concentrations in the Delta such that there would be an effect on public health. As such, there would be no adverse effect.

CEQA Conclusion: Relative to Existing Conditions, operation of the water conveyance facilities under Alternative 2D is not expected to cause additional exceedance of applicable water quality objectives/criteria by frequency, magnitude, and geographic extent that would cause adverse effects on any beneficial uses of waters in the affected environment. Because mercury concentrations are not expected to increase substantially relative to the Existing Conditions, no long-term water quality degradation is expected to occur and, thus, no adverse effects to beneficial uses would occur. As described in Chapter 8, *Water Quality*, concentrations of mercury in fish tissue using Equation 1 under Alternative 2D, would increase 7 percent or less in all years relative to the Existing Conditions. Using Equation 2, there would be increases from 10 percent or less relative to Existing Conditions in all years. Because these increases are relatively small, and because it is not apparent that substantive increases are expected throughout the Delta, these estimated changes in mercury concentrations in fish tissue under Alternative 2D are expected to be within the uncertainty inherent in the modeling approach and would not likely be measureable in the environment. Construction activities (e.g., pile driving and cofferdam installation) at intake sites or barge landing locations would result in a localized, short-term resuspension of sediment and an increase in turbidity that may contain elemental or methylated forms of mercury.

The effects of Alternative 2D on bioaccumulative pesticide levels in the Delta would be similar to or slightly less than those described for the Alternative 4. Alternative 2D would not result in increased tributary flows that would mobilize organochlorine pesticides in sediments. Thus, the change in source water in the Delta associated with the change in water supply operations is not expected to adversely affect public health with respect to bioaccumulation of pesticides. If present in sediment within in-water construction areas, legacy pesticides would be disturbed locally and would not be expected to partition into the water column to any substantial degree.

For these reasons, there would be no significant impact on public health due to mercury or bioaccumulative pesticides as a result of construction of or operation of the water conveyance facilities under Alternative 2D. No mitigation is required.

Impact PH-4: Expose Substantially More People to Transmission Lines Generating New Sources of EMFs as a Result of the Construction and Operation of the Water Conveyance Facilities

NEPA Effects: The potential for Alternative 2D transmission line construction and operation to expose people to new sources of EMFs would be similar to Alternative 4, although there would be nearly 5 miles of new permanent 69 kV transmission line under this alternative, whereas there would be no new permanent 69 kV transmission line under Alternative 4. As described in Table 25-9, a total of 4.97 miles of new permanent 69 kV transmission lines; 3.13 miles of new temporary 69 kV transmission lines; 14.96 miles of new permanent 230 kV transmission lines; 18.72 miles of new temporary 230 kV transmission line; 1.00 mile of new permanent 230 kV/34.5 kV (underbuild) transmission lines; 11.28 miles of new permanent 230 kV/34.5 kV (underbuild) transmission lines; and the relocation of 1.19 miles of existing 500 kV transmission line would be required for this alternative. As described for Alternative 4, this effect would not be adverse because transmission lines would generally not be located in populated areas or within 300 feet of sensitive receptors and CPUC's EMF design guidelines would be implemented for any new temporary or new permanent transmission lines constructed and operated under Alternative 2D.

CEQA Conclusion: The potential for Alternative 2D transmission line construction and operation to expose people to new sources of EMFs would be somewhat larger relative to Alternative 4 because there would be more facilities requiring power (i.e., intakes) under Alternative 2D. Under this alternative the majority of proposed new temporary (69 kV and 230 kV) and new permanent (69 kV, 230 kV, and 230 kV/34.5 kV) transmission lines would be located within the rights-of-way of existing transmission lines; any new temporary or permanent transmission lines not within the right-of-way of existing transmission lines would, for the most part, be located in sparsely populated areas generally away from existing sensitive receptors. None of the proposed temporary or permanent transmission lines would be within 300 feet of sensitive receptors. Further, the temporary transmission lines would be removed when construction of the water conveyance facility features is completed, so there would be no potential permanent effects. Therefore, these transmission lines would not substantially increase people's exposure to EMFs. This impact is considered to be less than significant because transmission lines would generally not be located in populated areas or within 300 feet of sensitive receptors and CPUC's EMF design guidelines would be implemented for any new temporary or permanent transmission lines constructed and operated under Alternative 2D. No mitigation is required.

Impact PH-5: Increase in Vector-Borne Diseases as a Result of Implementing Environmental Commitments 3, 4, 7, and 10

Effects of Alternative 2D related to the potential for increase in vector-borne diseases from implementing Environmental Commitments 3, 4, 7, and 10 would be slightly greater than described for Alternative 4A. As described in Chapter 3, *Description of Alternatives*, Alternative 2D would restore more habitat under these Environmental Commitments relative to Alternative 4A and, therefore, the potential for vector-borne disease effects under Alternative 2D would likely be greater than the potential associated with Alternative 4A.

NEPA Effects: Implementation of portions of Environmental Commitments 3, 4, 7 and 10 under Alternative 2D would involve protecting and restoring wetland and other surface water habitat that could potentially increase suitable mosquito habitat within the study area. This potential effect would not be adverse because the total restoration acreage of these types of habitat implemented under Alternative 2D would generally not be located near densely populated areas, and management plans under Environmental Commitment 11: Natural Communities Enhancement and Management would be implemented in consultation with the appropriate MVCDs to ensure MMPs are implemented to reduce mosquito breeding. Additionally, BMPs from the guidelines outlined in Appendix 3B, *Environmental Commitments, AMMs, and CMs*, would be incorporated into Alternative 2D and executed to maintain proper water circulation and flooding during appropriate times of the year (e.g., fall) to prevent stagnant water and habitat for mosquitoes. This consultation would occur when specific restoration and enhancement projects and locations are identified.

CEQA Conclusion: The potential for impacts related to increases of vector-borne disease from mosquitos during construction, operation, and maintenance of portions of Environmental Commitment 3, 4, 7 and 10 under Alternative 2D is considered less than significant because the total restoration acreage of wetland and other surface water areas implemented under this alternative would generally not be located near densely populated areas, and management plans under Environmental Commitment 11: Natural Communities Enhancement and Management would be implemented in consultation with the appropriate MVCDs to ensure MMPs are implemented to reduce mosquito breeding. Additionally, BMPs from the guidelines outlined in Appendix 3B, *Environmental Commitments, AMMs, and CMs*, would be incorporated and executed to maintain proper water circulation and flooding during appropriate times of the year (e.g., fall) to prevent stagnant water and habitat for mosquitoes. No mitigation is required.

Impact PH-6: Substantial Increase in Recreationists' Exposure to Pathogens as a Result of Implementing the Restoration Environmental Commitments

Effects of Alternative 2D related to the potential for increase in recreationists' exposure to pathogens from implementing portions of the restoration Environmental Commitments would be slightly greater than those described for Alternative 4A. As described in Chapter 3, *Description of Alternatives*, Alternative 2D would restore more acres of habitat under Environmental Commitments 3, 4, 6, 7, and 9–11 relative to Alternative 4A.

NEPA Effects: The study area currently supports habitat types, such as tidal habitat, upland wetlands, and agricultural lands that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). The study area does not currently have pathogen concentrations that rise to the level of adversely affecting beneficial uses of recreation. However, any potential increase in pathogens associated with the proposed habitat restoration and enhancement Environmental Commitments under Alternative 2D would be localized and within the vicinity of the actual restoration. This localized increase is not expected to be of sufficient magnitude and duration to result in adverse effects on recreationists because these areas would generally not support livestock and most areas would not have public access.

CEQA Conclusion: The potential for an increase in recreationists' exposure to pathogens under Alternative 2D is considered less than significant because of the localized nature of pathogens and because the rapid die-off of some types of pathogens in water would not create sufficient magnitudes of pathogen generation that could affect recreational beneficial uses. No mitigation is required.

Impact PH-7: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Implementing Environmental Commitments 3, 4, and 10

Effects of Alternative 2D related to the potential to mobilize contaminants known to bioaccumulate (pesticides and methylmercury) from implementing portions of the restoration Environmental Commitments would be slightly greater than those described for Alternative 4A. As described in Chapter 3, *Description of Alternatives,* Alternative 2D would restore more habitat under Environmental Commitments 3, 4 and 10 relative to Alternative 4A. Therefore, the potential for mobilization of contaminants under Alternative 2D would likely be greater than the potential associated with Alternative 4A.

NEPA Effects: The primary concern with habitat restoration regarding constituents known to bioaccumulate is the potential for mobilizing contaminants sequestered in sediments of the newly inundated floodplains and marshes. The mobilization depends on the presence of the constituent and the biogeochemical behavior of the constituent to determine whether it could re-enter the water column or be reintroduced into the food chain. This potential effect would not be adverse because the total tidal and nontidal habitat restoration acreage implemented under Alternative 2D would be relatively small, bioaccumulation of pesticides and/or methylmercury in these restoration areas is not expected to substantially affect public health because of the limited extent of this type of restored habitat under Alternative 2D, the localized nature of pesticide bioaccumulation, and because current OEHHA standards would be enforced. Environmental Commitment 12: Methylmercury Management would be implemented to reduce methylmercury production in restored habitats.

CEQA Conclusion: The potential for public health impacts related to mobilization of pesticides and methylmercury in habitat restoration areas related to Environmental Commitments 3, 4, and 10 is considered less than significant because the total tidal and nontidal restoration acreage implemented under Alternative 2D would be relatively small, bioaccumulation of pesticides and/or methylmercury in the these restoration areas is not expected to substantially affect public health because of the limited extent of restored habitat under Alternative 2D, the localized nature of pesticide bioaccumulation, and because current OEHHA standards would be enforced. Environmental Commitment 12: Methylmercury Management would be implemented to reduce methylmercury production in restored habitats. No mitigation is required.

Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water Conveyance Facilities

NEPA Effects: Any modified reservoir operations under Alternative 2D are not expected to promote *Microcystis* production upstream of the Delta relative to the No Action Alternative (ELT and LLT) since large reservoirs upstream of the Delta are typically low in nutrient concentrations, as described in Chapter 8, *Water Quality*. Further, in the rivers and streams of the Sacramento River watershed, watersheds of the eastern tributaries (Cosumnes, Mokelumne, and Calaveras Rivers), and the San Joaquin River upstream of the Delta, bloom development would be limited by high water velocity and low hydraulic residence times. These conditions would not be expected to change under Alternative 2D relative to the No Action Alternative (ELT and LLT)

With implementation of water supply operations under Alternative 2D, conditions in the Export Service Areas are not expected to become more conducive to *Microcystis* bloom formation relative to the No Action Alternative (ELT and LLT) because the fraction of water flowing through the Delta that would reach the existing south Delta intakes is not expected to be adversely affected by *Microcystis* blooms.

Operation of the water conveyance facilities under Alternative 2D could alter the source water flow paths through the Delta relative to the No Action Alternative (ELT and LLT), and this could result in localized increases in residence time in various Delta sub-regions, and decreases in residence time in other areas. Although there is uncertainty, because the only difference between operations and maintenance of Alternative 2D and the No Action Alternative is changes in flow paths and source water fractions in the Delta, water supply operations under Alternative 2D are not expected to increase water residence times or ambient water temperatures throughout the Delta, including Banks and Jones pumping plants, relative to the No Action Alternative (ELT and LLT), and therefore Delta waters are not expected to be adversely affected by *Microcystis* blooms.

CEQA Conclusion: Relative to Existing Conditions, operation of the water conveyance facilities under Alternative 2D is not expected to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta because large reservoirs upstream are typically low in nutrient concentrations, and high water velocity and low hydraulic residence times in the upstream area limit the development of *Microcystis* blooms.

Source waters to the south Delta intakes could be adversely affected relative to Existing Conditions by *Microcystis* both from an increase in Delta water temperatures associated with climate change and from an increase in water residence times. The impacts from increased water residence times in the Delta would be mostly related to tidal habitat restoration and improvements to the Yolo Bypass, which are assumed to occur separate from Alternative 2D, as well as to climate change and sea level rise. The combined effect of these factors on increasing *Microcystis* in source waters to the south

Delta intakes would likely be a greater influence than that of Alternative 2D operations. Increases in ambient air temperatures due to climate change relative to Existing Conditions are expected under this alternative. Increases in ambient air temperatures are expected to result in warmer ambient water temperatures, and thus conditions more suitable to *Microcystis* growth, in the water bodies of the SWP/CVP Export Service Areas.

Water supply operations under Alternative 2D could result in localized increases in Delta residence times in some locations and decreased residence times in other Delta locations. As indicated in Chapter 8, *Water Quality*, there is substantial uncertainty regarding the extent that Alternative 2D operations and maintenance would result in a net increase in water residence times relative to Existing Conditions. Regardless of this uncertainty, it is likely that these potential effects under Alternative 2D would be relatively small compared to the combined effects of tidal habitat restoration and Yolo Bypass improvements unrelated to Alternative 2D, and sea level rise and climate change. Climate change in the ELT is expected to result in a 1.3-2.5°F increase in ambient Delta water temperatures relative to Existing Conditions. The combined effects of restoration activities unrelated to Alternative 2D, climate change, and sea level rise on increased water residence time, as well as the effects of climate change on Delta water temperatures, it is possible that *Microcystis* blooms in the Delta would increase in frequency, magnitude, and geographic extent, relative to Existing Conditions. However, although there is considerable uncertainty regarding this impact, the effects on *Microcystis* due to operations under Alternative 2D would be less than significant. No mitigation is required.

Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing Environmental Commitment 4

Effects related to *Microcystis* from implementation of Environmental Commitment 4 under Alternative 2D would be similar to those described for Alternative 4A because the acreages of tidal natural communities restored under this alternative (300 acres) is nearly the same compared to Alternative 4A (295 acres). However, there would be substantially fewer acres of tidal natural communities restored under Alternative 2D relative to Alternative 4 (65,000 acres).

NEPA Effects: Under Alternative 2D, Yolo Bypass Fisheries Enhancement would not occur, unlike under Alternative 4. However, improvements in the Yolo Bypass, as well as restoration of 8,000 acres of tidal habitat, would be implemented under a plan separate and distinct from Alternative 2D (see Chapter 3, *Description of Alternatives*). These activities are assumed to occur under both Alternative 2D and the No Action Alternative. Similar to Alternative 4 (under CM 4), there would be tidal habitat restoration in the Delta under Alternative 2D with implementation of Environmental Commitment 4: Tidal Natural Communities Restoration. However, the 300 acres of tidal habitat restored under this alternative would be substantially fewer than under Alternative 4 (65,000 acres). As discussed in Chapter 8, *Water Quality*, implementation of Environmental Commitment 4 under Alternative 2D would have negligible effects in terms of the potential for creating conditions conducive to *Microcystis* bloom in the Delta relative to what could result from the development of 8,000 acres of tidal habitat and improvements in the Yolo Bypass in the ELT, which could increase water temperatures and hydraulic residence times relative to the No Action Alternative (LLT). Therefore, implementation of Environmental Commitment 4 under Alternative 2D would not be adverse because it would not increase *Microcystis* bloom formation.

CEQA Conclusion: Implementation of Environmental Commitment 4: Tidal Natural Communities Restoration under Alternative 2D would result in 300 acres of tidal restoration within the Delta. This would have a negligible effect on creating conditions conducive to *Microcystis* bloom formation, particularly relative to the development of 8,000 acres of tidal habitat and improvements to the Yolo Bypass in the ELT—activities separate and distinct from Alternative 2D. These activities would create shallow backwater areas that could result in a measureable increase in water temperatures and water residence times in the Delta, and therefore *Microcystis*, relative to Existing Conditions. Thus, implementation of Environmental Commitment 4 under Alternative 2D would be less than significant. No mitigation is required.

25.3.4.4 Alternative 5A—Dual Conveyance with Modified Pipeline/Tunnel and Intake 2 (3,000 cfs; Operational Scenario C)

Impact PH-1: Increase in Vector-Borne Diseases as a Result of Construction and Operation of the Water Conveyance Facilities

NEPA Effects: The potential for Alternative 5A construction and operation to increase vector-borne diseases would be similar to that for Alternative 4. Like Alternative 4, Alternative 5A will increase surface water within the study area at an intermediate forebay on Glannvale Tract, and at an expanded Clifton Court Forebay; however, unlike Alternative 4, Alternative 5A has only one intake (Intake 2) rather than three intakes (Intakes 2, 3, and 5). Therefore, there would be fewer sedimentation basins and solids lagoons under Alternative 5A relative to Alternative 4. As described for Alternative 4, the depth, design, and operation of the sedimentation basin and solids lagoons would prevent the development of suitable mosquito habitat. Specifically, the basins would be too deep and the constant movement/circulation of water would prevent mosquitoes from breeding and multiplying. It is unlikely that forebays would provide suitable breeding habitat for mosquitoes given that the water in the forebays would not be stagnant and would generally be too deep to support substantial mosquito habitat. Shallow edges of the forebays could provide some suitable mosquito breeding habitat if emergent vegetation or other aquatic plants (e.g., pond weed) were allowed to grow. However, as part of the regular maintenance of these forebay areas, floating vegetation such as pond weed would be harvested to maintain flow and forebay capacity. To further minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs, as necessary, to control mosquitoes and reduce the likelihood that construction and operation of the water conveyance facilities would require an increase in mosquito abatement activities by the local MVCDs (Appendix 3B, *Environmental Commitments, AMMs, and CMs*). BMP activities would be consistent with the CDPH's *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). Accordingly, Alternative 5A would not substantially increase suitable vector habitat, and would not substantially increase vector-borne diseases. No adverse effects on public health would result because conditions for mosquito breeding at conveyance facilities would be minimized and standard practices to control mosquitos would be implemented.

CEQA Conclusion: The potential for construction and operation of conveyance facilities under Alternative 5A to result in an increase in exposure of people to vector-borne diseases would be similar in nature to the impacts described for Alternative 4. However, because Alternative 5A has 2 fewer intakes and fewer associated sedimentation basins and solids lagoons than Alternative 4, there would be less surface water created under this alternative relative to Alternative 4. Alternative 5A conveyance facilities could create new and increased surface water areas (relative to baseline) at the intakes, intermediate forebay, and the expanded Clifton Court Forebay, and these areas have the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes) because of the large volumes of water that would be held there. However, during operations, the depth, design, and operation of conveyance facilities would prevent the development of suitable mosquito habitat. Specifically, the water bodies would be too deep to provide suitable mosquito habitat, and the constant movement of water would prevent mosquitoes from breeding and multiplying. To minimize the potential for impacts related to increasing suitable vector habitat within the study area, DWR would consult and coordinate with San Joaquin County and Sacramento-Yolo County MVCDs and prepare and implement MMPs. BMPs to be implemented as part of the MMPs would help control mosquitoes during construction and operation of the sedimentation basins, solids lagoons, the expanded Clifton Court Forebay, the intermediate forebay, and the intermediate forebay inundation area. These BMPs would be consistent with practices presented in *Best Management Practices for Mosquito Control in California* (California Department of Public Health 2012). Therefore, construction and operation of Alternative 5A would not result in a substantial increase in vector-borne diseases in the study area. This impact is considered to be less than significant because conditions for mosquito breeding at conveyance facilities would be minimized and standard practices to control mosquitos would be implemented. No mitigation is required.

Impact PH-2: Exceedances of Water Quality Criteria for Constituents of Concern Such That There is an Adverse Effect on Public Health as a Result of Operation of the Water Conveyance Facilities

NEPA Effects:

Disinfection Byproducts

As described in Chapter 8, *Water Quality*, the effects on long-term average DOC concentrations in the Delta under Alternative 5A would be similar to Alternative 4. However, the geographic extent of effects related to long-term average DOC concentrations within Delta waters with water supply operations under Alternative 5A would be less extensive than Alternative 4 and the magnitude of predicted long-term change and relative frequency of DOC concentration exceedances would be lower than Alternative 4. Relative to the No Action Alternative (ELT), Alternative 5A would result in small increases in long-term average DOC concentrations for the modeled 16-year period and drought period at the Franks Tract, Old River at Rock Slough, and Contra Costa Pumping Plant #1. The increases in average DOC concentrations would correspond to more frequent concentration threshold exceedances, with the greatest change occurring at Contra Costa Pumping Plant #1.

While Alternative 5A would lead to slightly higher long-term average DOC concentrations at some municipal water intakes and Delta interior locations, the predicted change would not be expected to adversely affect MUN beneficial uses, or any other beneficial use. The change in frequency of threshold concentration exceedances at other assessment locations would be similar or lower. In general, substantial change in ambient DOC concentrations would need to occur before significant changes in drinking water treatment plant design or operations are triggered. The increases in long-term average DOC concentrations estimated to occur at various Delta locations under Alternative 5A are of sufficiently small magnitude that they would not require existing drinking water treatment plants to substantially upgrade treatment for DOC removal above levels currently employed.

In the LLT, the primary difference will be changes in the Delta source water fractions due to hydrologic effects from climate change and sea level rise. These effects would occur regardless of the implementation of the alternative and, thus, at the LLT the effects of the alternative on DOC are expected to be similar to those described above. Therefore, changes in DOC concentrations in the Delta resulting from operation of the water conveyance facilities under Alternative 5A are not anticipated to contribute to increases in disinfection byproducts (DBPs).

As described in Chapter 8, *Water Quality*, operations and maintenance of the water conveyance facilities under Alternative 5A, relative to the No Action Alternative (ELT), would result in increases in long-term average bromide concentrations in the South Fork Mokelumne River at Staten Island and Sacramento River at Emmaton, and decrease at all other assessment locations. The long-term bromide concentration in the South Fork Mokelumne River at Staten Island would be less than the concentration believed to be sufficient to meet currently established drinking water criteria for disinfection byproducts, and the increase at Emmaton would be very small (<1%). At South Fork Mokelumne River at Staten Island, Old River at Rock Slough, Sacramento River at Emmaton, San Joaquin River at Antioch, and Sacramento River at Mallard Island there would be an increased frequency of exceedance of the 50 μg/L bromide threshold (the CALFED Drinking Water Program goal) for protecting against the formation of DBPs in treated drinking water. As described for Alternative 4, the use of seasonal intakes at Antioch and Mallard Slough is largely driven by acceptable water quality, and thus has historically been opportunistic. Opportunity to use these intakes would remain, and the predicted increases in bromide concentrations at Antioch and Mallard Slough would not be expected to adversely affect MUN beneficial uses, or any other beneficial use, at these locations.

The greatest increase in frequency of exceedance of the 50 μg/L threshold would occur in the South Fork Mokelumne River and Sacramento River at Emmaton. Other locations would experience smaller increases in the frequency of exceedance of the 50 μg/L and 100 μg/L threshold relative to these two locations. The 100 μg/L threshold is the concentration believed to be sufficient to meet currently established drinking water criteria for DBPs. The frequency of exceedance of the 100 μg/L threshold would increase at Contra Costa Pumping Plant #1 and, to a lesser degree at Franks Tract, Old River at Rock Slough, and the San Joaquin River at Antioch.

As described for Alternative 4, the effects of Alternative 5A in the LLT in the Delta relative to the No Action Alternative (LLT) would be expected to be similar to that described above. There may be higher bromide concentrations in the LLT in the western Delta, but this would be associated with sea level rise, not Alternative 5A, because the primary source of bromide to the Delta is sea water intrusion. Therefore, changes in bromide concentrations in the Delta resulting from operation of the water conveyance facilities under Alternative 5A are not anticipated to contribute to increases in DBPs.

Trace Metals

The changes in modeled trace metal concentrations of primarily human health and drinking water concern (arsenic, iron, manganese) in the Delta under Alternative 5A would be similar to those described for Alternative 4A because the factors that would affect trace metal concentrations in Delta waters would be the same in the ELT and LLT.

The arsenic criterion was established to protect human health from the effects of long-term chronic exposure, while secondary MCLs for iron and manganese were established as reasonable federal regulatory goals for drinking water quality, and enforceable standards in California. Average concentrations for arsenic, iron, and manganese in the primary source water (Sacramento River, San Joaquin River, and the bay at Martinez) are below these criteria. No mixing of these three source waters could result in a metal concentration greater than the highest source water concentration, and, given that the modeled average water concentrations for arsenic, iron, and manganese do not exceed water quality criteria, more frequent exceedances of drinking water criteria in the Delta would not be an expected result under this alternative. Accordingly, no adverse effect on public health related to the trace metals arsenic, iron, or manganese from drinking water sources is anticipated.

Pesticides

The changes in modeled pesticide concentrations in the Delta under Alternative 5A would be similar to those described for Alternative 4. The average winter and summer flow rates relative to the No Action Alternative (ELT) are expected to be similar to or less than changes in flow rates under Alternative 4 in the Sacramento River at Freeport, American River at Nimbus, Feather River at Thermalito and the San Joaquin River at Vernalis. The main factor influencing pesticide concentrations in Delta waters (i.e., changes in San Joaquin River, Sacramento River and Delta agriculture source water fractions at various Delta locations, including Banks and Jones pumping plants) is expected to change by a similar degree. As described in Chapter 8, *Water Quality*, the percent change in monthly average source water fractions would be similar to changes expected under Alternative 4. Modeled changes in the source water fractions of Sacramento River, San Joaquin River, and Delta agriculture water under Alternative 5A would not be of sufficient magnitude to substantially alter beneficial uses of the Delta. Therefore, it is not anticipated that there would be adverse effects on public health related to pesticides from drinking water sources.

Because there would be no increases in DBPs due to increases in bromide or DOC in Delta surface waters, and because the modeled changes in trace metals and pesticide concentrations would not increase substantially in magnitude or frequency in the Delta under Alternative 5A relative to the No Action Alternative (ELT and LLT), there would be no adverse effect on public health as a result of operation of the water conveyance facilities.

CEQA Conclusion: Under Alternative 5A, modeled long-term average pesticide levels in the Delta would be similar to or slightly less that described under Alternative 4 and would not be expected to increase substantially, relative to Existing Conditions, such that beneficial use impairments are made measurably worse.

Long-term average bromide concentrations would increase in the South Fork Mokelumne River at Staten Island and Sacramento River at Emmaton, and decrease at all other assessment locations relative to Existing Conditions. The long-term average bromide concentration in the South Fork Mokelumne River at Staten Island would be less than the 100 µg/L believed to be sufficient to meet currently established drinking water criteria for disinfection byproducts, and the increase at Sacramento River at Emmaton would be very small (<1%). There would be an increased frequency of exceedance of both the CALFED Drinking Water Program long-term bromide goal of 50 µg/L at the South Fork Mokelumne River at Staten Island, Franks Tract, Old River at Rock Slough, Sacramento River at Emmaton, San Joaquin River at Antioch, and Sacramento River at Mallard Island. Also, these locations (with the exception of the South Fork Mokelumne River), and Franks Tract and Contra Costa Pumping Plant #1, would have an increased frequency of exceedance of 100 µg/L, which is the concentration believed to be sufficient to meet currently established drinking water criteria for DBPs. The 100 bromide threshold would be exceeded at Franks Tract for the 16-year period modeled. The long-term average bromide concentrations would increase only in the South Fork Mokelumne River at Staten Island and Sacramento River at Emmaton and decrease at all other assessment locations. The long-term average bromide concentration in the South Fork

Mokelumne River at Staten Island would be less than the 100 µg/L believed to be sufficient to meet currently established drinking water criteria for disinfection byproducts, and the increase at Sacramento River at Emmaton would be very small (<1%). The effects of Alternative 5A in the LLT in the Delta relative to Existing Conditions would be expected to be similar. There may be higher bromide concentrations in the LLT in the western Delta, but this would be associated with sea level rise, not the project alternative, because the primary source of bromide to the Delta is sea water intrusion. The use of seasonal intakes at Antioch and Mallard Island is largely driven by acceptable water quality, and therefore has historically been opportunistic, and the opportunity to use these intakes would remain. Thus, the increased bromide concentrations at these locations would not be expected to adversely affect municipal beneficial uses, or any other beneficial use, and therefore would not be expected to contribute substantially to DBP formation. Operations and maintenance activities under Alternative 5A would not cause a substantial long-term change in DOC concentrations in the Delta, although there would be relatively small increases in long-term average DOC concentrations at some interior Delta locations (Franks Tract, Old River at Rock Slough, and Contra Costa Pumping Plant #1). However, the increases are of sufficiently small magnitude that they would not require existing drinking water treatment plants to substantially upgrade treatment for DOC above levels currently employed, and therefore these increases would not be expected to contribute substantially to DBP formation. Further, there would be predicted improvements in long-term average DOC concentrations at Barker Slough relative to Existing Conditions. Average concentrations of trace metals are not expected to increase substantially under Alternative 5A in the primary source water. Therefore, this alternative is not expected to cause additional exceedances of applicable water quality objectives by frequency, magnitude, and geographic extent that would cause significant impacts on any beneficial uses of waters in the affected environment.

Because there would be no increases in DBPs due to increases in bromide or DOC in Delta surface waters, and because the modeled changes in trace metals and pesticide concentrations would not increase substantially in magnitude or frequency in the Delta with implementation of water supply operations under Alternative 5A relative to Existing Conditions, there would be no significant impact on public health as a result of operation of the water conveyance facilities. No mitigation is required.

Impact PH-3: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Construction, Operation or Maintenance of the Water Conveyance Facilities

NEPA Effects: As described in Chapter 8, *Water Quality*, modeling scenarios included assumptions regarding how certain habitat restoration activities would affect Delta hydrodynamics. The amount of habitat restoration completed under Alternative 5A would be substantially less than under Alternative 4. To the extent that restoration actions would alter hydrodynamics within the Delta region, which affects mixing of source waters, these effects are included in this assessment of water quality changes due to water conveyance facilities operations and maintenance.

One intake would be constructed and operated under Alternative 5A. Sediment-disturbing activities during construction and maintenance of this intake and other water conveyance facilities proposed near or in surface waters under this alternative could result in the disturbance of existing constituents in sediment, such as pesticides or methylmercury. In-channel construction activities, such as pile driving during the construction of cofferdams at the intakes and pier construction at the barge unloading facilities, which would occur over a period of 5 months, would result in the localized disturbance of river sediment. In addition, maintenance of the single proposed north Delta intakes and the intermediate forebay would entail periodic dredging for sediment removal at these locations. Sediment accumulation in both the northern and southern portion of the expanded Clifton Court Forebay is expected to be minimal in the ELT period as the need for dredging is anticipated to be every 50 years given the design. However, it is anticipated that there may be some sediment accumulation at the inlet structure of the northern portion of Clifton Court Forebay. Therefore, while overall sediment accumulation in this forebay is not expected to be substantial, some dredging may be required at the inlet structure to maintain an even flow path.

Pesticides

Legacy pesticides, such as organochlorines, have low water solubility; they do not readily volatilize and have a tendency to bond to particulates (e.g., soil and sediment), settle out into the sediment, and not be transported far from the source. If present in sediment within in-water construction areas, legacy pesticides would be disturbed locally and would not be expected to partition into the water column to any substantial degree. Therefore, no significant adverse effect on public health would result from construction.

Numerous pesticides are currently used throughout the affected environment. While some of these pesticides may be bioaccumulative, those present-use pesticides for which there is sufficient evidence of their presence in waters affected by SWP and CVP operations (i.e., organophosphate pesticides, such as diazinon, chlorpyrifos, diuron, and pyrethroids) are not considered bioaccumulative. Thus, changes in their concentrations would not directly cause bioaccumulative problems in aquatic life or humans. The effects of Alternative 5A on pesticide levels in surface waters upstream of the Delta, in the Delta, and in the SWP/CVP Export Service Areas relative to the No Action Alternative (ELT) would be similar to or slightly less than those described for the Alternative 4. Alternative 5A would not result in increased tributary flows that would mobilize organochlorine pesticides in sediments. Thus, the change in source water in the Delta associated with the change in water supply operations is not expected to adversely affect public health with respect to bioaccumulation of pesticides.

Methylmercury

If mercury is sequestered in sediments at water facility construction sites, it could become suspended in the water column during construction activities, opening up a new pathway into the food chain. Construction activities (e.g., pile driving and cofferdam installation) at intake sites or barge landing locations would result in a localized, short-term resuspension of sediment and an increase in turbidity that may contain elemental or methylated forms of mercury. Please see Chapter 8, Section 8.1.3.9, *Mercury,* for a discussion of methylmercury concentrations in sediments.

Changes in methylmercury concentrations under Alternative 5A are expected to be small. As described in Chapter 8, *Water Quality,* the greatest annual average methylmercury concentration for drought conditions under Alternative 5A would be 0.168 ng/L for the San Joaquin River at Buckley Cove, which would be the same as the No Action Alternative (ELT). Fish tissue estimates show only small or no increases for mercury concentrations relative to the No Action Alternative (ELT) based on long-term annual average concentrations in the Delta. Mercury concentrations in fish tissue expected for Alternative 5A (with Equation 1), show increases of 5 percent or less, relative to the No Action Alternative (ELT), in all modeled years. Mercury concentrations in fish tissue expected for Alternative 5A (with Equation 2), are estimated to be 7 percent or less relative to the No Action Alternative (ELT), in all modeled years. Because these increases are relatively small, and because it is not apparent that substantive increases are expected throughout the Delta, these estimated changes in mercury concentrations in fish tissue under Alternative 5A are expected to be within the uncertainty inherent in the modeling approach and would not likely be measureable in the environment. See Appendix 8I, *Mercury*, for a discussion of the uncertainty associated with fish tissue estimates of mercury. As discussed in Chapter 8, in the LLT, the primary difference will be changes in the Delta source water fractions due to hydrologic effects from climate change and sea level rise. These effects would occur regardless of the implementation of the alternative and, thus, at the LLT the effects of the alternative on mercury are expected to be similar to those described above. Therefore, modeled changes in mercury in the Delta and in fish tissues due to operation of Alternative 5A would not be expected to adversely affect public health.

In summary, operation of the water conveyance facilities under Alternative 5A would not alter bioaccumulative pesticide concentrations or mercury concentrations in the Delta such that there would be an effect on public health. As such, there would be no adverse effect.

CEQA Conclusion: Operation of the water conveyance facilities under Alternative 5A is not expected to cause additional exceedance of applicable water quality objectives/criteria by frequency, magnitude, and geographic extent that would cause adverse effects on any beneficial uses of waters in the affected environment. Because mercury concentrations are not expected to increase substantially relative to the Existing Conditions, no long-term water quality degradation is expected to occur and, thus, no adverse effects to beneficial uses would occur. Because any increases in mercury or methylmercury concentrations are not likely to be measurable, changes in mercury concentrations or fish tissue mercury concentrations would not make any existing mercury-related impairment measurably worse. Construction activities (e.g., pile driving and cofferdam installation) at intake sites or barge landing locations would result in a localized, short-term resuspension of sediment and an increase in turbidity that may contain elemental or methylated forms of mercury.

The effects of Alternative 5A on bioaccumulative pesticide levels in the Delta would be similar to or slightly less than those described for the Alternative 4. Alternative 5A would not result in increased tributary flows that would mobilize organochlorine pesticides in sediments. Thus, the change in source water in the Delta associated with the change in water supply operations is not expected to adversely affect public health with respect to bioaccumulation of pesticides. If present in sediment within in-water construction areas, legacy pesticides would be disturbed locally and would not be expected to partition into the water column to any substantial degree.

For these reasons, there would be no significant impact on public health due to mercury or bioaccumulative pesticides as a result of construction of or operation of the water conveyance facilities under Alternative 5A. No mitigation is required.

Impact PH-4: Expose Substantially More People to Transmission Lines Generating New Sources of EMFs as a Result of the Construction and Operation of the Water Conveyance Facilities

NEPA Effects: The potential for Alternative 5A transmission line construction and operation to expose people to new sources of EMFs would be similar to Alternative 4. As shown in Table 25-9, a total of 4.59 miles of new temporary 69 kV transmission lines; 14.96 miles of new permanent 230 kV transmission lines; 18.72 miles of new temporary 230 kV transmission line; 1.00 mile of new permanent 230 kV/34.5 kV (underbuild) transmission lines; 11.28 miles of new permanent 230 kV/34.5 kV (underbuild) transmission lines; and the relocation of 1.19 miles of existing 500 kV transmission line would be required for this alternative. As described for Alternative 4, this effect would not be adverse because transmission lines would generally not be located in populated areas or within 300 feet of sensitive receptors and CPUC's EMF design guidelines would be implemented for any new temporary or new permanent transmission lines constructed and operated under Alternative 5A.

CEQA Conclusion: The potential for Alternative 5A transmission line construction and operation to expose people to new sources of EMFs would be smaller relative to Alternative 4 because there would be fewer facilities requiring power (i.e., intakes) under Alternative 5A. Under Alternative 5A, the majority of proposed new temporary (69 kV and 230 kV) and new permanent (230 kV and 230 kV/34.5 kV) transmission lines would be located within the rights-of-way of existing transmission lines; any new temporary or permanent transmission lines not within the right-of-way of existing transmission lines would, for the most part, be located in sparsely populated areas generally away from existing sensitive receptors. None of the proposed temporary or permanent transmission lines would be within 300 feet of sensitive receptors. Further, the temporary transmission lines would be removed when construction of the water conveyance facility features is completed, so there would be no potential permanent effects. Therefore, these transmission lines would not substantially increase people's exposure to EMFs. This impact is considered to be less than significant because transmission lines would generally not be located in populated areas or within 300 feet of sensitive receptors and CPUC's EMF design guidelines would be implemented for any new temporary or permanent transmission lines constructed and operated under Alternative 5A. No mitigation is required.

Impact PH-5: Increase in Vector-Borne Diseases as a Result of Implementing Environmental Commitments 3, 4, 6, 7, 10, and 11

Effects of Alternative 5A related to the potential for increase in vector-borne diseases from implementing Environmental Commitments 3, 4, 6, 7, 10, and 11 would be similar to those described for Alternative 4A. However, as described in Chapter 3, *Description of Alternatives*, Alternative 5A would restore fewer acres of habitat under these Environmental Commitments and, therefore, the potential for vector-borne disease effects under Alternative 5A would likely be less than the potential associated with Alternative 4A.

NEPA Effects: Implementation of portions of Environmental Commitments 3, 4, 6, 7, 10, and 11 under Alternative 5A would involve protecting and restoring wetland and other surface water habitat that could potentially increase suitable mosquito habitat within the study area. This potential effect would not be adverse because the total restoration acreage of these types of habitat implemented under Alternative 5A would generally not be located near densely populated areas, and management plans under Environmental Commitment 11: Natural Communities Enhancement and Management would be implemented in consultation with the appropriate MVCDs to ensure MMPs are implemented to reduce mosquito breeding. Additionally, BMPs from the guidelines outlined in Appendix 3B, *Environmental Commitments, AMMs, and CMs*, would be incorporated into Alternative 5A and executed to maintain proper water circulation and flooding during appropriate times of the year (e.g., fall) to prevent stagnant water and habitat for mosquitoes. This consultation would occur when specific restoration and enhancement projects and locations are identified.

CEQA Conclusion: The potential for impacts related to increases of vector-borne disease from mosquitos during construction, operation, and maintenance of portions of Environmental Commitment 3, 4, 6, 7, 10, and 11 under Alternative 5A is considered less than significant because the total wetland restoration acreage implemented under this alternative would generally not be located near densely populated areas, and management plans under Environmental Commitment 11: Natural Communities Enhancement and Management would be implemented in consultation with the appropriate MVCDs to ensure MMPs are implemented to reduce mosquito breeding. Additionally, BMPs from the guidelines outlined in Appendix 3B, *Environmental Commitments, AMMs, and CMs*, would be incorporated and executed to maintain proper water circulation and flooding during appropriate times of the year (e.g., fall) to prevent stagnant water and habitat for mosquitoes. No mitigation is required.

Impact PH-6: Substantial Increase in Recreationists' Exposure to Pathogens as a Result of Implementing the Restoration Environmental Commitments

Effects of Alternative 5A related to the potential for increase in recreationists' exposure to pathogens from implementing portions of the restoration Environmental Commitments would be similar to those described for Alternative 4A. However, as described in Chapter 3, *Description of Alternatives*, Alternative 5A would restore slightly fewer acres of habitat under Environmental Commitments 3, 4, 6, 7, and 9–11 relative to Alternative 4A.

NEPA Effects: The study area currently supports habitat types, such as tidal habitat, upland wetlands, and agricultural lands that produce pathogens as a result of the biological productivity in these areas (e.g., migrating birds, application of fertilizers, waste products of animals). The study area does not currently have pathogen concentrations that rise to the level of adversely affecting beneficial uses of recreation. However, any potential increase in pathogens associated with the proposed habitat restoration and enhancement Environmental Commitments under Alternative 5A would be localized and within the vicinity of the actual restoration. This localized increase is not expected to be of sufficient magnitude and duration to result in adverse effects on recreationists because these areas would generally not support livestock and most areas would not have public access.

CEQA Conclusion: The potential for an increase in recreationists' exposure to pathogens under Alternative 5A is considered less than significant because of the localized nature of pathogens and because the rapid die-off of some types of pathogens in water would not create sufficient magnitudes of pathogen generation that could affect recreational beneficial uses. No mitigation is required.

Impact PH-7: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Implementing Environmental Commitments 3, 4, and 10

Effects of Alternative 5A related to the potential to mobilize contaminants known to bioaccumulate (pesticides and methylmercury) from implementing portions of the restoration Environmental Commitments would be similar to those described for Alternative 4A. However, as described in Chapter 3, *Description of Alternatives*, Alternative 5A would restore fewer acres of habitat under Environmental Commitments 3, 4 and 10 relative to Alternative 4A. Therefore, the potential for mobilization of contaminants under Alternative 5A would likely be less than the potential associated with Alternative 4A.

NEPA Effects: The primary concern with habitat restoration regarding constituents known to bioaccumulate is the potential for mobilizing contaminants sequestered in sediments of the newly inundated floodplains and marshes. The mobilization depends on the presence of the constituent and the biogeochemical behavior of the constituent to determine whether it could re-enter the water column or be reintroduced into the food chain. This potential effect would not be adverse because the total tidal and nontidal habitat restoration acreage implemented under Alternative 5A would be relatively small, bioaccumulation of pesticides and/or methylmercury in these restoration areas is not expected to substantially affect public health because of the limited extent of this type of restored habitat under Alternative 5A, the localized nature of pesticide bioaccumulation, and because current OEHHA standards would be enforced. Environmental Commitment 12: Methylmercury Management would be implemented to reduce methylmercury production in restored habitats.

CEQA Conclusion: The potential for public health impacts related to mobilization of pesticides and methylmercury in habitat restoration areas related to Environmental Commitments 3, 4, and 10 is considered less than significant because the total tidal and nontidal restoration acreage implemented under Alternative 5A would be relatively small, bioaccumulation of pesticides and/or methylmercury in the these restoration areas is not expected to substantially affect public health because of the limited extent of restored habitat under Alternative 5A, the localized nature of pesticide bioaccumulation, and because current OEHHA standards would be enforced. Environmental Commitment 12: Methylmercury Management would be implemented to reduce methylmercury production in restored habitats. No mitigation is required.

Impact PH-8: Increase in *Microcystis* Bloom Formation as a Result of Operation of the Water Conveyance Facilities

NEPA Effects: Any modified reservoir operations under Alternative 5A are not expected to promote *Microcystis* production upstream of the Delta relative to the No Action Alternative (ELT and LLT) since large reservoirs upstream of the Delta are typically low in nutrient concentrations. Further, in the rivers and streams of the Sacramento River watershed, watersheds of the eastern tributaries (Cosumnes, Mokelumne, and Calaveras Rivers), and the San Joaquin River upstream of the Delta, bloom development would be limited by high water velocity and low hydraulic residence times. These conditions would not be expected to change under Alternative 5A relative to the No Action Alternative (ELT and LLT)

With implementation of water supply operations under Alternative 5A, conditions in the Export Service Areas are not expected to become more conducive to *Microcystis* bloom formation relative to the No Action Alternative (ELT and LLT) because the fraction of water flowing through the Delta that would reach the existing south Delta intakes is not expected to be adversely affected by *Microcystis* blooms*.*

As discussed in Chapter 8, under this alternative, a portion of the Sacramento River water, which would be conveyed through the Delta to the south Delta intakes under the No Action Alternative (ELT and LLT), would be replaced at various locations throughout the Delta by other source water due to diversion of Sacramento River water at the north Delta intake. The change in flow paths of water through the Delta that would occur due to operations and maintenance of the water conveyance facilities under Alternative 5A and could result in localized increases in residence time in various Delta sub-regions, and decreases in residence time in other areas. In general, there is substantial uncertainty regarding the extent that facilities operations and maintenance of Alternative 5A would result in a net increase in water residence times at various locations throughout the Delta relative to the No Action Alternative (ELT and LLT). Several factors unrelated to implementation of the alternative would influence water residence times including habitat restoration (8,000 acres of tidal habitat restoration and enhancements to the Yolo Bypass), climate change and sea level rise, and climate change would result in increased ambient water temperatures in the Delta. These effects would occur under both Alternative 5A and No Action Alternative (ELT and LLT). Thus, because the only difference between operations and maintenance of Alternative 5A and the No Action Alternative is changes in flow paths and source water fractions in the Delta, Alternative 5A is not expected to increase water residence times or ambient water temperatures throughout the Delta that would result in adverse effects on *Microcystis*, relative to No Action Alternative (ELT and LLT).

CEQA Conclusion: Relative to Existing Conditions, operation of the water conveyance facilities under Alternative 5A is not expected to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta because large reservoirs upstream are typically low in nutrient concentrations, and high water velocity and low hydraulic residence times in the upstream area limit the development of *Microcystis* blooms.

The potential for *Microcystis* blooms in the Export Service Areas under Alternative 5A would be less than under Alternative 4, but source waters to the south Delta intakes could be affected by *Microcystis* due to an increase in Delta water temperatures associated with climate change and from an increase in water residence times. The impacts from increased water residence times in the Delta would be mostly related to tidal habitat restoration and improvements to the Yolo Bypass, which are assumed to occur separate from Alternative 5A, as well as to climate change and sea level rise. The combined effect of these factors on increasing *Microcystis* in source waters to the south Delta intakes would likely be a greater influence than that of Alternative 5A operations.

Water supply operations under Alternative 5A could result in localized increases in Delta residence times in some locations and decreased residence times in other Delta locations. As indicated in Chapter 8, *Water Quality*, there is substantial uncertainty regarding the extent that Alternative 5A operations and maintenance would result in a net increase in water residence times relative to Existing Conditions. Regardless of this uncertainty, it is likely that these potential effects under Alternative 5A would be relatively small compared to the combined effects of tidal habitat restoration and Yolo Bypass improvements unrelated to Alternative 5A, and sea level rise and climate change. The combined effects of restoration activities unrelated to Alternative 5A, climate change, and sea level rise on increased water residence time, as well as the effects of climate change on Delta water temperatures, it is possible that *Microcystis* blooms in the Delta would increase in frequency, magnitude, and geographic extent, relative to Existing Conditions. Although there is considerable uncertainty regarding this impact, the effects on *Microcystis* due to operations under Alternative 5A would be less than significant. No mitigation is required.

Impact PH-9: Increase in *Microcystis* Bloom Formation as a Result of Implementing Environmental Commitment 4

Effects related to *Microcystis* from implementation of Environmental Commitment 4 under Alternative 5A would be similar to those described for Alternative 4A, but would likely be greater in magnitude because there would be substantially more acres of tidal natural communities restored under this alternative (292 acres) relative to Alternative 4A (59 acres).

NEPA Effects**:** Under Alternative 5A, Yolo Bypass Fisheries Enhancement would not occur. However, improvements in the Yolo Bypass, as well as restoration of 8,000 acres of tidal habitat, would be implemented under a plan separate and distinct from Alternative 5A (see Chapter 3, *Description of Alternatives*). These activities are assumed to occur under both Alternative 5A and the No Action Alternative. Similar to Alternative 4 (under CM 4), there would be tidal habitat restoration in the Delta under Alternative 5A with implementation of Environmental Commitment 4. Tidal habitat restoration would create shallow backwater areas that could result in local warmer water and increased water residence time of magnitude and extent that would result in measurable changes on

Microcystis levels in the Delta. However, the 292 acres of tidal habitat restored under this alternative would be substantially fewer)relative to the No Action Alternative and therefore, as discussed in Chapter 8, *Water Quality*, would have negligible effects in terms of the potential for creating conditions conducive to *Microcystis* bloom in the Delta in comparison to the No Action (ELT and LLT). Therefore, implementation of Environmental Commitment 4 under Alternative 5A would not be adverse because it would not contribute to measurable changes in *Microcystis* bloom formation.

CEQA Conclusion: Implementation of Environmental Commitment 4: Tidal Natural Communities Restoration under Alternative 5A would result in 292 acres of tidal restoration within the Delta. This would have a negligible effect on creating conditions conducive to *Microcystis* bloom formation, particularly relative to the development of 8,000 acres of tidal habitat and improvements to the Yolo Bypass—activities separate and distinct from Alternative 5A. These activities would create shallow backwater areas that could result in a measureable increase in water temperatures and water residence times in the Delta, and therefore *Microcystis*, relative to Existing Conditions. Thus, implementation of Environmental Commitment 4 under Alternative 5A would be less than significant. No mitigation is required.

25.3.5 Cumulative Analysis

This cumulative impact analysis considers past, present, and reasonably foreseeable future projects that could affect the same resources and, where relevant, occur within the same timeframe as the action alternatives. The effects of the action alternatives, as they relate to public health, considered in connection with the potential effects of projects (listed in Attachment 3D-A to Appendix 3D, *Defining Existing Conditions, No Action Alternative, No Project Alternative, and Cumulative Impact Conditions*) that may occur in the study area, could be cumulatively adverse. It is expected that some changes related to public health would take place, even though it is assumed that reasonably foreseeable future projects would include typical design and construction practices to avoid or minimize potential impacts.

The potential public health effects resulting from the action alternatives as addressed in this chapter are related to the following.

- Drinking water quality as related specifically to humans.
- Bioaccumulation of toxicants in fish and aquatic organisms that are consumed by humans.
- Pathogens and *Microcystis* in recreational waters.
- Vectors—specifically, disease-carrying mosquitoes.
- EMFs from transmission lines affecting the public.

These effects could occur during construction or operation of the water conveyance facilities and restoration/enhancement areas, and they primarily would be localized.

When the effects of any of the action alternatives are considered in combination with the effects of initiatives listed in Table 25-11, the cumulative effects on public health are potentially adverse. The specific programs, projects, and policies are identified below for each impact category based on the potential to contribute to an impact due to implementation of the proposed project that could be deemed cumulatively considerable. For a complete list of such projects, consult Appendix 3D, *Defining Existing Conditions, No Action Alternative, No Project Alternative, and Cumulative Impact*

Conditions. The potential for cumulative impacts on public health is described for effects related to the construction and operation of the water conveyance facilities and effects stemming from the long-term implementation of CM2–CM21 under the BDCP alternatives, or the Environmental Commitments under the non-HCP alternatives (Alternatives 4A, 2D, and 5A).

Table 25-11. Effects on Public Health from the Plans, Policies, and Programs Considered for Cumulative Analysis

Agency	Program/ Project	Status	Description of Program/Project	Effects on Public Health
Department of Water Resources	North Delta Flood Control and Ecosystem Restoration Project	Final EIR complete	Project implements flood control and ecosystem restoration benefits in the north Delta	Potential to increase the amount of breeding habitat for mosquitoes and thus increase the local populations of mosquitoes. Accordingly, within 10 miles of McCormack-Williamson Tract, there would be the potential to increase the public's exposure to mosquitoes and therefore potentially vector-borne disease.
Freeport Regional Water Authority and Bureau of Reclamation	Freeport Regional Water Project	Project was completed late 2010	Project includes an intake/pumping plant near Freeport on the Sacramento River and a conveyance structure to transport water through Sacramento County to the Folsom South Canal	No adverse effect on public health from vector-borne diseases and mobilization of constituents known to bioaccumulate during construction and operation.
Reclamation District 2093	Liberty Island Conservation Bank		This project includes the restoration of inaccessible, flood prone land, zoned as agriculture but not actively farmed, to area enhancement of wildlife resources	No effect on public health.
Bureau of Reclamation	Delta-Mendota Canal/ California Aqueduct Intertie	Anticipated completion by 2012	The purpose of the intertie is to better coordinate water delivery operations between the California Aqueduct (state) and the Delta-Mendota Canal (federal) and to provide better pumping capacity for the Jones Pumping Plant. New project facilities include a pipeline and pumping plant	No adverse effect on public health is expected from vector-borne diseases and mobilization of constituents known to bioaccumulate during construction and operation.
California Department of Fish and Wildlife, U.S. Fish and Wildlife Service, Bureau of Reclamation, California Department of Water Resources, Suisun Resource Conservation District	Suisun Marsh Habitat Management, Preservation, and Restoration Plan	Final EIS/EIR 2011	The plan is intended to balance the benefits of tidal wetland restoration with other habitat uses in Suisin Marsh by evaluating alternatives that provide a politically acceptable change in marsh-wide land uses, such as salt marsh harvest mouse habitat, managed wetlands, public use, and upland habitat.	No adverse effect on public health from vector-borne diseases or mobilization of constituents known to bioaccumulate during construction and operation.

Agency	Program/ Project	Status	Description of Program/Project	Effects on Public Health
California Department of Water Resources	Dutch Slough Tidal Marsh Restoration Project	EIR certified in 2010, project is ongoing.	The Dutch Slough Tidal Marsh Restoration Project, located near Oakley in Eastern Contra Costa County, would restore wetland and uplands, and provide public access to the 1,166-acre Dutch Slough property owned DWR. The property is composed of three parcels separated by narrow man-made sloughs.	Reduce levels of mosquito production relative to Existing Conditions in areas where seasonal wetland areas and unmanaged nontidal freshwater marsh are reduced. Increase mosquito production as a result of non-tidal open water management options, which would increase exposure of humans to mosquitoes and potentially vector-borne diseases. Potential incremental increase in methylmercury formation and contribution to Delta load.
California Department of Water Resources and U.S. Bureau of Reclamation	Franks Tract Project	Delayed	Operable gates would be installed to control the flow of water at Threemile Slough and/or West False River. Boat passage facilities would be included to allow for passing of watercraft when the gates are in operation.	No adverse effect would be expected on public health from vector-borne diseases or mobilization of constituents known to bioaccumulate during construction and operation.
Contra Costa Water District	Contra Costa Canal Fish Screen Project	Completed in 2011	Installation of a fish screen at Rock Slough Intake.	No effect on public health.
Semitropic Water District	Delta Wetlands Project	Final EIR 2011	The Delta Wetlands Project involves the construction of a new water diversion and storage system on two islands in the Delta: Bacon Island and Webb Tract (Reservoir Islands). The Reservoir Islands provide for a total estimated storage capacity of 215 thousand acre-feet. The Delta Wetlands Project would increase the availability of high-quality water in the Delta for export or outflow through the following: (1) diversion of water on to the Reservoir Islands during high-flow periods (i.e., December through March); (2) storage of water on the Reservoir Islands; (3) mitigation for wetland and wildlife effects of the water storage operations on the Reservoir Islands by implementing a habitat management plan on Bouldin Island and Holland Tract; (4) supplemental water storage in	Implementation of this project would result in an increase in mosquito breeding habitat. Accordingly, there would be in increase in the public's exposure to mosquitoes and therefore potentially vector-borne disease.

Agency	Program/ Project	Status	Description of Program/Project	Effects on Public Health
			Semitropic Groundwater Storage Bank and the Antelope Valley Water Bank; (5) discharging water for export to designated south- of-Delta users when excess CVP or SWP pumping capacity is available (i.e., typically July through November); and (6) releasing water for water quality and outflow enhancement in the Bay-Delta Estuary typically from September through November.	
U.S. Army Corps of Engineers	CALFED Levee System Integrity Program	Ongoing	Includes maintaining and improving levee stability in the Delta.	No effect on public health.
Contra Costa Water District, Bureau of Reclamation, and California Department of Water Resources	Middle River Intake and Pump Station (previously known as the Alternative Intake Project)	Completed in 2011	Construction of a potable water intake and pump station, along Victoria Canal on Victoria Island, to improve drinking water quality for Contra Costa Water District customers.	No effect on public health.
California Department of Water Resources	Mayberry Farms Subsidence Reversal and Carbon Sequestration Project	Completed October 2010	Permanently flood 308-acre parcel of DWR-owned land (Hunting Club leased) and restore 274 acres of palustrine emergent wetlands within Sherman Island to create permanent wetlands and to monitor waterfowl, water quality, and greenhouse gases.	No adverse effect on public health from vector-borne diseases and mobilization of constituents known to bioaccumulate during construction and operation.
City of Stockton	Delta Water Supply Project (Phase 1)	Completed in 2012	Construction of a new intake structure and pumping station adjacent to the San Joaquin River; a water treatment plant along Lower Sacramento Road; and water pipelines along Eight Mile, Davis, and Lower Sacramento Roads.	No adverse effect on public health is expected from vector-borne diseases and mobilization of constituents known to bioaccumulate during construction and operation.
Bureau of Reclamation, California Department of Fish and Wildlife, and Natomas Central Mutual Water Company	American Basin Fish Screen and Habitat Improvement Project	Expected completion in 2012	This project involves consolidation of diversion facilities; removal of decommissioned facilities; aquatic and riparian habitat restoration; and installing fish screens in the Sacramento River. Total project footprint encompasses about 124 acres east of the Yolo Bypass. Permanent conversion of 70 acres of farmland (including 60 acres of rice) during Phases I and II.	No adverse effect is expected to public health is expected from vector-borne diseases and mobilization of constituents known to bioaccumulate during or after conversion.

Agency	Program/ Project	Status	Description of Program/Project	Effects on Public Health
California Department of Water Resources, and California Department of Fish and Wildlife	Sherman and Twitchell Islands Fish Screen Project	Completed in 2009	This project would Install fish screens on ten remaining unscreened diversions used to irrigate state-owned lands on Sherman and Twitchell Islands.	No effect on public health.
University of California, Davis, California Department of Water Resources, California Department of Fish and Wildlife, U.S. Fish and Wildlife Service, and Bureau of Reclamation	Delta Smelt Permanent Refuge	Program under development	Develop a permanent facility, possibly at the proposed U.S. Fish and Wildlife Science Center at Rio Vista.	No effect on public health.
Bureau of Reclamation, U.S. Fish and Wildlife Service, National Marine Fisheries Service, California Department of Water Resources and California Department of Fish and Wildlife	San Joaquin River Restoration Program	Final PEIS/EIR 2012	The program would restore and maintain fish populations in "good condition" in the main stem of the San Joaquin River below Friant Dam to the confluence of the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish.	There is the potential for adverse effects on public health from vector-borne disease as operation of this program could result in an increase in adult mosquito populations.
California Department of Water Resources	Dutch Slough Tidal Marsh Restoration Project	EIR certified in 2010, project is ongoing	The Dutch Slough Tidal Marsh Restoration Project, located near Oakley in Eastern Contra Costa County, would restore wetland and uplands, and provide public access to the 1,166-acre Dutch Slough property owned DWR. The property is composed of three parcels separated by narrow man-made sloughs.	Reduced levels of mosquito production relative to Existing Conditions in areas where seasonal wetland areas and unmanaged nontidal freshwater marsh are reduced. Increase mosquito production as a result of non-tidal open water management options, which would increase exposure of humans to mosquitoes and potentially vector-borne diseases. Potential incremental increase in methylmercury formation and contribution to Delta load.
California Natural Resources Agency, California Environmental Protection Agency, and California Department of Food and Agriculture	California Water Action Plan	Ongoing and future	Identifies key actions for the next one to five years that address urgent needs and provide the foundation for the sustainable management of California's water resources.	Actions implemented may affect seasonal and long-term water quality conditions in the Delta.

Agency	Program/ Project	Status	Description of Program/Project	Effects on Public Health
State Water Resources Control Board	Bay-Delta Water Quality Control Plan Update	Ongoing and future	The State Water Board is updating the Bay-Delta Water Quality Control Plan in four phases: Phase I: Modifying water quality objectives (i.e., establishing minimum flows) on the Lower San Joaquin River and Stanislaus, Tuolumne, and Merced Rivers to protect the beneficial use of fish and wildlife and (2) modifying the water quality objectives in the southern Delta to protect the beneficial use of agriculture; Phase II: Evaluating and potentially amending existing water quality objectives that protect beneficial uses and the program of implementation to achieve those objectives. Water quality objectives that could be amended include Delta outflow criteria; Phase III: Requires a water rights proceeding to determine changes to existing water rights to achieve the objectives identified in Phase I and Phase II. Phase III will likely not occur until after Phase IV is complete or close to complete; Phase IV: Evaluating and potentially establishing water quality criteria and flow objectives that protect beneficial uses on tributaries to the Sacramento River.	To the extent that modifications in surface water flow patterns, increase minimum instream flows, and increase minimum Delta outflows, this would benefit water quality in the Delta.
Bureau of Reclamation, U.S. Fish and Wildlife Service, National Marine Fisheries Services, Department of Water Resources, and Department of Fish and Wildlife	San Joaquin River Restoration Program	Final EIS/EIR and Record of Decision completed in 2011	Program that aims at restoring flows to the San Joaquin River from Friant Dam to the confluence of Merced River (Bureau of Reclamation 2011).	The impact analysis in the EIS/EIR indicated that the program would entail construction and other restoration activities in the area located along the San Joaquin River between Friant Dam and the Merced River, which includes areas with an increased risk of exposure to West Nile virus in wetted portions of the San Joaquin River that provide mosquito habitat. In addition, The reoperation of Friant Dam would increase water volume and change the timing of water flows in the San Joaquin

Agency	Program/ Project	Status	Description of Program/Project	Effects on Public Health
				River. These changes could affect public health by increasing the amount of freestanding water, which could increase the amount of mosquito habitat and exposure to diseases.
Bureau of Reclamation, Department of Water Resources, and State Water Resources Control Board	Drought Contingency Plan (includes Emergency Drought Barriers project)	Completed for 2015; reasonably foreseeable to occur in future years with drought	Modification of Bay-Delta Water Quality Objectives (e.g., Delta outflow and electrical conductivity requirements) and requirements from 2008/2009 SWP/CVP BiOps to balance supplying human needs, repelling saltwater in the Delta, and providing for cold water needs of Chinook salmon.	Reduced Delta outflow may increase the potential for negative effects from flow-related stressors (e.g., *Microcystis*).

If the cumulative public health effects (which includes implementation of the action alternatives along with past, present, and reasonably foreseeable future projects, population growth, and climate change) for any of the identified impacts listed above is determined not to be adverse (or significant under CEQA), then no further assessment is required. No further assessment is required because a non-adverse cumulative condition demonstrates that the alternative would not have adverse effects that are individually less than significant but that would "cumulate" or "be additive" with those of other past, present, and reasonably foreseeable projects to result in an adverse cumulative effect. In this case, because the cumulative condition would not be adverse, and the alternative implemented would not contribute considerably to an adverse cumulative condition, no mitigation would be triggered from this cumulative impact assessment finding. Conversely, if the cumulative condition for public health is determined to be adverse, then further assessment is provided to determine if the incremental contribution of the alternatives would contribute considerably to that adverse cumulative condition. If an alternative's implementation would not contribute considerably to the adverse cumulative effects identified, then no mitigation is required. However, if an alternative's implementation would contribute considerably to the adverse cumulative effects identified, then mitigation for the alternative's contribution to the identified adverse cumulative public health effects is proposed.

25.3.5.1 Cumulative Effects of the No Action Alternative

Under the cumulative condition, the No Action Alternative would entail construction and/or operation and maintenance of the projects in Table 25-11. These projects could result in adverse effects on the public health by lowering drinking water quality due to exceedances of water quality criteria for constituents of concern (trace metals of human health/drinking water concern, DBP, and non-bioaccumulative pesticides) and *Microcystis*; exposing sensitive receptors (e.g., hospitals, schools, parks) to EMF from new transmission lines; increasing the public's risk of exposure to vector-borne diseases; increasing bioaccumulation of persistent toxicants (e.g., mercury) in fish consumed by people; and exposing the public to pathogens and *Microcystis* in recreational waters. Additionally, there would be a change in various source waters throughout the Delta (i.e., upstream water, Bay water, agricultural return flow) due to potential changes in inflows, particularly from the

Sacramento River watershed because of increased water demands or changes to climate and precipitation levels which could expose the public to pathogens in recreational waters.

Implementation of any projects would comply with federal, state, and local regulatory agency standards (e.g., CPUC design criteria and guidelines regarding EMFs; drinking water quality standards; existing MVCDs) and these projects in the cumulative No Action scenario would require its own separate environmental compliance process to ensure effects were minimized. Therefore, there would be no cumulative adverse effects on public health under the No Action Alternative related to drinking water quality due to exceedances of water quality criteria for constituents of concern; EMF exposure; vector-borne diseases; bioaccumulation of persistent toxicants; or pathogens in recreational waters. However, as indicated in Chapter 8, *Water Quality,* projected future water temperature changes in the Delta under the No Action Alternative indicate that water temperatures would increase due to climate change. This increase in temperature could lead to earlier attainment of the water temperature threshold of 19°C required to initiate *Microcystis* bloom formation, and thus earlier occurrences of *Microcystis* blooms in the Delta. In addition, warmer water temperatures could increase bloom duration and magnitude. Accordingly, long-term water quality degradation may occur in the Delta and water exported from the Delta to the SWP and CVP Export Service Areas. Therefore, impacts on beneficial uses, including drinking water and recreational waters, could occur and, as such, public health could be affected. Accordingly, this would be considered an adverse effect.

The Delta and vicinity are within a highly active seismic area, with a generally high potential for major future earthquake events along nearby and/or regional faults, and with the probability for such events increasing over time. Based on the location, extent and non-engineered nature of many existing levee structures in the Delta area, the potential for significant damage to, or failure of, these structures during a major local seismic event is generally moderate to high. In the instance of a large seismic event, levees constructed on liquefiable foundations are expected to experience large deformations (in excess of 10 feet) under a moderate to large earthquake in the region. A major earthquake event could result in breaching/failure of existing levees within the Delta area, with a substantial number of these structures exhibiting moderate to high failure probabilities. The most immediate and significant effect to water quality under such a scenario would be the influx of large volumes of seawater and/or brackish water into the Delta, which would alter the "normal" balance of freshwater/seawater flows and result in flooding of the associated islands. The corresponding shift in Delta water quality conditions would be characterized by an increase in salinity levels, including specific associated constituents such as bromide (which affects total dissolved solids concentrations and can contribute to the formation of undesirable chemical byproducts in treated drinking water). (See Appendix 3E, *Potential Seismic and Climate Change Risks to SWP/CVP Water Supplies*, for more detailed discussion). Flooding caused by levee failure could result in a substantial increase in the public's risk of exposure to vector-borne diseases due to large bodies of standing water prior to flood waters being pumped off inundated Delta islands. Additionally, flood events could cause exceedance(s) of water quality criteria for constituents of concern such that an adverse effect would occur to public health from drinking water sources. While similar risks would occur under implementation of the action alternatives, these risks may be reduced by levee improvements under the proposed project, along with those projects identified in Table 25-11.

25.3.5.2 Concurrent Project Effects

Construction, operation, and maintenance of the water conveyance facilities and other conservation measures under the action alternatives would result in effects on public health in the Plan Area. Effects could include increases in vector-borne diseases; exceedances of water quality criteria for constituents of concern (i.e., DBPs, trace metals, and pesticides); substantial mobilization of or increase in bioaccumulative constituents (i.e., pesticides and methylmercury); exposure of substantially more people to new sources of EMF; exposure of recreationists to pathogens; and increasing the potential for exposure of the public to *Microcystis* and microcystin in drinking water and recreational waters.

Construction activities for the water conveyance facilities and CM2–CM11 and CM16 or Environmental Commitments 3, 4, 6–11 and 16, depending upon the alternative, could overlap in time, with construction of the water conveyance facilities, concluding after approximately 14 years. Potential effects on public health resulting from concurrent construction, and potentially operation, of the water conveyance facilities and these conservation measures or Environmental Commitments could compound potential public health effects, particularly where these activities occur in close proximity and within the same timeframe. For example, construction and operation of the water conveyance facilities and CM2–CM7, CM10 and CM11 or Environmental Commitments 3, 4, 6, 7, 10, and 11 could increase suitable mosquito habitat within the Plan Area. Where the construction and operation of the water conveyance facilities and these conservation measures or Environmental Commitments are implemented in the same timeframe, and particularly within the same general area, the potential for adverse public health effects would increase relative to what may occur during construction and operation of the water conveyance facilities alone. Similarly, where construction and operation of the water conveyance facilities and CM2, CM4, CM5, and CM10 or Environmental Commitment 4, 5 and 10 overlap in time and occur in close proximity, there would be a greater potential for substantial mobilization of or increase in bioaccumulative pesticides and fish tissue concentrations of mercury in that area. Implementation of environmental commitments related to mosquito management and erosion and sediment control, and *CM12 Methylmercury Management* (or Environmental Commitment 12) would reduce the severity of these potential effects on public health.

In the long term, operation of the water conveyance facilities and conservation measures would occur simultaneously and, as a result, potential effects on public health could be additive for certain alternatives. For example, the concurrent implementation of Alternatives 6A–9, under which operation of the water conveyance facilities would result in significant unavoidable impacts on public health related to modeled increases in mercury concentrations in fish tissue, with conservation measures may be more adverse/significant than when considered separately, particularly because of the bioaccumulative properties of mercury and because the Delta is already impaired due to elevated mercury.

25.3.5.3 Cumulative Effects of the Action Alternatives

Impact PH-10: Cumulative Impact on Public Health from Constituents of Concern (DBPs and Pesticides)

NEPA Effects:

All Action Alternatives (Pesticides)

Currently, other projects that could affect drinking water include the projects listed in Table 25-11. These projects may result in changes to flow in the Plan Area and thus could alter surface water pesticide concentrations in the study area. While factors such as TMDLs and future development of more target-specific and less-toxic pesticides would ultimately influence the future cumulative condition for pesticides, forecasting whether these various efforts would ultimately be successful at resolving current pesticide-related impairments requires considerable speculation. Accordingly, it is conservatively assumed that the cumulative condition would be adverse with respect to pesticides. Construction and operation of the water conveyance facilities for Alternatives 1A–1C, 4A, 2D, and 5A are not expected to contribute considerably to the adverse cumulative condition associated with increases in pesticide concentrations in surface water and, consequently, in drinking water. Further, although there would be forecasted increases in pesticide concentrations in surface water at various Delta locations in the study area, according to modeling results for water supply operations for some proposed action alternatives (as previously indicated under Impact PH-2 for Alternatives 2A–2C, 3–5, 6A–6C, and 7–9), the prediction of adverse effects (the long-term risk of pesticide-related toxicity to aquatic life) fundamentally assumes that the present pattern of pesticide incidence in surface water would continue at similar levels into the future. In reality the makeup and character of the pesticide use market during the late long-term would not be exactly as it is today. Use of chlorpyrifos and diazinon is on the decline with their replacement by pyrethroids on the rise. Yet, in this assessment it is the apparent greater incidence of diazinon and chlorpyrifos in the San Joaquin River that serves as the basis for concluding that substantially increased San Joaquin River source water fraction would correspond to an increased risk of pesticide-related toxicity to aquatic life. However, water treatment plants are required to meet drinking water requirements set forth in the California Safe Drinking Water Act and the regulations adopted by CDPH. Therefore, it is not anticipated that there would be cumulative adverse effects on public health from pesticides in drinking water due to implementation of the action alternatives in combination with any of the cumulative projects.

Alternatives 1A–1C, 2A–2C, 3, 4, 5, 6A–6C, 7, 8, and 9 (DBPs [from increases in bromide concentrations])

Currently, other projects that could affect concentrations of constituents of concern in drinking water include the projects listed in Table 25-11. These projects may result in changes to flow in the study area and thus could alter DBP concentrations (from increases in bromide concentrations in surface water drinking sources). The BDCP alternatives are anticipated to result in the potential for public health concerns because the changes in flow associated with the water conveyance facilities operations would increase the concentrations of bromide at various modeled Delta locations, with the greatest increase projected to occur at the North Bay Aqueduct at Barker Slough. This increase could necessitate drinking water treatment plant upgrades or operational changes in order to maintain DBP compliance. While treatment technologies sufficient to achieve the necessary bromide removal exist, implementation of such technologies would likely require substantial investment in new or modified infrastructure. Should treatment plant upgrades not be undertaken, a change of such magnitude in long-term average bromide concentrations in drinking water sources would represent an increased risk for adverse effects on public health from DBP in drinking water sources. Implementation of Mitigation Measure WQ-5 would reduce the severity of this impact. The proposed mitigation requires a series of phased actions to identify and evaluate existing and possible feasible actions to avoid, minimize, or offset increased bromide concentrations, followed by development and implementation of the actions, if determined to be necessary. Further, as described for Impact PH-2 under Alternative 1A, the adverse water quality effects on the North Bay Aqueduct at Barker Slough may be further minimized by implementation of the AIP. However, when these potential effects of the BDCP alternatives on public health are considered in combination with the potential effects of projects listed in Table 25-11 and in Appendix 3D, *Defining Existing Conditions*, *the No Action Alternative, No Project Alternative, and Cumulative Impact Conditions*, the effects of these action alternatives would be cumulatively considerable and therefore there would be a cumulative adverse effect on public health due to DBPs.

Alternatives 4A, 2D, and 5A (DBPs [from increases in DOC and bromide concentrations])

Currently, other past, present, and probably future projects that could affect concentrations of constituents of concern in drinking water include the projects listed in Table 25-11. These projects may result in changes to flow in the study area and thus could alter DBP concentrations (from increases in bromide and DOC concentrations in surface water drinking sources). In addition, the Delta is currently known to have elevated DOC levels exceeding standards, the cumulative condition generated from past and present projects is already considered adverse. However, neither habitat restoration and enhancement activities or construction, operation, and maintenance of the water conveyance facilities under Alternatives 4A, 2D, and 5A is expected to make a considerable adverse contribution to existing and future DOC levels in the Delta. The areal extent and magnitude of habitat restoration under these alternatives is considerably less than under the other action alternatives and therefore the contribution to existing DOC would be relatively low. In addition, as indicated in the water quality analysis (see Chapter 8, *Water Quality*), bromide would not increase substantially in drinking water sources in the study area. Therefore, there would not be a cumulative adverse effect on public health from increases in DBPs in drinking water sources in the study area due to implementing Alternatives 4A, 2D, and 5A.

Alternatives 6A–C, 7–9 (DBPs [from increases in DOC concentrations])

Currently, other projects that could affect drinking water include the projects listed in Table 25-11. These projects may result in changes to flow in the study area and thus could alter DOC/DBP concentrations in the study area. Furthermore, since the Bay-Delta is currently known to have elevated DOC levels exceeding standards, the cumulative condition generated from past and present projects is already considered adverse.

Alternatives 6A–6C and 7–9 could have substantially adverse effects on public health associated with DBPs in drinking water as a result of increases in DOC concentrations at certain Delta locations. Operation of the water conveyance facilities under these alternatives would result in increased DOC levels at Franks Tract, Rock Slough and Contra Costa Pumping Plant No. 1. Under these alternatives, long-term average DOC concentration could increase by up to 41%, relative to the No Action Alternative. This increase could necessitate drinking water treatment plant upgrades or operational changes in order to maintain DBP compliance. Thus, the DOC contributions at Franks Tract, Rock Slough, and Contra Costa Pumping Plant No. 1 from these proposed alternatives are determined to contribute considerably to the adverse cumulative condition for DOC in the Delta and potentially DBPs in drinking water, which could result in an adverse effect on public health. While Mitigation Measure WQ-17 is available to reduce impacts associated with DOC, it is unknown whether it would reduce potential adverse effects entirely. Therefore, the contribution of Alternatives 6A–C and 7–9 to the cumulative DOC-related public health effects would be cumulatively considerable, and there would be a cumulative adverse effect.

CEQA Conclusion: Operation of cumulative projects within the Delta could result in cumulative impacts on public health related to increases in DBPs in drinking water. Alternatives 4A, 2D, and 5A would not substantially increase DOC and bromide concentrations, and therefore DBPs, in drinking water sources in the study area. Bromide concentrations at Barker Slough are anticipated to increase substantially under all action alternatives except Alternatives 4A, 2D and 5A during the drought period relative to Existing Conditions, and Alternatives 1A–1C, 2A–2C, 4, 5 and 6A–6C would substantially increase long-term average bromide concentrations at Barker Slough relative to Existing Conditions in all modeled years. DOC concentrations could increase by up to 46% at Franks Tract, Rock Slough and Contra Costa Pumping Plant No. 1 relative to Existing Conditions under Alternatives 6A–6C and 7–9. This cumulative impact is considered significant and the incremental contribution to potential impacts of DBPs on public health from the action alternatives discussed would be cumulatively considerable.

Mitigation Measure WQ-5 is available to reduce these effects (implementation of this measure along with a separate other commitment as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, relating to the potential increased treatment costs associated with bromide-related changes would reduce these effects). While Mitigation Measures WQ-5 and implementation of the AIP may reduce impacts associated with increase bromide concentrations at Barker Slough, and Mitigation Measure WQ-17 may reduce impacts associated with DOC, it is unknown to what level of reduction (i.e., below significance).

In addition to and to supplement Mitigation Measure WQ-5, the project proponents have incorporated into the project, as set forth in EIR/EIS Appendix 3B, *Environmental Commitments, AMMs, and CMs*, a separate other commitment to address the potential increased water treatment costs that could result from bromide-related concentration effects on municipal water purveyor operations. Potential options for making use of this financial commitment include funding or providing other assistance towards implementation of the North Bay Aqueduct AIP, acquiring alternative water supplies, or other actions to indirectly reduce the effects of elevated bromide and DOC in existing water supply diversion facilities. Please refer to Appendix 3B for the full list of potential actions that could be taken pursuant to this commitment in order to reduce the water quality treatment costs associated with water quality effects relating to chloride, electrical conductivity, and bromide. Because the proponents cannot ensure that the results of coordinated actions with water treatment entities will be fully funded or implemented successfully prior to the project's contribution to the cumulative impact, the ability to fully mitigate this impact is uncertain. If a solution that is identified by the proponents and an affected water purveyor is not fully funded, constructed, or implemented before the project's contribution to the cumulative impact is made, a cumulatively considerable impact in the form of increased DBP in drinking water sources could occur. Accordingly, this cumulative impact would be significant and unavoidable. If, however, all financial contributions, technical contributions, or partnerships required to avoid significant impacts prove to be feasible and any necessary agreements are completed before the project's contribution to the cumulative effect is made, the cumulative impact would be less than significant.

Mitigation Measure WQ-5: Avoid, Minimize, or Offset, as Feasible, Adverse Water Quality Conditions; Site and Design Restoration Sites to Reduce Bromide Increases in Barker Slough

Please see Mitigation Measure WQ-5 under Impact PH-2 in the discussion of Alternative 1A.

Mitigation Measure WQ-17: Consult with Delta Water Purveyors to Identify Means to Avoid, Minimize, or Offset Increases in Long-Term Average DOC Concentrations

Please see Mitigation Measure WQ-17 under Impact PH-2 in the discussion of Alternative 6A.

Impact PH-11: Cumulative Impact from Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate as a Result of Construction, Operation or Maintenance of the Water Conveyance Facilities or as a Result of Implementing the Restoration Conservation Measures or Environmental Commitments

NEPA Effects:

Alternatives 1A–1C, 2A–2C, 3, 4, 5, 4A, 2D and 5A

Numerous regulatory efforts have been implemented to control and reduce mercury loading to the Delta, which include a Delta mercury TMDL and its implementation strategies, increased restrictions on point-source discharges such as publically owned treatment works (POTWs), greater restrictions on suction dredging in Delta tributary watersheds, and continued clean-up actions on mine drainage in the upper watersheds. A key challenge surrounds the pool of mercury deposited in the sediments of the Delta, which cannot be readily or rapidly reduced despite efforts to reduce loads in Delta tributaries, and which serves as a source for continued methylation and bioaccumulation of methylmercury by Delta biota. Consequently, mercury levels in Delta waters are considered to be an adverse cumulative condition.

Projects shown in Table 25-11 could affect constituents known to bioaccumulate, such as methylmercury. These projects are not anticipated to substantially increase methylmercury concentrations in the study area because they are not anticipated to have actions that would mobilize such a constituent. Once operational, the habitat restoration projects could result in an increase of methylmercury in the study area as a result of biogeochemical processes and sediment conditions established in tidal wetlands. However, it is expected these projects either have evaluated or would evaluate the potential for methylmercury production and would implement measures to monitor and adaptively manage methylmercury production. For example, the Suisun Marsh Plan EIS/EIR evaluated the potential for methylmercury production due to tidal restoration and determined it would result in less-than-significant impacts and that monitoring and other measures would be incorporated into the adaptive management plan to manage methylmercury concerns. Therefore, the habitat restoration projects that would occur under cumulative conditions are not likely to adversely affect public health. However, because the existing condition is already considered cumulatively adverse, the cumulative effect of these restoration projects would be considered adverse.

Based on water quality modeling results, water conveyance facilities operation and maintenance for Alternatives 1A–5A would not be expected to substantially alter the existing adverse cumulative condition for mercury and the mercury impairment in the Delta. However, implementation of the following conservation measures and Environmental Commitments for the identified alternatives could create conditions resulting in increased methylation of mercury within the Delta per unit time, increased biotic exposure to and uptake of methylmercury, and result in increased mercury bioaccumulation in fish tissues.

- Tidal wetland restoration: CM4 (Alternatives 1A–1C, 2A–2C, 3, 4, and 5) and Environmental Commitment 4 (Alternatives 4A, 2D, and 5A)
- Nontidal marsh restoration: CM10 (Alternatives 1A–1C, 2A–2C, 3, 4, and 5) and Environmental Commitment 10 (Alternatives 4A, 2D, and 5A)
- Floodplain restoration: CM5 (Alternatives 1A–1C, 2A–2C, 3, 4, and 5)
- Yolo Bypass fisheries enhancement: CM2 (Alternatives 1A–1C, 2A–2C, 3, 4, and 5)

Although the amount of habitat restoration to be implemented for the Environmental Commitments of Alternatives 4A, 2D, and 5A would be relatively small compared to the areal extent of the Delta and compared to that implemented under Alternatives 1A–1C, 2A–2C, 3, 4, and 5, implementation of habitat restoration identified above under all of these action alternatives would be expected to contribute considerably to methylation of mercury at certain localized areas within the Delta (i.e., where the aquatic restoration areas are planned).

Design of habitat restoration sites for Alternatives 4A, 2D, and 5A would be guided by Environmental Commitment 12: Methylmercury Management and design of habitat restoration sites for Alternatives 1A–1C, 2A–2C, 3, 4, and 5 would similarly be guided by *CM12 Methylmercury Management,* both of which require development of site-specific mercury management plans as restoration actions are implemented. In addition, existing OEHHA standards would reduce the public's exposure to mercury-contaminated fish.

The effectiveness of minimization and mitigation actions implemented according to the mercury management plans is not known at this time, although the potential to reduce methylmercury concentrations exists based on current research. Although Environmental Commitment 12 and CM12 would be implemented with the goal to reduce this potential effect, the uncertainties related to site-specific restoration conditions and the potential for increases in methylmercury concentrations in the Delta could contribute substantially to the cumulative condition for mercury in the Delta.

Thus, the incremental contribution of implementing CM4, CM5, and CM10, and possibly CM2 for Alternatives 1A–1C, 2A–2C, 3, 4, and 5, or Environmental Commitments 3, 4, and 10 for Alternatives 4A, 2D, and 5A, in combination with projects shown in Table 25-11, could make a considerable incremental contribution to methylation of mercury in these restored wetland habitats and to the existing cumulative condition for mercury in the Delta. Because the existing condition is already considered cumulatively adverse, the cumulative effect would be adverse.

Alternatives 6A–C and 7–9

Water quality modeling results for Alternatives 6A–C and 7–9 water supply operations indicate that there may be small, insignificant increases in waterborne mercury and methylmercury concentrations at various modeled Delta locations within the study area; these increases are not expected to substantially alter the existing adverse cumulative condition for mercury and the mercury impairment in the Delta. Therefore, the incremental contribution to the existing adverse cumulative condition for waterborne mercury in the study area would not be considered adverse.

However, under Alternatives 6A–6C and 7–9, modeling results indicated that water supply operations would result in substantial increases in fish tissue mercury concentrations at certain Delta locations (see Impact PH-3 for Alternatives 6A–6C and 7–9) relative to the No Action Alternative. Thus, body burdens of mercury in fish would be measurably higher, and could thereby substantially increase the health risks to people consuming those fish. The incremental contribution of operating the water conveyance facilities under these action alternatives to increasing fish tissue mercury concentrations in fish, and thus contributing to potential public health effects from mercury bioaccumulation in the study area is considered cumulatively considerable and cumulatively adverse.

Further, implementation of CM4 (tidal wetland habitat), CM5 (floodplain habitat), CM10 (nontidal marsh habitat), and possibly CM2 (Yolo Bypass fisheries enhancements) could create conditions resulting in increased methylation of mercury within the Delta per unit time, increased biotic exposure to and uptake of methylmercury, and result in increased mercury bioaccumulation in fish tissues. The incremental contribution of implementing these conservation measures in combination with projects shown in Table 25-11 could make a cumulatively considerable contribution to methylation of mercury in these restored wetland habitats and to the existing cumulative condition for mercury in the Delta. Because the baseline condition is already considered cumulatively adverse, the cumulative effect would be adverse.

CEQA Conclusion**:** Water conveyance facilities operations and maintenance under any action alternative would not be expected to substantially alter the existing adverse cumulative condition for mercury and the Delta's mercury impairment. However, water quality modeling results indicate that water supply operations for Alternatives 6A–6C and 7–9 would result in substantial increases in fish tissue mercury concentrations at certain Delta locations. Additionally, implementing CM4, CM5, CM10, and possibly CM2 as part of the BDCP alternatives, or Environmental Commitments 3, 4, and 10 as part of the non-HCP alternatives, could create conditions resulting in increased methylation of mercury within the Delta per unit time, increased biotic exposure to and uptake of methylmercury, and result in increased mercury bioaccumulation in fish tissues. These potential increases in the bioaccumulation of mercury by fish in the study area could increase the health risks to people consuming those fish. Because the baseline condition for mercury in the study area is already impaired, implementation of the cumulative projects identified in Table 25-11 combined with the action alternatives would result in a significant cumulative impact on public health due to increased body burdens of mercury in fish, and the contribution of the action alternatives, as identified, would be cumulatively considerable.

To help reduce the severity of this impact design and implementation of wetland, floodplain, tidal and nontidal habitat shall conform to the relevant requirements of the Delta Mercury Control Strategy of the Central Valley Water Board Basin Plan. Requirements of the Delta Mercury Control Strategy include the following.

- Required participation in efforts to evaluate and minimize health risk associated with eating mercury contaminated fish.
- Required participation in monitoring methylmercury loading from wetlands.
- Implementation of appropriate and site-specific methylmercury control measures.

Appropriate methylmercury control measures shall be developed at the time of formal restoration planning and design. All practicable measures (i.e., those that are both feasible and reasonable from a cost-benefit perspective) to reduce methylmercury formation shall be considered for implementation. As part of CM12 and Environmental Commitment 12, appropriate strategies and control measures to minimize the production of methylmercury in restored tidal wetland areas would promote the following actions.

- Assessment of prerestoration conditions to determine the risk that the project could result in increased mercury methylation and bioavailability
- Definition of design elements that minimize conditions conducive to generation of methylmercury in restored areas
- Definition of adaptive management strategies that can be implemented to monitor and minimize actual post-restoration creation and mobilization of methylmercury into environmental media and biota

Implementation of Environmental Commitment 12 would be consistent with the revised description of CM12 (see Appendix 11F, *Substantive BDCP Revisions*). Development and implementation of this Environmental Commitment would be done in coordination with the Sacramento-San Joaquin Delta Methylmercury Total Maximum Daily Load (Methylmercury TMDL) and *Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of Methylmercury and Total Mercury in the Sacramento-San Joaquin Delta Estuary* (Mercury Basin Plan Amendments)(Central Valley Regional Water Quality Control Board 2010b, 2011).

The methylmercury control measures implemented under CM12 and Environmental Commitment 12 may not completely eliminate the adverse cumulative water quality conditions, but would be expected to lessen the contributions to the degree feasible. Hence, some level of contribution to adverse cumulative conditions is anticipated to remain after mitigation, and therefore the action alternatives' contribution to this cumulative impact would remain cumulatively considerable.

Impact PH-12: Cumulative Impact on Public Health from Construction, Operation or Maintenance of the Action Alternatives with Respect to Pathogens, Trace Metals, Vectors, and EMFs

***NEPA Effects*:** When the effects of implementing any of the action alternatives on pathogens and trace metals (including the new water conveyance facilities, fish screens, gates, and other physical structures and their operations and maintenance activities) are considered together with the potential effects of projects listed in Table 25-11, as well as in Appendix 3D, *Defining Existing Conditions*, *the No Action Alternative, No Project Alternative, and Cumulative Impact Conditions*, the cumulative water quality condition in the study area for the pathogens and trace metals is not considered to be adverse. Primary sources of trace metals to Delta waters include acid mine drainage (e.g., zinc, cadmium, copper, lead) from abandoned and inactive mines (i.e., Iron Mountain and Spring Creek mines) in the Shasta watershed area, which enter the Sacramento River system through Shasta Lake and Keswick Reservoir; agriculture (e.g., copper and zinc); POTW discharges (e.g., copper, zinc, and aluminum); and urban runoff (e.g., zinc, copper, lead, cadmium). Continued efforts to control acid mine drainage into the Sacramento River system and increasingly stringent regulations are expected in the future. Monitoring and regulatory controls on agricultural runoff, POTW discharges, and urban runoff are anticipated to prevent trace metal concentration under the cumulative condition from becoming adverse.

There are numerous potential sources of disease-causing pathogens in the Delta, including urban runoff, wastewater treatment discharges, agricultural discharges, and wetlands. Tidal wetland creation, which would occur under several of the cumulative projects and the action alternatives, could encourage increased coliform presence because of the aquatic, terrestrial, and avian wildlife that would be drawn to these areas. However, the localized nature of pathogen generation and the quick die-off of some types of pathogens once released into water bodies would generally prevent substantial pathogen exposure to recreationists and the cumulative effect would not be considerable or adverse. Accordingly, the incremental contribution of the action alternatives would not be cumulatively considerable.

Although the cumulative projects could result in an increase in potential mosquito habitat (e.g., more standing shallow water), vector habitat is already present in the study area and programs to prevent mosquitoes from breeding and multiplying are in place. With any action alternative, implementation of environmental commitments, such as coordination with MVCDs and implementation of BMPs under MMPs (as described under Impact PH-1 for Alternative 1A and in Appendix 3B, *Environmental Commitments, AMMs, and CMs*), would help control mosquitoes and reduce the potential for an increase in mosquito breeding habitat, and a cumulatively considerable increase in vector-borne diseases is unlikely to result. Furthermore, mosquito predators would likely increase as a result of restoration and enhancement actions undertaken for the cumulative projects, including the action alternatives. Therefore an action alternative's incremental impacts associated with vectors would not be cumulatively considerable or adverse.

Past, present and reasonably foreseeable future projects have resulted in the development and operation of transmission lines in the study area that expose existing populations and sensitive receptors to EMFs. Although existing populations and sensitive receptors are exposed to EMFs, it is not considered an adversecondition because current scientific evidence does not show conclusively that EMF exposure can increase health risks. Design and implementation of new temporary or permanent transmission lines under the action alternatives will incorporate CPUC's EMF Design Guidelines if feasible, which includes shielding, cancelation, and measures to reduce EMF exposure. Accordingly, although the action alternatives (except for Alternative 9) would have new EMF-generating facilities, they would not be a cumulatively considerable incremental contribution. There would not be an adverse cumulative effect with respect to an increase in public exposure to EMFs.

***CEQA Conclusion*:** Construction, and operation and maintenance of the action alternatives would not result in a significant incremental contribution to pathogens, trace metals, vectors, or EMFs in the study area. In combination with other past, present, and reasonably foreseeable future within the Delta, these alternatives would not result in significant cumulative impacts on public health related to pathogens, trace metals, disease vectors, or electromagnetic fields. The action alternatives contribution to this impact is not considered to be cumulatively considerable.

Impact PH-13: Cumulative Impact on Public Health due to Increases in *Microcystis* Bloom Formation as a Result of Operation of the Water Conveyance Facilities and Implementation of CM2 and CM4 or Environmental Commitment 4

***NEPA Effects*:** Neither operation of the water conveyance facilities or implementation of CM2 and CM4 (under the BDCP alternatives) or Environmental Commitment 4 (under Alternatives 4A, 2D, and 5A) would be expected to promote *Microcystis* bloom formation in the reservoirs and watersheds upstream of the Delta. *Microcystis* blooms in the Export Service Areas could increase due to increased water temperatures resulting from climate change, but not due to water conveyance facility operations. Hydraulic residence times in the Export Service Area would not be affected by operations of the water conveyance facilities, and therefore conditions in those areas would not be more conducive to *Microcystis* bloom formation. However, as discussed in Chapter 8, *Water Quality,* because the degree to which *Microcystis* blooms, and thus concentrations of microcystins, would increase in source water from the South Delta is unknown, it cannot be determined whether the action alternatives would result in increased or decreased levels of microcystins in the mixture of source waters exported from Banks and Jones pumping plants, relative to the No Action Alternative.

Operation of the water conveyance facilities, as well as implementation of CM2 and CM4 under the BDCP alternatives, would increase hydraulic residence time during the summer period in the Delta relative to the No Action Alternative. Longer residence times in portions of the Delta could potentially increase the frequency, magnitude, and geographic extent of *Microcystis* blooms relative to the No Action Alternative. Siting and design of restoration areas would have a substantial influence on the magnitude of residence time increases that would occur under these alternatives. However, as discussed in Chapter 8, *Water Quality*, the expected residence time changes under the BDCP alternatives, compared the No Action Alternative, are in a direction and of magnitude that could lead to an increase in Delta *Microcystis* blooms, which could potentially result in adverse effects on public health through exposure via drinking water quality and recreational waters.

As described in Chapter 8, change in flow paths of water through the Delta would occur under Alternatives 4A, 2D, and 5A, which could result in localized increases in hydraulic residence time in various Delta areas, and decreases in residence time in other areas. Implementation of the small amount of habitat restoration within the Delta under the Environmental Commitments for these non-HCP alternatives could also affect hydraulic residence times at the affected areas. While there is uncertainty regarding the degree to which the alternatives would affect water residence times in the Delta, it is anticipated that the combined effects of restoration activities, sea level rise and climate change will drive the residence time changes and that the alternatives and other cumulative projects would not contribute considerably to the adverse *Microcystis* and microcystins condition in the Delta, in particular because the amount of habitat restoration by the alternatives to be implemented would be so limited in area and location as it would not affect residence times Delta-wide.

Therefore, the effects on hydraulic residence time in the Delta of operating the water conveyance facilities under the BDCP alternatives relative to the No Action Alternative, as well as the effects of implementing CM2 and CM4, could result in an adverse effect on public health due to the potential adverse effects of *Microcystis* and microcystin on beneficial uses, including drinking water and recreational waters. As such, there would be an adverse effect on public health. Mitigation Measures WQ-32a and WQ-32b may reduce the effect on *Microcystis* from increased hydraulic residence time. However, the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain. Other past, present, and probable future projects and programs in the region (identified in Table 25-11 and Appendix 3D, *Environmental Commitments, AMMs, and CMs*) could contribute to lower flows and longer hydraulic residence times and water temperatures conducive to *Microcystis* blooms. The predicted increase in *Microcystis* blooms in the Delta as a result of operation of the water conveyance facilities and implementation of CM2 and CM4 under all action alternatives except Alternative 4A, 2D and 5A would be cumulatively considerable. Accordingly, there would be a cumulative adverse effect on public health as a result of increasing *Microcystis* blooms and microcystin levels in the Delta.

CEQA Conclusion: Although there is uncertainty, water supply operations under Alternatives 4A, 2D, and 5A are not expected to increase water residence times or ambient water temperatures throughout the Delta relative to Existing Conditions, and therefore Delta waters are not expected to be adversely affected by *Microcystis* blooms under these three alternatives. Implementation of Environmental Commitment 4 under Alternatives 4A, 2D, and 5A is not expected to contribute substantially to conditions conducive to *Microcystis* blooms because the area of restoration would be so small as to have no effect on through-Delta residence time.

Modeling results indicate that hydraulic residence times in the Delta would increase under the BDCP alternatives relative to Existing Conditions. Under these alternatives, the operation of the water conveyance facilities and implementation of CM2 and CM4 would increase hydraulic residence times in the Delta such that conditions would be favorable to *Microcystis* blooms, and therefore microcystin, throughout the area. Accordingly, beneficial uses including drinking water and recreational waters would be impacted and, as a result, so would public health.

Other past, present, and probable future projects and programs in the region (identified in Table 25-11 and Appendix 3D, *Environmental Commitments, AMMs, and CMs*) could contribute to lower flows and longer hydraulic residence times and water temperatures conducive to *Microcystis* blooms, and this could result in a significant impact on public health in the study area. The incremental contribution of operation of the water conveyance facilities and implementation of CM2 and CM4 to the cumulative effect on public health related to *Microcystis* under the BDCP alternatives would be cumulatively considerable and significant.

Implementation of Mitigation Measure WQ-32a and WQ-32b may reduce degradation of Delta water quality due to *Microcystis*. Mitigation Measure WQ-32a would require that hydraulic residence time considerations be incorporated into restoration area site design for CM2 and CM4 using the best available science at the time of design. Mitigation Measure WQ-32b would require that the project proponents monitor for *Microcystis* abundance in the Delta and use appropriate statistical methods to determine whether increases in abundance are significant. This mitigation measure also requires that if *Microcystis* abundance increases (relative to Existing Conditions), the project proponents will investigate and evaluate measures that could be taken to reduce hydraulic residence time in affected areas of the Delta. However, because the effectiveness of these mitigation measures to result in feasible measures for reducing water quality effects, and therefore potential public health effects, is uncertain, this impact would be cumulatively significant and unavoidable.

Mitigation Measure WQ-32a: Design Restoration Sites to Reduce Potential for Increased *Microcystis* Blooms

Please see Mitigation Measure WQ-32a under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

Mitigation Measure WQ-32b: Investigate and Implement Operational Measures to Manage Water Residence Time

Please see Mitigation Measure WQ-32b under Impact WQ-32 in the discussion of Alternative 1A in Chapter 8, *Water Quality*.

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