Chapter 26
Public Health

This chapter describes the environmental setting and study area for public health; analyzes impacts that could result from construction, operation, and maintenance of the project; and provides mitigation measures to reduce the effects of potentially significant impacts. This chapter also analyzes the impacts that could result from implementation of compensatory mitigation required for the project and describes any additional mitigation necessary to reduce those impacts, and analyzes the impacts that could result from other mitigation measures associated with other resource chapters in this Draft Environmental Impact Report (Draft EIR).

26.0 Summary Comparison of Alternatives

Table 26-0 provides a summary comparison of important impacts on public health by alternative. The table presents the CEQA finding after all mitigation is applied. If applicable, the table also presents quantitative results after all mitigation is applied. Important impacts to consider include increases in vector-borne diseases, substantial mobilization of or increases in chemical constituents known to bioaccumulate, and adverse effects on public health due to exposure of sensitive receptors to new sources of electromagnetic fields (EMF).

Table ES-2 in the Executive Summary provides a summary of all impacts disclosed in this chapter.

Table 26-0. Comparison of Impacts on Public Health by Alternative

	Alternative								
Chapter 26 – Public Health	1	2a	2b	2c	3	4a	4b	4c	5
Impact PH-1: Increase in Vector-Borne Diseases	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS
Impact PH-2: Exceedance(s) of Water Quality Criteria for Constituents of Concern Such That Drinking Water Quality May Be Affected	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS
Impact PH-3: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS
Impact PH-4: Adversely Affect Public Health Due to Exposing Sensitive Receptors to New Sources of EMF	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS
Impact PH-5: Impact Public Health Due to an Increase in *Microcystis* Bloom Formation	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS	LTS

EMF = electromagnetic fields; LTS = less than significant.

26.1 Environmental Setting

This section describes the environmental setting and potential environmental impact area (study area) for public health. Specifically, this section summarizes existing conditions as they relate to specific drinking water constituents, the bioaccumulation of toxicants in aquatic resources, disease-carrying vectors, and EMF from Delta Conveyance Project transmission lines within the study area in the context of public health.

The discussion of drinking water constituents of concern includes disinfection byproducts, trace metals, and pesticides. 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. The discussion of vectors concerns the spread of disease through mosquitoes. Although the California Public Utilities Commission (CPUC) does not currently recognize the potential adverse health impacts related to exposure to EMF generated by power transmission lines because no consistent link has been found, this chapter discusses the potential for adverse health effects associated with EMF exposure in relation to new transmission lines in the study area.

26.1.1 Study Area

For the purposes of the analysis in this chapter, the study area for public health as it relates to water quality and vector-borne disease consists of the statutory Sacramento–San Joaquin Delta (Delta). The statutory Delta includes parts of Yolo, Solano, Alameda, Contra Costa, San Joaquin, and Sacramento Counties. Potential public health impacts occurring as a result of implementing the project 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 health water quality-related effects in the area upstream of the Delta. Potential drinking water impacts would occur first and most prominently in the study area because water is treated and distributed by water purveyors and districts after it is exported to other areas of the state. 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 due to implementation of the project alternatives.

The study area for public health as it relates to vectors and EMF is generally the statutory Delta, where power transmission lines would be constructed. Where proposed power transmission lines are sited outside of the Delta, this area is considered as well.

26.1.1.1 Drinking Water

Water conveyed through the Delta and water from the Delta provide drinking water for two-thirds of California’s population (Water Education Foundation 2022). 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 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 by exceeding the water quality objectives intended to protect those beneficial uses. At high enough concentrations, these constituents can be directly harmful to human health if consumed. Constituents of concern, associated water quality objectives/criteria, and beneficial uses are discussed in detail in Chapter 9, *Water Quality*. The constituents of concern with regard to drinking water quality that are discussed in this impact analysis for public health include disinfection byproducts, non-bioaccumulative pesticides, and trace metals, which are all described below.

Disinfection Byproducts

Trihalomethanes (THMs) and haloacetic acids (HAAs) are chemicals that are formed along with other disinfection byproducts (DBPs) 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, dibromochloromethane, and bromoform. HAAs 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 organic carbon and dissolved organic carbon [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. Existing conditions for bromide and organic carbon in the study area are described in Chapter 9, *Water Quality*.

The U.S. Environmental Protection Agency (EPA) indicates that consumption of water containing relatively high levels of DBPs has been associated with bladder cancer and developmental effects in some studies (U.S. Environmental Protection Agency 2015:2). EPA developed the Stage 1 and Stage 2 Disinfectants and Disinfection Byproducts Rules to limit exposure to DBPs. Together, these rules establish maximum residual level goals and maximum residual levels for disinfectants; set maximum contaminant level goals and maximum contaminant levels for DBPs; and require of water systems that use surface water and conventional filtration treatment to remove specified percentages of organic materials.

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 primary sources of trace metals to the Delta 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), wastewater treatment plant (WWTP) discharges (e.g., copper, zinc, and aluminum), and urban runoff (e.g., zinc, copper, lead, cadmium). The beneficial uses of Delta waters most affected by trace metal concentrations include aquatic life uses (i.e., cold freshwater habitat, warm freshwater habitat, and estuarine habitat), harvesting activities that depend on aquatic life (e.g., shellfish harvesting, commercial and sport fishing), and drinking water supplies (i.e., municipal and domestic supply). See Chapter 9, *Water Quality,* for additional information on trace metals, including water quality objectives/criteria.

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 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. The EPA has phased out certain organophosphates, or their uses, because of their potential toxicity in humans, which has led to their gradual replacement by pyrethroids. See Chapter 9, *Water Quality*, for a discussion on the use of pesticides in the study area. *Legacy pesticides* include primarily organochlorine pesticides, such as dichlorodiphenyltrichloroethane (DDT) and "Group A" pesticides (i.e., aldrin, dieldrin, chlordane, endrin, heptachlor, heptachlor epoxide, hexachlorocyclohexane [including lindane], endosulfan, and toxaphene). Although banned in the 1970s due to their health and environmental effects, these chemicals are highly persistent in the environment (i.e., not readily degraded) and can bioaccumulate.

26.1.1.2 Bioaccumulative Constituents

Toxicants are present in the existing aquatic environment of the Delta and may be mobilized into the food chain. The toxicants that biomagnify through the food chain, such as methylmercury, organochlorines and other legacy pesticides, and polychlorinated biphenyls (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 toxicants 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 example, 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. The term *bioaccumulation* often is used loosely and interchangeably with the term *biomagnification.* Strictly speaking, bioaccumulation occurs at any one trophic level[1] 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.

[1] *Trophic levels* identify the position of an organism within the food chain.

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. Toxicants 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. These chemicals can biomagnify in the food chain, as does methylmercury and some pesticides, such as organochlorines (e.g., lindane).

In the Delta, the toxicants of primary concern to human health are mercury, pesticides, and 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 varying concentrations in Delta fish.

Mercury

In freshwater environments, inorganic mercury is converted by bacteria (sulfate- and iron-reducing) to methylmercury (Fleming et al. 2006:457). Methylmercury is the form of mercury that enters the food web in aquatic environments and bioaccumulates in fish and shellfish through consumption of prey and absorption from water. Fish consumption is the primary exposure route to methylmercury for humans (U.S. Environmental Protection Agency 2020). Health effects of methylmercury include neurotoxicity, reproductive and cardiovascular toxicity, and potentially immunotoxicity (Hong et al. 2012:355–358). The risks to human health from mercury due to fish consumption depend on the concentration of methylmercury in the fish tissue and the quantity of mercury-contaminated fish eaten over time. The concentration of methylmercury in fish species is dependent on the level of methylmercury contamination in the waterbody, or waterbodies, in which the fish reside, as well as the diet and lifespan of the fish species. Applicable water quality objectives for mercury and methylmercury are discussed in Appendix 9H, *Mercury.*

The Sacramento River is the primary transport route of methylmercury to the study area and contributes about 80% of river-borne mercury inputs (Central Valley Regional Water Quality Control Board 2010:iv). 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 drains approximately 2% of the Sacramento River watershed but contributes approximately 30% of the mercury from the watershed (Central Valley Regional Water Quality Control Board 2010:144); approximately 50% of the mercury from Cache Creek is trapped in the Cache Creek Settling Basin, and the remainder is exported to the Delta (Central Valley Regional Water Quality Control Board 2011:4). Delta inputs primarily drive mercury concentrations in northern San Francisco Bay, Suisun Bay, and Suisun Marsh (Central Valley Regional Water Quality Control Board 2010:197; San Francisco Bay Regional Water Quality Control Board 2018:49).

In 2011, EPA approved the Sacramento–San Joaquin Delta Estuary methylmercury total maximum daily load (TMDL) to protect human health, wildlife, and aquatic life. TMDL establishes methylmercury fish tissue objectives and waste-load allocations for agricultural drainage, tributary inputs, and point and nonpoint source dischargers in the Delta. In conjunction with the mercury and methylmercury load reduction goals of the TMDL, the Central Valley Regional Water Quality Control Board (Central Valley RWQCB) developed a Delta Mercury Exposure Reduction Program as a multiple stakeholder effort to promote a better understanding of mercury bioaccumulation in Delta fish and support approaches for reducing human exposure to mercury from fish caught in the Delta. The Central Valley RWQCB is also developing a statewide mercury control program for reservoirs, which was initiated in 2012, and a Central Valley mercury control program for rivers.

The San Francisco Bay mercury TMDL, adopted in 2008, includes Suisun Bay and describes numeric targets for mercury in fish tissue. TMDL implementation efforts include public outreach to raise awareness of fish contamination issues in the San Francisco Bay and a regional monitoring program to assess mercury loads in water, sediment, and fish tissue at several locations in the San Francisco Bay (San Francisco Bay Regional Water Quality Control Board 2020).

Polychlorinated Biphenyls

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 sampling in the San Francisco Bay as part of the regional monitoring program indicates that all eight species of sport fish monitored by the program have average tissue concentrations above the TMDL target (10 micrograms per kilogram wet weight of fish tissue) (Davis et al. 2014:10). Delta PCB concentrations are generally below California Office of Environmental Health Hazard Assessment (OEHHA) screening values (de Vlaming 2008:2). PCB concentrations in sediment from the Central Valley flowing into San Francisco Bay are lower than in sediment within the bay; the Central Valley loading of PCBs to the San Francisco Bay is 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 2019:7-48).

Legacy Pesticides

As discussed in Chapter 9, *Water Quality*, legacy pesticides include primarily organochlorine pesticides, such as DDT and “Group A” pesticides (i.e., aldrin, dieldrin, chlordane, endrin, heptachlor, heptachlor epoxide, hexachlorocyclohexane [including lindane], endosulfan, and toxaphene). These chemicals are highly persistent in the environment, including in sediment and fish tissue.

The Clean Water Act Section 303(d) list of impaired waterbodies identifies the entire Delta as impaired by one or more legacy pesticides (State Water Resources Control Board 2017). Chapter 9 provides a summary of the existing conditions of various pesticides in the Delta.

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 eliminated. 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.

Some fish species contain higher amounts of methylmercury, and thus it is not recommended that women who might become pregnant, women who are pregnant or nursing, or young children eat shark, marlin, orange roughy, swordfish, king mackerel, bigeye tuna, or tilefish (Gulf of Mexico) (U.S. Food and Drug Administration 2019). None of these species are commonly found in the Delta. EPA encourages states, territories, and Tribes to also issue safe eating guidelines to convey to the public which fish they can eat safely based on potential contamination.

Local advisories should be checked for the safety of locally caught fish, and if these advisories are unavailable, the weekly consumption of locally caught fish or shellfish species should be limited. Waterways within the Delta have differing 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, San Francisco Bay, and other California waterways. These advisories are issued by OEHHA and provide guidance on the specific types and number of servings per week of Delta fish that can be eaten safely according to age group. OEHHA provides two sets of guidelines for fish consumption, one for each of the following populations: women ages 18 to 49 years (pregnant, nursing or who may be pregnant) and children ages 1 to 17 years, and women 50 years and older and men 18 years and older (California Office of Environmental Health Hazard Assessment and California Environmental Protection Agency 2018).

The Delta Mercury Exposure Reduction Program is a collaborative effort of the Sacramento–San Joaquin Delta Conservancy, the California Department of Public Health (CDPH), Central Valley RWQCB, OEHHA, and California Department of Water Resources (DWR) to reduce human exposure to mercury 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.

26.1.1.3 Pathogens

The term *pathogens* refers to viruses, bacteria, and protozoa that pose human health risks. 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*. Sources of pathogens include wild and domestic animals, aquatic species, urban stormwater runoff, discharge from WWTPs, and agricultural point and nonpoint sources such as confined feeding lots (Larry Walker Associates 2018:3). 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 waterbodies. Stormwater runoff from urban or rural areas can contain pathogens carried in waste from domestic pets, birds, or rodents, as well as sewage spills. Pathogen concentrations are greatly influenced by proximity to the pathogen-generating source. Some types of pathogens may experience rapid die-off once excreted from their host, whereas other pathogens, such as *Giardia* and *Cryptosporidium*, can persist in the environment for long periods of time, even under unfavorable conditions (Tetra Tech 2007:2–3; Larry Walker Associates 2018:4).

Municipal and domestic water supply and water contact recreation can be affected by pathogens. 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 individuals exposed. Exposure to waterborne pathogens does not always result in infection, and infection with a pathogen does not always result in clinical illness (Pond 2005:3).

There are numerous potential sources of pathogens in the study area, including urban runoff, wastewater treatment discharges, agricultural discharges, and wetlands (Tetra Tech 2007:ES-1). 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 and Sanders et al. 2001; Evanson and Ambrose 2006; Tetra Tech 2007:ES-1). Of the known sources that deposit coliforms into the waters of the Central Valley, wastewater total coliform concentrations for most WWTPs are 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 milliliters) have been measured in waters influenced by urban areas (Tetra Tech 2007:ES-1). In the San Joaquin Valley, comparably high concentrations of *E. coli* have been measured for waters affected by urban areas and intensive agriculture (Tetra Tech 2007:ES-1). Higher concentrations have been observed during wet months, possibly indicating the contribution of stormwater runoff (Tetra Tech 2007:ES-2). The Basin Plan water quality objectives for pathogens are detailed in Appendix 9A, *Screening Analysis*.

26.1.1.4 Cyanobacteria Harmful Algae Blooms (CHABs)

As described in Chapter 9, *Water Quality*, *cyanobacteria* are aquatic photosynthetic bacteria that live in freshwater and saline environments. When cyanobacteria grow out of control, these masses of overgrowth are referred to as cyanobacteria harmful algal blooms (CHABs). To date, the most common and well-studied bloom-forming cyanobacteria in the Delta is *Microcystis*. As such, in this chapter, as well as in Chapter 9, most of the information presented on CHABs is related to *Microcystis*.

Many types of cyanobacteria produce toxins (known as *cyanotoxins*). *Microcystis* produce the cyanotoxin *microcystin*, a liver toxin, as well as a skin, eye, and throat irritant and the most widespread of the cyanotoxins. *Microcystis* blooms can have toxic effects on phytoplankton, zooplankton, and fish. Cyanotoxins, once released, eventually undergo biodegradation and, to a small extent, photodegradation (Gagala and Mankiewicz-Boczek 2012:1128). As described in Chapter 9, saline conditions can stimulate lysing of cells and cease growth of cyanobacteria species such as *Microcystis*.

There are multiple ways by which humans may be exposed to cyanotoxins, including drinking contaminated water, body contact, inhalation, consumption of contaminated food, consumption of algal dietary supplements, and hemodialysis (Massey et al. 2018:4). Human exposure to cyanotoxins in freshwater has the potential to occur during recreational activities (e.g., swimming, boating) through direct contact, by inhaling aerosolized toxins near a contaminated water body, or through accidental ingestion of (or oral exposure to) contaminated water (U.S. Environmental Protection Agency 2019a). 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 cyanotoxins in drinking water or from swimming in water in which cyanotoxins are present. Such health effects can occur within minutes to days following exposure to cyanotoxins (U.S. Environmental Protection Agency 2019b:4).

As discussed in Chapter 9, *Water Quality*, no single environmental factor causes the formation and maintenance (i.e., persistence) of CHABs. The five primary environmental factors that have been related to the emergence and subsequent growth of *Microcystis* in the Delta are water temperatures greater than 19°C (approximately 66°F); low flows and channel velocities resulting in low turbulence and long residence times; water column irradiance and clarity; sufficient nutrient availability of nitrogen and phosphorus; and salinity below 10 parts per thousand.

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:ES-10). Levels of microcystin measured in water exported from the Delta were below the 1 microgram per liter (µg/L) reportable limit (Archibald Consulting et al. 2012:ES-10). It is unknown if microcystin concentrations were below the California guidance levels or the EPA 10-day Health Advisory.

It is expected that the frequency and intensity of CHABs will increase with the increased frequency and intensity of droughts with climate change (Lehman, Marr et al. 2013:155; Lehman, Kurobe et al.

2017:105). In addition to increased water temperatures, other variables associated with drought conditions such as water stratification, evaporation, hydraulic residence time, salinization, and duration of the summer season will likely favor the formation of algal blooms (Lehman, Kurobe et al. 2017).

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. Conventional water treatment can effectively remove unlysed (i.e., intact) cyanobacteria and low concentrations of cyanotoxins in drinking water supplies. However, some water treatment options are effective for some cyanotoxins but not for others (U.S. Environmental Protection Agency 2019b:6–9). 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.

The EPA has established recommended criteria for microcystin and cylindrospermopsin (a cyanotoxin) in recreational waters in *Human Health Recreational Ambient Water Quality Criteria or Swimming Advisories (AWQC/SA) for Microcystins and Cylindrospermopsin* (U.S. Environmental Protection Agency 2019c). These recommended criteria have been published under Clean Water Act 304(a) for states to consider as the basis for swimming advisories for notification purposes in recreational waters to protect the public from CHABs and cyanotoxins. For use as a recreational water quality criterion, EPA recommends that states use 10-day assessment periods (not a rolling 10-day period) over the course of a recreation season to evaluate ambient waterbody conditions and recreational use attainment where the water quality criterion for the cyanotoxins microcystins and cylindrospermopsin is 8 µg/L and 15 µg/L, respectively. The 10-day period links the waterbody assessment period to the adverse health effects observed from ingestion of the toxins over short-term exposures. Where the concentration of these cyanotoxins exceeds the criterion during a 10-day period more than three times within a recreational season and this reoccurs in more than 1 year, EPA considers this an indication that the water quality has been or is becoming degraded. EPA recommends as a basis for issuing a swimming advisory that the criteria not be exceeded on any single day and that the advisory remain until the toxin concentration(s) fall below the recommended criterion/criteria.

The EPA has also developed 10-day drinking water health advisories for microcystin and cylindrospermopsin (Table 26-1).

Table 26-1. U.S. Environmental Protection Agency's 10-Day Drinking Water Health Advisories for Cyanotoxins

	Drinking Water Health Advisory (µg/L)	
Cyanotoxin	Bottle-Fed Infants and Pre-School Children	School-Age Children and Adults
Cylindrospermopsin	0.7	3.0
Microcystins	0.3	1.6

Source: U.S. Environmental Protection Agency 2020.
µg/L = micrograms per liter.

26.1.1.5 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 and Vector Control District 2019a, 2019b). 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 carried by infected animals and usually is spread through the bite of an infected animal (Sutter–Yuba Mosquito and Vector Control District 2020). Although rabies cases do occur in the Delta, this disease is not discussed in further detail because the project 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, *Aedes aegypti* (yellow fever mosquito) and *Aedes albopictus* (Asian tiger mosquito), have been detected in multiple counties in Northern and Southern California; the yellow fever mosquito has been detected in the study area in Yolo, Sacramento, and San Joaquin Counties (California Department of Public Health 2019; Mosquito and Vector Control Association of California 2021; California Department of Public Health 2021a). Currently, the risk of local dengue or chikungunya transmission is low, and there have been no reported cases of either of these diseases being 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.

The optimal conditions for mosquitoes to carry out their complete growth and reproduction cycles can be found in areas of shallow (generally less than 3 feet in depth) standing water and/or aquatic areas with dense floating or emergent vegetation (U.S. Environmental Protection Agency 2005:1; Walton 2003:4). The majority of mosquito species lay eggs on the surface of fresh or stagnant water.

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[2] *Hantavirus* is a pulmonary disease carried by deer mice, white-footed mice, and rice rats and spread through inhalation or ingestion of contaminated particles of urine, saliva, or excrement. Since 1993, there have only been 73 cases of hantavirus in California (Sutter–Yuba Mosquito and Vector Control District 2022a).

[3] *Plague* is a bacterial infection carried by fleas on small mammals and spread through the bite of infected fleas. Since 1900, there have been almost 500 human cases of plague in California (Sutter–Yuba Mosquito Vector Control District 2022b).

[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 Mexico, Puerto Rico, small areas in southern Texas and southern Florida, and some regions in Hawaii, dengue transmission does not occur in North America. Dengue virus cannot be transmitted from person to person (California Health and Human Services Agency and California Department of Public Health 2015).

[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 Health and Human Services Agency and California Department of Public Health 2016).

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. Most mosquito species prefer water sheltered from the wind by grass, weeds, or aquatic vegetation. Aquatic vegetation can provide habitat for mosquito development because the vegetation can reduce the rippling effect on the water's surface (Cuda n.d.:25). Deep, open-water habitats are poor mosquito breeding areas because the wave action generated over waterbodies disrupts the ability of larvae to penetrate the water surface for respiration (U.S. Fish and Wildlife Service 1992:4M-4). In addition, fluctuation in surface water elevations, specifically rapid drawdown rates, are associated with lower mosquito larval abundance. Experimental reservoir studies have shown that the larval abundance of *Anopheles* mosquitoes can be reduced with increasing water drawdown rates (Kibret and Wilson et al. 2018:6) and that this effect is due to larval stranding in areas that had been submerged prior to drawdown (Endo et al. 2015:5).

Tidally influenced marshes that lack sufficient tidal flow can provide suitable breeding habitat for mosquitoes (Kramer, Collins, Beesley 1992:21; Kramer, Collins, Malamud-Roam 1995:389). However, functional tidal marshes do not provide high-quality habitat for many mosquito species, such as *Aedes dorsalis* and *Aedes squamiger*, and maintenance and restoration of natural tidal flushing in marshes is effective at limiting mosquito populations (Kramer, Collins, Malamud-Roam 1995:393; Philip Williams and Associates, Ltd., and Faber 2004:27). Problems can occur in seasonally ponded wetlands, in densely vegetated tidal areas that pond water between tides, or where tidal drainage has been interrupted (Philip Williams and Associates, Ltd., and Faber 2004:27). 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 (Philip Williams and Associates, Ltd., and Faber 2004:27; Kramer, Collins, Malamud-Roam 1995:392). Semi-permanent and permanent nontidal wetlands can produce *Anopheles freeborni* and *Culex. tarsalis*; however, because of their limited acreage, stable water levels, and abundance of mosquito predators (i.e., fish, dragonflies, and other predatory invertebrates), such wetlands are not typically considered mosquito production areas (Kwasny et al. 2004:9).

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 the Delta* below for additional information). 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. Different cropping and land use patterns create differing amounts of suitable mosquito breeding habitat, which affects 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.

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 26-2 identifies the preferred habitat and seasonal presence of common mosquito species.

Table 26-2. Preferred Habitat and Seasonal Presence of Common Mosquito Species

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*) [a] • California salt marsh mosquito (*Ochlerotatus squamiger*) [b] • Winter salt marsh mosquito (*Aedes squamiger*)	• California salt marsh mosquito (*Ochlerotatus squamiger*) [b]	• 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*) [a]
Flood waters (e.g., seasonal/semi-permanent wetlands, including pastures and rice fields)	N/A	• Wetlands mosquito (*Aedes melanimon*) • Inland floodwater mosquito (*Aedes vexans*) • Pale marsh mosquito (*Ochlerotatus doralis*) [c]	• Inland floodwater mosquito (*Aedes vexans*) • Western malaria mosquito (*Anopheles freeborni*) [d]	• Wetlands mosquito (*Aedes melanimon*) • Inland floodwater mosquito (*Aedes vexans*)
Tule and grasses	N/A	• Tule mosquito (*Culex erythrothorax*) [e]	• Tule mosquito (*Culex erythrothorax*) [d]	N/A
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*)*	• Woodland malaria mosquito (*Anopheles punctipennis*)*	• Woodland malaria mosquito (*Anopheles punctipennis*)*	• Woodland malaria mosquito (*Anopheles punctipennis*)*

Sources: Unless otherwise noted, sources in this table are from Sacramento–Yolo Mosquito and Vector Control District 2008.
[a] Alameda County Mosquito Abatement District 2011:23–26.
[b] Solano County Mosquito Abatement District 2005b.

[c] Solano County Mosquito Abatement District 2005a; Napa County Mosquito Abatement District 2006.
[d] Marin/Sonoma Mosquito and Vector Control District 20219; Solano County Mosquito Abatement District 2005a.
[e] County of Santa Cruz Environmental Health Department 2021.
* Unknown what season the woodland malaria mosquito is most active.

Potential Mosquito-Borne Diseases in the Delta

Approximately 15 mosquito-borne viruses occur in California; however, of those, only St. Louis encephalitis virus (SLEV), western equine encephalomyelitis virus (WEEV), and WNV have caused significant human disease (California Department of Public Health, Mosquito and Vector Control Association of California et al. 2020:3, 4). Table 26-3 summarizes the types of mosquitoes known to occur in the study area, the types of diseases they commonly carry, and flight range. Depending on the species, mosquitoes have an average maximum flight distance of less than 1 mile to greater than 20 miles, and travel distances are influenced substantially by wind (Verdonschot and Besse-Lototskaya 2014:69). This flight range also applies to mosquito species known to occur in the study area.

Table 26-3. Mosquitoes Known to Occur in the Delta, Diseases they Commonly Carry, and Flight Range

Mosquito	Adult Flight Range	Diseases
Pale marsh mosquito (*Ochlerotatus dorsalis*) [a]	20 miles	CEV; Dog heartworms
Cool weather mosquito (*Culiseta incidens*)	<5 miles	Possible secondary WNV vector
Western encephalitis mosquito (*Culex tarsalis*)	3 to 15 miles	Primary WNV, WEEV, and SLEV vector
California salt marsh mosquito (*Ochlerotatus squamiger)* [b]	Up to 20 miles or more	CEV; WNV in a limited number of this species in 2004
Western treehole mosquito (*Aedes sierrensis*)	<1 mile	Dog heartworm vector
Wetlands mosquito (*Aedes melanimon*)	10 or more miles	Secondary vector of the WEEV Primary carrier of the CEV Potential vector of the WNV
House mosquito (*Culex pipiens*)	<1 mile	Primary WNV vector, secondary SLEV vector**
Inland floodwater mosquito (*Aedes vexans*)	10 or more miles	Possible WNV vector; secondary vector for dog heartworms
Tule mosquito (*Culex erythrothorax*)	<1 mile	Secondary WNV vector
Winter salt marsh mosquito (*Aedes squamiger*)	10 to 20 miles	Possible CEV vector
Western malaria mosquito (*Anopheles freeborni*)	10 miles	Malaria
Yellow Fever Mosquito *(Aedes aegypti)* [c]	Up to 1.5 miles	Zika, dengue, chikungunya, and yellow fever
Woodland malaria mosquito (*Anopheles punctipennis)*	Less than 1 mile	Malaria

Source: Contra Costa Mosquito and Vector Control District 2021.
* Identified under laboratory conditions as a vector for WEEV 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.
CEV = Cerebral Encephalitis virus; SLEV = St. Louis encephalitis virus; WEEV = western equine encephalomyelitis virus; WNV = West Nile virus.
[a] Marin/Sonoma Mosquito and Vector Control District 2021; Solano County Mosquito Abatement District 2005a.
[b] Solano County Mosquito Abatement District 2005b.
[c] California Department of Public Health 2016; Verdonschot and Besse-Lototskaya 2014.

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. Malaria occurs in tropical and subtropical areas with high humidity and temperatures, including Africa and Central and South America. In the United States there are approximately 2,000 diagnosed cases of malaria each year (Centers for Disease Control and Prevention 2020). The majority of these cases in the United States are diagnosed in travelers and immigrants returning from countries where malaria is endemic (Centers for Disease Control and Prevention 2020). 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 WNV, SLEV, and WEEV. Horses and birds are usually the most important carriers and also the most vulnerable and susceptible to these viruses (California Health and Human Services Agency and California Department of Public Health n.d.).

Yellow Fever

Yellow fever is caused by a virus transmitted by the *Aedes aegypti* mosquito. Symptoms include acute onset of fever, chills, nausea, vomiting, body aches and weakness (Centers for Disease Control and Prevention 2019). Although rare, with severe forms of yellow fever, jaundice, bleeding, and organ failure may occur. Although the yellow fever mosquito has been detected in several counties throughout California, the yellow fever virus is not currently known to have been transmitted in the state (California Department of Public Health 2021b).

West Nile Virus

WNV is a mosquito-borne virus introduced to North America in 1999 (Ronca et al. 2021:1). The *Culex* mosquito genus has been identified as the primary transmitting vector of the virus (Goodard et al. 2002:1385). 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 neurologic illness, including brain inflammation (encephalitis), which could lead to partial paralysis and death (Sejvar 2014:607).

Confirmed human WNV cases in California for the years 2014–2018 are provided in Table 26-4. This virus is commonly identified in small animals, such as squirrels and birds, and can also affect large mammals, including horses and humans.

Table 26-4. Confirmed West Nile Virus Cases in California (2014–2018)

Cases	2014	2015	2016	2017	2018
Number of Counties	40	41	39	47	41
Human Cases	801	783	442	553	217
Mosquito Samples	3,340	3,329	3,528	3,371	1,963

Sources: California Department of Public Health, University of California, Davis Arbovirus Research and Training et al. 2014, 2015, 2016, 2018; California Department of Public Health, University of California, Davis Arbovirus Research and Training et al. 2017.

Confirmed human cases of WNV in counties in the study area for the years 2014–2018 are identified in Table 26-5. Although WNV is a growing concern and a potential threat to the population within the study area and California in small mammals, the documented human occurrences within the study area have been relatively limited.

Table 26-5. Confirmed West Nile Virus Cases by County in Study Area (2014–2018)

County	2014		2015		2016		2017		2018	
	Human Cases	Mosquito Samples	Human Cases	Mosquito Samples	Human Cases	Mosquito Samples	Human Cases	Mosquito Samples	Human Cases	Mosquito Samples
Alameda	1	16	–	16	–	2	1	–	–	15
Contra Costa	5	25	1	8	4	11	4	9	4	17
Sacramento	10	487	4	164	25	455	6	153	15	300
San Joaquin	9	239	2	208	13	350	14	242	14	533
Solano	5	11	1	6	4	16	1	9	–	3
Yolo	15	22	8	17	16	25	6	87	11	90

Sources: California Department of Public Health, University of California, Davis Arbovirus Research and Training et al. 2014, 2015, 2016, 2018; California Department of Public Health, University of California, Davis Arbovirus Research and Training et al. 2017.
– = no record.

St. Louis Encephalitis

SLE is distributed throughout California and generally affects nonhuman mammals, principally horses. The western encephalitis mosquito (*Culex tarsalis*) and common house mosquito (*Culex pipiens*) are the main transmitting vectors in the western United States (Centers for Disease Control and Prevention 2021a). 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 mortality rate that ranges from 5%–20% (Centers for Disease Control and Prevention 2021b).

Western Equine Encephalitis

Seasonal viral activity is at its highest for WEEV from late spring to early summer, especially in areas with highly irrigated agriculture and stream drainages. The disease has a mortality rate of approximately 4 percent in humans and affects young children most severely (Simon et al. 2020). The western encephalitis mosquitoes are generally identified as primary transmitters of the virus. In

California, the pale marsh mosquito is also a major vector. Symptoms include fever, chills, malaise, weakness, and myalgias (Simon et al. 2020).

Mosquito Control

In California, mosquito and vector control services are provided by mosquito vector control districts (MVCDs), pest abatement districts, and other county environmental health departments and county agricultural departments. These entities, which are collectively referred to as *mosquito and vector control agencies,* are overseen and regulated primarily by the CDPH. Mosquito and vector control agencies collaborate with the CDPH weekly with reports/tests of dead birds within the individual agency's jurisdiction; when a member of the public reports a dead bird to the CDPH, the CDPH notifies the appropriate mosquito and vector control agency. Mosquito and vector control agencies also coordinate with local Office of Emergency Services. The *California Mosquito-Borne Virus Surveillance and Response Plan* (California Department of Public Health, Mosquito and Vector Control Association of California et al. 2020) outlines the roles and responsibilities of local and state agencies involved with mosquito-borne virus surveillance and response. Mosquito and vector control services in the study area are provided by Alameda County Vector Control Services District, Contra Costa Mosquito and Vector Control District, San Joaquin County Mosquito and Vector Control District, and Solano County Mosquito Abatement District.

MVCDs have the authority to conduct surveillance for vectors, prevent the occurrence of vectors, and abate production of vectors (Health & Saf. Code § 2040). MVCDs have broad authority to direct landowners to reduce or abate the source of a vector problem. Actions may include imposing civil penalties of up to $1,000 per day. Agencies have authority to abate vector sources on private and publicly owned properties (Health & Saf. Code §§ 2060–2065).

Mosquitoes within the Delta require varying degrees of control by 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 (California Department of Public Health, Mosquito and Vector Control Association of California et al. 2017:9). The local MVCDs monitor mosquito populations and take actions such as eliminating breeding sites and using biological control (predators such as mosquitofish) and chemical control to reduce mosquito population size (California Department of Public Health 2013:20). 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, 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* (Kwasny et al. 2004).
- *Best Management Practices for Mosquito Control on California State Properties* (California Department of Public Health 2008).
- *Best Management Practices for Mosquito Control in California* (California Department of Public Health and the Mosquito and Vector Control Association of California 2012).

Each county, following public health and safety code regulations, designs its individual MVCD 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, WEEV, SLEV, heartworm disease, and malaria.

26.1.1.6 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. Magnetic fields result from the flow of electrical current through wires or electrical devices and increase in strength as the current increases. 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 2016a).

EMFs are present everywhere in the environment. 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 EMFs, and various kinds of higher frequency radio waves are used to transmit information (World Health Organization 2016a).

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 EMFs produced by electrical wiring, electrical appliances and power lines are examples of extremely low-frequency (ELF) fields (National Cancer Institute n.d.). ELF fields generally have frequencies up to 300 Hz; power lines, electrical wiring, and electrical equipment produce ELF fields at 60 Hz (Occupational Safety and Health Administration n.d.).

Overhead power transmission lines produce electric fields and magnetic fields. Electric fields are shielded or weakened by materials that conduct electricity (including trees, buildings, and human skin). Magnetic fields, however, pass through most materials and are therefore more difficult to shield. Underground power lines do not produce electric fields above ground because the field is shielded by the surrounding jacket and soil, but the magnetic fields produced by these buried lines may produce aboveground magnetic fields. Magnetic fields directly above underground distribution lines can vary depending on the current carried by the line and range between 10 and 40 milligauss (mG). For comparison, most household appliances' magnetic field levels range from 4 mG–1,500 mG (at a distance of 6 inches) (National Institute of Environmental Health Sciences and National Institutes of Health 2002:34). High-voltage (generally above 69 kV) transmission line EMF levels range from 30–90 mG underneath the wires, based on the voltage, height, and placement of the lines. Both electric and magnetic fields decrease as the distance from the source increases (California Public Utilities Commission 2021). Table 26-6 identifies typical electric and magnetic field levels for overhead power transmission lines at the 50-foot and 300-foot distance from the lines.

Table 26-6. Typical EMF Levels for High-Voltage Power Transmission Lines

	Electric Field (kV/m)		Magnetic Field (mG)	
Transmission Line Voltage (kV)	Approximate Edge of Right-of-Way (50 ft)	300 ft	Approximate Edge of Right-of-Way (50 ft)	300 ft
115	0.5	0.003	6.5	0.2
230	1.5	0.01	19.5	0.8
500	3.0	0.1	29.4	1.4

Source: National Institute of Environmental Health Sciences and National Institutes of Health 2002:38.
ft=feet; kV=kilovolt; kV/m=kilovolt per meter; mG=milligauss.

Potential Health Concerns

Extensive research has been conducted over the past 30 years on the relationship of EMF exposure and human health risks. Epidemiological studies, designed to verify whether EMF exposure may be a risk factor for health, have provided inconsistent results. Even with regard to people working in "high magnetic fields," results from studies are mixed—some studies have reported small increases in some types of cancers, whereas other studies reported no such increases (National Institute for Occupational Safety and Health 2014). To date, the potential health risks 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. A recent review of studies published between 2007 and 2017 on the health effects of ELF and EMF exposure determined that exposure may be associated with Alzheimer's disease; the review focused on occupational, residential, and electric blanket exposures (Habash et al. 2019:323). However, the review found limited evidence to suggest an association with cancer, cardiovascular disease, or reproductive health effects. According to the World Health Organization, to date there is no conclusive evidence that exposure to low level EMF is harmful to human health; research is ongoing regarding potential links between cancer and EMF at power line and radio frequencies (World Health Organization 2016b).

There are no federal or state health-based standards limiting exposure to EMF. CPUC first established an interim policy regarding EMF in 1993 in Decision 93-11-013, where it was stated that "It is not appropriate to adopt any specific numerical standard in association with EMF until we have a firm scientific basis for adopting any particular value." Due to public concern and scientific uncertainty regarding health effects due to EMF exposure, CPUC authorized electric utilities to implement "no-cost" and "low-cost" actions to reduce EMF levels from new and upgraded electrical facilities. In 2006, after a thorough review of research on EMF and potential health effects, written testimony, and evidentiary hearings, CPUC stated in CPUC Decision 06-01-042 that "at this time we are unable to determine whether there is a significant scientifically verifiable relationship between EMF exposure and negative health consequences" (California Public Utilities Commission 2006a:2).

Nonetheless, in that decision, CPUC re-affirmed Decision 93-11-013 regarding no-cost and low-cost EMF mitigation for new and upgraded projects unless exempted by a utility's design guidelines exemption criteria. Further, decision 06-01-042 ordered utilities to convene a workshop to develop standardized approaches for EMF-reduction design guidelines for electrical utilities. CPUC's *EMF Design Guidelines for Electrical Facilities* (EMF Design Guidelines) are the standardized design guidelines produced as a result of that workshop (California Public Utilities Commission 2006b). The guidelines describe the routine magnetic field reduction measures that all regulated California electric utilities will consider for new and upgraded transmission lines and transmission substations. CPUC requires utilities to update their EMF Design Guidelines to reflect various key elements including low-cost EMF mitigation and how, where and to whom it should be applied.

Proximity to Power Lines

Based on the most recent research from the National Institute of Environmental Health Sciences, 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 2002:35). 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 rights-of-way 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 Health Services and the Public Health Institute 1999).

As calculated via Geographic Information System (GIS) mapping, there are currently approximately 719 miles of transmission lines in the study area.[6] Sensitive receptors to EMF include residences, schools, hospitals or assisted living facilities, 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 number of sensitive receptors within 300 feet of existing 69 kV or 230 kV power transmission lines the study area, as identified using GIS mapping.

- Thirty-two residences
- Four schools
- Two assisted living facilities/nursing homes and no hospitals
- Seventeen parks and recreation areas, and one wildlife refuge (Antioch Dunes National Wildlife Refuge)
- No fire stations

[6] The length of existing transmission lines was calculated using Esri ArcMap 10.71 by clipping existing transmission lines to the boundary of the public health study area plus a 300' buffer of proposed power transmission lines (California Energy Commission 2017).

26.2 Applicable Laws, Regulations, and Programs

The applicable laws, regulations, and programs considered in the assessment of project impacts on public health are indicated in Section 26.3.1, *Methods for Analysis*, or the impact analysis, as appropriate. Applicable laws, regulations, and programs associated with state and federal agencies that have a review or potential approval responsibility have also been considered in the development of CEQA impact thresholds or are otherwise considered in the assessment of environmental impacts. A listing of some of the agencies and their respective potential review and approval responsibilities, in addition to those under CEQA, is provided in Chapter 1, *Introduction*, Table 1-1. A listing of some of the federal agencies and their respective potential review, approval, and other responsibilities, in addition to those under NEPA, is provided in Chapter 1, Table 1-2.

26.3 Environmental Impacts

This section describes the direct and cumulative environmental impacts associated with public health that would result from project construction and operation and maintenance of the project. It describes the methods used to determine the impacts of the project and lists the thresholds used to conclude whether an impact would be significant. Measures to mitigate (i.e., avoid, minimize, rectify, reduce, eliminate, or compensate for) significant impacts are provided. Indirect impacts are discussed in Chapter 31, *Growth Inducement*.

26.3.1 Methods for Analysis

This section addresses the assessment methods used for the analysis of potential impacts on public health from construction, operation, and maintenance of the project alternatives. The potential impacts to public health considered in the analysis are the following.

- Increase in vector-borne diseases (specifically via mosquitoes).
- Effects on drinking water quality through increases in concentrations of DBPs, trace metals or pesticides in surface waters.
- Increase in concentrations of bioaccumulative water quality constituents.
- Increase in public exposure to EMF.
- Increase in public exposure to CHABs.

26.3.1.1 Process and Methods of Review for Public Health

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, except 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 to mosquitoes, and thus to vector-borne diseases, is evaluated by describing the project alternatives or potential conditions during construction and operation of the water conveyance facility and compensatory mitigation that could result in more potential mosquito breeding habitat (i.e., surface water areas) and qualitatively evaluating it against the existing amount of potential breeding habitat, taking into consideration the proximity of densely populated areas relative to potential new breeding habitat in the study area. A qualitative determination is made as to whether the project alternatives would result in a substantial[7] increase in the public's risk of exposure to vector-borne diseases.

The findings from Chapter 9, *Water Quality*, are summarized for each project alternative and a qualitative determination is made as to whether the public (e.g., recreationists) would experience a substantial increase in exposure to *Microcystis* and whether there would be significant impacts on drinking water due to increases in *Microcystis*.

Constituents of Concern and Water Quality

As discussed in Chapter 9, numerical water quality objectives/criteria have been established to protect beneficial uses surface waters, and therefore represent concentrations or values that should not be exceeded. Many of these water quality objectives/criteria are protective of public health where the beneficial use being protected relates to humans (e.g., "municipal and domestic supply"). The analysis in Chapter 9 discusses the different water quality standards evaluated through modeling and determines whether these standards would be exceeded as a result of implementation of the project alternatives. Accordingly, the analysis in this chapter summarizes the qualitative and quantitative results presented in Chapter 9 to identify whether the construction and operations of the water conveyance facilities and compensatory mitigation under all project alternatives would exceed water quality standards for pesticides that do not bioaccumulate; trace metals of human health and drinking water concern (i.e., aluminum, arsenic, iron, and manganese); and DBPs via increases in the concentrations of DOC and bromide. Qualitative assessments were then made to determine whether construction and operations of the project alternatives would result in significant impacts 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.

The assessment methods used to determine changes in levels of pesticides that do not bioaccumulate, trace metals, DOC, and bromide are described in Chapter 9, *Water Quality.* As discussed in Appendix 9A, *Screening Analysis*, for several water quality constituents considered in a screening evaluation, it was determined that the project alternatives would not result in any significant impacts on the beneficial use of water in the study area. Two of these constituents, PCBs and pathogens, are of concern to public health and are discussed in this chapter in Section 26.1, *Environmental Setting*. However, as described in Appendix 9A, these constituents would not be affected substantially by implementation of the project alternatives; therefore, they are not discussed further in the public health analysis.

Bioaccumulation

For the purpose of the bioaccumulation analysis in this chapter, results of the qualitative (pesticides) and quantitative (methylmercury) analysis for construction and operations of the project alternative in Chapter 9 are summarized. A qualitative evaluation is then conducted

[7] State CEQA Guidelines Section 15064(b) 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.

regarding the potential impact on public health due to a potential for increases in methylmercury bioaccumulation in fish in the study area. It is assumed any additional bioaccumulation that is detected is a potential effect.

The assessment methods used to determine changes in levels of pesticides that do not bioaccumulate, trace metals, DOC, and bromide are described in Chapter 9.

Electromagnetic Fields

EMF from power transmission lines vary continuously as electrical load varies on individual transmission lines. As such, EMF would vary with load during water conveyance facilities operation. When the transmission lines are energized, there would likely be some change in the level of EMF 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 EMF 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, residences, 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 determining whether people, specifically sensitive receptors, would be exposed to EMF in the study area due to operation of the project alternatives entails identifying the locations of sensitive receptors within 300 feet of the proposed 69 kV and 230 kV power transmission lines using GIS mapping methods. Also considered in the analysis is the general medical and scientific uncertainty as to the potential health effects of EMF on receptors in proximity to power transmission lines. As discussed in Section 26.1.1.6, *Electromagnetic Fields*, this uncertainty extends to people working in areas with high magnetic fields. Accordingly, the potential for health effects on project construction workers is not considered in this analysis because this population would likely receive lower overall exposure to EMF over time from proposed transmission lines in the study area during construction of the project alternatives than those sensitive receptors residing within 300 feet of the proposed transmission lines.

There is one proposed temporary aboveground 230 kV transmission line (0.04 mile long) to serve the Bethany Complex during construction under Alternative 5 only. There are no sensitive receptors within 300 feet of this transmission line. Therefore, exposure of sensitive receptors to EMF due to project construction is not considered in the public health analysis. Most of the power to the intakes, tunnel launch shafts, Southern Forebay, and the Bethany Complex would be 69 kV–capacity or greater, and some of these transmission lines would serve both construction and operations. Because these lines would be permanent, the potential for EMF exposure of sensitive receptors due to proximity to these proposed lines are discussed under *Operations and Maintenance* for Impact PH-4, below. Table 26-7 identifies for each alternative the approximate lengths of proposed permanent aboveground and underground transmission lines, as well as those sensitive receptors within 300 feet of the proposed lines.

Table 26-7. Length of Proposed Permanent 69 kV and 230 kV Transmission Lines (miles) and Proximity to Sensitive Receptors

	69 kV Transmission Lines				230 kV Transmission Lines			
	Underground		Aboveground		Underground		Aboveground	
Alternative	Length [a] (miles)	Residences (total) or Other Sensitive Receptors within 300 Feet of Proposed Lines	Length [a] (miles)	Residences (total) or Other Sensitive Receptors within 300 Feet of Proposed Lines	Length [a] (miles)	Residences (total) or Other Sensitive Receptors within 300 Feet of Proposed Lines	Length [a] (miles)	Residences (total) or Other Sensitive Receptors within 300 Feet of Proposed Lines
1	23.3	• Residences (37) • Cosumnes River Preserve • Stone Lakes National Wildlife Refuge • White Slough Wildlife Area	3.9	• Residences (23) • Cosumnes River Preserve	0.2	None	8.3	None
2a	23.7	• Residences (37) • Cosumnes River Preserve • Stone Lakes National Wildlife Refuge • White Slough Wildlife Area	3.9	• Residences (23) • Cosumnes River Preserve	0.2	None	8.3	None
2b	20.7	• Residences (32) • Cosumnes River Preserve • Stone Lakes National Wildlife Refuge • White Slough Wildlife Area	3.9	Residences (23) Cosumnes River Preserve	0.2	None	8.3	None

	69 kV Transmission Lines				230 kV Transmission Lines			
	Underground		Aboveground		Underground		Aboveground	
Alternative	Length [a] (miles)	Residences (total) or Other Sensitive Receptors within 300 Feet of Proposed Lines	Length [a] (miles)	Residences (total) or Other Sensitive Receptors within 300 Feet of Proposed Lines	Length [a] (miles)	Residences (total) or Other Sensitive Receptors within 300 Feet of Proposed Lines	Length [a] (miles)	Residences (total) or Other Sensitive Receptors within 300 Feet of Proposed Lines
2c	23.3	• Residences (37) • Cosumnes River Preserve • Stone Lakes National Wildlife Refuge • White Slough Wildlife Area	3.9	• Residences (23) • Cosumnes River Preserve	0.2	None	8.3	None
3	18.7	• Residences (7) • Cosumnes River Preserve • Stone Lakes National Wildlife Refuge	3.9	• Residences (23) • Cosumnes River Preserve	0.2	None	8.3	None
4a	19.1	• Residences (7) • Cosumnes River Preserve • Stone Lakes National Wildlife Refuge	3.9	• Residences (23) • Cosumnes River Preserve	0.2	None	8.3	None
4b	16.1	• Residences (2) • Cosumnes River Preserve • Stone Lakes National Wildlife Refuge	3.9	• Residences (23) • Cosumnes River Preserve	0.2	None	8.3	None
4c	18.7	• Residences (7) • Cosumnes River Preserve • Stone Lakes National Wildlife Refuge	3.9	• Residences (23) • Cosumnes River Preserve	0.2	None	8.3	None

	69 kV Transmission Lines				230 kV Transmission Lines			
	Underground		Aboveground		Underground		Aboveground	
Alternative	Length [a] (miles)	Residences (total) or Other Sensitive Receptors within 300 Feet of Proposed Lines	Length [a] (miles)	Residences (total) or Other Sensitive Receptors within 300 Feet of Proposed Lines	Length [a] (miles)	Residences (total) or Other Sensitive Receptors within 300 Feet of Proposed Lines	Length [a] (miles)	Residences (total) or Other Sensitive Receptors within 300 Feet of Proposed Lines
5	15.2	• Residences (7) • Cosumnes River Preserve • Stone Lakes National Wildlife Refuge	3.9	• Residences (23) • Cosumnes River Preserve	0	N/A	0.3	None

kV=kilovolt; N/A = not applicable.
[a] Length rounded to nearest tenth of a mile.

Microcystis

As described in Chapter 9, *Water Quality*, the assessment of water conveyance facility operations on CHABs utilized Delta Simulation Model II (DSM2)-modeled water temperature, velocity, and residence time. In addition, potential changes in nutrients and water clarity due to project operations, including compensatory mitigation, were assessed qualitatively to make determinations regarding whether the project alternatives could result in substantial changes to one or more of these environmental factors in Delta waters such that the frequency of magnitude of CHABs in the Delta would be affected. Additional details regarding the assessment methodology are provided in Appendix 9E, *Cyanobacteria Harmful Algal Blooms*.

26.3.2 Thresholds of Significance

This impacts analysis assumes that a project alternative would have a significant impact under CEQA if implementation would result in one of the following conditions.

- Substantial increase in the public's risk of exposure to vector-borne diseases. For purposes of this analysis, *substantial increase* would be evaluated qualitatively, depending on the location of the alternative, in accordance with State CEQA Guidelines Section 15064(b)(1).[8]
- Exceedance(s) of water quality criteria for constituents of concern such that drinking water quality may be affected. This analysis is based on the qualitative and quantitative results presented in Chapter 9 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., aluminum, 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.
- Adversely affect public health due to exposing sensitive receptors to new sources of EMF. Exposure to EMF from new transmission lines is dependent on the location of the transmission lines in relation to sensitive receptors. For purposes of this analysis, residences, schools, hospitals, parks, and fire stations are considered 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.
- Increase in *Microcystis,* and thus microcystin concentrations, in waterbodies in the study area such that public health may be adversely affected. This analysis is based on the results of the qualitative analysis presented in Chapter 9.

[8] State CEQA Guidelines Section 15064(b)(1): "The determination of 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 scientific and factual 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."

26.3.2.1 Evaluation of Mitigation Impacts

CEQA also requires an evaluation of potential impacts caused by the implementation of mitigation measures. Following the CEQA conclusion for each impact, the chapter analyzes potential impacts associated with implementing both the Compensatory Mitigation Plan and the other mitigation measures required to address with potential impacts caused by the project. Mitigation impacts are considered in combination with project impacts in determining the overall significance of the project. Additional information regarding the analysis of mitigation measure impacts is provided in Chapter 4, *Framework for the Environmental Analysis*.

26.3.3 Impacts and Mitigation Approaches

26.3.3.1 No Project Alternative

As described in Chapter 3, *Description of the Proposed Project and Alternatives,* CEQA Guidelines Section 15126.6 directs that an EIR evaluate a specific alternative of "no project" along with its impact. The No Project Alternative in this Draft EIR represents the circumstances under which the project (or project alternative) does not proceed and considers predictable actions, such as projects, plans, and programs, that would be predicted to occur in the foreseeable future if the Delta Conveyance Project is not constructed and operated. This description of the environmental conditions under the No Project Alternative first considers how public health could change over time and then discusses how other predictable actions could affect public health.

Future Public Health Conditions

Future conditions with respect to water quality changes within the Delta could be expected to primarily be driven by climate change and sea level rise, as described in Chapter 9, *Water Quality*. There would be little change in DOC, trace metals, and pesticides in the Delta under the No Project Alternative relative to existing conditions. Although no substantial changes in DOC would be expected, there may be changes in the potential for the formation of DBPs in drinking water due to potential increases in bromide concentrations in the western Delta. This change relative to existing conditions would be due in large part to increases in salinity in this area of the Delta that could be expected to occur as a result of climate change and sea level rise. Treatment plants that use the Delta as a source for drinking water already experience highly variable bromide concentrations and, thus, must implement appropriate treatment technologies to ensure compliance with drinking water regulations for disinfection byproducts. In addition, there would be little change in mercury within the Delta under the No Project Alternative relative to existing conditions and therefore no expected substantial change to levels of methylmercury in fish tissue in the Delta. OEHHA standards and fish consumption advisories would continue to be implemented for the consumption of fish, which would help protect people from the overconsumption of fish with increased body burdens of mercury. CHABs would be expected to occur with similar or greater frequency throughout the study area for the No Project Alternative, relative to existing conditions. Increases in water temperature and potentially lower inflows to the Delta in summer months due to climate change would be responsible for more frequent or extensive blooms in the Delta.

Climate change under the No Project Alternative would also be expected to affect the occurrence of vector-borne diseases in the study area relative to existing conditions. With increasing temperatures, it is expected that mosquito abundance, survival, and feeding activity would increase because mosquitoes are ectotherms (i.e., "cold-blooded") and, as such, rely on external sources of heat for reproduction and survival. Furthermore, the rate of development of the pathogen within the mosquito may also increase with increasing ambient temperatures (Rocklöv and Dubrow 2020:479–480).

To the extent that additional electric transmission lines are constructed and operated in the Delta in close proximity to sensitive receptors, those receptors could be exposed to EMF. Exposure of sensitive receptors to EMF in the Delta likely would not change substantially overall under the No Project Alternative relative to existing conditions given current land use policies and practices. It is also reasonable to assume that utilities would implement routine magnetic field–reduction measures identified in the EMF Design Guidelines to reduce the potential for EMF exposure.

Predictable Actions by Others

A list and description of actions included as part of the No Project Alternative are provided in Appendix 3C, *Defining Existing Conditions, No Project Alternative, and Cumulative Impact Conditions*. As described in Chapter 4, *Framework for the Environmental Analysis,* the No Project Alternative analyses focus on identifying the additional water supply–related actions public water agencies may opt to follow if the Delta Conveyance Project does not occur.

Public water agencies participating in the Delta Conveyance Project have been grouped into four geographic regions. The water agencies within each geographic region would likely pursue a similar suite of water supply projects under the No Project Alternative (see Appendix 3C). Although the types of water supply projects considered would vary somewhat by region, projects would generally include water conservation programs, water recycling for non-potable uses, groundwater recovery (brackish water desalination) projects, seawater desalination, and groundwater management.

Water conservation programs could include rebate programs or other incentives for water saving devices, water use restrictions, and water conservation outreach campaigns to educate the public (e.g., direct mail newsletters or community events). Water conservation programs would likely be pursued by all four regions. Implementation of these types of conservation actions would not result in public health impacts due to exposure to vector-borne diseases, exceedances of water quality criteria for constituents of concern in drinking water, increases in bioaccumulative pesticides or methylmercury in fish, or exposure to EMF or *Microcystis* and cyanotoxins. Because these water conservation actions are intended to reduce use and waste of water, they would not result in standing water (i.e., mosquito habitat), the mobilization or introduction of pollutants to surface or groundwater, require new power transmission lines, or result in changes in river flow (i.e., residence time), water temperature, nutrients or create other conditions conducive to CHABs.

Water recycling projects could be pursued in all four regions. Recycled water is wastewater treated to an acceptable water quality standard at a WWTP and then distributed for use. Water recycling for non-potable use generally requires modifications to existing WWTPs and water distribution systems for treatment and conveyance, respectively. To the extent that ground-disturbing construction activities may be required to modify existing WWTPs, there may be temporary effects on water quality potentially related to runoff and erosion, but these would be localized and would not result in increases in concentrations of trace metals, pesticides, or disinfection byproducts such that drinking water quality is compromised or cause a substantial mobilization of or increase in bioaccumulative water quality constituents. Water ponding, including in unused containers and building wastes, as well as on the ground, at construction sites during construction could increase standing water after rain events and thereby create mosquito habitat, but these inundated areas would likely be relatively small, localized, and temporary and would not negatively affect public health due to vector-borne disease exposure. Because recycled water treatment is relatively energy intensive, upgrades to the electrical system of a WWTP may be required, but upgrades would likely occur within the existing WWTP footprint or right-of-way; therefore, increased public exposure to EMF would not occur. Furthermore, the utilities would implement EMF Design Guidelines for construction of new or upgraded electrical transmission lines and substations. These design guidelines include no-cost and low-cost methods for reducing magnetic fields. It is not anticipated that the recycled water facilities would discharge recycled water into receiving waters because the water would be distributed to users in the service area. Accordingly, operation of these facilities would not result in changes in river flow, water temperature, nutrients or create other conditions conducive to CHABs.

The northern and southern coastal regions are most likely to explore implementing groundwater management projects. Construction of groundwater management projects could require excavation and other ground-disturbing activities, but there would be no effects on public health related to exposure to vector-borne diseases, increases in concentrations of trace metals, pesticides or disinfection byproducts such that drinking water quality is compromised, or cause a substantial mobilization of or increase in bioaccumulative water quality constituents for the reasons discussed for construction of water recycling projects. Implementation of groundwater management projects may or may not require new power transmission lines to provide power to electric groundwater pumps. However, groundwater recharge projects are not typically located in densely populated areas and therefore if new transmission lines required it is reasonable to assume that there would not be a substantial increase in public exposure to EMF. Groundwater management projects would not affect drinking water quality because drinking water in public water supply systems would continue to be treated to drinking water standards prior to distribution into the drinking water system. Operation of groundwater recharge sites would likely create standing pools of water (e.g., recharge basins), which could create mosquito breeding habitat, an increase in mosquitoes and subsequent exposure of the public to vector-borne diseases. However, local MVCDs would exercise their authority to conduct surveillance for vectors, prevent the occurrence of vectors, and abate production of vectors and project proponents would also be responsible for mosquito abatement (Health & Saf. Code § 2060).

Water supply desalination involves diverting seawater or brackish water to a desalination facility and removing excess salts or minerals through membrane distillation treatment. Seawater desalination projects would most likely be pursued in the northern and southern coastal regions. The southern coastal regions would likely pursue larger and more desalination projects than the northern coastal region in order to replace the water yield that otherwise would have been received through the Delta Conveyance Project. Brackish water desalination could occur across the northern inland, southern coastal, southern inland regions and in both coastal and inland areas. There would be no adverse construction-related effects on public health related to exposure to vector-borne diseases, increases in concentrations of trace metals, pesticides or disinfection byproducts such that drinking water quality is compromised for the reasons discussed for construction of water recycling projects. Construction of water diversion intakes could mobilize existing bioaccumulative constituents within sediments (e.g., methylmercury), but this would be temporary and localized and would not result in a substantial increase in bioaccumulation in fish and therefore would not affect public health. Construction effects would not be adverse because the mobilization would occur during a limited time and would be localized around the area of construction. Operation of desalination facilities, including distribution infrastructure, would not create habitat for mosquitoes because it would not create areas of standing water; therefore, there would be no increase in public exposure to vector-borne diseases. Public health would not be affected by adverse changes in drinking water quality because water intended for potable use would be treated to drinking water standards prior to distribution. Similarly, discharge of brine from either seawater or brackish water desalination facilities would be subject to waste discharge requirements of the Regional Water Board to avoid effects from increased salinity. Water desalination is an energy-intensive process, and it is likely that new transmission lines would be constructed and operated. New desalination facilities would require transmission lines for power and, although desalination facilities are not likely to be sited near sensitive receptors, transmission lines would traverse from the new desalination facility to existing electrical facilities providing power to the new lines. Accordingly, there could be an increase in exposure of sensitive receptors to EMF depending on proximity to new transmission lines. It is assumed that utilities would implement routine magnetic field reduction measures identified in the EMF Design Guidelines to reduce the potential for EMF exposure. It is not anticipated that the recycled water facilities would discharge recycled water into receiving waters because the water would be distributed to users in the service area. Accordingly, operation of these facilities would not result in changes in river flow, water temperature, nutrients or create other conditions conducive to CHABs.

New desalination facilities would require transmission lines for power and, although desalination facilities are not likely to be sited near sensitive receptors (e.g., adjacent to a hospital, school, or residential area), transmission lines would traverse from the new desalination facility to existing electrical facilities providing power.

26.3.3.2 Impacts of the Project Alternatives on Public Health

Impact PH-1: Increase in Vector-Borne Diseases

All Project Alternatives

Project Construction

Ponding in construction and staging areas for all alternatives, as well as at sites where preconstruction field investigations are performed, could develop after moderate to heavy precipitation events. Ponding areas that do not dry for several days may create suitable mosquito breeding habitat and thus contribute to mosquito population growth. Stormwater runoff would be diverted to an on-site collection system to be captured, treated, and stored in enclosed trailers for on-site water supplies. Therefore, stormwater would not be allowed to accumulate in large open-shallow ponds at the construction site, which would minimize potential mosquito breeding habitat. Because mosquitoes in Northern California typically breed April–October (Sacramento–Yolo Mosquito and Vector Control District 2008), ponding on the ground or any standing water at construction sites (e.g., in unused containers, construction and demolition debris) in spring or fall, when precipitation is more likely to occur, could temporarily create suitable mosquito breeding habitat, which may temporarily increase the public's exposure to vector-borne diseases in the study area.

Operations and Maintenance

All project alternatives would include operation and maintenance of one sedimentation basin and four sediment drying lagoons at each intake. Both of these project features would introduce new surface water areas in the study area. The total number of sedimentation basins and drying lagoons would vary by alternative. Alternatives 2a and 4a would each have a total of three sedimentation basins and 12 drying lagoons; Alternatives 1, 2c, 3, 4c, and 5 would each have a total of two sedimentation basins and eight drying lagoons; and Alternatives 2b and 4b would each have a total of 1 sedimentation basin and four drying lagoons. The water surface elevation in each sedimentation basin would vary from approximately 3 to 27 feet. Water depth in the sediment drying lagoons would average 10 to 12 feet when in use. The sedimentation basins and drying lagoons of Intake A would be located less than 1 mile south of Clarksburg and less than 1.5 miles west of Elk Grove. The town of Hood would be less than 1 mile south of the sedimentation basins and drying lagoons at Intake B and less than 1.5 miles north of the sedimentation basins and drying lagoons at Intake C.

Water diverted from the Sacramento River through an intake would be collected in a sedimentation basin where suspended sediment would settle. A control structure at the back of each sedimentation basin would hold the water in the basin at a constant water level relative to the river level and allow the diverted flow into the tunnel inlet channel. During the summer months (May through September), the sedimentation basins would be dredged, and the sediment slurry discharged to the drying lagoons where water would drain and be pumped back into the sedimentation basin. Each lagoon would be filled and drained for about 3 days, then the sediment would be dried and removed in about 4 to 5 days; the basin fill and drain/dry sequence would be approximately 7 to 8 days (Delta Conveyance Design and Construction Authority 2022:25). Therefore, water movement through the sedimentation basins and drying lagoons would be constant enough to prevent water from stagnating. As discussed in Section 26.1.1.5, *Vectors*, mosquitoes typically prefer shallow (generally less than 3 feet in depth), stagnant water with little movement for breeding. Water in the sedimentation basins and drying lagoons would generally be too deep and have too much regulated water movement to provide suitable mosquito habitat. On average, water residence time in the sedimentation basins at full depth and minimum intake flow would be approximately 1 day. During the summer, water residence time would be approximately 12 hours. 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. Minor vegetation management would be conducted on a monthly basis, at minimum, along the side slopes of the basins to keep them free of unwanted vegetative growth. Therefore, sedimentation basins and drying lagoons would not substantially increase suitable mosquito breeding habitat and would not substantially increase the public's exposure to vector-borne diseases.

Under all project alternatives except Alternative 5, a forebay (the Southern Forebay) would be constructed and operated. Located on Byron Tract, the Southern Forebay would have a water surface area of approximately 750 acres under normal operating conditions. Average surface water elevation in the Southern Forebay would be approximately 11.5 feet and would range from approximately 5.5 to 17.5 feet. Although the proposed Southern 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 would not be stagnant because DWR would manage the forebay to encourage volume turnover and would be too deep to provide suitable mosquito habitat under normal operating conditions. Mosquitoes prefer relatively shallow water (less than 3 feet deep) for egg laying. In drier water year types when flows are reduced, water residence time in the forebay would be expected to increase somewhat. Although 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, maintenance of the forebay would include biannual removal of aquatic vegetation.

The surge basin proposed for Alternative 5 would normally be empty and would only be used during infrequent hydraulic transient-surge events. As such, this facility would not create mosquito breeding habitat.

CEQA Conclusion—All Project Alternatives

Under all project alternatives, ponding in construction and staging areas (including in unused containers, construction, and demolition debris), as well as at sites where preconstruction field investigations are performed, could develop after moderate to heavy precipitation events and temporarily create areas conducive to mosquito breeding, which may temporarily increase the public's exposure to vector-borne diseases in the study area. However, there would be extensive stormwater facilities at each site where stormwater runoff would be diverted to an on-site collection system to be captured, treated, and stored in enclosed trailers for on-site water supplies. Therefore, stormwater would not be allowed to accumulate in large open-shallow ponds at the construction site, which would minimize potential mosquito breeding habitat. However, remaining smaller puddles of water could continue for several days and could increase potential for mosquito breeding, especially at the larger construction sites for the intakes, tunnel launch shaft sites, and Southern Complex or Bethany Complex. This could increase the public's exposure to vector-borne diseases, which would be a significant impact.

Operation of sedimentation basins and drying lagoons under all project alternatives, and operation of the Southern Forebay under all project alternatives except Alternative 5, has the potential to provide habitat for vectors that transmit diseases (e.g., mosquitoes) because new areas of surface water would be introduced in the study area relative to existing conditions. However, the depth, design, and operation of the sedimentation basins and drying lagoons would prevent the development of suitable mosquito habitat. Specifically, water in the basins would be too deep and the regular movement of water through the project facilities would prevent mosquitoes from breeding and multiplying. Similarly, water in the Southern Forebay would generally be circulated regularly because DWR would manage the forebay to encourage volume turnover and, with the exception of shallower areas around the periphery, would be too deep (5.5 to 17.5 feet surface water elevation) to provide suitable mosquito breeding habitat. In drier water year types, when flows are reduced, water residence time in the forebay would increase; however, because mosquitoes prefer relatively shallow water (less than 3 feet deep) for egg laying, substantial breeding habitat in the forebay is not expected. Minor vegetation management would be conducted on a monthly basis, at minimum, along the side slopes of the basins to keep them free of unwanted vegetative growth. Furthermore, although 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, maintenance of the forebay would include biannual removal of aquatic vegetation. Thus, operation and maintenance of the water conveyance facilities would not be expected to result in the creation of potentially suitable mosquito breeding habitat and thus would not likely increase the public's exposure to vector-borne diseases in the study area relative to existing conditions.

Implementation of Mitigation Measure PH-1a: *Avoid Creating Areas of Standing Water During Preconstruction, Field Investigations, and Project Construction* would minimize the potential for any impact on public health related to increasing suitable vector habitat within the study area during construction and reduce this impact to a less-than-significant level by reducing suitable mosquito habitat at project alternative facilities.

Mitigation Measure PH-1a: Avoid Creating Areas of Standing Water During Preconstruction Field Investigations and Project Construction

1. DWR will eliminate standing water to reduce potentially suitable mosquito breeding areas at field investigation sites and construction sites (including staging areas). Actions will include, but not necessarily be limited to:
   a. Avoid leaving containers that can accumulate water in an uncovered or upright position. This includes wheelbarrows, drums, buckets, cans, tarps, and other containers. If uncovered containers must remain on-site, create drainage holes.
   b. Store building materials under shelter/cover that does not collect water.
   c. Grade all work areas to drain.
   d. Fill in potholes and other areas where water is likely to accumulate and/or clear pooled, stagnant water regularly.
   e. Routinely remove garbage and other debris that may collect water.
   f. Periodically pump out water from trenches, ditches, or other ground areas where water could accumulate for several days and potentially provide mosquito breeding habitat.

Mitigation Impacts

Compensatory Mitigation

Although the CMP described in Appendix 3F, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources*, does not act as mitigation for impacts on public health from project construction or operations, its implementation could result in impacts on public health.

Implementation of compensatory mitigation on Bouldin Island and at three ponds east of the Mokelumne River and west of Interstate (I-) 5 would create aquatic habitat potentially suitable for mosquito breeding. Table 26-8 summarizes the change in acreage for aquatic habitat types on Bouldin Island and at I-5 Pond Sites 6, 7, and 8 relative to existing conditions.

Tidal wetland habitat, created as part of the proposed Tidal Habitat Mitigation Framework, would not be expected to contribute suitable mosquito breeding habitat in the study area. 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. Details on the proposed Tidal Habitat Mitigation Framework, as well as the creation and enhancement of aquatic and other habitat types on Bouldin Island and at I-5 pond sites, are provided in Appendix 3F.

Table 26-8. Change in Aquatic Habitat on Bouldin Island and at I-5 Ponds (acres) [a, b]

Aquatic Habitat Type	Bouldin Island (Sites B1 and B2)	Pond 6	Ponds 7 and 8
Agricultural ditch/drain	-13.3	-0.1	-0.3
Depression (lake/pond)	10.3	10.2	-30.0
Tidal channel	0	0	N/A
Natural channel	0	N/A	N/A
Conveyance channel	0	N/A	N/A
Alkaline seasonal wetland	0	N/A	N/A
Seasonal wetland	77.7	N/A	-0.2
Nontidal freshwater emergent wetland	49.9	37.6	58.6
Valley/foothill riparian (forested and scrub shrub wetland)	193.7	-31.0	-5.8
Tidal freshwater emergent wetland	0	N/A	N/A
Vernal pool	0	N/A	N/A
Total	318.3	16.7	22.3

[a] Acres rounded to the nearest tenths. See Appendix 3F, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources*, for more detail.
[b] Acreage identified in the table represents the change in acreage of that aquatic habitat type relative to existing conditions.
N/A = not applicable.

A net increase in potentially suitable mosquito breeding habitat as a result of implementing compensatory mitigation would occur on Bouldin Island and at all I-5 pond sites (Table 26-8). Of the compensatory mitigation sites, I-5 Pond 7 and 8 sites are the closest to a densely populated area (i.e., approximately 5 miles west of Lodi). The I-5 Pond 6 site is less than approximately 7 miles from Lodi, but fewer acres of potentially suitable mosquito breeding habitat would be created/enhanced relative to Ponds 7 and 8 (Figure 26-1). Bouldin Island is less than 10 miles from Oakley and Stockton. Table 26-3 outlines the distances traveled from breeding grounds for the mosquito species known to occur in the Delta. These distances range from less than 1 mile to up to 20 or more miles. Therefore, aquatic habitat creation and enhancement restoration at all proposed compensatory mitigation sites on Bouldin Island and at the I-5 pond sites may result in an increase in mosquito breeding habitat, mosquitoes, and public exposure to vector-borne diseases. It should be noted that although there would be a net increase in aquatic habitat, not necessarily all of this habitat would be high-quality mosquito breeding habitat. For example, as described in Section 26.1.1.5, *Vectors*, functional tidal marshes do not provide high-quality habitat for all mosquito species, and maintenance and restoration of natural tidal flushing in marshes is effective at limiting mosquito populations. Furthermore, forested and scrub shrub wetlands typically are in areas that have saturated soils, but are not necessarily inundated such that pooling would occur, although the potential for pooling exists.

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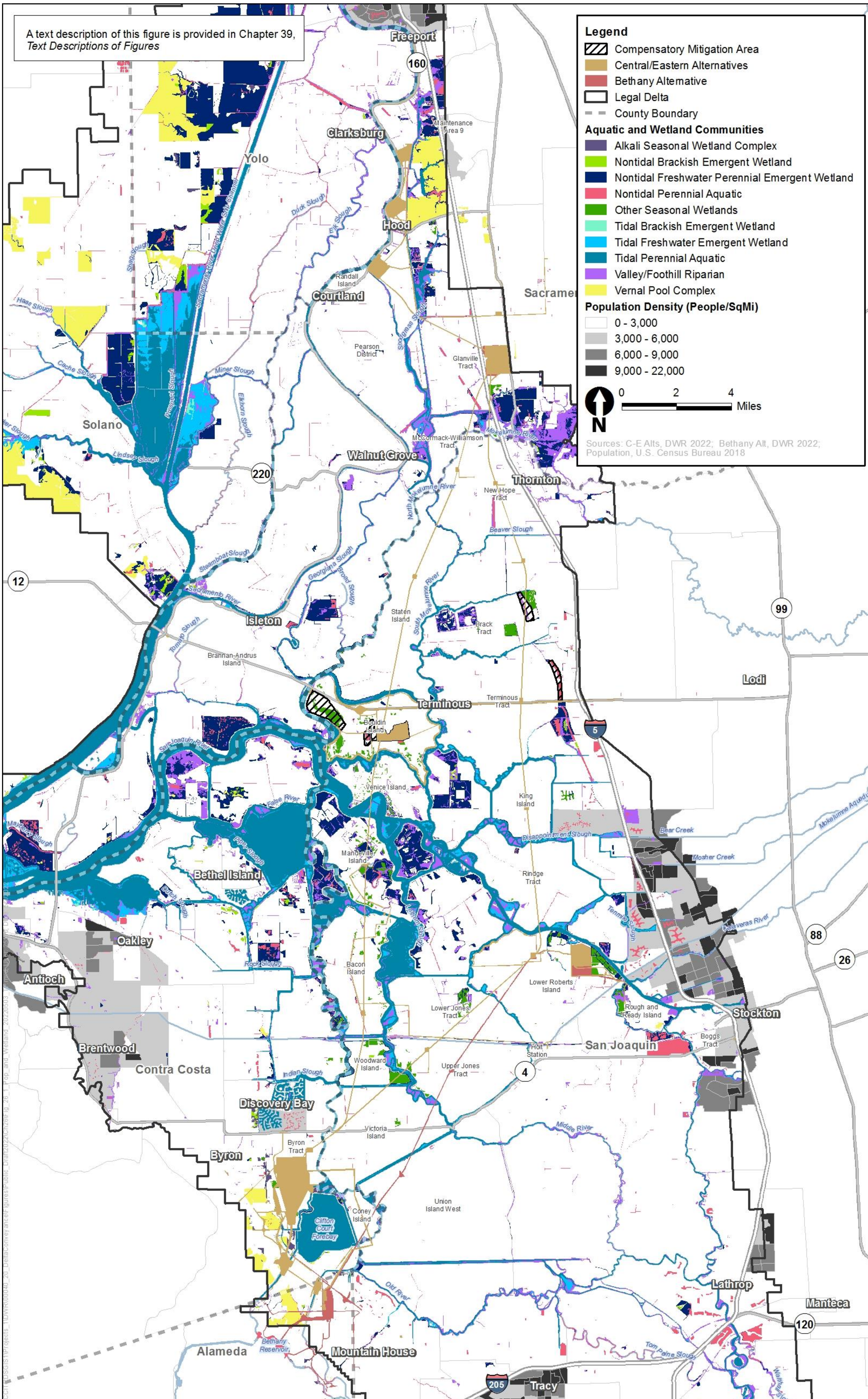

Figure 26-1. Population Density and Wetland Communities

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The project alternatives combined with implementation of the CMP would have a potentially significant impact on public health by increasing suitable mosquito breeding habitat within the study area both temporarily and permanently, as discussed above. Implementation of Mitigation Measure PH-1a: *Avoid Creating Areas of Standing Water During Preconstruction Field Investigations and Project Construction* and Mitigation Measure PH-1b: *Develop and Implement a Mosquito Management Plan for Compensatory Mitigation Sites on Bouldin Island and at I-5 Ponds* would reduce the severity of this impact to a less-than-significant level by managing project facilities to reduce mosquito habitat and implementing a vector control plan in coordination with local MVCDs. Combined with project alternatives, there would be no change in the overall impact conclusion.

Mitigation Measure PH-1b: Develop and Implement a Mosquito Management Plan for Compensatory Mitigation Sites on Bouldin Island and at I-5 Ponds

1. To aid in vector management and control, DWR will develop and implement a mosquito management plan for the compensatory mitigation sites where freshwater marsh, lake/pond, riparian, or seasonal wetland habitat is created/enhanced on Bouldin Island and at the I-5 Ponds. Bouldin Island and the I-5 Ponds are located in San Joaquin County and thus DWR will consult with the San Joaquin County MVCD with respect to habitat creation and enhancement activities at these locations. Consultation will include, but may not be limited to, review of the mosquito management plan and best management practices (BMPs) to be implemented at the compensatory mitigation sites, review of proposed mosquito monitoring efforts at the sites, and assistance with monitoring efforts where feasible. In addition, DWR will consult with the San Joaquin County MVCD during all phases of habitat creation and enhancement (i.e., design, implementation, and operations).

2. The Central Valley Joint Venture's Technical Guide to Best Management Practices for Mosquito Control in Managed Wetlands (Kwasny et al. 2004), the California Department of Public Health's Best Management Practices for Mosquito Control in California (California Department of Public Health and the Mosquito and Vector Control Association of California 2012), and other guidelines will be used to help design appropriate habitat creation and enhancement features to the extent feasible, consistent with the biological goals and objectives of the Delta Conveyance Project.

3. The mosquito management plan will address aquatic habitat design considerations, water management practices, vegetation management, biological controls, and habitat maintenance. BMPs included in the mosquito management plan will include (as applicable), but may not be limited to:

    a. Implement monitoring and sampling programs to detect early signs of mosquito population problems.

    b. Implement freshwater habitat management to include water-control-structure management, vegetation management to reduce mosquito production, mosquito predator management, drainage improvements, and coordination with California Department of Fish and Wildlife regarding these strategies and specific techniques to help minimize mosquito production.

    c. Maintain permanent ponds that increase the diversity of waterfowl yet decrease the introduction of vectors through constant circulation of water, vegetation control, and periodic draining of ponds.

d. Utilize water sources with mosquito predators (e.g., mosquito-eating fish or invertebrate predators) for flooding.

e. Manage vegetation routinely; activities such as annual thinning of rushes and cattails and removing excess vegetative debris enables natural predators to hunt mosquito larvae more effectively in permanent wetlands. Vegetation in shallow, temporary wetlands can be mowed when dry.

f. Implement time flooding of seasonal wetlands to reduce overlap with peak mosquito activity.

g. Excavate deep channels or basins to maintain permanent water areas (>2.5 feet deep) within a portion of seasonal managed wetlands. This provides year-round habitat for mosquito predators that can inoculate seasonal wetlands when they are irrigated or flooded.

h. Provide adequate water control structures for complete drawdown and rapid flooding.

i. When possible, include independent inlets and outlets in the design of each wetland unit.

j. Construct or enhance swales so they are sloped from inlet to outlet and allow maximum drawdown.

k. Use biological agents, such as mosquito fish (*Gambusia affinis*), to limit larval mosquito populations.

l. Use larvicides and adulticides, as necessary, in compliance with all applicable federal and state regulations (e.g., Clean Water Act, Endangered Species Act). Use only larvicides and adulticides that are currently registered by the California Department of Pesticide Regulation. These pesticides will be applied only by trained personnel and according to label directions. If larvicides and/or adulticides are required, DWR will evaluate the effects of these chemicals and, if required, prepare a monitoring program for review by fish and wildlife agencies to evaluate effects, if any, application would have on macroinvertebrates and associated covered fish and wildlife species.

Other Mitigation Measures

Some mitigation measures would involve the use of heavy equipment such as graders, excavators, dozers, and haul trucks, which would create the potential for ponding after moderate to heavy precipitation events due to ground disturbance. The mitigation measures with potential to result in ponding and associated increase in vector-borne diseases are: Mitigation Measures BIO-2c: *Electrical Power Line Support Placement*; AG-3: *Replacement or Relocation of Affected Infrastructure Supporting Agricultural Properties*; AES-1c: *Implement Best Management Practices to Implement Project Landscaping Plan;* CUL-1: *Prepare and Implement a Built-Environment Treatment Plan in Consultation with Interested Parties*; and AQ-9: *Develop and Implement a GHG Reduction Plan to Reduce GHG Emissions from Construction and Net CVP Operational Pumping to Net Zero*. Temporary increases in mosquito breeding habitat and potentially vector-borne diseases resulting from implementation of mitigation measures would be similar to construction effects of the project alternatives in certain construction areas and could contribute to vector-borne disease impacts of the project alternatives. Implementation of Mitigation Measure PH-1a: *Avoid Creating Areas of Standing Water During Preconstruction, Field Investigations, and Project Construction*, would minimize the potential for any impact on public health related to increasing suitable vector habitat by reducing suitable mosquito habitat. Therefore, implementation of other mitigation measures is unlikely to increase vector-borne diseases and the impact would not be substantial with mitigation.

Overall, the impact of increased vector-borne diseases from construction of compensatory mitigation and implementation of other mitigation measures, combined with project alternatives, would not change the impact conclusion of less than significant with mitigation.

Impact PH-2: Exceedance(s) of Water Quality Criteria for Constituents of Concern Such That Drinking Water Quality May Be Affected

All Project Alternatives

Project Construction

Ground-disturbing activities as part of field investigations and construction of the project alternatives, or exposure of disturbed sites immediately following field investigations and project construction and prior to stabilization, could result in precipitation-related soil erosion and runoff to surface waterbodies in the study area. Any existing trace metals, pesticides, other contaminants, or organic matter in the soil could incrementally increase concentrations in surface water. Implementation of Erosion and Sediment Control Plans and Stormwater Pollution Prevention Plans (SWPPP) (Environmental Commitments EC-4a: *Develop and Implement Erosion and Sediment Control Plans* and EC-4b: *Develop and Implement Stormwater Pollution Prevention Plans*, respectively) under all project alternatives for each construction site would minimize the potential for existing trace metals or pesticides in soils at project construction sites to be introduced to adjacent surface water by controlling erosion and runoff to surface water. Erosion and sediment control BMPs implemented as part of EC-4a would include diverting runoff away from steep, denuded slopes, retaining native vegetation to reduce erosion, and slowing runoff and retaining sediment transported by runoff using silt traps, wattles, and berms. BMPs implemented as part EC-4b would include watering soil and covering stockpiles to prevent wind erosion and capturing sediment in detention facilities (refer to Appendix 3B, *Environmental Commitments and Best Management Practices,* for details). Environmental Commitments EC-4a and EC-4b would be implemented before, during, and after construction and would prevent and minimize the introduction of contaminants into surface waters. Accordingly, project construction would not be expected to negatively affect public health from drinking water sources with respect to trace metals, pesticides, or DBP.

Operation and Maintenance

Trace Metals

Operation of the water conveyance facilities would not substantially change concentrations of metals of primarily human health and drinking water concern (i.e., aluminum, arsenic, iron, manganese) relative to existing conditions in Delta waters. Average concentrations for aluminum, arsenic, iron, and manganese in the Sacramento and San Joaquin Rivers are below the applicable water quality criteria for these metals. No mixing of the primary source waters to the Delta (i.e., Sacramento River, San Joaquin River, and San Francisco Bay) could result in concentrations of these trace metals greater than the highest source water concentration and given that the average water concentrations for these metals do not exceed water quality criteria in any of these surface waterbodies, more frequent exceedances of drinking water criteria in the Delta would not occur under the project alternatives. Accordingly, no effect on public health related to the trace metals from drinking water sources is anticipated.

Pesticides

Sources of pesticides in the study area under existing conditions include direct input of surface runoff from agriculture and urbanized areas in the Delta as well as inputs from rivers upstream of the Delta. These sources would not be affected by implementing the project alternatives. There may be use of both terrestrial and aquatic pesticides/herbicides by DWR during operation and maintenance of the water conveyance facilities, and these would be used in accordance with the established DWR policy for pesticide use per the *Water Resources Engineering Memorandum No. 10b* (WREM 10b [California Department of Water Resources 2018]) as well as per the requirements of the Statewide General National Discharge Pollutant Discharge Elimination System Permit for the Discharge of Aquatic Pesticides for Aquatic Weed Control in Waters of the United States for DWR's Aquatic Pesticides Application Plan for State Water Project facilities (Water Quality Order 2013-0002-DWQ) (California Department of Water Resources 2016). The purpose of WREM 10b is to identify staff roles and responsibilities and to ensure that DWR is following safe procedures for all pesticide-related activities by meeting current regulatory requirements and using up-to-date BMPs. As described in Chapter 9, *Water Quality*, existing pesticide monitoring and control programs implemented for the Sacramento River and San Joaquin River to address past pesticide-related impairments and prevent potential future impairments are also applicable to the Delta. Because of these programs and the limited potential for any of the project alternatives to affect pesticide concentrations, use or discharge to waterbodies in the study area, the potential for pesticide to impact drinking water quality and therefore public health due to the operation of the water conveyance facilities is low.

Disinfection Byproducts

As discussed in Section 26.1.1.1, *Drinking Water*, chlorine used in the drinking water disinfection process reacts with organic carbon and bromide in water supply sources to form DBPs. There are no numeric federal water quality criteria or state water quality objectives for bromide or organic carbon applicable to Delta waters, to meet current drinking water regulations for DBPs.

DSM2 modeling results of DOC for the project alternatives indicate that monthly average DOC concentrations at assessment locations in the study area would change minimally relative to existing conditions for the full simulation period, as described in Chapter 9. Although nominal, concentration increases would be greatest at Contra Costa Pumping Plant #1, Old River at State Route (SR) 4 and Victoria Canal and would range from 0.1 mg/L at Victoria Canal and Old River, to 0.2 mg/L at Contra Costa Pumping Plant #1. At other locations, specifically Banks and Jones Pumping Plants, monthly average DOC concentrations would either remain the same as existing conditions or decrease slightly, depending on the month (see Appendix 9I, *Organic Carbon*). During the drought years assessed, the project alternatives would result in similar small changes in monthly average DOC concentrations at the Delta assessment locations (refer to Appendix 9I, Tables 9I-1-1-A through 9I-11-6-D). Because DOC concentrations are not expected to change substantially, no long-term water quality degradation from DOC is expected to occur. Any minor increases in DOC concentrations that could occur in the Delta would not cause additional treatment operations or facilities for drinking water treatment plants that utilize Delta waters in order to comply with drinking water regulations.

As described in Chapter 9, modeled bromide concentrations at all Delta assessment locations except Banks Pumping Plant would seasonally increase under the project alternatives relative to existing conditions. However, there would be no substantial changes in the frequency that bromide exceeds 300 μg/L[9] relative to existing conditions. The greatest magnitude increases in monthly average bromide concentrations would occur in the western Delta at times of the year when bromide concentrations are already high (i.e., typically greater than 1,000 μg/L). To what degree changes in bromide concentrations may result in increased formation of DBPs in the study area is uncertain, as discussed in Chapter 9. Given the numerous variables that affect disinfection byproduct formation potential in Delta-diverted waters, including diversion location and water treatment plant processes, it cannot be definitively determined for this assessment. Treatment plants that use the Delta as a source for drinking water already experience highly variable bromide concentrations and thus must implement appropriate treatment technologies to ensure compliance with drinking water regulations for disinfection byproducts. Despite the potential for periodically higher bromide concentrations under the project alternatives relative to existing conditions at specific times and locations, it is expected that water quality would not be substantially degraded at any Delta location with regard to bromide concentrations given the relatively small increases in long-term average concentrations that would be observed at the locations assessed. These incremental increases in annual average bromide concentrations are not expected to be of sufficient magnitude to cause Delta water diverters to exceed drinking water standards for DBPs more often than under existing conditions.

CEQA Conclusion—All Project Alternatives

Ground-disturbing activities as part of field investigations and project construction activities could result in soil erosion and runoff, which may result in the transport of pesticides and trace metals of primarily human health and drinking water concern (i.e., arsenic, aluminum, iron, and manganese) potentially present in soil to nearby surface waters. However, this potential effect on water quality would be temporary and fairly localized to areas of construction. The development and implementation of site-specific Erosion and Sediment Control Plans and SWPPPs (Environmental Commitments EC-4a: *Develop and Implement Erosion and Sediment Control Plans* and EC-4b: *Develop and Implement Stormwater Pollution Prevention Plans*, respectively) under all project alternatives would minimize the potential for this impact by controlling erosion and runoff to surface water. Sources of pesticides in the study area include direct input of surface runoff from agriculture and urbanized areas in the Delta as well as inputs from rivers upstream of the Delta. These sources would not be affected by operation and maintenance of the project alternatives. Average concentrations for trace metals in the Sacramento and San Joaquin Rivers are below the applicable water quality criteria for these metals. No mixing of the primary source waters to the Delta (i.e., Sacramento River, San Joaquin River, and San Francisco Bay) could result in concentrations of these trace metals greater than the highest source water concentration and given that the average water concentrations for these metals do not exceed water quality criteria in any of these surface waterbodies, more frequent exceedances of drinking water criteria in the Delta would not occur under the project alternatives.

[9] As described in Chapter 9, *Water Quality*, to evaluate the effects of the project alternatives on bromide, the assessment considered work by a panel of three water quality and treatment experts, engaged by the California Urban Water Agencies, which determined that bromide concentrations up to 300 μg/L, and total organic carbon from 4 mg/L to 7 mg/L, is acceptable to provide users adequate flexibility in their choice of treatment method.

Bromide concentrations at all Delta assessment locations, except Banks Pumping Plant, would seasonally increase under the project alternatives, relative to existing conditions, but would not result in substantial changes to the frequency that bromide exceeds 300 μg/L, relative to existing conditions. The greatest magnitude increases in monthly average bromide concentrations would occur in the western Delta at times of the year when bromide concentrations are already high. The project alternatives would not cause long-term degradation of water quality with regard to bromide at any of the Delta locations assessed.

Because there would be no substantial changes to water quality relative to existing conditions with respect to non-bioaccumulative pesticides, trace metals, or DBPs due to construction, or operation and maintenance under any of the project alternatives, there would be a less-than-significant impact on public health from drinking water sources.

Mitigation Impacts

Compensatory Mitigation

Although the CMP described in Appendix 3F does not act as mitigation for impacts on public health from project construction or operations, its implementation could result in impacts on public health.

Compensatory mitigation implemented on Bouldin Island and at the sites of the I-5 Ponds 6, 7, and 8 would not adversely affect water quality through increases in concentrations of trace metals (i.e., aluminum, arsenic, iron, and manganese) or pesticides. As described in Chapter 9, *Water Quality*, natural habitats contribute fewer trace metals and pesticides to receiving waters than agricultural or urban areas. In addition, any newly created wetlands or enhanced habitat may also filter stormwater to remove solids and either improve or have no effect on concentrations of trace metals and pesticides relative to existing conditions.

Similarly, compensatory mitigation would not adversely affect drinking water quality due to increases in DBPs because this mitigation is not expected to increase bromide or substantially increase organic carbon in surrounding waterbodies. The natural habitats proposed by the compensatory mitigation are not sources of bromide to receiving waters. As described in Chapter 9, *Water Quality*, soil type, amount and type of vegetation, construction method, and age of wetland are all factors affecting the potential for wetlands to form reactive carbon that could form DBPs. To ensure that the proposed tidal wetlands do not generate additional organic carbon that could affect municipal water supplies utilizing the Delta for source waters, siting of tidal wetlands would take into consideration the location of nearby drinking water supply intakes. DOC is a concern in drainage water from oxidizing peat soils (Fleck et al. 2007:3). However, likely new tidal wetland sites with suitable elevations would have more mineral-based soils, due to either natural geography (Cache Slough and lower Yolo Bypass areas) or design (e.g., build up elevations with reusable tunnel material or dredge spoil). The hydrologic regime that would occur in the new tidal wetlands would create a consistently anoxic environment in the soils, which would minimize conditions that could foster oxidation of soil organic carbon. Therefore, compensatory mitigation would not affect public health due to substantial increases in DBPs in drinking water or trace metals or pesticides in drinking water sources in the study area. As such, potential impacts on public health related to trace metals, pesticides, and DBPs in drinking water due to implementation of project alternatives combined with compensatory mitigation would be minimized; combined with project alternatives, there would be no change in the overall impact conclusion.

Other Mitigation Measures

Some mitigation measures would involve the use of heavy equipment such as graders, excavators, dozers, and haul trucks that would have the potential to result in soil erosion and runoff and associated transport of pesticides, trace metals, or other contaminants in soil. These mitigation measures with potential to result in soil erosion and runoff are Mitigation Measures BIO-2c: *Electrical Power Line Support Placement*; AG-3: *Replacement or Relocation of Affected Infrastructure Supporting Agricultural Properties*; AES-1c: *Implement Best Management Practices to Implement Project Landscaping Plan;* CUL-1: *Prepare and Implement a Built-Environment Treatment Plan in Consultation with Interested Parties*; and AQ-9: *Develop and Implement a GHG Reduction Plan to Reduce GHG Emissions from Construction and Net CVP Operational Pumping to Net Zero*.

Potential temporary increases in any existing trace metals, pesticides, other contaminants, or organic matter in surface water from eroded soil, which may affect drinking water quality downstream, resulting from implementation of mitigation measures would be similar to construction effects of the project alternatives in certain construction areas and could temporarily contribute to drinking water quality impacts of the project alternatives. Implementation of site-specific Erosion and Sediment Control Plans and SWPPPs (Environmental Commitments EC-4a: *Develop and Implement Erosion and Sediment Control Plans* and EC-4b: *Develop and Implement Stormwater Pollution Prevention Plans*, respectively) would minimize the potential for this impact by controlling erosion and runoff to surface water. Average concentrations for trace metals in the Sacramento and San Joaquin Rivers are below the applicable water quality criteria and exceedances of drinking water criteria would not occur. Implementation of other mitigation measures would not result in substantial changes to water quality relative to existing conditions with respect to non-bioaccumulative pesticides, trace metals, or DBPs. Therefore, implementation of other mitigation measures is unlikely to exceed water quality criteria that may affect drinking water quality, and the impact on drinking water quality would not be substantial.

Overall, the impact of exceeding water quality criteria that may affect drinking water quality from construction of compensatory mitigation and implementation of other mitigation measures, combined with project alternatives, would not change the impact conclusion of less than significant.

Impact PH-3: Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate

All Project Alternatives

Project Construction

Bioaccumulative Pesticides and Methylmercury

Legacy pesticides, such as organochlorines, have low water solubility—they do not readily volatilize and tend to adsorb (bond) to particulates, settle out into the sediment, and not be transported far from the source. Similarly, mercury and methylmercury adsorb to suspended particulate matter and particulates in sediment. If organochlorines or mercury and methylmercury are present in sediment within in-water construction areas, these toxicants would be temporarily disturbed and resuspended in the water column due to in-channel sediment-disturbing construction activities at intake sites (e.g., pile driving and cofferdam installation, dredging at intakes prior to riprap placement) or field investigations. In addition, legacy pesticides and mercury that may be present in soil at construction sites adjacent to surface water in the study area could enter the water column via runoff and erosion. Increases in water column concentrations of bioaccumulative pesticides or methylmercury can ultimately be transferred to fish consumed by humans. Given the temporary nature of any sediment resuspension, potential changes in water column concentrations of legacy pesticides, mercury, or methylmercury during construction of the project alternatives would not increase long-term fish tissue concentrations in the study area.

The development and implementation of Erosion and Sediment Control Plans and SWPPPs (Environmental Commitments EC-4a: *Develop and Implement Erosion and Sediment Control Plans* and EC-4b: *Develop and Implement Stormwater Pollution Prevention Plans*, respectively) under all project alternatives would minimize the potential for legacy pesticides and mercury in soil to be introduced to the water column. BMPs implemented as part of these plans would control erosion and runoff to surface water (refer to Appendix 3B, *Environmental Commitments and Best Management Practices*).

<u>Operations and Maintenance</u>

Bioaccumulative Pesticides

Legacy pesticides that are bioaccumulative, such as organochlorines, are not currently in use and the project alternatives would not increase their concentrations in fish. As discussed in Chapter 9, *Water Quality*, considering that these legacy pesticides are no longer used, their low frequency of detection in source waters of the Sacramento and San Joaquin Rivers, concentrations of legacy pesticides would not be affected measurably by operation of the water conveyance facilities under all project alternatives. Maintenance dredging of sediment around the intake and pumping plant structures and potential emergency dredging at the fish screens (case-by-case basis) would result in the temporary resuspension of sediments, which could reintroduce legacy pesticides to the water column. However, this would only occur periodically as needed, and sediment resuspension would be temporary and fairly localized. Because of the limited potential for operation and maintenance of the project alternatives to affect legacy pesticide concentrations waterbodies in the study area, the potential for bioaccumulative pesticides to increase in fish tissue relative to existing conditions and indirectly affect public health through consumption of those fish is low.

Methylmercury

Modeling results indicate that the water column concentration of total mercury and methylmercury would differ little from existing concentrations at the 11 Delta assessment locations modeled (Chapter 9, Tables 9-33 and 9-34). Total mercury concentrations under the project alternatives would be well below the California Toxics Rule criterion (50 nanograms per liter) for protection of human health from consumption of water and organisms. Modeled fish tissue concentrations exceed the methylmercury water quality objective for fish tissue under both existing conditions and all project alternatives. Fish tissue modeling results indicate that there would be a nominal increase in average fish tissue methylmercury concentrations (no more than 0.01 milligrams per kilogram (mg/kg) wet weight as averages over full simulation period) at all modeled locations (Chapter 9, Table 9-35). As indicated in Chapter 9, all modeled fish tissue concentrations exceed the methylmercury water quality objective of 0.24 mg/kg wet weight (350 millimeter largemouth bass) under existing conditions. Based on the small changes in total mercury and aqueous and fish tissue methylmercury concentrations at all Delta assessment locations, the project alternatives would not contribute to measurable water quality degradation with respect to mercury and methylmercury (i.e., the existing mercury/methylmercury impairment in Delta waters would not be made measurably worse). As such, operation of the project alternatives would not increase public health risks due to the consumption of fish in the study area.

CEQA Conclusion—All Project Alternatives

Intermittent and short-term construction-related activities (as would occur for in-river construction) under all project alternatives, or in-channel activities as part of field investigations, would not be anticipated to result in changes in concentrations of bioaccumulative pesticides, mercury, or methylmercury of sufficient magnitude or duration to contribute to long-term bioaccumulation processes. The development and implementation of Erosion and Sediment Control Plans and SWPPPs (Environmental Commitments EC-4a: *Develop and Implement Erosion and Sediment Control Plans* and EC-4b: *Develop and Implement Stormwater Pollution Prevention Plans*, respectively) would help ensure that construction activities would not substantially increase or substantially mobilize legacy organochlorine pesticides or methylmercury during construction.

Given that legacy pesticides are no longer used, are infrequently detected in source waters of the Sacramento and San Joaquin Rivers, concentrations of legacy pesticides would not be affected measurably by operation of the water conveyance facilities under all project alternatives. Maintenance dredging of sediment around the intake structures would result in the temporary resuspension of sediments, which could reintroduce legacy pesticides to the water column, but this would only occur periodically, and sediment resuspension would be temporary and fairly localized. Thus, operation and maintenance of the water conveyance facilities under all project alternatives would not result in an increase in bioaccumulation of legacy pesticides in fish, and public health would not be affected. Changes in long-term methylmercury concentrations that may occur in waterbodies of the study area related to operation of the proposed water conveyance facilities would not differ substantially from existing conditions. Fish tissue methylmercury concentrations under all project alternatives would not differ substantially from existing conditions. As such, operation of the proposed water conveyance facilities under the project alternatives would not contribute to measurable water quality degradation with respect to mercury and methylmercury, and thus would not increase existing health risks related to the consumption of fish in the study area. OEHHA standards and fish consumption advisories would continue to be implemented for the consumption of study area fish, which would help protect people from the overconsumption of fish with increased body burdens of mercury. This impact would be less than significant because construction and operation of project alternatives would not increase bioaccumulation of pesticides and methylmercury in fish that could affect human health.

Mitigation Impacts

<u>Compensatory Mitigation</u>

Although the CMP described in Appendix 3F, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources*, does not act as mitigation for impacts on public health from project construction or operations, its implementation could result in impacts on public health.

Compensatory mitigation implemented on Bouldin Island and at the sites of the I-5 Ponds 6, 7, and 8 would not negatively affect water quality through increases in concentrations of pesticides. As described in Chapter 9, *Water Quality*, natural habitats contribute fewer pesticides to receiving waters than agricultural or urban areas. In addition, any newly created wetlands or enhanced habitat may also filter stormwater to remove solids and either improve or have no effect on pesticide concentrations relative to existing conditions.

Conditions that are conducive to mercury methylation and uptake from water into fish tissues may increase, relative to existing conditions, in localized areas of the Delta as part of the creation of new freshwater-emergent perennial wetlands, seasonal wetlands, and tidal habitats. Mercury methylation occurs under anoxic conditions in sediments, flooded shoreline soils and, to a lesser degree, in the water column. Increased methylmercury is also associated with wetting and drying cycles. Accordingly, implementation of the CMP could result in increased production, mobilization, and bioavailability of methylmercury. An increase in methylmercury bioavailability could result in a corresponding increase in bioaccumulation in fish tissue, biomagnification through the food chain, and human exposure.

The freshwater emergent perennial wetlands and seasonal wetlands would be located on Bouldin Island and would not be hydrodynamically connected with adjacent Delta waters. As part of management of the new wetlands, water may be discharged from the wetlands to adjacent Delta waterways through existing drains or outfalls. As part of adaptive management, monitoring of the discharge would be conducted and the discharges potentially modified (e.g., to a detention basin) should monitoring results show the wetland discharges to be a net exporter of methylmercury to Delta waters. Thus, the wetlands to be created on Bouldin Island would not contribute to measurable increases in methylmercury concentrations in fish in the Delta.

Location(s) and size(s) of the new tidal habitats would generally be in the northern and western portins of the Delta and would be selected in accordance with the Tidal Habitat Mitigation Framework in Appendix 3F, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources*. The new tidal habitats would be hydrodynamically connected to the Delta and conditions that are conducive to increased mercury methylation and uptake from water into fish tissues may occur within the new tidal habitats. Although there are uncertainties related to the potential for increases in methylmercury concentrations in new tidal habitats, as described in Chapter 9 (Impact WQ-6: *Effects on Mercury Resulting from Facility Operations and Maintenance*), measurable increases in levels of methylmercury concentrations in waters and fish within and near the new tidal habitats could potentially occur. OEHHA standards and fish consumption advisories would continue to be implemented for the consumption of study area fish, which would help protect people from the overconsumption of fish with increased body burdens of mercury. Accordingly, this impact would be less than significant. In addition, as described in Chapter 9, Mitigation Measure WQ-6: *Develop and Implement a Mercury Management and Monitoring Plan* would be implemented with the goal to minimize generation of methylmercury within new tidal habitat, which would further reduce the potential for an increase in methylmercury in fish tissue of study area fish. Therefore, implementation of the CMP combined with the project alternatives would not substantially mobilize or substantially increase the public’s exposure to constituents known to bioaccumulate, and would not change the overall impact conclusion.

Other Mitigation Measures

Some mitigation measures would involve the use of heavy equipment such as graders, excavators, dozers, and haul trucks that would have the potential to result in the mobilization of or an increase in constituents known to bioaccumulate due to soil disturbance and runoff, or sediment disturbance if these constituents are present. The mitigation measures with potential to result in bioaccumulation are: Mitigation Measures BIO-2c: *Electrical Power Line Support Placement*; AG-3:

Replacement or Relocation of Affected Infrastructure Supporting Agricultural Properties; AES-1c: *Implement Best Management Practices to Implement Project Landscaping Plan;* CUL-1: *Prepare and Implement a Built-Environment Treatment Plan in Consultation with Interested Parties*; and AQ-9: *Develop and Implement a GHG Reduction Plan to Reduce GHG Emissions from Construction and Net CVP Operational Pumping to Net Zero*. Temporary increases in the mobilization of or an increase in constituents known to bioaccumulate resulting from implementation of mitigation measures would be similar to construction effects of the project alternatives in certain construction areas and could contribute to bioaccumulation impacts of the project alternatives. Implementation of site-specific Erosion and Sediment Control Plans and SWPPPs (Environmental Commitments EC-4a: *Develop and Implement Erosion and Sediment Control Plans* and EC-4b: *Develop and Implement Stormwater Pollution Prevention Plans*, respectively) would help ensure that implementation of mitigation measures would not substantially increase or substantially mobilize legacy organochlorine pesticides or methylmercury during construction. Given the temporary nature of any sediment resuspension, potential changes in water column concentrations of legacy pesticides, mercury, or methylmercury resulting from implementation of other mitigation measures would not likely increase long-term fish tissue concentrations in the study area. Therefore, implementation of other mitigation measures is unlikely to result in an increase in bioaccumulative constituents in surface waters in the study area and the impact of bioaccumulation on public health would not be substantial.

Overall, the impact of mobilization or increase in constituents known to bioaccumulate from construction of compensatory mitigation and implementation of other mitigation measures, combined with project alternatives, would not change the impact conclusion of less than significant.

Impact PH-4: Adversely Affect Public Health Due to Exposing Sensitive Receptors to New Sources of EMF

All Project Alternatives

<u>Operations and Maintenance</u>

Approximately 719 miles of existing transmission lines are located within the study area. Table 26-7 identifies the lengths of the proposed permanent 69 kV and 230 kV transmission lines for all project alternatives as well as the sensitive receptors that would be located within 300 feet of these proposed transmission lines.

Although new transmission lines generating new sources of EMF would be constructed for all project alternatives, the proposed permanent aboveground and underground transmission lines would be located in relatively sparsely populated areas (Figure 26-2). As shown in Table 26-7, from 2 (Alternative 4b) to 37 residences (Alternatives 1, 2a, and 2c), and up to three wildlife preserve areas would be within 300 feet of a proposed permanent underground 69 kV transmission line, depending on the project alternative. Under all alternatives there would be a proposed permanent aboveground 69 kV line installed on existing towers, and the Cosumnes River Preserve, as well as 23 residences, would be within 300 feet of this proposed line. There would be no sensitive receptors located within 300 feet of the proposed permanent aboveground and underground 230 kV transmission lines.

Generally, visitors to wildlife preserve areas and parks come for walks, birdwatching, water recreation, and hunting for a limited time. As such, it is unlikely that large groups of people would be staying in these areas, and therefore any EMF exposure would be limited. Up to 37 residences are located within 300 feet of proposed permanent transmission lines, depending on project alternative. Although there may be general public concern about exposure to EMF, there are no state or federal standards (health-based or otherwise) to limit occupational or residential exposure to EMF and, furthermore, there is currently no medical or scientific consensus that EMF exposure poses a health risk. The location and design of proposed transmission lines and substations would be in accordance with EMF Design Guidelines (California Public Utilities Commission 2006b) to minimize potential exposure of sensitive receptors to EMF due to operation of project alternatives.

CEQA Conclusion—All Project Alternatives

The permanent aboveground and underground 69 kV and 230 kV transmission lines proposed for construction and operation of the water conveyance facilities for all project alternatives would be located in generally sparsely populated areas away from most existing potentially sensitive receptors. However, depending on project alternative, 2 to 37 residences and up to three wildlife preserve areas would be within 300 feet of a proposed permanent underground 69 kV transmission line, and 23 residences and the Cosumnes River Preserve would be within 300 feet of a proposed permanent aboveground 69 kV transmission line. There would be no sensitive receptors within 300 feet of any proposed permanent aboveground or underground 230 kV transmission lines. Because visitors to wildlife preserve areas generally come for walks and other recreational activities, it is unlikely that large groups of people would be staying in these areas within 300 feet of any proposed transmission line, so any EMF exposure would be limited. There are no state or federal standards (health-based or otherwise) to limit occupational or residential exposure to EMF, and there is no medical or scientific consensus that EMF exposure poses a health risk. Furthermore, the location and design of proposed transmission lines and power facilities would be in accordance with EMF Design Guidelines (California Public Utilities Commission 2006b) to minimize potential exposure of sensitive receptors to EMF due to operation of project alternatives. As such, this impact would be less than significant.

Mitigation Impacts

Compensatory Mitigation

Although the CMP described in Appendix 3F, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources*, does not act as mitigation for impacts on public health from project construction or operations, its implementation could result in impacts on public health.

No transmission lines would be constructed or operated as part of implementation of compensatory mitigation. Therefore, implementation of compensatory mitigation would not create a new source of EMF in the study area relative to existing conditions. Therefore, impacts related to new sources of EMF on public health due to implementation of the project alternatives, combined with implementation of the CMP, would not change the overall impact conclusion.

Other Mitigation Measures

Other mitigation measures proposed would not result in generation of EMF because none of the mitigation measures propose constructing and operating electrical transmission lines in the study area. Therefore, implementation of mitigation measures would not result in a potential impact on public health related to EMF exposure.

Overall, the impact of affecting public health due to exposure to new sources of EMF from construction of compensatory mitigation and implementation of other mitigation measures, combined with project alternatives, would not change the less than significant impact conclusion.

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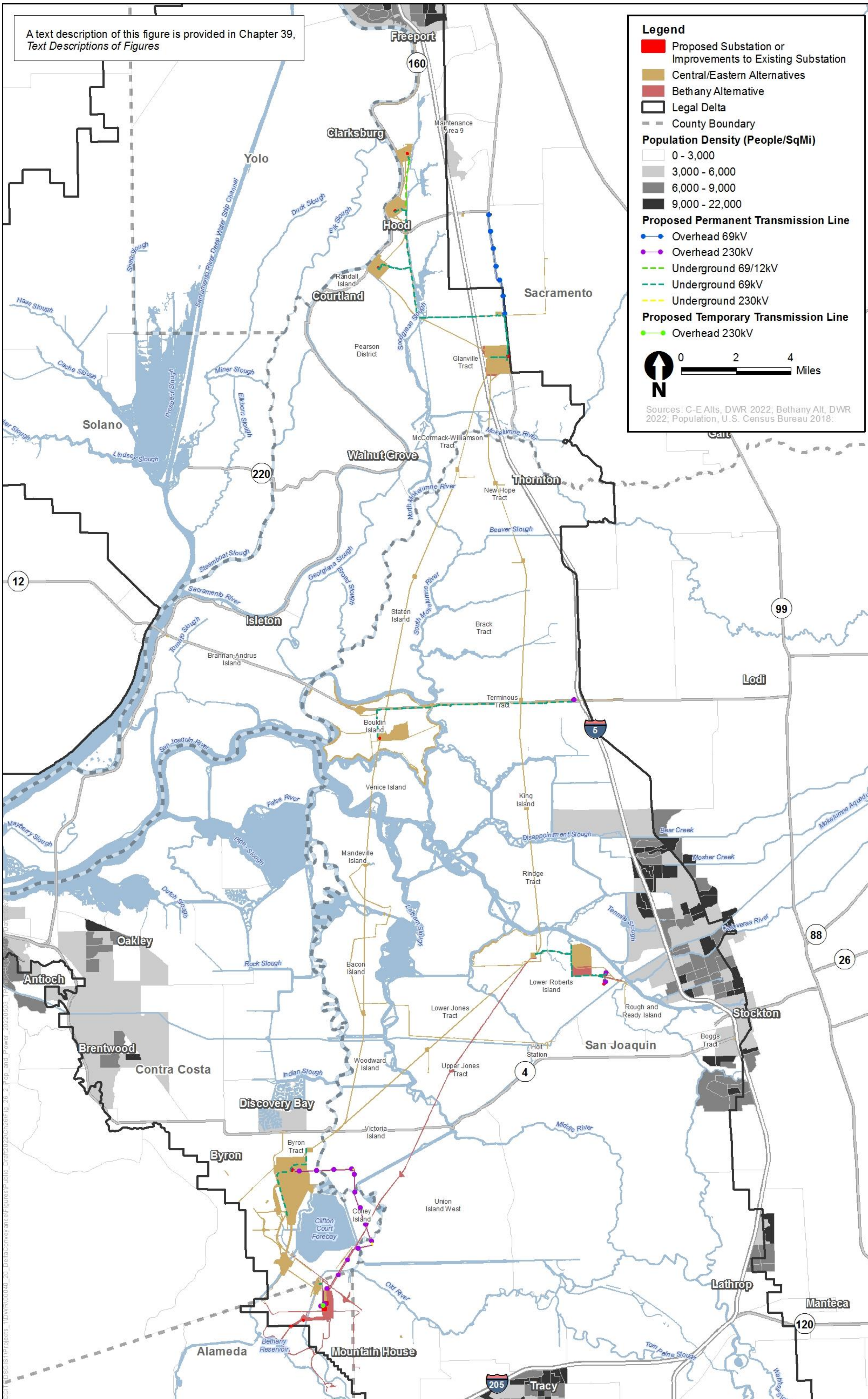

Figure 26-2. Population Density and Proposed Transmission Lines

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Impact PH-5: Impact Public Health Due to an Increase in *Microcystis* Bloom Formation

All Project Alternatives

The five factors that affect the development of CHABs in Delta are water temperature, channel velocities and associated turbulence/mixing, hydraulic residence time, nutrients, and water clarity. As discussed in Chapter 9, *Water Quality* (Impact WQ-14: *Effects on Cyanobacteria Harmful Algal Blooms Resulting from Facility Operations and Maintenance*), the project alternatives would not affect these factors in the northern, southern, western, or eastern Delta to such a degree that the frequency or magnitude of CHABs in these areas of the Delta would be affected relative to existing conditions. However, based on DSM2 modeling, the project alternatives would be expected to increase residence times somewhat in the open-water areas of the central Delta relative to existing conditions. Because water temperature, turbulence and mixing, nutrient levels, and water clarity and associated irradiance are key to the initiation of blooms and subsequent growth, and because these factors would not be affected by the project alternatives, the project alternatives would not be expected to cause more frequent CHABs anywhere in the Delta, relative to existing conditions.

The modeled 1- to 2-day increase in hydraulic residence time in the central portion of the Delta, specifically Discovery Bay, relative to existing conditions, may contribute to more *Microcystis* cell and colony production and accumulation/aggregation at this location in July, although this is uncertain, as discussed in Chapter 9. The project alternatives would not affect water temperature, nutrients, turbulence and mixing, water clarity, or residence time in the central Delta sufficiently to cause substantially increased frequency or magnitude of CHABs in the central Delta, including Discovery Bay. Accordingly, the project alternatives are not expected to substantially increase microcystin or any other cyanotoxins in the Delta, relative to existing conditions at the Delta assessment locations.

CEQA Conclusion—All Project Alternatives

The frequency and magnitude of CHABs in the study area would not increase relative to existing conditions under the project alternatives because operation of the water conveyance facilities would not cause the key factors potentially associated with CHABs (i.e., temperature, residence time, nutrients, water velocities and associated turbulence and mixing, and water clarity and associated irradiance) to change in a manner that would increase the frequency or magnitude of CHABs in the Delta. Accordingly, concentrations of cyanotoxins within the study area would not be expected to substantially increase relative to existing conditions due to operation of the water conveyance facilities and therefore there would be no increased potential for public health to be affected by exposure to cyanotoxins. This impact would be less than significant.

Mitigation Impacts

<u>Compensatory Mitigation</u>

Although the CMP described in Appendix 3F, *Compensatory Mitigation Plan for Special-Status Species and Aquatic Resources*, does not act as mitigation for impacts on public health from project construction or operations, its implementation could result in impacts on public health.

The creation of valley/foothill riparian, freshwater emergent perennial wetland, and seasonal wetland, lake/pond habitat types from implementation of compensatory mitigation would not affect CHAB formation within the Delta relative to existing conditions because they would be located within Bouldin Island and I-5 ponds and thus would not be hydrodynamically connected with Delta channels.

As part of implementation of compensatory mitigation, the creation of tidal habitats in the North Delta Habitat Arc (i.e., the region from Cache Slough to Suisun Marsh) that would be hydrodynamically connected to Delta channels, could create some new areas that are conducive to CHABs. There is some uncertainty related to the design of the wetlands (e.g., depth, amount of aquatic vegetation, and exact location). However, design of the tidal habitat would consider hydrologic regime and channel morphology (backwater areas with low velocities and high residence time can create conditions that foster CHABs) to help ensure potential adverse effects related to CHABs are minimized. As such, newly created tidal habitats would have daily tidal flushing to ensure no substantial increase in residence time, relative to existing conditions. Although tidal habitats would be designed to reduce potential for CHAB formation, it is possible that along the edges of the new tidal habitat, there could be small areas of increased residence time, elevated water temperature, reduced water turbulence and mixing, and turbidity (which affects irradiance). Depending on the vegetation in the tidal habitat, there could be some increased nutrient concentrations (from decomposing vegetation). However, the presence of vegetation would generally decrease the potential for CHAB formation as plants would likely outcompete cyanobacteria for nutrients and sunlight.

As discussed in Chapter 9, *Water Quality*, although there are some characteristics of the newly created tidal habitats that could increase residence time and water temperatures along the margins, implementation of the CMP is not expected to cause substantial additional *Microcystis* or other cyanobacteria production for the following reasons: (1) tidal restoration sites would be sited in a region where conditions are not conducive to CHAB formation; (2) the design of the tidal habitats would be such that there would be daily hydrologic exchange, which would ensure that there would not be substantially increased residence times compared to adjacent habitats; and (3) if the tidal habitat were to be located in Cache Slough, the region would continue to be fed with waters that are relatively nutrient poor and not conducive to substantial cyanobacteria formation. Similarly, if the tidal habitat were to be located in the Suisun Marsh region, salinities would continue to be high enough to prevent substantial growth and aggregation of cyanobacteria. Accordingly, impacts on public health due to potential exposure to cyanotoxins as a result of increases in CHABs, due to implementation of the project alternatives combined with implementation of the CMP, would be less than significant.

<u>Other Mitigation Measures</u>

Other mitigation measures proposed would not have impacts on public health due to potential exposure to CHABs because none of the mitigation measures would create conditions that would be conducive to the formation of CHABs. Therefore, there would be no impact.

Overall, impacts to public health related to increased *Microcystis* bloom formation and cyanotoxins due to implementation of compensatory mitigation and other mitigation measures, combined with project alternatives would not change the impact conclusion of less than significant.

26.3.4 Cumulative Analysis

This cumulative impact analysis considers past, present, and probable future projects in the study area that could affect the same resources and, where relevant, occur within the same timeframe as the project. The impacts of the project, as they relate to public health, considered in connection with the potential impacts of projects that may occur in the study area, could be cumulatively significant. It is expected that some changes related to public health would take place, even though it is assumed that probable future projects would include typical design and construction practices to avoid or minimize potential impacts.

When the effects of the project are considered in combination with the effects of projects listed in Table 26-9, the cumulative impacts on public health are potentially significant. The specific plans, policies, programs, and projects are identified below for each impact category based on the potential to contribute to an impact due to implementation of the Delta Conveyance Project that could be deemed cumulatively considerable. The potential for cumulative impacts on public health is described for potential effects related to the construction and operation of the water conveyance facilities and compensatory mitigation under the project.

Table 26-9. Cumulative Impacts on Public Health from Plans, Policies, and Programs

Program/Project	Agency	Status	Description of Program/Project	Impacts on Public Health
North Delta Flood Control and Ecosystem Restoration Project	DWR	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.
Suisun Marsh Habitat Management, Preservation, and Restoration Plan	CDFW, USFWS, Reclamation, DWR, and Suisun Resource Conservation District	Final EIS/EIR 2011	The plan is intended to balance the benefits of tidal wetland restoration with other habitat uses in Suisun 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 impact on public health from vector-borne diseases or mobilization of constituents known to bioaccumulate during construction and operation.
Cache Slough Area Restoration	DWR and CDFW	Ongoing and future actions	Enhancement and restoration of existing and potential open-water, marsh, floodplain, and riparian habitat in northern Delta.	Potential incremental increase in methylmercury formation and contribution to Delta load

Program/Project	Agency	Status	Description of Program/Project	Impacts on Public Health
Dutch Slough Tidal Marsh Restoration Project (EcoRestore Project)	DWR	Planning phase	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 in areas where seasonal wetland areas and unmanaged nontidal freshwater marsh are reduced. Increase mosquito production as a result of nontidal 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.
American Basin Fish Screen and Habitat Improvement Project	Reclamation, CDFW, and Natomas Central Mutual Water Company	Ongoing	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 impact on public health is expected from vector-borne diseases and mobilization of constituents known to bioaccumulate during or after conversion.
California Water Action Plan	CNRA, CalEPA, and CDFA	Ongoing and future	Identifies key actions for the next 1 to 5 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.
Bay-Delta Water Quality Control Plan Update	State Water Board	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 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	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.

Program/Project	Agency	Status	Description of Program/Project	Impacts on Public Health
			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.	
Drought Contingency Plan (includes Emergency Drought Barriers project)	Reclamation, DWR, and State Water Board	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*).
San Joaquin River Restoration Program	Reclamation, USFWS, NMFS, DWR, and CDFW	Final Program EIS/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 vector-borne diseases to adversely affect public health as operation of this program could result in an increase in adult mosquito populations.
Central Valley Diuron TMDL	Central Valley Water Board	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of diuron pesticide.
Central Valley Diazinon and Chlorpyrifos TMDL	Central Valley Water Board	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of diazinon and chlorpyrifos pesticides.
Sacramento and Feather Rivers Diazinon TMDL	Central Valley Water Board	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of diazinon pesticides.
Sacramento–San Joaquin Delta Diazinon and Chlorpyrifos TMDL	Central Valley Water Board	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of diazinon and chlorpyrifos pesticides.
Central Valley Pyrethroid Pesticide TMDL	Central Valley Water Board	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of pesticides.

Program/Project	Agency	Status	Description of Program/Project	Impacts on Public Health
Central Valley Organochlorine Pesticide TMDL	Central Valley Water Board	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of legacy organochlorine pesticides.
Cache Creek, Bear Creek, Sulphur Creek, and Harley Gulch Mercury TMDL	Central Valley Water Board	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of mercury and methylmercury formation, and thus bioaccumulation in fish and consequent potential effects on public health.
Clear Lake Mercury TMDL	Central Valley Water Board	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of mercury and methylmercury formation, and thus bioaccumulation in fish and consequent potential effects on public health.
Sacramento–San Joaquin Delta Methylmercury TMDL	Central Valley Water Board	Ongoing and future actions	Regulatory and implementation actions to achieve compliance with water quality objectives.	Goal is reduced source loading of mercury and methylmercury formation, and thus bioaccumulation in fish and consequent potential effects on public health.

CalEPA = California Environmental Protection Agency; CDFW = California Department of Fish and Wildlife; CNRA= California Natural Resources Agency; CVP = Central Valley Project; DWR = California Department of Water Resources; EIR = Environmental Impact Report; EIS = Environmental Impact Statement; NMFS = National Marine Fisheries Service; Reclamation = Bureau of Reclamation; State Water Board = State Water Resources Control Board; SWP = State Water Project; TMDL = total maximum daily load; USFWS = U.S. Fish and Wildlife Service.

26.3.4.1 Cumulative Impacts of the No Project Alternative

The No Project Alternative considers projects, plans, and programs that would be predicted to occur under foreseeable conditions if the project were not approved and project objectives were not met, and also included climate change and sea level rise. In combination with the past, present, and probable future projects in the study area (Table 26-9), the No Project Alternative could have a cumulative impact on public health in the study area. The No Project Alternative could result in adverse impacts on public health by increasing the public's risk of exposure to vector-borne diseases; lowering drinking water quality due to exceedances of water quality criteria for constituents of concern; increasing bioaccumulation of persistent toxicants (e.g., mercury) in fish consumed by people; exposing sensitive receptors (e.g., hospitals, schools, parks) to EMF from new transmission lines; and exposing the public to microcystins as a result of CHABs.

As described in Chapter 9, *Water Quality*, some water quality constituents in the study area are at levels under existing conditions that cause occasional adverse effects to beneficial uses, including mercury, OC, and CHABs, and under the cumulative condition with the No Project Alternative, these constituents are expected to remain at levels that will cause some impact to beneficial uses. It is expected that potential cumulative impacts on public health related to mercury bioaccumulation in fish in the study area from both the No Project Alternative and past, present, and probable future projects could be avoided because OEHHA standards and fish consumption advisories would continue to be implemented for the consumption of study area fish. This would help protect people from the overconsumption of fish with increased body burdens of mercury so that the impact would not be cumulatively significant. Potential increases in OC would not be expected to affect public health by causing an increase in DBPs in drinking water because under the federal Stage 1 Disinfectants and Disinfection Byproducts Rule, municipal drinking water treatment facilities are required to remove specific percentages of TOC in source waters through enhanced treatment methods unless the drinking water treatment system can meet alternative criteria. Therefore, this impact would not be cumulatively significant. Increases in surface water temperatures in the Delta under the No Project Alternative due to climate change may result in earlier occurrences of *Microcystis* blooms in the Delta. In addition, warmer water temperatures could increase bloom duration and magnitude. This, in combination with past, present, and probable future projects, would result in a cumulatively significant impact on public health due to potential exposure to increased cyanotoxins in the study area.

Climate change is expected to influence the seasonal patterns of mosquito reproduction and thus of vector-borne diseases. Warmer temperatures associated with climate change can accelerate mosquito development, biting rates, and disease incubation within mosquitoes (U.S. Environmental Protection Agency 2021). Therefore, the No Project Alternative combined with past, present and probably future projects would result in a cumulatively significant impact on public health due to potential increased exposure to vector-borne diseases.

Some projects under the No Project Alternative and identified in Table 26-9 may require constructing and operating power transmission lines. These transmission lines may be sited within 300 feet of sensitive receptors and thus operation of these transmission lines could expose sensitive receptors in the study area to EMF. However, there are no state or federal standards (health-based or otherwise) to limit exposure to EMF, and there is no medical or scientific consensus that EMF exposure poses a health risk. Furthermore, it is reasonable to assume that project proponents would locate and design proposed transmission lines in accordance with EMF Design Guidelines to minimize potential exposure of sensitive receptors to EMF due to operation of electrical transmission lines. Accordingly, this cumulative impact would be less than significant.

26.3.4.2 Cumulative Impacts of the Project Alternatives

Increase in Vector-Borne Diseases

Substantial vector habitat is present throughout the study area, and the cumulative projects could result in an increase in potential mosquito habitat (e.g., more standing shallow water). Although programs to prevent mosquitoes from breeding and multiplying are in place throughout the study area, the incremental contribution of implementation of aquatic habitat restoration as part of compensatory mitigation to the cumulative effect on public health could be cumulatively considerable and significant. Implementation of Mitigation Measure PH-1b: *Develop and Implement a Mosquito Management Plan for Compensatory Mitigation Sites on Bouldin Island and at I-5 Ponds*, which would help control mosquitoes and reduce the potential for an increase in mosquito breeding habitat due to compensatory mitigation related to aquatic habitat on Bouldin Island and at I-5 ponds, would reduce this cumulative impact to less than significant.

Exceedance(s) of Water Quality Criteria for Constituents of Concern Such That Drinking Water Quality May be Affected

As described in Section 26.1.1.1, *Drinking Water*, the primary sources of trace metals to the Delta include acid mine drainage from abandoned and inactive mines, agriculture, WWTP discharges, and urban runoff. Ongoing efforts to control acid mine drainage into the Sacramento River system and increasingly stringent regulations in the future are expected. Regulatory controls on and monitoring of agricultural runoff, WWTP discharges, and urban runoff are anticipated to prevent trace metal concentration under the cumulative condition from becoming substantially worse than existing conditions. Furthermore, the project would not present new or substantially changed sources of trace metals into the Delta. As such, implementation of the project, including compensatory mitigation, combined with potential effects of other cumulative projects would not affect trace metal levels in the Delta, and therefore there would be a less-than-significant cumulative impact with regard to trace metals.

Pesticide use within and upstream of the Delta is changing continuously. Although factors such as TMDLs and future development of more target-specific and less-toxic pesticides will ultimately influence the cumulative condition for pesticides, forecasting whether these various efforts will ultimately be successful at resolving current pesticide-related impairments requires considerable speculation. As such, it is conservatively assumed that the cumulative condition would be significant with respect to pesticides in the Delta. The project would not contribute considerably to the significant cumulative condition for pesticides in the study area. This is because the changes in the source water fractions to the Delta (i.e., Sacramento River, San Joaquin River, San Francisco Bay water, eastside tributaries, and Delta agriculture water) resulting from implementation of the project would not substantially alter the pesticide concentrations in the Delta consistently over time in a manner that would substantially alter the long-term risk of impacts on water quality. Similarly, implementation of the CMP would not substantially affect pesticide concentrations in the Delta. As such, any incremental contribution of the project to the significant cumulative conditions with regards to pesticides in the Delta would not be cumulatively considerable.

The cumulative condition for bromide and OC in the Delta is considered significant relative to existing conditions due to anticipated future increases in these constituents in the Delta. For bromide, the primary driver of these increases would be seawater intrusion associated with climate change and sea level rise. Nonpoint- and point-source loadings of OC from growing urbanized areas of the watershed are expected to increase in the future.

Modeling results (Appendix 9D, *Bromide*) indicate that long-term average bromide concentrations with implementation of the project would be similar to existing conditions at most Delta locations and months. Concentrations at Banks Pumping Plant would decrease, relative to existing conditions. Bromide increases that would occur due to the project would not be of sufficient frequency, magnitude and geographic extent to directly cause impacts to beneficial uses or contribute considerably to anticipated future bromide levels in the western Delta. Likewise, the CMP would not substantially affect, or affect at all, bromide levels in the Delta. The incremental contribution of the project, including compensatory mitigation, to the significant cumulative condition for OC in the Delta would not be cumulatively considerably based on modeling results (Appendix 9I, Attachment 9I.1, *Organic Carbon, No Project Alternative Modeling Results*), which show little effect of the project on long-term average DOC concentrations. Thus, the project, including compensatory mitigation, would not contribute considerably to the formation of DBPs in Delta-diverted drinking water supplies.

Substantial Mobilization of or Increase in Constituents Known to Bioaccumulate

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 from WWTPs, greater restrictions on suction dredging in Delta tributary watersheds, and continued clean-up actions on mine drainage in the upper watersheds. The Sacramento–San Joaquin Delta Estuary TMDL for methylmercury is intended to reduce agricultural drainage, tributary inputs, and point and nonpoint source discharges of mercury and methylmercury in the Delta to meet fish tissue objectives and is supported by the Central Valley RWQCB Delta Mercury Exposure Reduction Program. The State Water Resources Control Board is also developing a statewide mercury control program for reservoirs and a Central Valley mercury control program for rivers. Despite these regulatory programs, 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. Accordingly, the existing cumulative condition for mercury/methylmercury in the Delta is considered significant.

Other projects shown in Table 26-9 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 restored aquatic habitat types conducive to mercury methylation. However, it is expected that these projects either have evaluated or would evaluate the potential for methylmercury production and would implement measures to monitor and adaptively manage methylmercury production. Therefore, the habitat restoration projects that would occur under cumulative conditions are not likely to negatively affect public health.

Modeling results (Appendix 9H, *Mercury*) indicate that long-term average mercury concentrations with implementation of the project would be similar to existing conditions at most Delta locations. Any changes in Delta fish tissue methylmercury concentrations from facility operations would likely not be measurable. Accordingly, implementation of facility operations under the project would not substantially alter the cumulative condition for mercury/methylmercury and the impairment in the Delta or contribute considerably to significant cumulative mercury/methylmercury condition. However, implementation of the CMP would result in additional wetland habitat in the Delta. Wetlands have the potential to methylate mercury at higher rates than most other aquatic habitats. Thus, the creation of the compensatory mitigation wetlands could contribute to additional mercury methylation and bioaccumulation methylmercury in Delta fish. However, OEHHA standards and fish consumption advisories would continue to be implemented for the consumption of study area fish, which would help protect people from the overconsumption of fish with increased body burdens of mercury. As such, the incremental contribution of the compensatory mitigation component of the project would not contribute considerably to the significant cumulative impact on public health due to potential increases in bioaccumulation of methylmercury in fish in the Delta. In addition, Mitigation Measure WQ-6: *Develop and Implement a Mercury Management and Monitoring Plan* would be implemented with the goal to minimize generation of methylmercury within compensatory mitigation sites, which would further reduce the potential for an increase in methylmercury in fish tissue.

Adversely Affect Public Health Due to Exposing Sensitive Receptors to New Sources of EMF

Past, present, and reasonably foreseeable future projects have resulted and will likely result in the development and operation of power transmission lines in the study area, which have or will potentially expose existing populations and sensitive receptors to EMF. There would be up to 37 residences (depending on project alternative) within 300 feet of a proposed permanent transmission line. Although there may be general public concern about exposure to EMF, there are no state or federal standards (health-based or otherwise) to limit occupational or residential exposure to EMF. Furthermore, although existing populations and sensitive receptors are exposed to EMF, the medical and scientific communities generally agree that evidence from available research has not demonstrated that EMF exposure creates a health risk, although research is ongoing. Therefore, the project combined with other cumulative projects would result in a less-than-significant cumulative impact on public health due to new sources of EMF. The siting and design of proposed transmission lines and substations for the project would be done in accordance with EMF Design Guidelines (California Public Utilities Commission 2006b) to minimize potential exposure of sensitive receptors to EMF due to operation of the project.

Impact Public Health Due to an Increase in *Microcystis* Bloom Formation

Future climate change will result in reduced Delta inflows and increased average Delta water temperatures during the summer and early fall months, as discussed in Chapter 9, *Water Quality*. High water temperatures, particularly those above 25°C (77°F) give cyanobacteria a competitive advantage over other algae. As such, *Microcystis* and other cyanobacteria typically produce more biovolume and cell abundance at elevated water temperatures. Increased water temperatures could lead to earlier attainment of the water temperature threshold of 19°C (66.2°F) required to initiate *Microcystis* blooms in the Delta; thus, earlier occurrences of blooms, relative to existing conditions. Warmer water temperatures could also increase bloom duration and magnitude, relative to existing conditions.

The other key environmental factors that affect *Microcystis* and other cyanobacteria production—nutrient levels, channel velocities and associated turbulence and mixing, and water clarity and associated irradiance—are not expected to change substantially in the future, relative to existing conditions. Increased residence time and higher water temperatures are the two most important drivers of past and present problem-level CHABs in the Delta. Because water temperatures, and possibly residence times in some portions of the Delta, are expected to increase in the future due primarily to sea level rise and climate change (which will favor CHABs), the future cumulative condition for *Microcystis* (and thus microcystin concentrations), as well as other cyanobacterial species, would be significant in the Delta.

The project alternatives would not substantially alter Delta water temperatures, nutrient levels, channel velocities and associated turbulence and mixing, water clarity and associated irradiance, or residence times, relative to existing conditions. Modeled residence times would increase somewhat (i.e., by up to 32 hours) under the project alternatives in the northern, eastern, and southern Delta, but these increases would not be sufficiently large to result in greater magnitude of cyanobacteria blooms through the Delta. Residence times in the open-water areas of Discovery Bay would increase by up to 2 days, where residence times for existing conditions were on the order of several weeks. Multi-week-long residence times occur annually in Discovery Bay under existing conditions and such long residence times would continue for the future cumulative condition, albeit potentially increasing by several days. Discovery Bay, characterized by long residence times, would support substantial accumulation of cyanobacteria cells under both existing and project conditions. Consequently, these project alternatives' individual contributions to the significant cumulative condition for CHABs in the Delta would not be cumulatively considerable and, thus, would not be significant.

The compensatory mitigation tidal wetlands to be constructed in the North Delta Habitat Arc could cause small areas of increased residence times, reduced water turbulence and mixing (which affects irradiance), increased nutrient concentrations, and slightly elevated water temperatures. However, tidal wetland design would consider the hydrologic regime and channel morphology to ensure backwater areas with low velocities and high residence times do not develop. Cyanobacteria are ubiquitous within the Delta as part of the overall phytoplankton community and will continue to be present, particularly along the channel margins at the compensatory mitigation sites. Even if some additional CHABs form along the margins of the tidal habitats, the additional cyanobacterial biomass would not be sufficient to have a cumulatively considerable or significant contribution to the significant cumulative condition for CHABs in the Delta.