2 Program Description

2.1 Program Area and Vicinity

The San Mateo County Mosquito and Vector Control District (SMCMVCD or District) is preparing this Programmatic Environmental Impact Report (PEIR) to evaluate the effects of the continued implementation of a suite of control strategies and methods prescribed in its Integrated Mosquito and Vector Management Program (Program). The District implements its Program primarily within a jurisdiction or Service Area of 448.41 square miles. The activities described herein are conducted throughout San Mateo County.

The District has a host of federal, state, and county owned land where control activities are conducted. The majority of federal and state land within San Mateo County is located within the Don Edwards San Francisco Bay Wildlife Refuge, a 30,000-acre complex of tidal salt marsh along the shores of San Francisco Bay. The remainder of the Service Area consists of 20 cities. Previous to 2003, the District's activities were conducted within a 163 square mile jurisdiction contained within San Mateo County, California. Following completion of an annexation, the District's activities now cover the entire County of San Mateo, consisting of 450 square miles. The areas that are served by District activities include the incorporated cities of Atherton, Belmont, Burlingame, East Palo Alto, Foster City, Hillsborough, Menlo Park, Millbrae, Portola Valley, Redwood City, San Carlos, San Mateo, Woodside, South San Francisco, Brisbane, Daly City, Colma, San Bruno, Pacifica, and Half Moon Bay. The District's Service Area also include the unincorporated areas of Burlingame Hills, Emerald Lake, Fair Oaks, Ladera, Los Trancos Woods, The Highlands of San Mateo, , San Francisco Airport, Pescadero, Montara, El Granada, Moss Beach, Princeton, Miramar and San Gregorio.

The environmental impact analysis of the Program will focus on the potential for impacts within the County from the District's Proposed Program and also identify the potential for control activities within the Service Area to affect any adjacent jurisdictions. Under California law, the District also can take direct but limited action in adjacent areas bordering its Service Area which include San Francisco, Santa Cruz, and Santa Clara counties, if needed to provide control of mosquitoes and other vectors originating in adjacent areas for the health and safety of residents of the immediate Service Area (California Health and Safety Code Section 2270[a]). Control activities may also be provided in adjacent areas upon request of the adjacent jurisdictions to protect the health and safety of residents in adjacent jurisdictions. Actions that would be taken outside of the Service Area are the same types of actions undertaken within the Service Area and in similar types of habitats or sites. In summary, the Program occurs in an area that is somewhat larger than the District's Service Area; this larger area is called the Program Area, the area in which potential impacts could occur. The Program Area and its location within the State of California are shown on Figure 2-1, San Mateo County Mosquito and Vector Control District Program Area.

Mosquito and/or vector control activities are conducted at a wide variety of locations or sites throughout the District's Service Area, including tidal marshes, duck clubs, other diked marshes, lakes and ponds, rivers and streams, vernal pools and other seasonal wetlands, stormwater detention basins, flood control channels, spreading grounds, street drains and gutters, wash drains, irrigated pastures, or agricultural ditches, as well as animal troughs, artificial containers, tire piles, fountains, ornamental fishponds, swimming pools, liquid waste detention ponds, and nonnatural harborage (such as covered wood piles, residential and commercial landscape, trash receptacles). Within the larger Program Area, activities would be conducted at similar sites.

2.2 Program Objectives

2.2.1 Purpose and Need

The District was established in 1916 to reduce the risk of vector-borne disease and discomfort to the residents of its Service Area (e.g., malaria). In addition to being nuisances by disrupting human activities and enjoyment of public and private areas, certain vectors can transmit a number of diseases. A vector is defined by the State of California as "any animal capable of transmitting the causative agent of human disease or capable of producing human discomfort or injury, including, but not limited to, mosquitoes, flies, other insects, ticks, mites, and rats, but not including any domesticated animal…" (California Health and Safety Code Section 2200[f]). The diseases of most concern today in the Program Area are as follows, by the vector they are associated with:

> **Mosquito-transmitted illnesses:** West Nile virus (WNV), western equine encephalomyelitis (WEE), St. Louis encephalitis (SLE), dog heartworm, malaria, and myxomatosis

> **Tick-transmitted illnesses:** Lyme disease, babesiosis, ehrlichiosis, tularemia, anaplasmosis, spotted fever group *Rickettsia* (including Rocky Mountain Spotted Fever and *Rickettsia philippi*), tularemia

> **Rodent/rat-transmitted illnesses:** leptospirosis, hantavirus pulmonary syndrome (HPS), tularemia, plague

> **Other vector-transmitted illnesses:** rabies transmitted by skunks, plague and murine typhus transmitted by fleas (usually on rats), raccoon roundworm

Depending on the disease, both human and domestic animal health can be at risk of disability, illness, and/or death. Furthermore, potential exists for introduction of new disease vectors into the District's Service Area (e.g., yellow fever, Dengue fever, chikungunya, and Zika virus).

2.2.2 Program Objectives

The District undertakes vector control activities through its Program to control and educate the public on the following vectors of disease and/or discomfort in the Program Area: mosquitoes, cockroaches, fleas, flies, rats, mice, ticks, yellow jackets, Africanized honeybees, other stinging/biting insects including mites and bed bugs, nuisance wildlife (skunks, raccoons, opossum, and ground squirrels), and noxious/invasive weeds.

The Proposed Program's specific objectives are as follows:

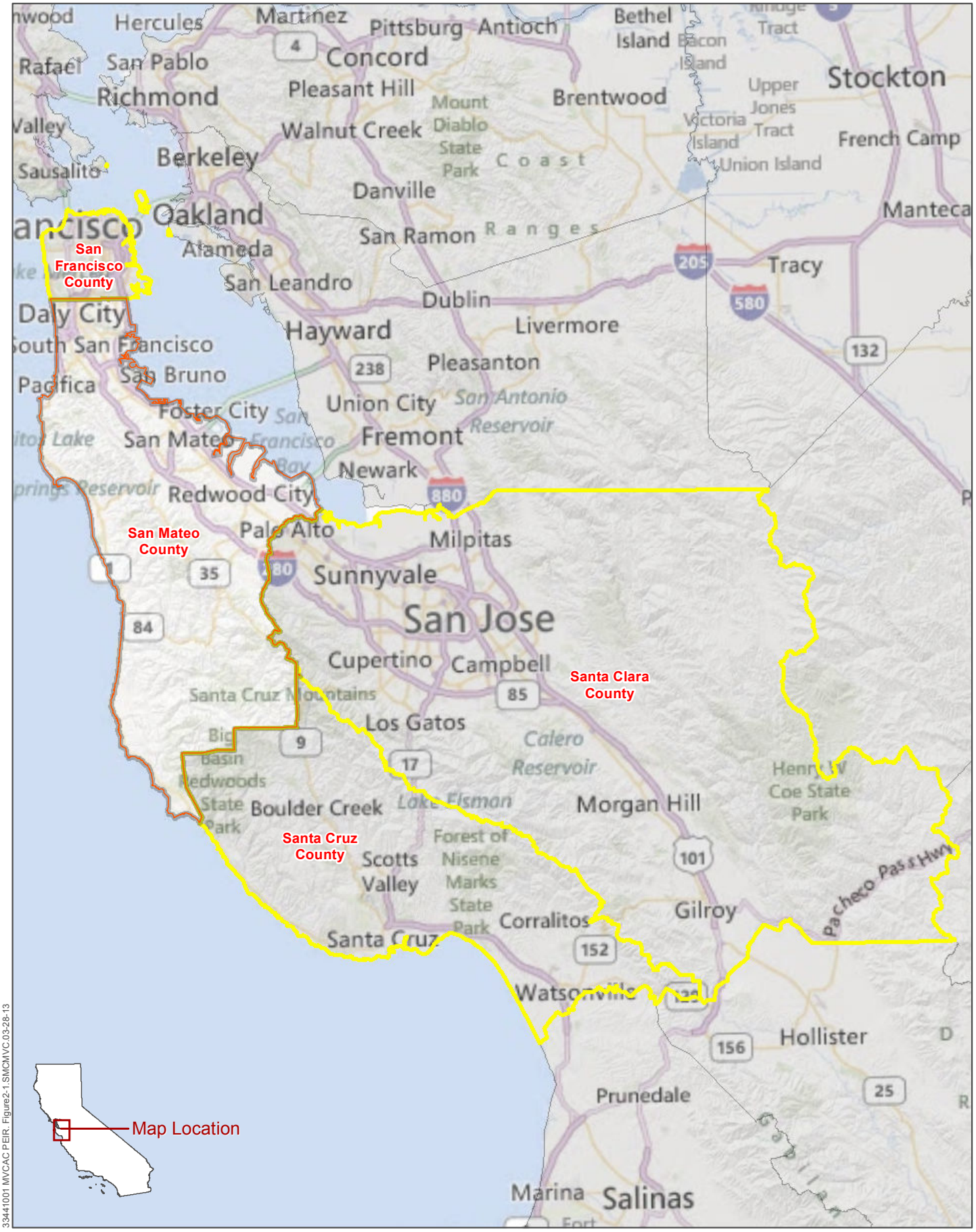
> Reduce the potential for human and animal disease caused by vectors

> Reduce the potential for human and animal discomfort or injury from vectors

> Accomplish effective and environmentally sound vector management by means of:

- Surveying for vector presence, abundance, human and animal contact or potential for human and animal contact
- Surveying for vector-borne diseases and their antecedent factors that initiate and/or amplify disease
- Establishing treatment criteria
- Appropriately selecting from a wide range of Program tools or components

Most of the relevant vectors are quite mobile and cause the greatest hazard or discomfort at a distance from where they breed. Each potential vector has a unique life cycle, and most of them occupy several types of habitats. To effectively control them, an integrated vector management program (IVMP) must be employed. District policy is to identify those species that are currently vectors, to recommend techniques for their prevention and control, and to anticipate and minimize any new interactions between vectors and humans.



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INTEGRATED MOSQUITO & VECTOR MANAGEMENT PROGRAM PEIR

San Mateo County Mosquito and Vector Control District

Figure 2-1 - Program Area

2.3 Proposed Program

The District's Program is an ongoing series of related actions for control of mosquitoes and other vectors of human disease and discomfort. The District's activities involve the identification of vector problems; responsive actions to control existing populations of vectors, prevent new sources of vectors from developing, and manage habitat to minimize vector production; education of landowners and others on measures to minimize vector production or interaction with vectors; and provision and administration of funding and institutional support necessary to accomplish District objectives.

Over the last 100 years, the District has taken an integrated systems approach to mosquito and vector control, utilizing a suite of tools that consist of surveillance, vegetation management, and physical, biological, and chemical controls along with public education. These Program "tools" or components are described in the subsequent subsection as "Program alternatives" for the subsequent impact analyses for resource and environmental topics under the CEQA process (except for elements of public education as explained in Section 2.4). The Program alternatives are groups of related or similar activities by type of management activity: surveillance, physical control, vegetation management, biological control, chemical control, and nonchemical control. The Proposed Program is a combination of these alternatives into an overall, comprehensive program of vector control. Program implementation is weighted heavily towards vegetation management and physical and biological control, in part, to reduce the potential for environmental impacts. To realize effective and environmentally sound vector management, vector control must be based on several factors:

> Carefully monitoring or surveying for vector abundance, disease prevalence in vectors, and/or potential contact with people

> Carefully monitoring and surveying for vector-borne diseases and their antecedent factors that initiate and/or amplify disease

> Establishing treatment criteria

> Selecting appropriate tools from a wide range of control methods

This Program consists of a dynamic combination of surveillance, treatment criteria, and use of multiple control activities in a coordinated program with public education that is generally known as Integrated Pest Management (IPM) or Integrated Vector Management (IVM).

While these Program components or tools together encompass the District's Program, it is important to acknowledge that the specific tools utilized by District staff vary from day to day and from site to site in response to the vector species that are active, their population size or density, their age structure, location, time of year, local climate and weather, potential for vector-borne disease, proximity to human populations, including (a) proximity to sensitive receptors, (b) access by District staff to vector habitat, (c) abundance of natural predators, (d) availability and cost of control methods, (e) effectiveness of previous control efforts at the site, (f) potential for development of resistance in vector populations, (g) landowner policies or concerns, (h) proximity to special-status species, and (i) applicability of Endangered Species Recovery Plans, Habitat Conservation Plans, Natural Community Conservation Plans, and local community concerns, among other variables. Therefore, the specific actions taken in response to current or potential vector activity at a specific place and time depend on factors of vector and pathogen biology, physical and biotic environment, human settlement patterns, local standards, available control methods, and institutional and legal constraints. While some consistent vector sources are exposed to repeated control activity, many areas with minor vector activity are not routinely treated, and most of the land within the District's Service Area has never been directly treated for vectors.

The District's IMVMP, like any IPM program, seeks by definition to use procedures that will minimize potential environmental impacts. The District's IMVMP employs IPM principles by first determining the species and abundance of mosquitoes/vectors through evaluation of public service requests and field

surveys of immature and adult mosquito/vector populations. Then, if the populations exceed predetermined criteria, using the most efficient, effective, and environmentally-sensitive means of control. For all vector species, public education is an important control strategy. In some situations, water management or other physical control activities can be instituted to reduce mosquito-breeding sites. The District also uses biological control such as the planting of mosquitofish in some settings: ornamental fish ponds, water troughs, water gardens, fountains, and unused swimming pools. For rat control, property owners are provided educational materials on control measures that include removal of food sources (such as pet food, bird/squirrel feeders, and fruit from trees) and blockage of access points into the structure. The District's rodent management program relies on physical control tools of sanitation, exclusion, and rodent proofing. When these approaches are not effective, or are otherwise deemed inappropriate, then pesticides are used to treat specific vector-producing or vector-harboring areas.

Three core tenets are essential to the success of a sound IMVMP.

> First, a proactive approach is necessary to minimize impacts and maximize successful vector management. Elements such as thorough surveillance and a strong public education program make all the difference in reducing potential human vector interactions.

> Second, long-term environmentally based solutions (e.g., water management, reduction of harborage and food resources, exclusion, and enhancement of predators and parasites) are optimal as they reduce the potential pesticide load in the environment as well as other potential long- and short-term impacts.

> Lastly, utilizing the full array of options and tools (public education, surveillance, physical control, biological control, and when necessary chemical control) in an informed and coordinated approach supports the overall goal of an environmentally sensitive vector management program.

The District's Program consists of the following alternatives, which are general types of coordinated and component activities, as described below. The Proposed Program is a combination of these alternatives with the potential for all of these alternatives to be used in their entirety along with public education (Section 2.4) and with best management practices (Section 2.9).

2.3.1 Surveillance Alternative

Vector surveillance, which is an integral part of the District's responsibility to protect public health and welfare, involves monitoring vector populations and habitat, their disease pathogens, and human/vector interactions. Vector surveillance provides the District with valuable information on what vector species are present or likely to occur, when they occur, where they occur, how many they are, and if they are carrying disease or otherwise affecting humans. Vector surveillance is critical to an IVMP because the information it provides is evaluated against treatment criteria to decide when and where to institute vector control measures. Vector surveillance minimizes the area to which control will be applied by directing activities to the areas where it is needed. Information gained through surveillance is used to help form action plans that can also assist in reducing the risk of contracting disease. Equally important is the use of vector surveillance in evaluating the efficacy, cost effectiveness, and environmental impacts of specific vector control actions.

2.3.1.1 Mosquito Surveillance

Mosquitoes in nature are distributed within their environment in a pattern that maximizes their survival to guarantee reproductive success. Immature stages develop in water and later mature to a winged adult that is capable of both long- and short-range dispersal. This duality of their life history presents vector control agencies with unique circumstances that require separate surveillance strategies for the aquatic versus terrestrial life stages.

Surveillance involves monitoring the abundance of mosquito populations, their habitat, presence of mosquito-borne disease pathogens, and the interactions between mosquitoes and people over time and space. The District routinely uses a variety of tools for surveillance. These include traps for adult

mosquitoes and eggs, regular field investigation of known mosquito sources, direct sampling for immature stages in water, analysis of requests for service from the public, and the use of low ground pressure all-terrain vehicles (Argo's) to access these sites. The District conducts surveillance in the following manner:

> **Field counting/sampling and use of trapping**, along with the laboratory analysis of mosquitoes, their hosts, and pathogens to evaluate population densities and potential disease threats such as WNV, WEE, and SLE. Sampling for the presence and abundance of mosquito populations tends to occur in areas where the citizenry would have a likelihood of exposure to them; field counts take place both at immature and adult stages of mosquito development or life cycle. Three kinds of traps, host-seeking traps, light traps, and gravid/oviposition traps, are used as described below:

- Host-seeking traps use dry ice (carbon dioxide) to attract female mosquitoes seeking a host on which to blood feed. The trap's components include a battery power source, a low ampere motor/fan combination, and a collection bag for holding captured adults.
- BG-Sentinel Traps – These host-seeking traps, primarily used for surveillance of *Aedes* species, use a chemical lure that mimics human scent and black and white coloration to attract adult mosquitoes. The trap utilizes a motorized fan and mosquitoes are collected in a mesh bag.
- Light traps (commonly called New Jersey Light traps) use a source of photo-attraction such as an incandescent lamp (25 watt) or fluorescent lamp (7 watt) where they are pulled in by the suction provided by an electric (110 v AC) appliance motor/fan combination. Mosquitoes picked up by the suction are directed downward (via screened cone) inside the trap body to a glass or plastic collection jar containing a 1-inch strip of Vapona, Hot Shot®, or No-Pest® strip (dichlorvos). The collection jar is enclosed within an expanded metal cage with a hinged trap door that is padlocked.
- Oviposition traps, are used to collect gravid Aedes spp. mosquitoes and/or to measure their egg-laying activity. This trap uses 5-day-old hay-infused water contained in a small plastic dishpan that has a 6-volt battery-operated fan directly above to draw the gravid female mosquitoes into the small collection net.
- The newest form of surveillance is using a trap called Autocidal Gravid Ovitrap. This method of trapping adult mosquitoes is typically associated with invasive *Aedes* species. AGO traps consist of a black 5-gallon bucket. A specific amount of organic material is placed inside the bucket along with a measured amount of water. A black cup is positioned on top of the bucket with screening to block the adult mosquito from reaching the water. The cup is lined with a sticky substance and will eventually capture the adult mosquito seeking a place to lay eggs.

Ovicups are used to collect mosquito eggs. They consist of a small black plastic cup with water inside, and a filter paper on which the eggs are deposited. Some have a wooden tongue depressor. Mosquito immatures include eggs, four larval stages, and a transitional pupal stage. Mosquito control agencies routinely target the larval and pupal stages to prevent their emergence as adults. Sampling and collection of the immature stages (egg, four larval stages, and a transitional pupal stage) involves the use of a 1-pint dipper (a standardized small plastic pot or cup-like container on the end of a 36-inch handle), which scoops up a small amount of water from the mosquito-breeding site. Operationally, the abundance of the immatures in any identifiable "breeding" source is measured through direct sampling, which provides relative local abundance as the number of immatures per unit volume or area of the source. This method requires access by field personnel to within about 3 feet of larval sites at least every 2 weeks in warm weather. The spatial patchiness of larvae requires access to multiple locations within each source, rather than to single "bell-weather" stations.

- **"Arbovirus"[1] surveillance to determine the likelihood and occurrence of mosquito-borne illness** is accomplished by two methods commonly used in California: (1) capturing and testing female vector mosquitoes for the presence of mosquito-borne encephalitis viruses as explained above and (2) periodic testing for the presence of encephalitis virus-specific antibodies in the blood serum of sentinel chickens, and (3) collecting and testing dead birds and squirrels for WNV. The first method involves the use of host-seeking traps to capture female vector mosquitoes. Captured females are sorted into groups of up to 50 (called pools) and submitted to UC Davis to test for the presence of mosquito-borne viruses. The District uses the second method through the placement of caged chickens as "sentinel birds." Since the viruses of major concern (WNV, WEE, and SLE) are diseases actively transmitted by mosquitoes to both birds and to humans through bites, caged chickens' routine blood samples will reveal whether one or more of the virus-specific antibodies are present. The chickens are placed generally 10 to a caged area (at least 6 by 12 feet or larger), are humanely treated, and are provided ample shelter with nest boxes, water, and feed. Chickens are used as the early detection system for virus transmission, as they are unaffected by the presence of these viruses in their systems. At the end of the mosquito season, the chickens are adopted out. Dead birds and squirrels are reported to the District by the public. Suitable bird carcasses are tested for WNV in the District laboratory, or can be sent to UC Davis for testing of WNV, WEE and SLE. Squirrels are shipped to the California Health and Food Safety Laboratory in Davis and tested for the presence of WNV.
- **Field inspection of known or suspected habitats** where mosquitoes live and breed. Sites where water can collect, be stored, or remain standing for more than a few days are potential habitats for mosquito breeding that require continuous inspection and surveillance. Water runoff into catch basins and stormwater detention systems from land uses including, but not limited to, residential communities, parks and recreation areas, and industrial sites, as well as ornamental ponds, unmaintained swimming pools, seeps/seepages, seasonal wetlands, tidal and diked marshes, freshwater marshes, wastewater ponds, sewer plants, /agricultural ponds, managed waterfowl ponds, canals, creeks, streams, tree holes, tires, man-made containers, flooded basements/crawl spaces, and other standing waters are likely sources.
- **Maintenance of paths and clearings** to facilitate sampling and to provide access to vector habitat. It is District policy that staff use preexisting roads, trails, walkways, and open areas to conduct routine and essential surveillance activities with the least impact on the environment. Surveillance is conducted using ATVs, but offroad access is minimized and used only when roads and trails are not available.
- **Analysis of public service requests and surveys** and other methods of data collection.

The District's mosquito surveillance activities are conducted in compliance with accepted federal and state guidelines, in particular the *California Mosquito-borne Virus Surveillance and Response Plan* (CDPH et al. 2013) and *Best Management Practices for Mosquito Control in California* (CDPH and MVCAC 2012).These guidelines recognize that local conditions will necessarily vary and, thus, call for flexibility in selection and specific application of control methods.

2.3.1.2 Tick Surveillance

The District performs surveillance of ticks (*Ixodes pacificus, Dermacentor occidentalis, and D. variabilis*) to detect the presence of disease agents affecting humans. Disease agents for which the District conducts surveillance include Lyme disease bacteria (*Borrelia burgdorferi and other Borrelia species*) and anaplasma. Other disease agents such as ehrlichia, bartonella, tularemia, and Rocky Mountain spotted fever may be included in surveillance if a human case of disease occurs. Surveillance is conducted by way of the following practices:

[1] **Arthropod-borne Viruses.** The primary reservoir for the pathogens that cause these diseases is wild birds, and humans only become exposed as a consequence of an accidental exposure to the bite of infective mosquito vectors.

- **Collection** of ticks in public contact areas to (a) determine the location of ticks infected with disease-causing pathogens and (b) to determine the seasonal and geographical distribution of the ticks by species. Ticks are collected by "flagging" vegetation along trails. A 1-meter-square piece of white flannel is dragged along recreational trails to pick up host-seeking ticks. Ticks are manually removed from the flag and placed in vials for transport back to the laboratory for testing.
- **Identification** of ticks brought in by the public, which are usually found biting persons or their domestic animals.
- **Analysis** of the geographic distribution of human cases.

2.3.1.3 Surveillance for Yellow Jackets and Other Wasps

Venomous biting insect encounters often require the response of District staff. Residents that call about yellow jackets and wasps are informed that while these insect stings may potentially induce life-threatening allergic reactions and pain, overall, these insects serve beneficial roles as pollinators and biological control agents. In cases where public health is at risk, the District will provide control of individual nests of yellow jackets or wasps.

The District responds to public service requests and provides recommendations and control on nonstructural pest populations of yellow jackets and wasps. The District does not control honeybees, but provides information to homeowners and will refer them to a beekeeper.

2.3.1.4 Rodent Surveillance

The District assesses local rat populations and species distribution through service requests and information from a third party licensed pest control operator (PCO) that conducts baiting for various cities. The monitoring and control focuses on domestic rats including Norway rats (*Rattus norvegicus*) and roof rats (*Rattus rattus*) and on house mice. Norway rats are known to invade homes and businesses from sanitary sewers. Roof rats are known to invade homes and businesses. The District offers property inspections in response to requests for service from the public. These inspections involve looking for entryways, rodent burrows, and signs of rodent infestation. During these inspections, District personnel will give advice and written information on how to exclude rodents from buildings and reduce domestic rodent populations around the property if necessary.

Testing for the presence of hantavirus pulmonary syndrome, plague, tularemia, and other rodent-borne diseases is conducted by collecting wild rodents. For surveillance of these diseases, small traps are placed in suspect areas including peridomestic habitats along the urban fringe or rural areas where humans may be exposed to these diseases. Each trap is supplied with a small amount of polyester nesting material and a small amount of grain or other bait at the time they are set. The live traps are set in the late afternoon and checked the following morning to remove any rodents for sampling. Animals are handled according to the guidelines set out in the *Guidelines of the American Society of Mammalogists for the Use of Wild Mammals in Research* (Sikes et al. 2011), *Guidelines for Conducting Surveillance for Hantavirus in Rodents in California* prepared by the California Department of Health Services (CDHS 2004 [now California Department of Public Health (CDPH)]), and *Guidelines for Local Plague Surveillance and Control Programs in California* (CDPH 2011). After removal from the traps, each animal is sedated, identified to species, and the age, sex and reproductive state recorded. Samples of blood or tissue are obtained from each animal captured. Blood samples are submitted to the CDPH Vector-Borne Disease Section for testing if the testing cannot be done in-house.

2.3.1.5 Other Vector Surveillance

Ground squirrels (*Spermophilus beecheyi*) and other sylvatic rodents are surveyed for plague (*Yersinia pestis*). Surveillance for these diseases consists of sampling animals by trapping and obtaining samples of blood and fleas or other ectoparasites. Blood samples are sent to the CDPH, for testing. These animals may

also be tested for tularemia. Testing for the presence of murine typhus may be conducted by collecting ground squirrels, opossums, skunks, and their fleas in addition to the wild rodents described in Section 2.3.1.3 above. Small animals will be trapped using live traps baited with food. The traps will be set in late afternoon and will be collected within 24 hours. The animals will be anesthetized and blood, tissue, and flea samples will be obtained. Threatened and endangered species and other legally protected animals that may become trapped will be released immediately and will not be used in these tests.

The two primary reservoir vectors of rabies in California are bats and skunks. Both live in close proximity to humans and their pets because of their ability to adapt to the urban/suburban environment. Residential landscapes provide them with an abundance of food and shelter that have increased their numbers and the potential for direct contact with the human population. This is true for all wildlife and because of it, a potential rabies health threat exists. The District works with home and property owners to discourage wildlife such as skunks and bats from taking up residence on their property. Upon a service request, the District's Vector Control Officer will survey the property and provide guidance and recommendations on exclusion methods to minimize vector impact on the property.

The District responds to public service requests for bed bugs. The CDC and USEPA have jointly stated that bed bugs are a public health nuisance pest. Their biting can cause welts. Under heavy infestations, asthma or allergy can be problematic for children and senior citizens. The District's bed bug protocol includes the following inspection and educational activities:

> Positively identify that a submitted insect is a bed bug.

> Provide information on ways to reduce clutter, improve sanitation, make repairs, and use pillow and mattress encasements.

> Advise using passive monitoring devices (e.g., Climb Up or Night Watch bed bug detection devices).

> Advise on hiring a reputable and experienced pest control operator to control the bed bugs.

> Remain neutral on landlord/tenant bed bug disputes.

2.3.2 Physical Control Alternative

Managing vector habitat to reduce vector production or migration, either directly or through public education is often the most cost-effective and environmentally benign element of an IVMP. This approach to the control of vectors and other pests is often called "physical control" to distinguish it from those vector management activities that directly rely on application of chemical pesticides (chemical control) or the introduction or relocation of living agents (biological control). Other terms that have been used for vector habitat management include "source reduction," which emphasizes the significance of reducing the habitat value of an area for vectors, or "permanent control," to contrast with the temporary effectiveness of pesticide applications.[2] Vector habitat management is important because its use can virtually eliminate the need for pesticide use in and adjacent to the affected habitat and, in some situations, can virtually eliminate vector production from specific areas for long periods of time, reducing the potential disturbances associated with frequent biological or chemical control activities. The intent is to reduce the abundance of vectors produced or sheltered by an area while protecting or enhancing the habitat values of the area for desirable species. In many cases, physical control activities involve restoration and enhancement of natural ecological functioning, including production and dispersal of special-status species and/or predators of vectors.

2.3.2.1 Mosquitoes

Physical control for mosquitoes consists of the management of mosquito-producing habitat (including freshwater marshes and lakes, saltwater marshes, temporary standing water that persists for 1 week or

[2] This terminology can be misleading if periodic maintenance is needed for physical control devices or structure.

more, and wastewater treatment facilities). Physical control can include the use of water control structures, maintenance or improvement of channels, tide gates, levees, and other water control facilities. Physical control is usually the most effective mosquito control technique because it provides a long-term solution by reducing or eliminating mosquito developmental sites and ultimately reduces the need for chemical applications. The physical control practices may be categorized into three groups: maintenance, new construction, and cultural practices.

Maintenance activities are conducted within tidal, managed tidal, and nontidal marshes, seasonal wetlands, diked, historic baylands, and in some creeks adjacent to these wetlands. The following activities are classified as maintenance:

> Removal of sediments from existing water circulation ditches

> Repair of existing water control structures

> Removal of debris, weeds, and emergent vegetation in natural channels

> Trimming of brush to create paths for access to streams tributary to wetland areas

> New construction typically involves the creation of new ditches to enhance tidal flow preventing stagnant water

Cultural practices include vegetation and water management, placing culverts or other engineering works, and making other physical changes to the land. They reduce mosquito production directly by improving water circulation and indirectly by improving habitat values for predators of larval mosquitoes (fish and invertebrates), or by otherwise reducing a site's habitat value to mosquito larvae.

The District performs these physical control activities in accordance with all appropriate environmental regulations (e.g., wetland fill and dredge permits, endangered species review, water quality review, streambed alteration permits, see Section 2.7), and in a manner that generally maintains or improves habitat values for desirable species. Major physical control activities or projects (beyond the scope of the District's 5-year regional wetlands permits with the United States Army Corps of Engineers (USACE) and the San Francisco Bay Conservation and Development Commission (BCDC) are not addressed under this PEIR . Minor physical control activities (covered by the regional wetlands permits) are addressed in this PEIR. They vary substantially from year to year and are unpredictable with ongoing habitat restoration projects. Under the regional permits, the District's work plans are reviewed annually by trustee[3] and other responsible agencies prior to initiation of the planned work. Completed work is inspected by USACE, USFWS, CDFW, and other responsible agencies.

The District may request/require landowners and stewards to maintain and clear debris from drainage channels and waterways; excavate built-up spoil material; remove water from tires and other urban containers; cut, trim, mow, and harvest aquatic and riparian plants (but not including any mature trees, threatened or endangered plant species, or sensitive habitat areas); and install minor trenching and ditching.

The remainder of this subsection describes physical control or "source reduction" practices by type of potential mosquito habitat.

2.3.2.1.1 Freshwater Habitats

The District Service Area includes a number of areas, generally man-made, that are permanently ponded with fresh water. Examples include the margins of reservoirs with shallow water and emergent vegetation, artificial ponds for holding drinking water for livestock, and retention ponds created for holding of rainwater. Some retention ponds have been constructed within freeway interchanges and others have

[3] A "trustee agency" is a public agency having jurisdiction by law over natural resources affected by a project which are held in trust for the people of the State of California.

been built in cities and towns to provide wildlife habitat and flood protection. Natural lakes are usually not a mosquito problem because most of the water is deep, and little emergent vegetation may exist.

Source reduction activities to control mosquito populations in freshwater habitats, i.e., marshes and ponds, generally consist of consultation with landowners or land stewards to implement measures including constructing and maintaining channels to reduce mosquito production in floodplains and marshes. The primary principle governing source reduction is to manipulate water levels in low-lying areas to eliminate or reduce the need for chemical control applications. Physical control of mosquitoes in nontidal habitats typically involves improving the habitat value or dispersal potential of the site for mosquito predators; reducing the habitat value for mosquitoes through vegetation management, increased circulation, steepening banks, or changes in water quality; or by reducing the duration of standing water in areas that produce mosquitoes by filling small areas or improving drainage. Filling or draining artificially ponded areas (low spots in flood-irrigated fields, etc.) can be cost-effective and environmentally acceptable, but is not an appropriate strategy in natural areas (however small), large permanent water bodies, or in areas set aside for stormwater or wastewater retention. In such situations, the other options are more appropriate. At this time, the District is rarely involved in new drainage projects. However, the District does maintain or assist with the maintenance of some existing drainage systems. This maintenance can include upkeep of gates and other water control structures, excavating accumulated spoil materials, and vegetation management such as cutting, mowing, clearing debris, and/or herbiciding overgrown vegetation (see Section 2.3.3 for vegetation management including the use of herbicides).

Ditches are a traditional technique for mosquito control, and they function in a number of ways. In addition to providing drainage if they lead from high to low ground, ditches can serve as a larvivorous fish (i.e., fish that eat mosquito larvae) reservoir. As rainfall increases, larvivorous fish move outward to adjacent areas to prey on immature mosquitoes, and as water levels decrease, larvivorous fish retreat to water in the ditches. Also, sills or weirs constructed in ditches can intentionally decrease water flow, decrease emergent aquatic weeds, prevent depletion of the water table, and allow larvivorous fish year-round refuge. Over the past several decades, urban development has occurred in areas where mosquito control drainage ditches have existed as the primary drainage systems. In many cases, maintenance responsibility for mosquito control projects has been taken over by city and county public works departments and integrated into their comprehensive stormwater management programs.

The District considers two mosquito control strategies when advising on freshwater source reduction for mosquito habitat. One strategy involves reducing the amount of standing water or reducing the length of time that water can stand in low areas following significant rainfall or artificial flooding events. In light of this strategy, District staff will advise or require landowners to construct channels or ditches with control elevations low enough to allow for a certain amount of water to leave an area before immature mosquitoes can complete their life cycle. However, the District does not encourage land managers and/or owners to alter vernal pool and seasonal wetland habitats, especially those managed for waterfowl. The other strategy relies on vegetation management (see Section 2.3.3). District staff will advise or require landowners to remove or thin vegetation to improve surveillance or reduce mosquito habitats.

As environmental laws, including Clean Water Act Section 404, greatly restrict mosquito habitat manipulations in freshwater habitats, the District is generally precluded from undertaking permanent physical control of these areas. Consequently, the District does not usually undertake physical control projects in freshwater bodies including marshes and ponds.

2.3.2.1.2 Seasonal Wetlands and Vernal Pools

The Service Area's Mediterranean climate results in large numbers of seasonally flooded areas, which may produce large numbers of mosquitoes during part of the year. Vernal pools are a specific type of seasonally flooded wetland, distinguished by a subsurface hardpan and often an assemblage of protected plants and invertebrates. Peripheral areas of tidal and historically tidal marshes can produce mosquitoes in response to seasonal rains, as well as following unusually high tides. Physical control methods include

those described above for freshwater habitats (Section 2.3.2.1.1). San Mateo County has very few vernal pools, and the District does not do source reduction in vernal pools.

2.3.2.1.3 Freshwater Marshes

Within federal and state property, a number of marshes have been created and operated to provide aquatic habitats for wildlife, especially waterfowl. Some of these marshes may be flushed to increase tidal flow (not drained) and flooded periodically by the property managers to enhance the primary productivity of the habitat and provide food for waterfowl. Under certain circumstances, this enhancement can result in the production of large populations of mosquitoes. Physical control methods include those described above for freshwater habitats (i.e., managing the water levels or the seasonality with which flooding occurs or by increasing the depth of the water).

2.3.2.1.4 Saline and Brackish Habitats

The saline and brackish marsh habitats of concern are along the edge of San Francisco Bay and are subject to tidal action. They can include reclaimed or other brackish/salt marshes that are not subject to natural tidal action. These brackish areas are usually contained by levees or other water control structures. Physical control measures include those used for freshwater marshes (nontidal) as well as increasing tidal circulation. These measures include the use of:

> Circulation ditches to enhance tidal flushing and allow larvivorous fish access to mosquito breeding locations (with enhancement through the creation of permanent water bodies that act as predatory fish reservoirs.

> Small ditches formed by a speed scavel that are up to 18 inches wide and 18 inches deep to enhance water circulation.

> Rotary ditching, which involves the construction of shallow ditches usually 4 feet wide and 2 to 3 feet deep, using high-speed rotary equipment with the spoil material evenly distributed in a very thin layer over the marsh surface, with limitations on its use based on the size of ditch needed, soil types, access, adjacent terrain, and vegetation present.

> Impoundments that involve keeping a sheet of water across a salt-marsh substrate.

> Rotational impoundment management (RIM) which is a formal strategy of impoundment management that achieves multipurpose management by allowing the impoundment to (1) control salt-marsh mosquito production from the marsh through means other than insecticides, (2) promote survival and revegetation by maintaining open periods and sufficiently low water levels during the summer flooding period, and (3) allow marine life to use the previously unavailable impounded high marsh.

> Excavation using a low ground pressure excavator.

These ecologically sensitive areas require careful implementation of any physical modifications to avoid damage to the habitat and sensitive species that may be present. Physical control measures can reduce salt-marsh mosquito production through enhancement of the frequency and duration of tidal inundation or through other water management strategies.

2.3.2.1.5 Temporary Standing Water and Artificial Ponds

Temporary standing water can occur from a variety of conditions including irrigation of parks, golf courses, and agricultural fields in addition to ponding from rainfall events in natural areas. As environmental laws generally prevent/restrict permanent draining or filling of small artificial ponds, the District employs other options that are effective in controlling mosquitoes, which include periodic draining, providing deepwater sanctuary for larvivorous fish, minimizing emergent and standing vegetation, and maintaining steep banks. Improved drainage is one effective tool for source reduction in such habitats. The second is the use of irrigation practices for those agricultural areas that require artificial watering.

Proper water management, land preparation, and adequate drainage are the most effective means of physically controlling mosquitoes in these types of sources. The District provides technical assistance to landowners who are interested in reducing mosquitoes by developing effective water management systems on certain lands.

Pond management options that are effective in controlling mosquitoes include periodic draining, providing deepwater sanctuary for larvivorous fish, working with landowners to identify leaky pipes, and advising management to minimize emergent and standing vegetation and maintain steep banks. The District routinely advises landowners on the BMPs for ponds to reduce mosquito development.

2.3.2.1.6 Riparian Areas

Control measures will vary depending on the density of the human population, proximity of sensitive species, the vector potential of the mosquito causing the complaint, and access to the larval breeding or adult resting habitat. Minor physical control activities with insignificant environmental impacts can be accomplished using hand tools to connect small ponded areas to the channel along the edge of streams with highly variable flows. Generally, thick brush and complex microtopography preclude extensive physical control in these areas, and biological or chemical control is generally more effective.

2.3.2.1.7 Tree Holes

Control measures are very limited here due to the large numbers of tree holes in most impacted areas, difficulties in accessing treeholes, concerns for staff safety, and in some cases, the age and size of the tree (heritage trees). The control methods utilized are also dependent on the location and numbers of people and pets affected by the mosquitoes produced from this habitat. Current control measures include public education, filling of some holes with sand or other inert materials to displace larval habitat, or chemical control (larvicides or adulticides).

2.3.2.1.8 Wastewater Treatment Facilities/Septic Systems

Wastewater recycling and reuse help to conserve and replenish freshwater supplies. To adjust to these changing conditions, many communities must implement wastewater reuse and recycling programs. Mosquito problems are frequently associated with some of the conventional wastewater treatment operations, and the expanded use of wastewater recycling and reuse by both municipal and commercial/industrial operations may inadvertently create even more mosquito habitats.

Mosquitoes can develop in constructed wetlands at wastewater treatment plants, ponds that are part of the treatment plant, and in standing water left in tanks or channels that are “offline” and temporarily taken out of operation. To control mosquito development in ponds or constructed wetlands of wastewater treatment plants, a number of options exist. They include periodic draining of the pond or wetland, providing deepwater sanctuary for larvivorous fish, minimizing emergent and standing vegetation, and maintaining steep banks. The District routinely advises property owners on the BMPs for ponds to reduce mosquito development. Localized vegetation management on these ponds can discourage mosquito oviposition sites.

Physical control of mosquitoes in tanks and channels at wastewater treatment plants involves complete drainage of these items or flushing to remove mosquito larvae and eggs, similar to the methods described for artificial containers below (Section 2.3.2.1.9). The portions of a wastewater treatment plant that are under active operation do not produce mosquitoes due to the steady strong flow of water and sewage. Problems arise when portions of the system are taken “offline” and small amounts of water or rainwater collect in them.

Onsite treatment systems on individual properties, such as septic tanks and associated drain fields, can flow laterally into nearby swales and ditches, especially in rural areas. Physical control requires maintenance and repair of these systems by the property owner and ditch maintenance where lateral flow occurs.

2.3.2.1.9 Artificial Container Habitats

Artificial containers, such as flowerpots, cans, barrels, and tires, provide opportunities for mosquitoes to breed in urban areas. A container-breeding mosquito problem can be solved by properly disposing of such materials, covering them, or tipping them over to ensure that they do not collect water. The District has both house-to-house surveillance and resident education programs to address urban container-breeding mosquito problems.

2.3.2.2 Other Vectors (Vertebrates)

Physical control for other (vertebrate) vectors such as rats, mice, raccoons, skunks, ground squirrels, and opossums is based on site inspections by the District to determine conditions promoting harborage and signs of infestation. Property owners are provided educational materials on control measures that include removal of food sources (such as pet food, bird/squirrel feeders, and fruit from trees) and blockage of access points into the structure. If the vector shows signs of disease, has been involved in human or pet contact incident, or is otherwise posing a health or safety risk, then the District may conduct removal by trapping. Most often this is done by private pest control companies, but under some circumstances the District may conduct trapping themselves (see Section 2.3.6).

Three elements are necessary for a successful rodent management program: sanitation, exclusion, and blocking access.

> **Sanitation.** Correcting sanitation deficiencies is basic in control of rodents and other vertebrates. Eliminating food sources through good sanitation practices will prevent an increase in their populations. Sanitation involves good housekeeping, including proper storage and handling of food materials and pet food. For example, store pet food in metal, rodent-proof containers, clean up bird seed spillage, and pick up tree fruit that is on the ground. For roof rats, thinning dense vegetation will make the habitat less desirable. Algerian or English ivy, star jasmine, and honeysuckle on fences or buildings are very conducive to roof rat infestations and should be thinned or removed if possible.

> **Exclusion.** Sealing cracks and openings in building foundations, and any openings for water pipes, electric wires, sewer pipes, drain spouts, and vents is recommended. No hole larger than 0.25 inch should be left unsealed to exclude both rats and house mice. Doors, windows, and screens should fit tightly. Their edges can be covered with sheet metal if gnawing is a problem. Coarse steel wool, wire screen, and lightweight sheet metal are excellent materials for plugging gaps and holes.

> **Blocking Access.** Sealing entry points for roof rats requires more time to find these entry points than for Norway rats because of their greater climbing ability. Roof rats often enter buildings at the roofline area, so property owner must be sure that all access points in the roof are sealed. If roof rats are traveling on overhead utility wires, the District recommends/encourages the property owner to contact a pest control professional or the utility company for information and assistance with measures that can be taken to prevent this access.

While activities designed to reduce vector populations through changes in the physical environment are considered Physical Control, they must be distinguished from activities related to rearing or relocating predators of vectors, which are discussed below as “Biological Control,” as well as those tools that impact vector habitat through manipulation of vegetation, which are described below as “Vegetation Management” practices.

2.3.3 Vegetation Management Alternative

The species composition and density of vegetation are basic elements of the habitat value of any area for mosquitoes and other vectors, for predators of these vectors, and for protected flora and fauna. District staff periodically undertake vegetation management activities, or encourage and teach others how to do so on their property, as a tool to reduce the habitat value of sites for mosquitoes and other vectors or to aid production or dispersal of predators of vectors, as well as to allow access by District staff to vector habitat

for control activities. Direct vegetation management by District staff generally consists of activities to reduce the mosquito habitat value of sites by improving water circulation or access by fish and other predators, or to allow access by District staff to standing water for inspections and treatment.

For vegetation management, the District uses hand tools or other mechanical means (i.e., heavy equipment) for vegetation removal or thinning and sometimes applies herbicides (chemical pesticides with specific toxicity to plants) to improve surveillance or reduce vector habitats. Vegetation removal or thinning primarily occurs in aquatic habitats to assist with the control of mosquitoes and in terrestrial habitats to help with the control of other vectors. To reduce the potential for mosquito breeding associated with water retention and infiltration structures, District staff may systematically clear weeds and other obstructing vegetation in stormwater treatment wetlands and retention basins (or request the structures' owners to perform this task). In particular, thinning and removal of cattail overgrowth would be done to provide a maximum surface coverage of 30 percent or less. In some sensitive habitats and/or where sensitive species concerns exist, vegetation removal and maintenance actions would be restricted to those months or times of the year that minimize disturbance/impacts. Vegetation management is also performed to assist other agencies and landowners with the management of invasive/nonnative weeds (e.g., Spartina, Pepperweed, Arundo, Tamarix, and Ailanthus). These actions are typically performed under the direction of the concerned agency, which also maintains any required permits.

Tools ranging from shovels and pruners to chain saws and "weed-whackers" up to heavy equipment can all be used at times to clear plant matter that either prevent access to mosquito breeding sites or that prevent good water management practices that would minimize mosquito populations. Generally, however, District "brushing" activities rely almost entirely on hand tools. Trimmed vegetation is either removed and disposed of properly from the site or broadcast in such a way as to minimize visual degradation of the habitat. Trimming is also kept to a minimum to reduce the possibility of the invasion of exotic species of plants and animals. Surveys for special-status plants, coordination with the landowner, and acquisition of necessary permits are completed before any work is undertaken. Follow-up surveys are also conducted to verify that the work undertaken was effective and that the physical manipulation of the vegetation did not result in any unintended overall habitat degradation.

In addition, the use of water management to control vegetation is in some ways an extension of physical control, in that water control structures created as part of a physical control project may be used to directly manipulate hydroperiod (flood frequency, duration, and depth) as a tool for vegetation management. Where potential evapotranspiration rates are high, water management can also become a mechanism for vegetation management through a "drying out" process.

Table 2-1 (Herbicides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Mosquito Abatement) identifies the herbicides used by the District to control mosquito populations and those under consideration for future use. For example, both AquaMaster® (labeled for aquatic applications) and Roundup (labeled for terrestrial applications) are used for spot control of actively growing vegetation. All herbicides are applied in strict conformance with label requirements and District BMPs. Additional information on herbicides used, is contained in Appendix B (Table 3-2, Table 4-1, and Section 4.6).

2.3.4 Biological Control Alternative

Biological control of mosquitoes and other vectors involves the intentional use of vector pathogens (diseases), parasites, and/or predators to reduce the population size of target vectors. It is one of the principal components of a rational and integrated vector control management program. Biological control is used as a method of protecting the public from mosquitoes and the diseases they transmit without the use of pesticides and potential problem of pesticide resistance; however, the use of pathogens involves chemical treatment with USEPA-registered materials. The different types of biological controls are described in the following paragraphs.

2.3.4.1 Mosquito Pathogens

Mosquito pathogens include an assortment of viruses and bacteria. Pathogens are highly host-specific and usually infect mosquito larvae when they are ingested. Upon entering the host, these pathogens multiply rapidly, destroying internal organs and consuming nutrients. The pathogen can be spread to other mosquito larvae in some cases when larval tissue disintegrates and the pathogens are released into the water to be ingested by uninfected larvae. Examples of viruses that can infect mosquitoes are mosquito iridoviruses, densonucleosis viruses, nuclear polyhedrosis viruses, cytoplasmic polyhedrosis viruses, and entomopoxviruses. Examples of bacteria pathogenic to mosquitoes are *Bacillus sphaericus* (Bs), the several strains of *Bacillus thuringiensis israelensis* (Bti), and *Saccharopolyspora spinosa*. Two bacteria, Bs and Bti, produce proteins that are toxic to most mosquito larvae, while *Saccharopolyspora spinosa* produces compounds known as spinosysns, which effectively control all larval mosquitoes. Bs can reproduce in natural settings for some time following release. Bti materials applied by the District do not contain live organisms, but only spores made up of specific protein molecules.

All three bacteria are naturally occurring soil organisms that are commercially produced as mosquito larvicides. Because the potential environmental impacts of Bs or Bti application are generally similar to those of chemical pesticide applications, these materials and spinosad are evaluated below under the Chemical Control Alternative in Section 2.3.5.

2.3.4.2 Mosquito Parasites

The life cycles of mosquito parasites are biologically more complex than those of mosquito pathogens and involve intermediate hosts, organisms other than mosquitoes. Mosquito parasites are ingested by the feeding larva or actively penetrate the larval cuticle to gain access to the host interior. Once inside the host, parasites consume the internal organs and food reserves until the parasite's developmental process is complete. The host is killed when the parasite reaches maturity and leaves the host (*Romanomermis culicivorax*) or reproduces (*Lagenidium giganteum*). Once free of the host, the parasite can remain dormant in the environment until it can begin its developmental cycle in another host. Examples of mosquito parasites are the fungi *Coelomomyces spp*., *Lagenidium giganteum, Culicinomyces clavosporus*, and *Metarhizium anisopliae*; the protozoa *Nosema algerae, Hazardia milleh, Vavraia culicis, Helicosporidium* spp*., Amblyospora californica, Lambornella clarki*, and *Tetrahymena* spp.; and the nematode *Romanomermis culicivorax*. These parasites are not generally available commercially for mosquito control at present.

Table 2-1 Herbicides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Mosquito Abatement

Herbicides Product Name	Common Name / Active Ingredients	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
Materials in Current Use						
Roundup Pro	41% glyphosate	EPA # 524-475	Shikimic acid pathway disrupter	Spring – Fall	Backpack sprayer, hand can	Management of woody brush including poison oak
AquaMaster®	53.8% glyphosate	EPA # 524-343	Shikimic acid pathway disrupter	Late Spring – Fall	Truck-mounted sprayer; backpack sprayer, hand can	Interior margins of waste water ponds, ditches, marshes
Habitat	28.7% imazapyr	EPA # 241-426	Amino acid synthesis inhibitor	Late Spring – Fall	Truck-mounted sprayer, backpack sprayer, hand can, and boat-mounted sprayer	Aquatic vegetation in estuarine and marine sites
Liberate	Lecithin, methyl esters of fatty acids, alcohol ethoxylate	CA Reg. No. 34704-50030	Surfactant Mixture	Late Spring – Fall	Boat-mounted sprayer, backpack sprayer, hand can	Ponds, lakes, reservoirs, canals, ditches, marshes, wetlands
Polaris	27.7% imazapyr	EPA # 228-534	Amino acid synthesis inhibitor	Late Spring – Fall	Truck-mounted sprayer, backpack sprayer, hand can, and boat-mounted sprayer	Aquatic vegetation control in estuarine marine surface water
Turf Trax Blue	Polymeric Colorant (proprietary)	Exempt	N/A	Late Spring – Fall	Boat-mounted sprayer, backpack sprayer, hand can	Ponds, lakes, reservoirs, canals, ditches, marshes, wetlands
Karmex XP	Diuron	EPA #352-692	Photosynthesis inhibitor	Fall	Truck-mounted sprayer; back pack sprayer	Tops and exterior slopes of waste water & winery waste ponds

Table 2-1 Herbicides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Mosquito Abatement

Herbicides Product Name	Common Name / Active Ingredients	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
Materials Under Consideration for Future Use						
Alligare Dithiopyr 40	40% dithiopyr	EPA 81927-10	Pre-emergent herbicide, inhibits microtubule assembly, inhibits root growth	Late Spring-Fall	Truck-mounted sprayer; backpack sprayer, hand can	Noncrop and Industrial sites
Alligare Glyphosate 4 Plus	41% glyphosate	EPA # 81927-9	Shikimic acid pathway disrupter	Late Spring-Fall	Truck-mounted sprayer, backpack sprayer, hand can	Management of woody brush including poison oak
Alligare Glyphosate 5.4	53.8% glyphosate	EPA # 81927-8	Shikimic acid pathway disrupter	Late Spring-Fall	Truck-mounted sprayer; backpack sprayer, hand can	Interior margins of waste water ponds, ditches, marshes
Alligare Imazapyr 2 SL	27.8% imazapyr	EPA # 81927-23	Amino acid synthesis inhibitor	Late Spring-Fall	Truck-mounted sprayer, backpack sprayer, hand can.	Vegetation control along railroad lines, utility, pipelines, and highway right of ways
Alligare Oryzalin 4	41% oryzalin	EPA 81927-46	Pre-emergent herbicide	Late Spring-Fall	Truck-mounted sprayer; backpack sprayer, hand can	Noncrop site vegetation management
Alligare Triclopyr 3	44.4% triclopyr	EPA # 81927-13	Auxin mimic	Late Spring-Fall	Truck-mounted sprayer, backpack sprayer, hand can	Woody plants, vines, Poison oak
AMVAC Dacthal	54.9% DCPA	EPA 5481-487	Pre-emergent herbicide, inhibits microtubule assembly, inhibits root growth	Late Spring-Fall	Truck-mounted sprayer; backpack sprayer, hand can	Noncrop site vegetation, and Industrial sites
Blazon Pattern Indicator	Polymeric Colorant (proprietary)	EPA # 352-346	N/A	Late Spring-Fall	Truck-mounted sprayer; backpack sprayer, hand can	Interior margins of waste water ponds, access roads, levees, marshes

Table 2-1 Herbicides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Mosquito Abatement

Herbicides Product Name	Common Name / Active Ingredients	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
Bullseye Spray Pattern Indicator	Polymeric Colorant (proprietary)	Exempt	N/A	Late Spring-Fall	Truck-mounted sprayer; backpack sprayer, hand can	Interior margins of waste water ponds, access roads, levees, marshes
Competitor	Modified Vegetable Oil	CA Reg. No. 2935-50173	Adjuvant	Late Spring-Fall	Boat-mounted sprayer, backpack sprayer, hand can	Ponds, lakes, reservoirs, canals, ditches, marshes, wetlands
Dimension Ultra 40WP	40% dithiopyr	EPA 62719-445	Pre-emergent herbicide, inhibits microtubule assembly, inhibits root growth	Late Spring-Fall	Truck-mounted sprayer; backpack sprayer, hand can	Noncrop site vegetation and Industrial sites
Ecomazapyr 2 SL	27.8% imazapyr	EPA # 74477-8	Amino acid synthesis inhibitor	Late Spring-Fall	Truck-mounted sprayer, backpack sprayer, hand can, and boat-mounted sprayer	Aquatic vegetation in estuarine and marine sites
Green Light Amaze XL 2G	1% Benefin; 1% oryzalin	EPA # 70506-45-AA-38167	Pre-emergent herbicide, inhibits microtubule assembly, inhibits root growth	Late Spring-Fall	Truck-mounted sprayer; backpack sprayer, hand can	Noncropland
Imazapyr 4 SL	52.6% imazapyr	EPA # 74477-5	Amino acid synthesis inhibitor	Late Spring-Fall	Truck-mounted sprayer, backpack sprayer, hand can.	Vegetation control along forested roads and nonirrigation ditch banks
Oust XP	Sulfometuron Methyl	EPA # 352-601	Amino acid synthesis inhibitor	Late Spring-Fall	Backpack sprayer, hand can	Control of annual and broadleaf weeds in noncrop sites, and roadside ditches

Table 2-1 Herbicides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Mosquito Abatement

Herbicides Product Name	Common Name / Active Ingredients	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
Pro-Spreader Activator	90% alkyl phenol ethoxylate, isopropanol, and fatty acids	CAS # 1050775-50022-AA	Adjuvant	Late Spring-Fall	Truck-mounted sprayer, backpack sprayer, hand can.	Agricultural, industrial and noncropland sites
Renovate 3	44.4% triclopyr	EPA # 62719-37-67690	Auxin mimic	Late Spring-Fall	Truck-mounted sprayer, backpack sprayer, hand can	Ponds, lakes, reservoirs, canals, ditches, marshes, wetlands
Roundup Pro Max	48.7% glyphosate	EPA # 524-579	Shikimic acid pathway disrupter	Late Spring-Fall	Truck-mounted sprayer, backpack sprayer, hand can.	Management of woody brush including poison oak

CAS Number = Chemical Abstracts Service Registry Number

EPA Number = Registered with the US Environmental Protection Agency

2.3.4.3 Mosquito Predators

Mosquito predators are represented by highly complex organisms, such as insects, fish, birds, and bats that consume larval or adult mosquitoes as prey. Predators are opportunistic in their feeding habits and typically forage on a variety of prey types, which allows them to build and maintain populations at levels sufficient to control mosquitoes, even when mosquitoes are scarce. Examples of mosquito predators include representatives from a wide variety of taxa: coelenterates, *Hydra* spp.; platyhelminthes, *Dugesia dorotocephala, Mesostoma lingua, and Planaria* spp.; insects, *Anisoptera, Zygoptera, Belostomatidae, Gerridae, Notonectidae, Veliidae, Dytiscidae, and Hydrophilidae*; arachnids, *Pardosa* spp.; mosquitofish, *Gambusia affinis*, *Gasterosteus aculeatus*; bats; and birds, *anseriformes, apodiformes, charadriiformes, and passeriformes*. Only mosquitofish are commercially available to use at present, or able to be reproduced/reared, while the District supports the presence of the other species as practical (also see Section 15.2).

The District's rearing and stocking of mosquitofish in mosquito habitat is the most commonly used biological control agent for mosquitoes in the world. These fish are ideal control agents for several reasons. They feed primarily at the water's surface, where larvae can be found. They can tolerate a significant range in water temperature and water quality. They are also easy to handle, transport, stock, and monitor. Correct use of this fish can provide safe, effective, and persistent suppression of a variety of mosquito species in many types of mosquito sources. As with all safe and effective control agents, the use of mosquitofish requires a good knowledge of operational techniques and ecological implications, careful evaluation of stocking sites, use of appropriate stocking methods, and regular monitoring of stocked fish. Mosquitofish reproduce in natural settings, for at least some time after release. Due to allegations that mosquitofish may potentially impact red-legged frog and tiger salamander populations, District policy is to limit the use of mosquitofish to ornamental fish ponds, water troughs, water gardens, fountains, and unused swimming pools. Limiting the introduction of the mosquitofish to these sources should prevent their migration into habitats used by threatened, endangered, or rare species.

On average, the District produces and releases about 21 pounds of mosquitofish annually. The District's rearing and stocking program occurs at District offices. The small-scale fish hatchery produces a discharge that averages 25 gallons per week, and this hatchery wastewater is now being placed onto the vegetation located on District property. The District typically produces fish for distribution, but fish purchases are made periodically to promote genetic diversity or to increase stock.

2.3.4.4 Other Vectors

No effective predators exist to control high rodent populations. Cats may provide short-term control when the rodent population is low, but they can impact bird populations. The District would not employ cats for rat control. Raptors cannot provide adequate rodent control in urban environments.

Currently, no commercial biological control agents or products are available for wasp and yellow jacket control.

2.3.5 Chemical Control Alternative

Chemical control is a Program tool that consists of the application of nonpersistent selective insecticides (and herbicides noted in Section 2.3.3 above) to directly reduce populations of larval or adult mosquitoes and other invertebrate threats to public health (e.g., ticks) and the use of rodenticides to control rats and mice. If and when inspections reveal that mosquitoes or other vector populations are present at levels that trigger the District's criteria for chemical control – based on the vector's abundance, density, species composition, proximity to human settlements, water temperature, presence of predators and other factors – District staff will apply pesticides to the site in strict accordance with the pesticide label instructions. The total number of applications and weight or volumes of specific pesticides applied by the District in Summer 2011 through Spring 2012 are presented in Appendix B, Attachment A (Tables A91–A44) of this PEIR.

2.3.5.1 Mosquito Abatement

The vast majority of chemical control tools are used for mosquito abatement. The primary pesticides used can be divided between "larvicides," which are specifically toxic to mosquito larvae, and "adulticides," which are used to control adult mosquito populations. These pesticides and their applications are described in the following paragraphs.

2.3.5.1.1 Mosquito Larvicides

Larvicides are applied when the chemical control criteria for mosquito larvae are present and application rates vary according to time of year, water temperature, the level of organic content in the water, the type of mosquito species present, larval density, and other variables. Larvicide applications may be repeated at any site at recurrence intervals ranging from annually to weekly.

Larvicides routinely used by the District include Bti, Bs, Methoprene (Altosid), CoCoBear Oil, BVA-2, MasterLine Mosquito Larvicide, and *Saccharopolyspora spinosa* (spinosad) (Natular).

> **Bti** is a bacterium that is ingested by mosquito larvae and that disrupts their gut lining, leading to death before pupation. Bti is applied by the District as a liquid or bonded to an inert substrate (sand or corncob granules) to assist penetration of vegetation. Persistence is low in the environment, and efficacy depends on careful timing of application to coincide with periods in the life cycle when larvae are actively feeding. Pupae and late 4th stage larvae do not feed and, therefore, will not be controlled by Bti. Low water temperature inhibits larval feeding behavior, reducing the effectiveness of Bti during very cold periods. High organic conditions also reduce the effectiveness of Bti. Therefore, use of Bti requires frequent inspections of larval sources during periods of larval production, and may require frequent applications of material. Application can be by hand, from an ATV, or from aircraft (helicopter).

> **Bs** is a bacterium that when ingested by mosquito larvae produces microbial gut toxins that destroy the insect gut wall, leading to paralysis and death. Bs is a biological larvicide applied by the District as a liquid or bonded to an inert substrate (corncob granules) to assist penetration of vegetation. The mode of action is similar to that of Bti, but Bs may be used more than Bti in some sites because of its higher effectiveness in water with higher organic content and residual properties that allow longer larvicidal action. Persistence is low in the environment, and efficacy depends on careful timing of application to coincide with periods in the life cycle when larvae are actively feeding. Pupae and late 4th stage larvae do not feed and, therefore, will not be controlled by Bs. Low water temperature inhibits larval feeding behavior, reducing the effectiveness of Bs during very cold periods. Bs is also ineffective against certain mosquito species such as those in the genera *Aedes*. Knowing the stage and species present can increase the effectiveness of this material, restricting it to sources containing susceptible species. Therefore, use of Bs requires frequent inspections of larval sources during periods of larval production and may require frequent applications of material. Application can be by hand, from an ATV, or from aircraft (helicopter).

> **Spinosad** is an Organic Materials Research Institute-Listed Dow AgroSciences active ingredient that is a fermentation product of bacteria first discovered in an old rum distillery. Spinosad is a fermentation product of the naturally occurring soil bacterium *Saccharopolyspora spinosa*. It causes excitation of the mosquito's nervous system, ultimately leading to paralysis and death. This mode of action makes this pesticide a good option for rotational use in the prevention of resistance. Its action on the target organism is either by contact or by ingestion, and as with other bacterial larvicides, activity can be reduced in highly organic water. Spinosad is applied by the District as a liquid or as a sustained-release product that can persist anywhere from 30 to 180 days. It is applied either in response to high observed populations of mosquito larvae at a site or as a sustained-release product that can persist for up to about 180 days. This product has very low potential for accumulation in soil or groundwater contamination. Application can be performed by hand, from an ATV, or from aircraft (helicopter).

- **Methoprene**, or Altosid, is a synthetic juvenile hormone that is designed to disrupt the transformation of a juvenile mosquito into an adult. Methoprene products must be applied (or present, if using a slow release formula) to the late fourth instar and/or pupal stages of mosquitoes. It is not effective against other life stages. Methoprene can be applied in granular, liquid, pellet, or briquette formulation. Sustained-release products can persist for up to 30 or 150 days. Application can be performed by hand, from an ATV, or from aircraft (helicopter).
- **BVA-2** and MasterLine Mosquito Larvicide are highly refined petroleum distillates (mineral oil). These new larvicides demonstrate a low level of toxicity to plant growth (phytotoxicity) and rapid environmental breakdown. BVA-2 larvicide oil has a water-white clear color and is also practically odorless. It forms a thin film on water and kills larvae through suffocation and/or direct toxicity. It is typically applied at application rates of 3 to 5 gallons per acre and can be applied by hand, from an ATV, or from a truck.
- **CoCoBear Oil** is a food grade, highly refined petroleum distillate (mineral oil) that has replaced the discontinued Golden Bear Oil 1111. This new larvicide has similar characteristics and properties to Golden Bear Oil 1111 in that it also demonstrates low-level toxicity to plant growth (phytotoxicity) and rapid environmental breakdown. It forms a thin film on water and kills larvae through suffocation and/or direct toxicity. It is typically applied at application rates of 3 to 5 gallons per acre and can be applied by hand, from an ATV, or from a truck.

Mosquito pathogens and other larvicides most likely to be used are listed in Table 2-2 (Pathogens and Other Larvicides Used or Proposed for Use by SMCMVCD for Mosquito Abatement). Products containing temephos are under consideration for future use.

Larviciding Techniques

Because of the wide range of mosquito sources in the Service Area, and the variety of pesticide formulations described above, the District uses a variety of techniques and equipment to apply larvicides, including handheld sprayers, backpack sprayers and blowers, truck-or-ATV-mounted spray rigs, and helicopters or other aircraft. See Section 2.6 for more detailed information on equipment used by the District.

Ground Larviciding Techniques

The District uses conventional pickup trucks and ARGO ATVs as larvicide vehicles. Truck-mounted power sprayers are used. Alternatively, a chemical container tank, high-pressure, low-volume electric or gas pump, and spray nozzle are mounted in the back of the truck bed, with a switch and extension hose allowing the driver to operate the equipment and apply the larvicide. The ATVs have a chemical container mounted on the vehicle, a 12-volt electric pump supplying high-pressure, low-volume flow, and booms and/or hose and spray tips allowing for application while steering the vehicle. ATVs are ideal for treating areas such as agricultural fields, pastures, and other offroad sites. Additional training in minimizing habitat impacts, recognizing sensitive flora and fauna, and ATV safety and handling is provided to employees before operating these machines.

Additional equipment used in ground applications of liquid formulations includes handheld sprayers (hand cans or spray bottles), and backpack sprayers and blowers. Handheld sprayers (hand cans) are standard 1- to 4-gallon garden style pump-up sprayers used to treat very small isolated areas. Backpack sprayers are either hand pump-up for liquid applications and have a 2- to 5-gallon tank or are gas powered with a chemical tank and calibrated proportioning slot. Generally, a pellet or small granular material is applied by hand or with a gas-powered backpack sprayer, blower, ATV-mounted Herd Seeder, or hand crank "belly grinder" machine designed to evenly distribute the pellets or granules.

Table 2-2 Pathogens and Other Larvicides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Mosquito Abatement

Pesticide Product Name	Common Name / Active Ingredients	Chemical Type	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
Pathogens/Biological Control in Current Use							
AQUABAC (200 G)	Bacillus thuringiensis israelensis 2.86%	Microbial	EPA 62637-3	Larvicide; when ingested, produce microbial gut toxins that destroy insect gut wall leading to paralysis and death.	January - December	Hand, Ground, Air, Argo	Flood water, ditches, tidal water, salt marshes, catch basins, lakes, ponds
AQUABAC (400 G)	Bacillus thuringiensis israelensis 5.71%	Microbial	EPA 62637-13	Larvicide; when ingested, produce microbial gut toxins that destroy insect gut wall leading to paralysis and death.	January - December	Hand, Ground, Air, Argo	Pools, ponds, flood water, ditches, catch basins, salt marshes
AQUABAC XT	Bacillus thuringiensis israelensis 8.0%	Microbial	EPA 62637-1	Larvicide; when ingested produce microbial gut toxins	January - December	Hand, Ground, Air, Argo	Flood water, ditches, ponds, pools, salt marshes
FourStar Briquets - 180	Bacillus sphaericus 6% Bti 1% 180 day briquet	Microbial	EPA 83362-3	Larvicide; when ingested, produce microbial gut toxins that destroy insect gut wall leading to paralysis and death.	January - December	Hand	Catch basins, containers, ditches, impounds, fishponds, green pools, marshes, utility vaults, water under buildings
FourStar Briquets - 45	Bacillus sphaericus 6% Bti 1% 45 day briquet	Microbial	EPA 83362-3	Larvicide; when ingested, produce microbial gut toxins that destroy insect gut wall leading to paralysis and death.	January - December	Hand	Catch basins, containers, ditches, impounds, fishponds, green pools, marshes, utility vaults, water under buildings

Table 2-2 Pathogens and Other Larvicides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Mosquito Abatement

Pesticide Product Name	Common Name / Active Ingredients	Chemical Type	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
FourStar Briquets - 90	Bacillus sphaericus 6% Bti 1% 90 day briquet	Microbial	EPA 69504-3	Larvicide; when ingested, produce microbial gut toxins that destroy insect gut wall leading to paralysis and death.	January - December	Hand	Catch basins, containers, ditches, impounds, fishponds, green pools, marshes, utility vaults, water under buildings
FourStar Bti Briquets - 150	Bacillus thuringiensis israelensis 7% 150 day briquet	Microbial	EPA 83362-2 (Registration current with EPA but technically abandoned with CA DPR. Can be reactivated at any time.)	Larvicide; when ingested, produce microbial gut toxins that destroy insect gut wall leading to paralysis and death.	January - December	Hand	Catch basins, containers, ditches, impounds, fishponds, green pools, marshes, utility vaults, water under buildings
FourStar Bti Briquets - 45	Bacillus thuringiensis israelensis, 7% 45 day briquet	Microbial	EPA 83362-2 (Registration current with EPA but technically abandoned with CA DPR. Can be reactivated at any time.)	Larvicide; when ingested, produce microbial gut toxins that destroy insect gut wall leading to paralysis and death.	January - December	Hand	Catch basins, containers, ditches, impounds, fishponds, green pools, marshes, utility vaults, water under buildings
FourStar CRG (Controlled Release Granule)	Bacillus sphaericus 9% Bti 1% 60 day Sand Granule	Microbial	EPA 85685-2 (Registration current with EPA and pending with CA DPR. Approval expected during 2012.)	Larvicide; when ingested, produce microbial gut toxins that destroy insect gut wall leading to paralysis and death.	January - December	Hand, Ground, Air, Argo	Marshes, catch basins, containers, ditches, impounds, fishponds, green pools, marshes, utility vaults, water under buildings

Table 2-2 Pathogens and Other Larvicides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Mosquito Abatement

Pesticide Product Name	Common Name / Active Ingredients	Chemical Type	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
FourStar SBG (Single Brood Granule)	Bacillus thuringiensis israelensis 2.15% Single Brood Bti Sand Granule	Microbial	EPA 85685-1	Larvicide; when ingested, produce microbial gut toxins that destroy insect gut wall leading to paralysis and death.	January - December	Hand, Ground, Air, Argo	Marshes, catch basins, containers, ditches, impounds, fishponds, green pools, marshes, utility vaults, water under buildings
Natular G30	Spinosad 2.5% granules 30 days	Microbial	EPA 8329-83	Larvicide; alters acetylcholine receptors causing involuntary neurological impacts.	January - December	Hand, Ground, Air, Argo	Catch basins, containers, ditches, impounds, fishponds, green pools, marshes, utility vaults, water under buildings
Natular XRT	Spinosad 6.25% tablets 180 days	Microbial	EPA 8329-82	Larvicide; alters acetylcholine receptors causing involuntary neurological impacts.	January - December	Hand, Ground, Air, Argo	Catch basins, containers, ditches, impounds, fishponds, green pools, marshes, utility vaults, water under buildings
Spheratax SPH (50 G)	Bacillus sphaericus 6.0% granule	Microbial	EPA 84268-2	Larvicide; when ingested, produce microbial gut toxins that destroy insect gut wall leading to paralysis and death.	January - December	Hand, Ground, Air	Catch basins, containers, ditches, impounds, fishponds, green pools, marshes, utility vaults, water under buildings

Table 2-2 Pathogens and Other Larvicides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Mosquito Abatement

Pesticide Product Name	Common Name / Active Ingredients	Chemical Type	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
Spheratax SPH (50 G) WSP	Bacillus sphaericus 5.0% granule in water soluble packets	Microbial	EPA 84268-2	Larvicide; when ingested, produce microbial gut toxins that destroy insect gut wall leading to paralysis and death.	January - December	Hand	Catch basins, containers, ditches, impounds, fishponds, green pools, marshes, utility vaults, water under buildings
Teknar SC	Bacillus thuringiensis israelensis, 5.6% liquid	Microbial	EPA 73049-435	Larvicide; when ingested, produce microbial gut toxins that destroy insect gut wall leading to paralysis and death.	January - December	Hand, Ground, Air, Argo	Marshes
VectoBac 12AS	Bacillus thuringiensis israelensis, 1.2% liquid	Microbial	EPA 275-66	Larvicide; when ingested, produce microbial gut toxins that destroy insect gut wall leading to paralysis and death.	January - December	Hand, Ground, Air, Argo	Marshes
VectoBac CG	Bacillus thuringiensis israelensis	Microbial	EPA 275-70	Larvicide; when ingested, produce microbial gut toxins that destroy insect gut wall leading to paralysis and death.	January - December	Hand, Ground, Air, Argo	Marshes, flood water, pools, ponds, ditches
VectoBac G	Bacillus thuringiensis israelensis, 0.2% granule	Microbial	EPA 275-50	Larvicide; when ingested, produce microbial gut toxins that destroy insect gut wall leading to paralysis and death.	January - December	Hand, Ground, Air, Argo	Catch basins, containers, ditches, impounds, fishponds, green pools, marshes, utility vaults, water under buildings

Table 2-2 Pathogens and Other Larvicides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Mosquito Abatement

Pesticide Product Name	Common Name / Active Ingredients	Chemical Type	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
VectoBac GS Biological Larvicide Granules	Bacillus thuringiensis israelensis, 2.8% granule	Microbial	EPA 73049-10	Larvicide; when ingested, produce microbial gut toxins that destroy insect gut wall leading to paralysis and death.	January - December	Hand, Ground, Air, Argo	Marshes, flood water, pools, ponds, ditches
VectoLex CG Biologic	Bacillus sphaericus 7.5% granule	Microbial	EPA 275-77	Larvicide; when ingested, produce microbial gut toxins that destroy insect gut wall leading to paralysis and death.	January - December	Hand, Ground, Air, Argo	Catch basins, containers, ditches, impounds, fishponds, green pools, marshes, utility vaults, water under buildings
VectoLex WDG	Bacillus sphaericus	Microbial	EPA 73049-57	Larvicide; when ingested, produce microbial gut toxins that destroy insect gut wall leading to paralysis and death.	January - December	Hand, Ground	Catch basins, containers, ditches, impounds, fishponds, green pools, marshes, utility vaults, water under buildings
VectoLex WSP	Bacillus sphaericus, 7.5% granule in water soluble packets	Microbial	EPA 73049-20	Larvicide; when ingested, produce microbial gut toxins that destroy insect gut wall leading to paralysis and death.	January - December	Hand	Catch basins, containers, ditches, impounds, fishponds, green pools, marshes, utility vaults, water under buildings

Table 2-2 Pathogens and Other Larvicides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Mosquito Abatement

Pesticide Product Name	Common Name / Active Ingredients	Chemical Type	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
VectoMax CG	Bacillus sphaericus, 2.7% and Bacillus thuringiensis israelensis 4.5% granules	Microbial	EPA 73049-429	Larvicide; when ingested, produce microbial gut toxins that destroy insect gut wall leading to paralysis and death.	January - December	Hand, Ground, Air, Argo	Catch basins, containers, ditches, impounds, fishponds, green pools, marshes, utility vaults, water under buildings
Other Larvicides							
Agnique MMF	Water soluble surface film	Larviciding Surface Film	EPA 2302-14	Larvicide/pupacide; film spreads over standing water surface and reduces surface tension causing larvae to drown (prevents adult emergence).	January - December	Hand, Ground, Air, Argo	Catch basins, containers, fishponds, green pools, utility vaults, water under buildings
Agnique MMF G Larvicide and Pupacide (granular formulation)	Biodegradable alcohol ethoxylated surfactant 321%	Larviciding Surface Film	EPA 53263-30	Larvicide/Pupacide, monomolecular film that disrupts surface tension causing larvae and pupae to drown	January - December	Hand, Ground, Air, Argo	Catch basins, containers, fishponds, green pools, utility vaults, water under buildings.
Agnique MMF Mosquito Larvicide and Pupacide	Biodegradable alcohol ethoxylated surfactant 321%	Larviciding Surface Film	EPA 53263-28	Larvicide/Pupacide, monomolecular film that disrupts surface tension causing larvae and pupae to drown	January - December	Hand, Ground, Air, Argo	Catch basins, containers, fishponds, green pools, utility vaults, water under buildings.

Table 2-2 Pathogens and Other Larvicides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Mosquito Abatement

Pesticide Product Name	Common Name / Active Ingredients	Chemical Type	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
Altosid Briquets	Methoprene 7.9% 30 day	Insect Growth Regulator	EPA 2724-375-64833	Hormone analogue that interferes with larval development (insect growth regulator)	January - December	Hand	Catch basins, containers, ditches, impounds, fishponds, green pools, marshes, utility vaults, water under buildings
Altosid Liquid conc.	Methoprene 20% liquid con.	Insect Growth Regulator	EPA 2724-446-64833	Hormone analogue that interferes with larval development (insect growth regulator).	January - December	Hand, Ground, Air, Argo	Impounds, marshes
Altosid Liquid Larvicide	Methoprene 5% liquid	Insect Growth Regulator	EPA 2724-392	Hormone analogue that interferes with larval development (insect growth regulator)	January - December	Hand, Ground, Air, Argo	Marshes, pools, ponds, ditches,
Altosid Pellets	Methoprene 4% pellet 30 days	Insect Growth Regulator	EPA 2724-448-50809	Hormone analogue that interferes with larval development (insect growth regulator).	January - December	Hand, Ground, Air, Argo	Catch basins, containers, ditches, impounds, fishponds, green pools, marshes, utility vaults, water under buildings
Altosid SBG	Methoprene 0.2% granule 5-10 days	Insect Growth Regulator	EPA 2724-489	Hormone analogue that interferes with larval development (insect growth regulator).	January - December	Hand, Ground, Air, Argo	Catch basins, containers, ditches, impounds, fishponds, green pools, marshes, utility vaults, water under buildings

Table 2-2 Pathogens and Other Larvicides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Mosquito Abatement

Pesticide Product Name	Common Name / Active Ingredients	Chemical Type	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
Altosid WSP (pellets)	Methoprene 4.25% granule in water soluble packs 30 days	Insect Growth Regulator	EPA 2724-448	Hormone analogue that interferes with larval development (insect growth regulator).	January - December	Hand, Ground, Air, Argo	Catch basins, containers, ditches, impounds, fishponds, green pools, marshes, utility vaults, water under buildings
Altosid XR-Briquets	Methoprene 2.1% 150 day	Insect Growth Regulator	EPA 2724-421-64833	Hormone analogue that interferes with larval development (insect growth regulator).	January - December	Hand	Catch basins, containers, ditches, impounds, fishponds, green pools, marshes, utility vaults, water under buildings
Altosid XR-G (granules)	Methoprene 1.5% granule 21 days	Insect Growth Regulator	EPA 2724-451	Hormone analogue that interferes with larval development (insect growth regulator).	January - December	Hand, Ground, Air, Argo	Catch basins, containers, ditches, impounds, fishponds, green pools, marshes, utility vaults, water under buildings
BVA 2	Refined petroleum distillate	Larviciding Oil	EPA 70589-1	Larvicide/pupacide; film spreads over standing water surface and reduces surface tension causing larvae to drown (prevents adult emergence).	January - December	Hand, Ground, Air, Argo	Catch basins, containers, fishponds, green pools, utility vaults, water under buildings

Table 2-2 Pathogens and Other Larvicides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Mosquito Abatement

Pesticide Product Name	Common Name / Active Ingredients	Chemical Type	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
CoCoBear Mosquito Larvicide Oil	Mineral oil	Larviciding Surface Film	EPA 8329-93	Larvicide/pupacide; film spreads over standing water surface and reduces surface tension causing larvae to drown (prevents adult emergence).	January - December	Hand, Ground, Air, Argo	Catch basins, flooded areas, drainage areas, ditches, stagnant pools, swamps, marshes, open sewage basins, settling ponds
MasterLine Kontrol Mosquito Larvicide	Mineral oil	Larviciding Surface Film	EPA 73748-10	Larvicide/pupacide; film spreads over standing water surface and reduces surface tension causing larvae to drown (prevents adult emergence).	January - December	Hand, Ground, Air, Argo	Catch basins, drainage areas, ditches, stagnant pools, open sewage basins
Mosquito Larvicide GB-1111	Aliphatic petroleum hydrocarbons	Larviciding Oil	EPA 8329-72	Larvicide/adulticide; oil spreads over surface and suffocates larvae as they are unable to break the water surface with their breathing tubes (prevents adult emergence).	January - December	Hand, Ground, Air, Argo	Catch basins, containers, fishponds, green pools, utility vaults, water under buildings
Pesticides Under Consideration for Future Use							
5% Skeeter Abate®	Temephos	Insecticide	EPA 8329-70	Larvicide; central and peripheral nerve system disrupter.	January - December	Hand, Ground, Air, Argo	Catch basins, containers, ditches, impounds, fishponds, green pools, marshes, utility vaults, water under buildings
AllPro ProVect 4E Larvicide	Temephos 45%	Insecticide	EPA 769-678	Larvicide; central and peripheral nerve system disrupter.	January - December	Hand, Ground, Air, Argo	

Table 2-2 Pathogens and Other Larvicides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Mosquito Abatement

Pesticide Product Name	Common Name / Active Ingredients	Chemical Type	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
AllPro ProVect 5G Larvicide	Temephos 45%	Insecticide	EPA 769-678	Larvicide; central and peripheral nerve system disrupter.	January - December	Hand, Ground, Air, Argo	Catch basins, containers, ditches, impounds, fishponds, green pools, marshes, utility vaults, water under buildings

Air = Aircraft
Argo = Amphibious Vehicle
CAS Number = Chemical Abstracts Service Registry Number
EPA Number = Registered with the US Environmental Protection Agency
Ground = Passenger vehicle (truck, Jeep, etc.)
Hand = Applied by personnel on foot (hand can, backpack spreader, squirt bottle, etc.)

Using ground application equipment, both when on foot and when conveyed by vehicles, has several advantages. Ground larviciding allows applications while in close proximity to the actual treatment area and, consequently, treatments occur to only those microhabitats where larvae are actually present. This method also reduces both the unnecessary pesticide load on the environment and the financial cost of the amount of material used and its application. Both the initial and the maintenance costs of ground equipment are generally less than for aerial equipment. Furthermore, ground larviciding applications are less affected by weather conditions than are aerial applications.

However, ground larviciding is impractical for large or densely wooded/vegetated areas. Also, risk of chemical exposure for the applicators (workers) is greater than during aerial larviciding operations. Damage may occur from the use of a ground vehicle in some natural areas. Ruts and vegetation damage may occur, although both these conditions are reversible and generally short-lived. Technicians are trained to recognize sensitive habitat areas and to use good judgment to avoid impacting these areas.

Aerial Larviciding Techniques

When large areas are simultaneously producing mosquito larvae at densities exceeding District treatment thresholds, then the District may use helicopters to apply any of the larvicides discussed above or listed in Table 2-2. The District contracts with independent flying services to perform aerial applications, with guidance to the target site provided by District staff. Aerial application of larvicides is a relatively infrequent activity for the District, typically occurring only four times a year at three sites each time, with each application covering around 100 up to 3,000 acres. However, larval production can vary substantially, and the District is capable of undertaking more frequent or extensive operations if necessary.

The larvicides, excluding granular and pellet formulations, are typically combined with water and applied as a low-volume wet spray mix at 2 gallons per acre. Depending on weather conditions, the volume of final mix can be increased to 5 gallons per acre without changing the actual amount of larvicidal active ingredient that is applied per acre. Adjusting the final mix volume per acre to 5 gallons has the advantage of increasing the droplet size to help minimize potential drift and the disadvantage of substantially increasing the flying time, which also increases costs. Aerial application of liquid larvicides typically occurs during daylight hours and at an altitude above the treatment site of generally less than 40 feet.

Granular and pellet formulations of larvicides are applied using calibrated mechanical spreaders fixed to a helicopter. Granular and pellet formulations are generally much more expensive than liquid formulations of larvicides and are used to penetrate dense vegetation. Application rates can range between 3 and 20 pounds per acre for pellets/granules impregnated with methoprene. Applications of methoprene pellets above 5 pounds per acre are highly unlikely due to the high cost. Applications are around 10 to 20 pounds per acre for corncob granules impregnated with Bti or Bs. Rates depend on the density of vegetative cover and the organic content of the mosquito breeding water being treated. It is also significant to note that granular applications occur during daylight hours and are typically at an altitude that is less than 50 feet.

Using aerial application equipment has are three advantages compared to ground application. First, it can be more economical for large target areas with extensive mosquito production. Second, by covering large areas more quickly, it can free District staff to conduct other needed surveillance or control. Third, it can be more practical for remote or inaccessible areas, such as islands, large marshes, and densely vegetated tule areas, than ground larviciding. However, risk of drift is greater with aerial applications, especially with liquid or ultralow volume (ULV) aerial larviciding and, consequently, more potential risk of nontarget exposure exists. In addition, accuracy in hitting the target area temporarily requires additional manpower for flagging or electronic guidance systems, which can increase costs. Finally, in addition to the timing constraints inherent in most larvicide use, the potential application window can be very narrow for aerial activities due to weather conditions. Larvicides will not be applied if winds are exceeding 10 MPH.

2.3.5.1.2 Mosquito Adulticides

In addition to chemical control of mosquito larvae, the District may use pesticides for control of adult mosquitoes when no other tools are available and if specific criteria are met, including species composition, population density (as measured by landing count or other quantitative method), proximity to human populations, and/or human disease risk. As with larvicides, adulticides are applied in strict conformance with label requirements (Appendix B). Adulticides potentially used by the District include pyrethrins (Pyrocide®, Pyrenone 25-5®, Pyrenone Crop Spray®); and the synthetic pyrethroids resmethrin (Scourge®), permethrin (Kontrol 4-4) and etofenprox (Zenivex®). Table 2-3 lists the adulticides currently used or under consideration for future use by the District for mosquito abatement. Adulticide materials are used infrequently and only when necessary to control mosquito populations.

Ground Adulticiding Techniques

The most common form of adulticide application is via insecticide aerosols at very low dosages. This ultra low volume method is commonly referred to as the ULV method. This method employs handheld or backpack sprayers for ground applications. Barrier or residual treatments for adult mosquitoes consist of an application using a material generally applied with a compressed air sprayer to the preferred foliage, buildings, or resting areas of the mosquito species. Cold aerosol generators, cold foggers, and ULV aerosol machines were developed to eliminate the need for great quantities of petroleum oil diluents necessary for earlier fogging techniques. These units are constructed by mounting a vortex nozzle on the forced air blower of a thermal fogger. Insecticide is applied as technical material or at moderately high concentrations (as is common with the pyrethroids), which translates to very small quantities per acre and is, therefore, referred to as ULV. In agriculture, this rate is assumed less than 36 ounces per acre, but mosquito control ground adulticiding operations rarely exceed 1 ounce per acre. The optimum sized droplet for mosquito control with cold aerosols applied at ground level has been determined to be in the range of 5 to 20 microns.

Adulticiding is the only known effective measure of reducing an adult mosquito population in a timely manner. All mosquito adulticiding activities follow reasonable guidelines and best management practices (BMPs) to avoid affecting nontarget species including bees. Timing of applications (when mosquitoes are most active), avoiding sensitive areas, working and coordinating efforts with CDFW or USFWS, and following label instructions all result in responsible mosquito control practices.

Aerial Adulticiding Techniques

Aerial applications may be the only reliable means of obtaining effective control in areas bordered by extensive mosquito production sites or with a small, narrow, or inaccessible network of roads. Aerial adulticiding is often the only means available to cover a very large area quickly in case of severe mosquito outbreaks or vector-borne disease epidemics. The District has not needed to do any aerial adulticiding and would only do so in the case of an extensive outbreak of disease in an area larger than what could be covered by trucks in a couple of days.

Two aerial adulticiding techniques are used in California: low-volume spraying and ULV aerosols. Low-volume (<2 gallons per acre) sprays are applied with the pesticide diluted in light petroleum oils or water and applied as a rather wet spray. The size of the droplets reduces drift, thus limiting swath widths, and may not be ideal under certain circumstances for impinging on mosquitoes. The technique is compatible with equipment commonly used for aerial liquid larviciding.

Table 2-3 Adulticides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Mosquito Abatement

Pesticide Product Name	Common Name / Active Ingredients	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
Pesticides in Current Use						
Bayer Pyrenone 25-5	5% Pyrethrins and 25% Piperonyl butoxide	EPA 432-1050	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
Clarke AquaHalt™ Water-based Adulticide	5% Pyrethrins and 25% Piperonyl butoxide	EPA 1021-1803	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
MGK Pyrocide Mosquito Adulticide 7067	5% Pyrethrins and 25% Piperonyl butoxide.	EPA 1021-1199	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
Prentox Pyronyl Oil Concentrate # 525	5% Pyrethrins and 25% Piperonyl butoxide	EPA 655-471	Adulticide; interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
Zenivex E20	20% Etofenprox	EPA 2724-791	Adulticide; interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
Zenivex E4	4% Etofenprox	EPA 2724-807	Adulticide; interferes with sodium channel function in the nervous system	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban

Table 2-3 Adulticides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Mosquito Abatement

Pesticide Product Name	Common Name / Active Ingredients	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
Pesticides Under Consideration for Future Use						
AllPro Aqualuer 20-20	20.6% Permethrin and 20.6% Piperonyl butoxide	EPA 769-985	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
AllPro Evoluer 30-30 ULV	30% Permethrin and 30% Piperonyl butoxide	EPA 769-983	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
AllPro Evoluer 4-4 ULV	4% Permethrin and 4% Piperonyl butoxide	EPA 769-982	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
AMVAC Dibrom	87.4% Naled	EPA 5481-480	Adulticide; interferes with cholinesterase inhibitor	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
Bayer Aqua-Reslin	20% Permethrin and 20% Piperonyl butoxide	EPA 432-796	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
Bayer Permanone 30-30	30% Permethrin and 30% Piperonyl butoxide	EPA 432-1235	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
Bayer Permanone 31-66	31.28% Permethrin and 66% Piperonyl butoxide	EPA 432-1250	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban

Table 2-3 Adulticides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Mosquito Abatement

Pesticide Product Name	Common Name / Active Ingredients	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
Bayer Permanone RTU	3.98% Permethrin and 8.48% Piperonyl butoxide	EPA 432-1277	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
Bayer Pyrenone Crop Spray	6% Pyrethrins and 60% Piperonyl butoxide	EPA 432-1033	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
Clarke Anvil 10+10 ULV	10% Sumithrin and 10% Piperonyl butoxide	EPA 1021-1688	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
Clarke Anvil 2+2 ULV	2% Pyrethrins and 2% Piperonyl butoxide	EPA 1021-1687-8329	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
Clarke AquaAnvil	10% Sumithrin and 10% Piperonyl butoxide	EPA 1021-1807-8329	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
Clarke Biomist 31 + 66 ULV	31.28% Permethrin and 66% Piperonyl butoxide	EPA 8329-43	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
Clarke Biomist 4 + 12 ULV	4% Permethrin and 12% Piperonyl butoxide	EPA 8329-34	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban

Table 2-3 Adulticides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Mosquito Abatement

Pesticide Product Name	Common Name / Active Ingredients	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
Clarke Biomist 4 + 4 ULV	4% Permethrin and 4% Piperonyl butoxide	EPA 8329-35	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
Clarke Duet Dual-action Adulticide	1% Prallethrin and 5% Sumithrin and 5% Piperonyl butoxide	EPA 1021-1795-8329	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
Evergreen Crop Protection EC 60-6	6% Pyrethrins and 60% Piperonyl butoxide	EPA 1021-1770	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
MasterLine Aqua Kontrol Concentrate	20% Permethrin and 20% Piperonyl butoxide	EPA 73748-1	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
MasterLine Kontrol 30-30	30% Permethrin and 30% Piperonyl butoxide	EPA 73748-5	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
MasterLine Kontrol 2-2	2% Permethrin and 2% Piperonyl butoxide	EPA 73748-3	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
MasterLine Kontrol 4-4	4.6% Permethrin and 4.6% Piperonyl butoxide	EPA 73748-4	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban

Table 2-3 Adulticides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Mosquito Abatement

Pesticide Product Name	Common Name / Active Ingredients	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
MGK Pyrocide Mosquito Adulticide 7396	5% Pyrethrins and 25% Piperonyl butoxide.	EPA 1021-1569	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
MGK Pyrocide Mosquito Adulticide 7395	12% Pyrethrins and 60% Piperonyl butoxide.	EPA 1021-1570	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
Prentox PERM-X UL 4-4	4% Permethrin and 4% Piperonyl butoxide	EPA 655-898	Adulticide interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
Prentox Pyronyl Crop Spray	6% Pyrethrins and 60% Piperonyl butoxide	EPA 655-489	Adulticide; interferes with sodium channel function in the nervous system	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
Scourge 18% + 54%*	18% Resmethrin and 54% Piperonyl butoxide	EPA 432-667	Adulticide; interferes with sodium channel function in the nervous system.	January - December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban
Scourge 4% + 12%*	4.14% Resmethrin and 12.42% Piperonyl butoxide	EPA 432-716	Adulticide; interferes with sodium channel function in the nervous system.	January – December	Truck-mounted ULV Handheld ULV Backpack ULV	Rural, semi-rural, urban

*Scourge pesticides to be replaced with Pyrenone 25-5 Public Health Insecticide, EPA Number 432-1050, in 2012.

CAS Number = Chemical Abstracts Service Registry Number

EPA Number = Registered with the US Environmental Protection Agency

A common aerial adulticiding technique applies the insecticide in a technical concentrate or in a very high concentration formulation as a ULV cold aerosol. Lighter aircraft, including helicopters, can be used because the insecticide load is a fraction of the other techniques. If the aircraft are capable of >120 knots, fine droplets can be created by the high-speed air stream impacting the flow from hydraulic nozzles. Slower aircraft and most helicopters typically use some variety of rotary atomizers to create the required droplet spectrum. ULV applications can be difficult to accurately place with any regularity. Without the visual cues, drift and settling characteristics can be difficult to assess.

The flight parameters differ by program and technique. Some operations fly during hours of daylight, so their applications begin either at morning's first light or before sunset and work into twilight. At these times, the pilots should be able to see towers and other obstructions as well as keep track of the spray plume. The aircraft can be flown at less than a 200-foot altitude, which may make it easier to hit the target area.

Other operations may be conducted in the dark of the night, typically after twilight or early in the morning before dawn. The aircrafts typically are flown between a 200- and 300-foot altitude. Swath widths vary from operation to operation but are normally set somewhere between 400 and 1,200 feet. Most mosquito flight activity is crepuscular, so these flights catch the adults at their peak activity.

Swaths are flown as close to perpendicular with the wind as is possible, working into the wind and commonly forming a long, tight S pattern. A number of factors affect the spray-drift offset and settling such as wind speed, droplet size, aircraft wake turbulence, altitude, and even characteristics of the individual aircraft. Pilots rely somewhat on experience for determining this offset, and some use telltale smoke or paper markers for swath alignment.

Aerial applications may be conducted over, but are not limited to, the following land uses within the Program Area: residential, commercial, and industrial areas.

2.3.5.2 Yellow Jacket and Tick Abatement

Besides using insecticides for mosquito populations, the District selectively applies them to control ground-nesting yellow jackets, as well as to control tick populations that pose an imminent threat to people or to pets. This activity is generally triggered by public requests for District assistance or action rather than as a result of regular surveillance of their populations. The District excludes from its yellow jacket control program populations of this vector that are located in or on a structure. Yellow jacket nests that are off the ground would be treated under special circumstances to protect public health and safety of the District's residents. Whenever a District technician learns that a hive is situated inside or on a structure, the resident(s) are encouraged to contact a private pest control company that is licensed to perform this work. When a technician encounters a honeybee swarm or unwanted hive, residents are referred to the San Mateo County Beekeepers Guild, a group that can safely remove the bees. If a District technician deems it appropriate to treat stinging insects, they will apply the insecticide directly within the nest in accordance with the District's policies to avoid drift of the insecticide or harm to other organisms. Alternatively, they will place tamper-resistant traps or bait stations, selective for the target insect, in the immediate environment of the vector (which is equivalent to "other vertebrate vector control").

Tick control is done on a limited basis as demonstration projects in areas with a high density of ticks or a high risk of tick-borne disease to the public. Tick control consists of treating specific areas where humans would be exposed to high numbers of ticks. Also, tick control could involve a demonstration project in which a tube with a strip of absorbent material at its entrance is treated with a pesticide that rubs off onto a rodent when they enter it.

Pyrethroid-based chemicals are typically used against ground-nesting yellow jackets and ticks. The potential environmental impacts of these materials is minimal due to two factors: (1) their active ingredients consist largely of pyrethrin (a photosensitive natural insecticide manufactured from a Chrysanthemum species), or allethrin, and phenothrin (first generation synthetic pyrethroids with similar photosensitive, nonpersistent characteristics as pyrethrin), and (2) the mode of their application for yellow jacket population control (i.e.,

directly into the underground nest) prevents drift and further reduces the potential for inadvertent exposure to these materials. The pesticides used by the District to control yellow jacket and tick populations are shown in Table 2-4 (Pesticides Used or Proposed for Use by the District for Yellow Jacket Wasp Abatement) and Table 2-5 (Pesticides Used or Proposed for Use by the District for Tick Abatement).

2.3.5.3 Rat Abatement

The District has more recently developed a rat population control program to serve residents in the Service Area. The limited use of rodenticides by the District is not performed as result of surveillance, but in response to District resident requests. Table 2-6 (Pesticides Used or Proposed for Use by the District for Rat Abatement) lists the pesticides used by the District for control of rats. Two different groups of anticoagulant rodenticides, known as first generation and second generation rodenticides, may be utilized by the District. First generation rodenticides require consecutive multiple doses or feedings over a number of days to be effective. Concentrations of active ingredient in the bait typically range from 0.005 to 0.1 percent. Second generation rodenticides are lethal after one dose and are effective against rodents that have become resistant to first generation rodenticides. Concentrations of active ingredient in the bait typically range from 0.001 to 0.005 percent, as these anticoagulant baits are far more toxic than first generation baits. A neurotoxin type of rodenticide may also be used where rapid breakdown of the active ingredient is desired to minimize the potential for secondary poisoning of nontarget animals.

The District may conduct rodent baiting at underground sites such as sewers, storm drains, catch basins. Secure bait stations or other accepted methods of rodent baiting are conducted in areas with severe rodent infestations. In sewer baiting, bait blocks containing bromadiolone (a second generation, single-feeding anticoagulant rodenticide) are often used. The block is suspended by wire above the water line to encourage rodent feeding.

The District takes part in a control program that consists of baiting along aboveground public storm control waterways, primarily in residential and commercial areas including urban creeks and not in recreational areas. Bait stations could be placed at the edge of public areas such as the untraveled edge along a fence in a remote section of a park. The bait is placed in an anchored tamper-proof bait station that only allows the target animal (mostly rats) to enter to eat the bait and then to leave the station to die. If the entrance size is compromised from animal gnawing, then the bait station is disposed of and replaced with a new one. All stations are labeled with a caution sticker, contents, and District information. All bait stations must be located a safe distance above the water line, and every effort is made to take advantage of natural vegetation and other factors to conceal the stations from children to the greatest extent possible. All stations are placed within 50 feet of a man-made structure unless a “feature” is associated with the site beyond 50 feet that is harboring rodents that could infest the main structure. Under no circumstances are bait stations placed in areas where children are known to play. In areas where it is obvious that children do not play, the bait stations must still be adequately concealed so they are not conspicuous to the ordinary child. In addition, the areas being baited are in heavily residential areas that contain very few predatory birds and no foxes, mountain lions, or other predators. If the presence of predatory animals exists, the technician will select a less toxic bait to reduce the chance of secondary poisoning. Dead rodents are picked up and disposed of if seen during inspection periods. The baits are applied largely by a third party PCO, and the District acts as a quality control component. In certain circumstances, District staff will place the bait stations themselves. The bait is monitored regularly and, depending on results, may be moved to other locations if rodent activity is low. Bait stations may also be place in public rights-of-way and on public property.

Table 2-4 Pesticides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Yellow Jacket Wasp Abatement

Pesticide Product Name	Common Name / Active Ingredients	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
Pesticides in Current Use						
Astro® Ortho® products Bonide® products Tengard® products, etc.	Permethrin	CAS 51877-74-8 (trans-isomer) CAS 52645-53-1 (mixed isomers) CAS 54744-45-7 (cis-isomer)	Pyrethroid; Interferes with sodium channel function in the nervous system	April-October	Hand	Residential, Commercial Agriculture
Delta Dust	Deltamethrin	CAS 432-772	Pyrethroid; Interferes with sodium channel function in the nervous system	April-October	Hand	Residential, Commercial Agriculture
Drione	Pyrethrins, Piperonyl Butoxide, Amorphous Silica Gel	CAS 432-992	Pyrethrins; Insect nervous system stimulation / dehydration	April-October	Hand	Residential, Commercial Agriculture
Spectracide Pro®	Tetramethrin, Permethrin, Piperonyl Butoxide	EPA 9688-141-8845	Pyrethroid; Interferes with sodium channel function in the nervous system	April-October	Hand	Residential, Commercial Agriculture
Spectracide®	Prallethrin, Lambda-cyhalothrin	EPA 9688-190-8845	Pyrethroid; Interferes with sodium channel function in the nervous system	April-October	Hand	Residential, Commercial Agriculture
Suspend® DeltaGard®	Deltamethrin	CAS 52918-63-5	Pyrethroid; Interferes with sodium channel function in the nervous system	April-October	Hand	Residential, Commercial Agriculture
Wasp-Freeze	d-trans Allethrin, Phenothrin	EPA 499-362	Pyrethroid; Interferes with sodium channel function in the nervous system	April-October	Hand	Residential, Commercial Agriculture

Table 2-4 Pesticides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Yellow Jacket Wasp Abatement

Pesticide Product Name	Common Name / Active Ingredients	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
Pesticides Under Consideration for Future Use						
MPEDE	Potassium Salts of Fatty Acids	CAS 53219-6	Fills tracheae or asphyxiation	April-October	Hand	Residential, Commercial Agriculture
Onslaught Microencapsulated	Esfenvalerate	EPA 1021-1815	Sodium channel modulator	April-October	Onslaught is one of the only products on the market that can be used to bait for Yellow Jackets. Hand	Residential, Commercial Agriculture
Raid® products Scourge®, etc.	Resmethrin	CAS 10453-86-8	Pyrethroid; Interferes with sodium channel function in the nervous system	April-October	Hand	Residential, Commercial Agriculture
Scimitar® Demand	Lambda-cyhalothrin	CAS 91465-08-6	Pyrethroid; Interferes with sodium channel function in the nervous system	April-October	Is this in a can from the hardware store? If so, then hand	Residential, Commercial
Wasp – X	Etofenprox, Tetramethrin, Piperonyl butoxide	EPA 2724-786	Pyrethroid; Interferes with sodium channel function in the nervous system	April-October	Hand	Residential, Commercial Agriculture

Notes

CAS Number = Chemical Abstracts Service Registry Number

EPA Number = Registered with the US Environmental Protection Agency

Table 2-5 Pesticides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Tick Abatement

Pesticide Product Name	Common Name / Active Ingredients	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
Pesticides in Current Use						
Suspend® Polyzone	Deltamethrin	EPA 432-1514	Pyrethroid; Interferes with sodium channel function in the nervous system	November - August	Hand	residential areas, parks, campgrounds, along trails
Suspend® DeltaGard®	Deltamethrin	CAS 52918-63-5	Pyrethroid; Interferes with sodium channel function in the nervous system	November - August	Hand	residential areas, parks, campgrounds, along trails
Delta Dust	Deltamethrin	CAS 432-772	Pyrethroid; Interferes with sodium channel function in the nervous system	April-October	Hand	Residential, Commercial Agriculture
Drione	Pyrethrins, Piperonyl Butoxide, Amorphous Silica Gel	CAS 432-992	Pyrethrins; Insect nervous system stimulation / dehydration	April-October	Hand	Residential, Commercial Agriculture
Pesticides Under Consideration for Future Use						
Astro® Ortho® products Bonide® products Tengard® SFR, etc.	Permethrin	CAS 51877-74-8 (trans-isomer) CAS 52645-53-1 (mixed isomers) CAS 54774-45-7 (cis-isomer)	Pyrethroid; Interferes with sodium channel function in the nervous system	January-December	Truck-mounted sprayer; backpack sprayer, hand can	Residential, Commercial Agriculture
Pyrenone® Kicker® Organic Solutions All Crop Commercial & Agricultural Multipurpose Insecticide®	Pyrethrin	CAS 121-21-1	Natural pyrethrins; Insect nervous system stimulation	January-December	Truck-mounted sprayer; backpack sprayer, hand can	Residential, Commercial Agriculture

Table 2-5 Pesticides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Tick Abatement

Pesticide Product Name	Common Name / Active Ingredients	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
Onslaught Microencapsulated	Esfenvalerate	EPA 1021-1815	Sodium channel modulator	April-October	Onslaught is one of the only products on the market that can be used to bait for Yellow Jackets. Hand	Residential, Commercial Agriculture

CAS Number = Chemical Abstracts Service Registry Number
EPA Number = Registered with the US Environmental Protection Agency

Table 2-6 Pesticides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Rat Abatement

Pesticide Product Name	Common Name / Active Ingredients	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
Pesticides in Current Use						
Contrac All-Weather Blox	Bromadiolone 0.005%	EPA 12455-79	Second-generation anticoagulant	January - December	Hand	sewer vaults, urban creek corridors, riprap areas
Contrac Super-Size Blocks	Bromadiolone 0.005%	EPA 12455-82	Second-generation anticoagulant	January - December	Hand	sewer vaults, urban creek corridors, riprap areas
Ditrac Blox All-Weather Blox	Diphacinone 0.005%	EPA 12455-80	First-generation anticoagulant	January - December	Hand	sewer vaults, urban creek corridors, riprap areas
Final All-Weather Blox	Brodifacoum 0.005%	EPA 12455-89	Second generation anticoagulant	January - December	Hand	Sewer vaults, urban creek corridors, riprap areas
Tomcat Ground Squirrel Bait	Diphacinone	CAS 82-66-6	First-generation anticoagulant	March - October	Hand	Ground squirrel habitat
Pesticides Under Consideration for Future Use						
Adios	Diphacinone 0.005% Imidacloprid 0.020%	EPA 72500-18	First-generation anticoagulant and Flea Control	January - December	Hand	Inside nonresidential structures or within 50 feet of structures
Agrid3	Cholecalciferol 0.075%	EPA 12455-117-3240	Hypercalcemia, CNS depression	January - December	Hand	Sewer vaults, urban creek corridors, riprap areas
BootHill® Paraffinized Pellets	Bromadiolone 0.005%	EPA 7173-188	Second-generation anticoagulant	January - December	Hand	Ground squirrel habitat

Table 2-6 Pesticides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Rat Abatement

Pesticide Product Name	Common Name / Active Ingredients	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
BootHill Rodenticide Bulk Pellets	Bromadiolone 0.005%	EPA 21891	Second-generation anticoagulant	January - December	Hand	Ground squirrel habitat
Di-Kill	Difenacoum 0.005%	EPA 47629-14-61282	Second-generation anticoagulant	January - December	Hand	Sewer vaults, urban creek corridors, riprap areas
First Strike Soft Bait	Difethialone 0.0025%	EPA 7173-258	Second-generation anticoagulant	January - December	Tamper-resistant bait stations	Sanitary sewers, residential, industrial, commercial, agricultural
Generation Pellets	Difethialone 0.0025%	EPA7173-205	Second generation anticoagulant	January - December	Tamper-resistant bait stations	Sanitary sewers, residential, industrial, commercial, agricultural
Giant Destroyers	Sodium nitrate 50% Sulfur 38%	EPA 10551-1	Fumigant	January - December	Hand	Within burrows of targeted species
Havoc Rodenticide Pellets	Brodifacoum 0.005%	EPA 100-1052-61282	Second generation anticoagulant	January - December	Tamper-resistant bait stations	Residential, industrial, commercial, agricultural
Hawk Rodenticide Ready to Use Place Pacs	Bromadiolone 0.005%	EPA 12455-76-3240	Second-generation anticoagulant	January - December	Hand, tamper-resistant bait stations	Sanitary sewers, residential, industrial, commercial
Hombre Mini Blocks	Difethialone 0.0025%	EPA 7173-218	Second-generation anticoagulant	January - December	Attach by wire, tamper-resistant bait stations	Sanitary sewers, residential, industrial, commercial, agricultural

Table 2-6 Pesticides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Rat Abatement

Pesticide Product Name	Common Name / Active Ingredients	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
Hombre Pellets Place Packs	Difethialone 0.0025%	EPA 7173-211	Second-generation anticoagulant	January - December	Hand, tamper-resistant bait stations	Sanitary sewers, residential, industrial, commercial, agricultural
J.T. Eaton AC, Contrac pellets	Chlorophacinone	CAS 3691-35-8	First-generation anticoagulant	January - December	Tamper-resistant bait stations	Residential, industrial, commercial, agricultural
Jaguar Rodenticide Ready to Use Place Pac	Brodifacoum 0.005%	EPA 12455-91-3240	Second generation anticoagulant	January - December	Tamper-Resistant Bait Stations	Residential, industrial, commercial, agricultural
Large Gas Cartridge	Sodium nitrate	EPA 56228-21	Fumigant	January - December	Hand	Within burrows or targeted species
Maki Rodenticide Bait Packs	Bromadiolone 0.005%	EPA 7173-208	Second-generation anticoagulant	January - December	Hand; Tamper-resistant bait stations	Sanitary sewers, residential, industrial, commercial, agricultural
P.C.Q. Pelleted Rodent Bait	Diphacinone	EPA 780146	First-generation anticoagulant	January - December	Tamper- resistant bait stations	Sanitary sewers, residential, industrial, commercial, agricultural
Rampage All-Weather Bait Chunx	Bromethalin 0.01%	EPA 12455-95-3240	Neurotoxin	January - December	Attach by wire, tamper-resistant bait stations	Sanitary sewers, residential, industrial, commercial
Resolv Soft Bait	Bromadiolone 0.005%	EPA 7173-297	Second-generation anticoagulant	January - December	Tamper-resistant bait stations	Sanitary sewers, residential, industrial, commercial, agricultural

Table 2-6 Pesticides Used or Proposed for Use by the San Mateo County Mosquito and Vector Control District for Rat Abatement

Pesticide Product Name	Common Name / Active Ingredients	CAS or EPA Number	Mode of Action	Timing of Application	Method of Application	Sites
Talon G Rodenticide Pellets	Brodifacoum 0.005%	EPA 10182-336	Second generation anticoagulant	January - December	Tamper-resistant bait stations	Residential, industrial, commercial, agricultural
Terad3 AG Blox	Cholecalciferol 0.075%	EPA 12455-116	Hypercalcemia, CNS depression	January - December	Attach by wire, tamper-resistant bait stations	Sanitary sewers, residential, commercial
TomCat Rodenticide	Diphacinone 0.005%	EPA 12455-81-3240	First-generation anticoagulant	January - December	Tamper-resistant bait stations	Residential, industrial, commercial, agricultural

Notes:

CAS Number = Chemical Abstracts Service Registry Number

EPA Number = Registered with the US Environmental Protection Agency

2.3.6 Other Nonchemical Control/Trapping Alternative

This tool includes the trapping of rodents that pose a threat to public health and welfare using tamper-resistant or baited traps. District staff place the trap(s) primarily at the request of the property owner or manager. When requests for yellow jacket pest removal in or on structures occurs, citizens are advised on the proper way to choose a local private pest control company, because the District is not licensed for this type of activity.

Trapping is also used for the removal of nuisance wildlife such as skunks, raccoons, and opossums when these animals pose a threat to public health and safety. Skunks are one of the primary reservoir vectors of rabies in California. Raccoons carry raccoon roundworm (*Baylisascaris procyon*) which can cause severe brain damage in children. There is no effective treatment for raccoon roundworm. A survey of raccoons in San Mateo County in 2007 revealed that 80 percent of local raccoons were infested with raccoon roundworm. Opossums are a reservoir of murine typhus. Skunks, raccoons and opossums live in close proximity to humans and their pets because of their ability to adapt to the urban/suburban environment. Residential landscapes provide them with an abundance of food and shelter options that have increased their numbers and the potential for direct contact with the human population. This scenario is true for all wildlife and because of it a potential rabies health threat exists. The District works with home and property owners to discourage wildlife such as skunks and bats from taking up residence on their property. Upon a service request, the District's Vector Control Technicians will survey the property and provide guidance and recommendations on exclusion methods to minimize their impact on the property and on ways to minimize factors that may draw these animals to the property. If all efforts have been made and the problem remains or there is a threat of physical injury or economic damage is imminent, the District may trap the animal and remove it from the property.

Current protocol is to have the property owner contact a private licensed pest control company to remove the animal. Alternatively, in the future, the District may loan live catch traps if specific criteria are met. Residents are requested to check traps every morning and promptly report trapped animals to the District. Failure to comply with this will result in removal of the trap. Captured skunks are humanely euthanized using carbon dioxide gas in compliance with California Fish and Game Code prohibiting the translocation of trapped animals, which would create a risk of spreading disease.

Concerning raccoons and skunks, in the future, if all efforts are tried and the problem remains or threat of physical injury or economic damage is imminent, then a live trap may be set on the property, and the resident would be requested to check the trap every morning and promptly report trapped animals to the District. It is against California Fish and Game laws and regulations to relocate wildlife. All trapped animals are either released on site or euthanized. Suspect animals that have injured a human or their pet, or appear to be sick, are submitted to the San Mateo County Environmental Lab for rabies testing.

2.4 Public Education

Public education is a key component that is used to encourage and assist reduction and prevention of vector habitats on private and public property. While this component is a critical element of the District's Program, most public education activities are categorically exempt from CEQA review (CEQA Guidelines Section 15322) based on a finding by the State Secretary of Resources that these activities do not have a significant effect on the environment. Therefore, these activities, when separate from surveillance and the control alternatives, will not be further reviewed in this document.

A solid mosquito/vector prevention program includes good public education. The District's education program teaches the public how to recognize, prevent, and suppress mosquito/vector breeding on their property. This part of the project is accomplished through the distribution of brochures, fact sheets, newsletters, participation in local events and fairs, a District-sponsored open house, presentations to community organizations, newspaper and radio advertising, public service announcements, and contact with District staff in response to service requests. Public education also includes a school program that

teaches future adults to be responsible by preventing and/or eliminating vector breeding sources and educates their parents or guardians about District services and how they can reduce vector-human interaction. Any distribution of educational materials or advice associated with surveillance, physical control, vegetation management, biological control, chemical control, and other nonchemical control/trapping components of the District's overall Program does not add to the impact analyses conducted in this PEIR for these alternatives. For example, if the District determines that it needs to implement control activity on a site in response to a request for service, that activity is evaluated for potential impacts on the environment. The educational activity to the property owner on how to avoid creating a vector control problem is not the environmental impact issue in responding to a request for service by the District.

Educational activities also include making recommendations on specific property development and land and water management practices or proposals, in response to ongoing or proposed developments or management practices that may create sources of mosquitoes/vectors. To ensure that the District does not indirectly encourage environmental impacts without CEQA review, the District informs landowners and others who might modify the physical environment in response to vector control educational programs that they have specific environmental compliance obligations, including compliance with CEQA and agency permit requirements. The District is not a permitting agency and it is not responsible for implementing or approving the recommendations; therefore, property owners or developers are required to prepare and submit their own documents for projects which may require CEQA review.

2.5 Emergency Activities

In the event of emergency conditions, comprising an actual or imminent disease outbreak declared by the CDPH, the District's Program activities will temporarily vary from its routine operational tools through increases in scope or intensity of methods, and potentially through use of legal pesticides, in strict conformance with label requirements, that are not routinely used by the District. Because of their temporary nature and their similarity to routine activities, emergency activities are not evaluated separately in this PEIR. In addition, the state has recognized that emergency conditions may require prompt action of a nature or intensity above typical levels as a means to protect public health, welfare, safety, or property, and has exempted these activities from requirements for further environmental review (CEQA Guidelines Sections 15269, 15359).

2.6 Vehicles and Equipment Used to implement the Program

Equipment listed and described herein is those mechanized items with engines or applicators that have the potential to affect air quality, greenhouse gas emissions, noise, or hazard evaluations for the environmental impact analyses. The specific types of District vehicles and equipment, and aerial equipment used by other pesticide applicators under contract, used in its Program are listed in Table 2-7 (District Vehicle and Equipment List). The list includes vehicles, vehicle-borne pesticide applicators, personnel-borne applicators, and power tools. Nonmechanized equipment such as trailers and hand rakes is not included.

Table 2-7 San Mateo County Mosquito and Vector Control District Vehicles and Equipment

Type of Vehicle/Equipment	Engine	Fuel Type
Ground Surveillance and Applications/Management		
Dodge Power Wagon 1948	230 ci, 94 hp	Gasoline
Chevy 2500 pickup truck 4x4	6.0 liter	Diesel
Ford F-150 pickup truck 4x4	Varied 5.4 liter to 6.2 liter	Gasoline
Hyundai Sonata Hybrid	1.8 liter hybrid	Gasoline/electric
Ford Escape Hybrid 4x4	2.3 liter hybrid	Gasoline/electric
Jeep Wrangler (Right Hand Drive)	3.8 liter	Gasoline
Ford Ranger pickup truck 4x4	4.0 liter	Gasoline
Nissan Frontier Pro4X pickup truck 4x4	4.0 liter	Gasoline
Toyota Sienna Van	3.5 liter	Gasoline
Nurse Rig 200 gal tank and sprayer	Honda GX 120, 4.0, 119 cc	Gasoline
Argo Avenger (off road)	41.1 cc 26 hp	Gasoline
Argo Avenger Trailer	n/a	
Argo 25-gallon Mounted Sprayer	Electric 12v	
Fork Lift - hydraulic	Mazda 2.0 liter	propane
Pallet Jack	n/a	
Westward Floor Jack 5ML67 3 tons	n/a	
P1 Handheld ULV Sprayer	Robyn ECO2EHR	Gas/oil mix
Micron ULVA Fan ULV Sprayer	Electric 6v	
Porta-Pak ULV Backpack Sprayer	Hudson 78.5 cc	Gas/oil mix
Maruyama Power Mister/Duster Backpack Sprayer	Kawasaki 40.2 cc	Gas/oil mix
Curtis Dyna-Fog Twister XL ULV Backpack Sprayer	Tanaka 40 cc	Gas/oil mix
Clark Grizzly ULV Truck-mounted Sprayer	B&S OHV 694 cc, 18 hp	Gasoline
Univar Dyna-Jet ULV Electric Truck-mounted Sprayer	Electric 12v	
Hydro Tech Hydraulic 25-gallon Truck-mounted Sprayer	Honda GX 120, 4.0, 119 cc	Gasoline
Hydro Tech Hydraulic 50-gallon Truck-mounted Sprayer	Honda GX 120, 4.0, 119 cc	Gasoline
Jeep Mounted 24-gallon Sprayer	Electric 12v	
Argo seeder	Electric 12v	
Mozzie granular applicator	Electric 12v	
Kelly seeder	n/a	
Birchmeier Backpack Sprayers 2.5 gal	n/a	
Birchmeier Backpack Sprayers 4 gal	n/a	
Birchmeier Backpack Sprayers 5 gal	n/a	
Hotsy High Pressure Washer	Electric 110v	
Band Saw – Dayton 15” – 6Y002B	Electric 110v	
Dewalt 10” Compound Miter Saw DW703	Electric 110v	

Table 2-7 San Mateo County Mosquito and Vector Control District Vehicles and Equipment

Type of Vehicle/Equipment	Engine	Fuel Type
Welder – Dayton 3Z564A	Electric 220v	
Parts Washer Vehicle Shop	Electric 110v	
Dewalt 14" Multicutter Metal Saw	Electric 110v	
Atlas Tire Balancer	n/a	
Atlas Tire Changer	n/a	
Fay Mosquito Trap	Electric 6v	
CO2 Mosquito Trap	Electric 6v	
New Jersey Light Mosquito Trap	Electric 110v	
Chicken coops for sentinel chickens	n/a	
Hand Compressed 1 gal Sprayer	n/a	
Hand Compressed 2 gal Sprayer	n/a	
Hand Compressed 3 gal Sprayer	n/a	
Hand Compressed 4 gal Sprayer	n/a	
Hand Compressed 5 gal Sprayer	n/a	
Yellow jacket Duster	n/a	
Echo handheld blower PB 23 ILN	22.8 cc	Gas/oil mix
Echo backpack blower	40.2 cc	Gas/oil mix
Stihl Chainsaw 084		Gas/oil mix
Stihl Chainsaw MS440	71 cc	Gas/oil mix
Stihl Chainsaw 026		Gas/oil mix
Stihl Chainsaw 021	35 cc	Gas/oil mix
Stihl Chainsaw 039		Gas/oil mix
Stihl Chainsaw 290	56 cc	Gas/oil mix
Stihl Chainsaw 260	50 cc	Gas/oil mix
ECHO Chainsaw CS 301	33.4 cc	Gas/oil mix
Stihl Trimmer HS 85	23 cc	Gas/oil mix
ECHO Weed Eater SRM 225	21.2 cc	Gas/oil mix
Stihl Weed Eater FS 250	40.2 cc	Gas/oil mix
2500 Gal Water Truck 01 Int 8000 (Operated by Alpine Helicopter – Contractor) GW 52,000 lbs	10.3 liter	Diesel
2000 Gal Water truck 99 Int 4700 (Operated by Alpine Helicopter – Contractor) GW 33,000 lbs	7.6 liter	Diesel
2000 Gal Water truck 97 Ford Louisville (Operated by Alpine Helicopter – Contractor) GW 33,000 lbs	7.9 liter	Diesel
99 Ford F550 Flat Bed 4X4 truck	7.3 liter	Diesel
Ball Mix Trailer	n/a	
Big Mix Trailer	n/a	

Table 2-7 San Mateo County Mosquito and Vector Control District Vehicles and Equipment

Type of Vehicle/Equipment	Engine	Fuel Type
Water Surveillance and Applications/Management		
Marsh “Jon” Flat bottom boat	123 cc 4 hp	Gasoline
Marsh “Jon” Flat bottom boat trailer	n/a	
GTO Airboat	454 cubic inches: output 600hp	Gasoline
GTO Airboat Trailer	n/a	
GTO Airboat 50 gallon spray tank	Robin EHO35, 33.5cc	Gas/oil mix
Klamath Boat 14’	20 hp	4 stroke Gasoline
Klamath 14’ Boat trailer	n/a	
Hydro Tech Hydraulic 25-gallon Boat-Mounted Sprayer	Honda GX 120, 4.0	Gasoline
Klamath Boat 18’	70 hp, Suzuki	4 stroke Gasoline
Klamath 18’ Boat trailer	n/a	
Hydro Tech Hydraulic 50-gallon Boat-Mounted Sprayer	Honda GX 120, 4.0	Gasoline
Argo Avenger (off road)	41.1 cubic inches 26 hp	Gasoline
Argo Avenger Trailer	n/a	
Argo 25-gallon Mounted Sprayer	Electric 12v	
Birchmeier Backpack Sprayers 2.5 gal	n/a	
Birchmeier Backpack Sprayers 4 gal	n/a	
Birchmeier Backpack Sprayers 5 gal	n/a	
Hand Compressed 3 gal Sprayer	n/a	
Hand Compressed 4 gal Sprayer	n/a	
Hand Compressed 5 gal Sprayer	n/a	
Mozzie granular applicator	Electric 12v	
Water Pump	Tanaka TCP 381	Gas/oil mix
Agnique spray bottle	n/a	
Aerial Applications		
1968 Bell 206 Jet Ranger helicopter (Operated by Alpine Helicopter – Contractor) 120 gal material tank	Allison 250-C20J turboshaft, 420 shp	Jet fuel
1989 Bell 206 Jet Ranger helicopter (Operated by Alpine Helicopter – Contractor) 120 gal material tank	Allison 250-C20J turboshaft, 420 shp	Jet fuel
1960 Hiller Soloy helicopter (Operated by Alpine Helicopter – Contractor) 120 gal material tank	Allison 250-C20J turboshaft, 420 shp	Jet fuel
Isolair Air spray system model 3900 (helicopter-mounted)	n/a	
Isolair 4400 bucket system (helicopter-mounted)	n/a	
Isolair 4500 broadcaster (helicopter-mounted)	n/a	

2.6.1 Vehicles and Equipment for Ground Surveillance and Chemical Application

The District uses open bed 4-wheel drive pickup trucks that have been modified for the particular Program activity. Generally, a chemical container tank, high-pressure, low-volume electric or gas pump, and spray nozzle are mounted in the back of the bed, with a switch and extension hose allowing the driver to operate the equipment and apply larvicides. When treatment sites cannot be accessed by roads, access is by way of ATVs or by foot (if vehicle access is prohibited), and treatments are made using handheld sprayers or belly grinders (for granular or pellet formulations). Some situations where flooding and wetlands preclude access by 4-wheel drive vehicles or reasonable walking distance in waders/boots do require the use of an approved ATV. District staff do not use ATVs where environmental conditions (e.g., impenetrable vegetation/terrain, endangered/threatened plants, sensitive habitat) can result in causing an accident, personal injury, or significant environmental damage. When used, ATVs are fitted with a chemical container mounted on the vehicle, a 12-volt electric- or gasoline-engine-powered pump supplying high-pressure, low-volume flow, and a hose and spray tip allowing for application while steering the vehicle. ATVs are ideal for treating areas like agricultural fields, pastures, salt marshes, and other offroad sites. The District does not use heavy equipment for vegetation management but could engage a contractor with heavy equipment if needed in the future.

Additional equipment used in ground applications includes handheld sprayers, seeders, and backpack sprayers/blowers. Handheld sprayers (hand cans) are standard 1- or 2- or 2- or 3-gallon garden style pump-up sprayers used to treat small isolated areas with precision. Backpack sprayers are either gas or hand powered and are fitted with chemical tanks that can hold granular or pellet formulations in addition to liquid. Generally, for smaller areas, pellet or small granular material is applied with a mechanical hand-crank spreader, seeder, or backpack blower.

2.6.2 Boats for Water Surveillance and Application

District personnel use a 20-foot aluminum airboat or a 16-foot aluminum outboard-equipped boat to inspect and treat large, areas of salt marsh and islands. They are commonly used for carrying personnel to various locations throughout the Don Edwards Wildlife Area and specifically Bair Island. The boat is required to inspect and treat the offshore portions of Bair Island for mosquitoes. Further, boat operations do not have lasting environmental impacts. The airboat allows for access to tidal areas for inspection and treatment at low tide.

2.6.3 Aerial Application

The District contracts with an agricultural application service to provide helicopter treatments to large source areas of 100 to 3,000 acres. Helicopter operations are done at very low altitude in areas away from people. The advantage of using a helicopter is the high rate of application to large areas without contact with the ground surface (no disturbance of vegetation) at a reasonable cost per acre. A helicopter can treat up to 200 acres per hour. A second advantage of treatment by helicopter, is treatment of sources with cattails or tules or other thick, tall vegetation. In sites such as these, it is difficult to get the material through the vegetation and into the water without applying it from the air. Helicopter treatments occur during daylight hours, typically before noontime when little or no wind (less than 10miles per hour) occurs, and at an altitude that is typically less than 40 feet above the surface of the site being treated. For application of liquid formulations of larvicides to waterbodies, a 120-gallon tank is used with a typical application rate of 2 gallons of final mix per acre. Although very cost prohibitive, the application rate can be increased to 5 gallons per acre when a larger droplet size is desired to further minimize potential drift issues. Typically, aerial larvicide treatments are done using granular Bs and Bti formulations at a target rate of 10-20 pounds per acre. If dense vegetation is present, application rates may increase to up to 20 pounds per acre but they normally do not exceed 12 pounds per acre.

The District does not foresee using fixed-wing aircraft for aerial applications at present, but could use them in the future if needed.

2.7 Program Alternatives

A range of project alternatives has been developed by the District, partially as result of input from the scoping process, and these alternatives and others are briefly described and evaluated in a technical report to the PEIR (Appendix E, Alternatives Analysis Report). Additional analysis of alternatives to the Proposed Program is contained in Chapter 15, Alternatives.

2.7.1 No Program Alternative

CEQA Guidelines require an analysis of the "No Project" Alternative, which is defined as what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services [Section 15126.6, Subdivision (e)(2)]. For Program purposes, the No Project Alternative would be equivalent to "no action" or to discontinue the Program described above. In the absence of continuing the current Program, the District would exist solely to engage in public education control activities. See Section 15.3.

2.7.2 Alternatives Eliminated from Further Consideration

These alternatives are identified and evaluated in the Napa County Mosquito Abatement District (NCMAD) Alternatives Analysis Report adopted by the District for use in this PEIR (included herein as Appendix E) and summarized in Section 15.2 of this PEIR. They include the following:

> *Biological Control pathogens (viruses)* is deemed infeasible as no viral pathogens are commercially available in California and this method currently has many efficacy-related issues.

> *Biological Control (parasites)* is deemed infeasible as this material is not commercially available in California. Research on the use of parasites for mosquito control has also shown several limitations related to efficacy.

> *Mass Trapping* is not considered by the District to be a practical, effective, reliable method of controlling vector populations. Can be very expensive and time consuming (i.e., labor intensive) and is not effective.

> *Attract and Kill* is not considered by the District to be a practical, effective, reliable, method of controlling vector populations. The technology for both mosquitoes and yellow jackets is limited, and effectiveness is either not obtained or is inconsistent. Nontarget insects can be impacted. The District is aware of one commercially available Attractive Toxic Sugar Bait (ATSB) product, Terminix® AllClear. The District still needs to operationally test this material, as well as other potential ATSBs, to determine those circumstances where their use may be effective while also having little or no nontarget species impacts.

> *Inundative Releases of Parasites* is not considered by the District to be a practical or currently feasible method of controlling vector populations. They are not commercially available and remain experimental at this time.

> *Inundative Releases of Predators*, either sterilized or genetically altered organisms, is not considered by the District to be a practical or a currently feasible method of controlling vector populations. Genetically modified vectors are still experimental. They are also not commercially available at this time.

> *Regulatory Control* is not considered feasible because the adoption of regulations is lengthy, time consuming, expensive, and its outcome is uncertain. This approach is not effective for control of existing populations of vectors. Moreover, regulatory controls are dependent upon state and federal agencies to initiate and implement and, thus, this approach cannot assure that any Program objectives would be achieved.

> *Repellants*, although effective for small-scale use by humans and animals, are not part of the overall Program control strategy, because they merely displace the problem and do not reduce the mosquito population in an area.

2.7.3 Other Alternatives

No other alternatives as components of the overall Proposed Program are considered feasible or appropriate to achieve the District's Program objectives, and all of the Program alternatives would be combined into the District's Proposed Program. However, potential options or alternative methods within some of the Program alternatives could be used to modify those alternatives, thus minimizing impacts to the environment or replacing chemical treatments previously used.

One potentially significant impact, an air quality impact, is associated with the Chemical Control Alternative. The Chemical Control Alternative could subject people to objectionable odors. Impacts, even with BMPs implemented, could be **potentially significant, but mitigable** (Impact AQ-25)**.** Certain volatile organic compounds (VOCs), sulfur compounds, and chlorine compounds found in some pesticides emit characteristic odors when they evaporate (volatilize) into air, even at very low concentrations well within safety limits. Pesticides currently used, or proposed for future use, emit phenols (e.g., deltamethrin, etofenprox, permethrin, resmethrin, and lambda-cyhalothrin). Note that the District does not use lambda-cyhalothrin for widespread control (no fogging) and only uses it in specific instances by applying it directly to yellow jacket nests, reducing the potential impact. Materials such as Bti in liquid form and the adulticides pyrethrin and permethrin have an odor.

CEQA alternatives to the Proposed Program (i.e., alternative Programs) to avoid the potentially significant impact associated with the Proposed Program's Chemical Control Alternative, could include the following:

> Reduced Program based on a Reduced Chemical Control Alternative

> Reduced Program with a No Chemical Control Alternative

These two "alternative Programs" are evaluated in Section 15.4. Limiting the choices of materials that can be used to a few chemicals significantly increases the risks of a vector developing resistance to the few products that are available for use and, therefore, resulting in ineffective vector control. Removing the types of pesticides listed above from the IMVMP entirely would reduce Program effectiveness and not meet Program objectives stated in Section 2.2.2. A No Chemical Control Alternative-based Program would not be effective and would not meet the District's Proposed Program objectives. The No Chemical Control Alternative Program would not meet the principles of successful IVM. The impacts to public health would be substantial. Sound IVM involves many tools, using many materials, and using the most effective and least environmentally harmful products.

2.7.4 Environmentally Superior Alternative

Table S-1 presents a summary of all the impacts associated with each Program alternative and therefore, the overall Proposed Program of all of the alternatives combined. It is based on Table 15-1, which presents a summary of all the statements of impact with significance determinations. For the Surveillance, Physical Control, Vegetation Management, Chemical Control, and Nonchemical Control/Trapping Alternatives, the impacts are either "less than significant" (LS) or "no impact" (N) with two exceptions, under the Chemical Control Alternative: odorous pesticides (SM) and use of naled (SU).

One potentially significant impact could subject people to objectionable odors. Impacts, even with BMPs implemented, could be **potentially significant, but mitigable.** Certain VOCs, sulfur compounds, and chlorine compounds found in some pesticides emit characteristic odors when they evaporate (volatilize) into air, even at very low concentrations that are well within safety limits. Pesticides currently used or proposed for future use emit phenols (e.g., deltamethrin, etofenprox, permethrin, resmethrin, and lambda-cyhalothrin). Materials such as Bti in liquid form and the adulticides pyrethrin and permethrin have an odor. Due to limited applicability, small quantities of these types of substances are typically used. The human sense of smell (olfactory system) is sensitive to these types of compounds as a warning mechanism, and some individuals are more sensitive than others. The Chemical Control Alternative would apply certain types of odorous treatments using hydraulic spraying and atomizing (fogging), excluding lambda-cyhalothrin, which could result in drift of small droplets and gaseous vapors. Depending on atmospheric

conditions (i.e., wind direction, wind speed, stability class), this drift could subject people to objectionable odors near a treatment area. The materials have been used in the current Program, and people have not complained about odors. However, it is possible that complaints could occur in the future despite public notification procedures about large-scale treatments.

Naled is an organophosphate (OP) insecticide that could be used in rotation with pyrethrins or pyrethroids for control of adult mosquitoes, to prevent the development of resistance. Naled breaks down into dichlorvos, itself a registered pesticide that may be present in toxic concentrations after naled is no longer detectable. It has high water solubility but does not persist. To the extent that dichlorvos could impact a pesticide-impaired water body (lower San Mateo Creek), its use would pose a **significant and unavoidable** impact to surface water resources.

Section 15.4 describes two "Reduced Alternative Programs:" Reduced Chemical Control and No Chemical Control.

> Reduced Chemical Control: To the extent the District can modify elements of the Chemical Control Alternative to mitigate identified impacts by avoiding the potentially significant impacts associated with some pesticide products (by using less of any of these products or by eliminating one or more of them in favor of other, less odorous products), then the **environmentally superior alternative would be a Program incorporating these modifications to this alternative as components of the overall IMVMP as long as Program effectiveness is maintained.** However, limiting the choices of materials that can be used to a few chemicals significantly increases the risks of a vector developing resistance to the few products that are available for use and, therefore, resulting in ineffective vector control. Excluding air quality and the odor issue, the impacts to all of the other resources would be the same as for the Proposed Program.

> No Chemical Control: This alternative would completely remove the chemical treatment options under the Vegetation Management and Chemical Control Alternatives. It would not have any of the less-than-significant impacts associated with herbicide and pesticide use or the two significant impacts related to odorous products and naled. It would require greater reliance on physical control methods, which may not be appropriate at some treatment sites. However, it was determined to be inconsistent with Program objectives and IVM principles, and it could lead to substantial impacts to human health due to the reduced effectiveness of the Program in controlling mosquito and other vector populations.

The No Program Alternative is not the environmentally superior alternative due to its potentially significant impacts to the following resources and concerns identified in Section 15.3: urban and rural land uses, aquatic and terrestrial biological resources, ecological health, human health, and public services and hazard response.

2.8 Other Required Permits and Agency Coordination

2.8.1 Required Permits

2.8.1.1 California Department of Public Health

The District's Program as a whole, including the registration and continuing education of state-certified field personnel, is reviewed and approved by the CDPH, through a formal Cooperative Agreement that is renewed annually. The CDPH also performs an annual onsite inspection of the District's equipment, operations, safety training, and records.

2.8.1.2 Statewide General NPDES Permit for Vector Control

The application of pesticides at, near, or over waters of the US that results in discharges of pollutants requires coverage under a National Pollutant Discharge Elimination System (NPDES) permit. In response to the Sixth Circuit Court's decisions and previous decisions by other courts on pesticide regulation, the

State Water Resources Control Board (SWRCB) has adopted four Pesticide Permits. Water Quality Order No. 2011-0002-DWQ (General Permit No. CAG 990004) is the Permit for Biological and Residual Pesticide Discharges to waters of the US from vector control applications. The District completed application requirements, including preparation of a Pesticide Application Plan (PAP) and public notice requirements, and received permit approval on October 21, 2011.

This General Permit covers the point source discharge of biological and residual pesticides resulting from direct and spray applications for vector control using (1) larvicides containing monomolecular films, methoprene, Bti, Bs), temephos, petroleum distillates, or spinosad; and (2) adulticides containing malathion, naled, pyrethrin, permethrin, resmethrin, sumithrin, prallethrin, piperonyl butoxide (PBO, an inert ingredient), etofenprox, or N-octyl bicycloheptene dicarboximide (or MGK-264). Users of products containing these active ingredients (and the inert PBO) are required to obtain coverage under this General Permit prior to application to waters of the US. This General Permit only covers the discharge of larvicides and adulticides that are currently registered in California.

Pursuant to California Water Code Section 13389, SWRCB and Regional Water Resources Control Boards (RWQCBs) are exempt from the requirement to comply with Public Resources Code, Chapter 3, Division 13 when adopting NPDES permits (SWRCB 2011a).

2.8.1.3 Statewide General NPDES Permit for Algae and Aquatic Weed Control

This General Permit regulates the discharge of aquatic pesticides (algaecides and aquatic herbicides) used for algae and aquatic weed control to waters of the United States. These are algaecides and aquatic herbicides with registration labels that explicitly allow direct application to water bodies. This General Permit became effective on December 1, 2013. (SWRCB Order No. 2013-0002-DWQ with amendments)

Except for discharges on tribal lands that are regulated by a federal permit, this General Permit covers the point source discharge to waters of the United States of residues resulting from pesticide applications using products containing 2,4-D, acrolein, copper, diquat, endothall, fluridone, glyphosate, imazamox, imazapyr, penoxsulam, sodium carbonate peroxyhydrate, and triclopyr-based algaecides and aquatic herbicides, and adjuvants containing ingredients represented by the surrogate nonylphenol. This General Permit covers only discharges of algaecides, and aquatic herbicides that are currently registered for use in California, or that become registered for use and contain the above-listed active ingredients and ingredients represented by the surrogate of nonylphenol.

A Discharger under this General Permit includes any entity involved in the application of algaecides and aquatic herbicides that results in a discharge of algaecides and aquatic herbicides and their residues and degradation byproducts to waters of the United States, and meets either or both of the following two criteria:

> The entity has control over the financing for or the decision to perform algaecide and aquatic herbicide applications that result in discharges, including the ability to modify those decisions; or

> The entity has day-to-day control of algaecide and aquatic herbicide applications or performs activities that are necessary to ensure compliance with this General Permit. For example, the entity is authorized to direct workers to carry out activities required by this General Permit or perform such activities themselves.

2.8.1.4 U.S. Army Corps of Engineers

For minor physical control activities, the District obtains 5-year regional permits from the USACE (with review by the San Francisco Bay Regional Water Quality Control Board [SFBRWQCB] and/or the USFWS, as needed), and from the BCDC (as needed). The current USACE permit runs through December 31, 2012, and the BCDC permit runs through April 1, 2014. A proposed extension of up to 2 years is being considered as an interim measure until the District completes this PEIR.

2.8.1.5 United States Fish and Wildlife Service

The District is required to submit an annual Pesticide Use Proposal (PUP) and apply for a Supplemental Use Permit (SUP) whenever performing vector control activities on USFWS lands. Depending on the location and nature of the work, the District may also be required to undergo a Section 7 consultation (under the federal Endangered Species Act) with USFWS to address potential impacts to sensitive species and habitats. In addition to SUPs and PUPs, the USFWS reviews and may also comment on the District's proposed annual minor physical control projects (see Section 2.8.1.3 above on the USACE permit).

2.8.1.6 San Mateo County Agricultural Commissioner

County Agricultural Commissioners also regulate sale and use of pesticides in California. In addition, County Agricultural Commissioners issue Use Permits for applications of pesticides that are deemed as restricted materials by CDPR. For chemical control activities, the District reports to and is annually reviewed by the San Mateo County Agricultural Commissioner. The District's Use Permit is issued at the beginning of every calendar year.

During the Use Permit permitting process, the County Agricultural Commissioner determines if the pesticide use will result in substantial adverse environmental impact, whether appropriate alternatives were considered, and if any potential adverse effects are mitigated. The Use Permit conditions contain minimum measures necessary to protect people and the environment. The County Agricultural Commissioner conducts random inspections of treatment events at least 5 percent of projects.

2.8.2 Agency Coordination

For work on State of California lands and riparian zones, wetlands, or other sensitive habitats, the District coordinates and reviews activities with the CDFW and the California State Lands Commission as Trustee Agencies.

2.9 Best Management Practices

The District has implemented a number of procedures and practices under current Program activities that would continue into the future for the Proposed Program. These BMPs represent measures to avoid, minimize, eliminate, rectify, or compensate for potential adverse effects on the human, biological, and physical environments and District Staff. While similar to mitigation measures under CEQA, these BMPs are already in use and would continue to be used as part of the Proposed Program. Subsequent environmental impact assessments in this PEIR reflect the continued use of these measures, which are organized under the following categories and listed under Table 2-8:

> General

> Tidal Marsh-Specific

> Salt Marsh Harvest Mouse (SMHM)

> Ridgway's Rail (formerly California Clapper Rail) (RIRA)

> California Red-Legged Frog (CRLF), San Francisco Garter Snake (SFGS), and Steelhead - Central California Coast

> Vegetation Management

> Maintenance / Construction and Repair of Tide Gates and Water Structures in Waters of the U.S.

> Applications of Pesticides, Surfactants, and/or Herbicides

> Hazardous Materials and Spill Management

> Worker Illness and Injury Prevention and Emergency Response

The District will observe all state and federal regulations. The Districts will follow all appropriate laws and regulations pertaining to the use of pesticides and herbicides and safety standards for employees and the public, as governed by the USEPA, CDPR, and local jurisdictions (with some exceptions). The products the District uses are all tested, registered, and approved for use by the USEPA and/or CDPR. In addition, the District provides additional margins of safety through the adherence to additional internal guidance based on its BMPs and the principles embodied in its IVM policies, where applicable.

These additional factors include:

> Ensuring that all District and contracted applicators are appropriately licensed by the state.

> Ensuring that District staff or contractors will coordinate with the County Agricultural Commissioners, and obtain and verify all required licenses and permits are current prior to pesticide/herbicide application.

> Ensuring that all applicators and handlers use proper personal protective equipment.

2.9.1 Pesticide Applications to Product Label Requirements

2.9.1.1 California Pesticide Regulatory Program

CDPR regulates the sale and use of pesticides in California. CDPR is responsible for reviewing the toxic effects of pesticide formulations and determining whether a pesticide is suitable for use in California through a registration process. Although CDPR cannot require manufacturers to make changes in labels, it can refuse to register products in California unless manufacturers address unmitigated hazards by amending the pesticide label. Consequently, many pesticide labels that are already approved by USEPA also contain California-specific requirements. Pesticide labels are legal requirements and include instructions telling users how to make sure the product is applied only to target pests and including precautions the applicator should take to protect human health and the environment. For example, product labels may contain such measures as restrictions for applications in certain land uses and under certain weather (i.e., wind speed) parameters.

2.9.2 Other BMPs for Mosquito and/or Vector Control

Many BMPs the District recommends to landowners and land managers can be found in the *Best Management Practices for Mosquito Control in California* (CDPH and MVCAC 2012). These BMPs are incorporated by reference into this PEIR; it is available at the following web address: http://www.cdph.ca.gov/HealthInfo/discond/Documents/BMPforMosquitoControl07-12.pdf.

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	**Physical Control**	**Vegetation Management**	**Biological Control**	**Chemical Control**	**Other Nonchemical/ Trapping**
A. General BMPs						
1. District staff has had long standing and continues to have cooperative, collaborative relationships with federal, state, and local agencies. The District regularly communicates with agencies regarding the District's operations and/or the necessity and opportunity for increased access for surveillance, source reduction, habitat enhancement, and the presence of special-status species and wildlife. The District often participates in and contributes to interagency projects. The District will continue to foster these relationships, communication, and collaboration.	X	X	X	X	X	X
2. In particular, District staff will regularly communicate with resource agency staff regarding vector management operations, habitat, and flora and fauna in sensitive habitats. Such communications will include wildlife studies and occurrences of sensitive species in areas that may be subject to vector management activities.	X	X	X	*	X	X
3. When walking or using small equipment in marshes, riparian corridors, or other sensitive habitats, existing trails, levees and access roads will be used whenever possible to minimize or avoid impacts to species of concern and sensitive habitats. Specific care will be taken when walking and performing surveillance in the vicinity of natural and man-	X	X	X	*[4]	X	X

[4] (*) Means not available at this time. Should a viable biocontrol agent become available, evaluation of BMP measures would occur and be implemented.

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
made ditches or sloughs or in the vicinity of tidal marsh habitat.						
4. District staff has received training from USFWS and CDFW biologists regarding endangered species, endangered species habitat, and wildlife/wildlife habitat recognition and avoidance measures. District supervisory staff frequently engages staff on these subjects. For example, District staff has become familiar with Ridgway's Rail (RIRA) call recordings to invoke avoidance measures if these calls are heard in the field. District staff is trained to be observant, proceed carefully, and practice avoidance measures if needed when accessing areas that may serve as bird nesting habitat (e.g., watch for flushing birds that may indicate a nest is nearby). Emphasis will be placed on species and habitats of concern where vector management activities might occur (e.g., SMHM, RIRA, special-status plants, vernal pools, tidal marsh, etc.). These training sessions will be included as a part of the required safety training records that are kept by vector control agencies.	X	X	X		X	X
5. Conduct worker environmental awareness training for all treatment field crews and contractors for special-status species and sensitive natural communities that a qualified person (e.g., District biologist) determines to have the potential to occur on the treatment site. Conduct the education training prior to starting work at the treatment site and upon the arrival of any new worker onto sites with	X	X	X	X	X	X

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
the potential for special-status species or sensitive natural communities.						
6. District staff will work with care and caution to minimize potential disturbance to wildlife while performing surveillance and vector treatment/population management activities (see 1 through 5 above).	X	X	X	*	X	X
7. Identify probable (based on historical experience) treatment sites that may contain habitat for special-status species every year prior to work to determine the potential presence of special-status flora and fauna using the CNDDB, relevant Habitat Conservation Plans (HCPs), NOAA Fisheries and USFWS websites, Calfish.org, and other biological information developed for other permits. Establish a predetermined buffer of reasonable distance, when feasible, from known special-status species locations and do not allow application of pesticides/herbicides within this buffer without further agency consultations. Nonchemical methods are acceptable within the buffer zone when designed to avoid damage to any identified and documented rare flora and fauna.	X	X	X	*	X	
8. Vehicles driving on levees to travel through tidal marsh or to access sloughs or channels for surveillance or treatment activities will travel at speeds no greater than 10 miles per hour to minimize noise and dust disturbance.	X	X	X		X	X
9. District staff will implement site access selection guidelines to minimize equipment use in sensitive habitats including active	X	X	X	X	X	X

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
nesting areas and to use the proper vehicles for on-road and off-road conditions.						
10. Properly train all staff, contractors, and volunteer help to prevent spreading weeds and pests to other sites. The District headquarters contains wash rack facilities (including high-pressure washers) to regularly (in many cases daily) and thoroughly clean equipment to prevent the spread of weeds.	X	X	X	X	X	X
11. Operation of noise-generating equipment (e.g., chainsaws, wood chippers, brush-cutters, pickup trucks) will abide by the time-of-day restrictions established by the applicable local jurisdiction (i.e., City and/or County) if such noise activities would be audible to receptors (e.g., residential land uses, schools, hospitals, places of worship) located in the applicable local jurisdiction. Shut down all motorized equipment when not in use.	X	X	X	X	X	X
12. For operations that generate noise expected to be of concern to the public, the following measures will be implemented: – Measure 1: Provide Advance Notices. A variety of measures are implemented depending on the nature and magnitude of the activities, including press releases, social media, District website, hand-delivered flyers, posted signs, and/or emails. Public agencies and elected officials also may be notified of the nature and duration of the activities, including the local Board of Supervisors or City Council, environmental health and agricultural	X	X	X	X	X	X

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	**Physical Control**	**Vegetation Management**	**Biological Control**	**Chemical Control**	**Other Nonchemical/ Trapping**
agencies, emergency service providers, and airports. – Measure 2: Provide Mechanism to Address Complaints. The District staff is available during regular business hours to respond to service calls and may staff phone lines to address concerns during nighttime operations.						
13. The District will perform public education and outreach activities.	X	X	X	X	X	X
14. Engine idling times will be minimized either by shutting equipment and vehicles off when not in use or reducing the maximum idling time to 5 minutes. Clear signage will be provided for workers at all access points. Correct tire inflation will be maintained in accordance with manufacturer's specifications on wheeled equipment and vehicles to prevent excessive rolling resistance. All equipment and vehicles will be maintained and properly tuned in accordance with manufacturer's specifications. All equipment will be checked by a certified visible emissions evaluator if visible emissions are apparent to onsite staff.	X	X	X	X	X	X
B. Tidal Marsh-Specific BMPs						
1. District staff will continue to implement the measures in the USFWS's "Walking in the Marsh: Methods to Increase Safety and Reduce Impacts to Wildlife/Plants." District staff will receive annual training and review of this document to remain up to date and current on this document and its methodologies for	X	X	X	*	X	

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
protecting sensitive species and the marsh habitat.						
2. District will minimize the use of equipment (e.g., ARGOs) in tidal marshes and wetlands. When feasible and appropriate, surveillance and control work will be performed on-foot with handheld equipment. Aerial treatment (helicopter) treatments will be utilized when feasible and appropriate to minimize the disturbance of the marsh during pesticide applications. When ATVs (e.g., ARGOs) are utilized techniques will be employed that limit impacts to the marsh, including slow speeds; slow, several point turns; using existing levees or upland to travel through sites when possible; use existing pathways or limit the number of travel pathways used.	X	X	X	*	X	X
3. District will minimize travel along tidal channels and sloughs in order to reduce impacts to vegetation used as habitat (e.g., RIRA nesting and escape habitat).	X	X	X		X	
4. District staff will minimize the potential for the introduction and spread of Spartina, perennial pepperweed and other invasive plant species by cleaning all equipment, vehicles, personal gear, clothing, and boots of soil, seeds, and plant material prior to entering the marsh, and avoiding walking and driving through patches of perennial pepperweed to the maximum extent feasible.	X	X	X	*	X	X

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	**Physical Control**	**Vegetation Management**	**Biological Control**	**Chemical Control**	**Other Nonchemical/ Trapping**
5. When feasible, boats will be used to access marsh areas for surveillance and treatment of vectors to further reduce the risk of potential impacts that may occur when using ATVs to conduct vector management activities.	X	X	X	*	X	
6. The District currently references and provides staff training relevant to the USFWS "Walking in the Marsh: Methods to Increase Safety and Reduce Impacts to Wildlife/Plants" guidelines (USFWS undated). – District staff is trained to walk carefully in the marsh and to continuously look ahead of themselves to avoid potential wildlife disturbance (e.g., carefully make observations in their surroundings to detect flushing birds and nests). Specific care is taken when walking and performing surveillance in the vicinity of natural and man-made ditches or sloughs or in vicinity of cord grass habitat (e.g., rack line). – When walking in marshes District staff utilizes existing trails when possible (i.e., deer trails and other preexisting trails).	X	X	X	X	X	X
C. Salt Marsh Harvest Mouse (SMHM)						
1. Activities (surveillance, treatment, source reduction) within or adjacent to harvest mouse habitat will not occur within two hours before or after extreme high tides of 6.5 feet National Geodetic Vertical Datum (NGVD) or above as measured at the Golden Gate Bridge (corrected for time and tide height for the site) or when the marsh plain is completely inundated because suitable upland refugia	X	X	X	*	X	X

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	**Physical Control**	**Vegetation Management**	**Biological Control**	**Chemical Control**	**Other Nonchemical/ Trapping**
cover is limited and potentially disturbance-creating activities could prevent mice from reaching available cover.						
2. Vegetation removal is limited to the minimum amount necessary to allow for surveillance, treatment, and vector habitat reduction (vegetation management) to minimize or avoid loss of SMHM. Similarly, excavation, fill, or construction activities will also be limited to the minimum amount necessary to minimize/avoid loss of SMHM.	X	X	X		X	
3. Vegetation clearing will be conducted systematically within the project area to ensure that SMHM are encouraged to move toward remaining vegetation and are not trapped in islands of vegetation subject to removal and far from suitable cover.		X	X			
4. Each day, 30 minutes before commencement of vector habitat management (physical control, vegetation management), observations will be conducted for the presence of SMHM in the work area by staff trained by USFWS personnel in the safe and effective methods for observing SMHM.		X	X	*	X	
5. To the extent feasible, physical control, vegetation management and other vector habitat reduction activities will be conducted between December 1 and February 28 (outside of the SMHM breeding season). Surveillance, chemical control, biological control, and public education activities occur year-round and are, therefore, carefully coordinated with resource		X	X		X	

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
agencies to minimize potential impacts to SMHMs and their habitats.						
6. When walking in the marsh, existing trails will be used whenever possible. Specific care will be taken when walking and performing surveillance in the vicinity of natural and man-made ditches or sloughs or in the vicinity of tidal marsh habitat to avoid potential disturbance of SMHM.	X	X	X	*	X	X
7. District staff will receive training on measures to avoid impacts to SMHM.	X	X	X	*	X	X
8. If SMHM nests or adults are encountered during vector management activities, avoidance measures will be immediately implemented and findings will be reported to the appropriate resource agency.	X	X	X	*	X	X
D. Ridgway's Rail (formerly California Clapper Rail) (RIRA)						
1. Activities (surveillance, treatment, source reduction) within or adjacent to RIRA habitat will not occur within two hours before or after extreme high tides of 6.5 feet National Geodetic Vertical Datum (NGVD) or above as measured at the Golden Gate Bridge (corrected for time and tide height for the site) or when the marsh plain is completely inundated because suitable upland refugia cover is limited and potentially disturbance-creating activities could prevent RIRA from reaching available cover.	X	X	X	*	X	X

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
2. Vegetation removal is limited to the minimum amount necessary to allow for surveillance, treatment, and vector habitat reduction (vegetation management) to minimize or avoid loss of RIRA. Similarly, excavation, fill, or construction activities will also be limited to the minimum amount necessary to minimize/avoid loss of RIRA.	X	X	X		X	
3. To the extent feasible, physical control, vegetation management and other vector habitat reduction activities will be conducted between September 1 and January 31 (outside of the RIRA breeding season). Surveillance, chemical control, biological control, and public education activities occur year-round and are, therefore, carefully coordinated with resource agencies to minimize potential impacts to RIRAs and their habitats.		X	X		X	
4. District staff will notify the appropriate resource agency prior to entering potential RIRA habitats and will regularly coordinate with the resource agency(ies) on the locations of breeding RIRAs and avoid breeding RIRAs to the extent feasible. Any observations of adverse effects to RIRAs will be reported by District staff.	X	X	X	X	X	
5. When walking in the marsh District staff will use existing trails whenever possible. Specific care will be taken when walking and performing surveillance in the vicinity of natural and man-made ditches or sloughs or in the vicinity of tidal marsh habitat to avoid potential disturbance of RIRAs.	X	X	X	*	X	X

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
6. Entry into suitable breeding habitat for RIRAs will be minimized. When entry is required, the preferred method will be by foot. Other entry methods will be based on consultation with the appropriate resource agency.	X	X	X	*	X	X
7. District staff will receive training on measures to avoid impacts to RIRAs	X	X	X	*	X	X
8. If RIRA nests or adults are encountered during vector management activities, avoidance measures, as provided during training from the resource agencies, will be immediately implemented and findings will be reported to the appropriate resource agency.	X	X	X	*	X	X
E. California Red-Legged Frog (CRLF), San Francisco Garter Snake (SFGS) and Steelhead – Central California Coast						
1. District staff will receive training on the identification, biology and preferred habitat of California red-legged frog, San Francisco garter snake and steelhead - central California coast prior to accessing potential habitat for these species.	X	X	X	*	X	X
2. If suitable habitat is found in the nearby waterways for the California red-legged frog, San Francisco garter snake, and steelhead - central California coast. The District shall conduct a tailboard meeting prior to required work to identify avoid potentially adverse effects to these species.	X	X	X	*	X	X
3. Prior to the initiation of channel excavation, or vehicle operation, the project work site and adjacent area will be surveyed by a designated District biologist trained in identification and	X	X	X	*	X	X

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
ecology of the three special-status species to ensure that none are present. This survey is not intended to be a protocol-level survey, but rather one designed to verify that no special-status species are actually on site or in the adjacent waterway.						
4. All on-site workers will attend an information session (tailboard) conducted by the designated onsite District biologist. This session shall cover identification of the three species and various life stages (such as CRLF tadpoles) and procedures to be followed if an individual is found on site or in the adjacent waterway.	X	X	X	*	X	X
5. All treatment areas will be inspected each morning by the designated onsite biological monitor to ensure that none of the three species are present. All construction activities that take place on the ground shall be performed in daylight hours. Construction materials, soil, construction debris, or other material shall be deposited only on areas where vegetation has been mowed and any snakes or frogs present would be readily visible.	X	X	X		X	X
6. Vehicle speed on site will not exceed 15 miles per hour on dirt roads and 5 miles per hour on the two track vegetated access roads to work locations. All vehicles will be escorted on the two track road by the District biologist to avoid any adverse effects to California red-legged frogs and San Francisco garter snakes.	X	X	X		X	X

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
7. Work activities at this site should be avoided for 24 hours after a significant rain, if possible.	X	X	X		X	X
8. When possible, vector management activities will be conducted on foot using handheld equipment.	X	X	X		X	X
F. Vegetation Management						
1. Consultations will be made with the appropriate resource agency to discuss proposed vegetation management work, determine potential presence of sensitive species and areas of concern, and any required permits.		X	X			
2. Vegetation management work performed will typically be by hand, using handheld tools, to provide access to vector habitat for surveillance, and when needed control activities. Tools used include machetes, small garden-variety chainsaws, hedge trimmers, and "weed-eaters."		X	X			
3. District will consult and coordinate with resource agencies as well as have all necessary permits prior to the commencement of work using heavy equipment (e.g., larger than handheld/garden variety tools such as small excavators with rotary mowers) in riparian areas.		X	X			
4. Minor trimming of vegetation (e.g., willow branches approximately 3 inches in diameter or less, blackberry bushes, and poison oak) to the minimum extent necessary will occur to maintain existing paths or create access points		X	X			

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
through dense riparian vegetation into vector habitat. This may include minor trimming of overhanging limbs, brush and blackberry thickets that obstruct the ability to walk within creek channels. Paths to be maintained will not be a cut, defined corridor but rather a path maintained by selective trimming of overhanging or intrusive vegetation. Paths to be maintained will range in width from 3 to 6 feet across.						
5. Downed trees and large limbs that have fallen due to storm events or disease will be cut only to the extent necessary to maintain existing access points or to allow access to vector habitats.		X	X			
6. Vegetation management work will be confined to October 1 to April 30[5] to minimize potential impacts to special-status species, especially breeding birds. When work is expected to occur between February 1 and April 30 (nesting season), additional consultations will occur with appropriate resource agencies to help identify locations of active nests of raptors or migratory birds as well as any additional protection measures that will need to be implemented prior to commencement of work.		X	X			
7. Every effort will be made to complete vegetation management in riparian corridors prior to the onset of heavy rains. Maintenance work to be done in early spring will be limited to trimming of access routes to new willow		X	X			

[5] Dates may be modified pending review by CDFW.

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
shoots, poison oak, blackberries, and downed trees that block these paths.						
8. District staff will work with care and caution to minimize potential disturbance to wildlife, while performing vegetation management activities within or near riparian corridors.		X	X			
9. If suitable habitat necessary for special-status species is found, including vernal pools, and if nonchemical physical and vegetation management control methods have the potential for affecting special-status species, then the District will coordinate with the CDFW, USFWS, and/or NMFS before conducting control activities within this boundary or cancel activities in this area. If the District determines no suitable habitat is present, control activities may occur without further agency consultations.		X	X			
10. When using heavy equipment for vegetation management, District staff (and contractors) will minimize the area that is affected by the activity and employ all appropriate measures to minimize and contain turbidity. Heavy equipment will not be operated in the water and appropriate containment and cleanup systems will be in place on site to avoid, contain, and clean up any leakage of toxic chemicals.		X	X			

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
G. Maintenance / Construction and Repair of Tide Gates and Water Structures in Waters of the US						
1. District staff will consult with appropriate resource agencies (USACE, USFWS, CDFW, NMFS, BCDC, RWQCB) and obtain all required permits prior to the commencement of ditch maintenance or construction within tidal marshes.		X				
2. Work plans for the upcoming season proposed work as well as a summary of the last season' completed work will be submitted for review and comment to USACE, USFWS, NMFS, CDFW, BCDC, and RWQCB no later than July 1 of each year for which work is being proposed. The work plan will include a delineation of all proposed ditching overlain on topographic maps at a minimum of 1" = 1000' scale, with accompanying vicinity maps. The plan will also indicate the dominant vegetation of the site, based on subjective estimates, the length and width of the ditches to be maintained, cleared or filled, and the estimated date the work will be carried out.		X				
3. All maintenance work will be done at times that minimize adverse impacts to nesting birds, anadromous fish, and other species of concern, in consultation with USFWS, NMFS, and CDFW. Work conducted will, whenever possible, be conducted during approved in water work periods for that habitat, considering the species likely to be present. For example, tidal marsh work will be conducted between September 1 and January 31, where possible		X				

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
and not contraindicated by the presence of other sensitive species.[6]						
4. Care will be taken to minimize the risk of potential disruption to the indigenous aquatic life of a water body in which ditch maintenance is to take place, including those aquatic organisms that migrate through the area.		X				
5. Staging of equipment will occur on upland sites.		X				
6. Mats or other measures taken to minimize soil disturbance (e.g., use of low ground pressure equipment) when heavy equipment is used.		X				
7. All projects will be evaluated prior to bringing mechanical equipment on site, in order to identify and flag sensitive sites, select the best access route to the work site consistent with protection of sensitive areas, and clearly demarcate work areas.		X				
8. Measures will be taken to minimize impacts from mechanical equipment, such as hand ditching as much as possible; reducing turns by track-type vehicles, taking a minimum number of passes with equipment, varying points of entry, driving vehicles at low speed, and not driving on open mud and other soft areas.		X				
9. Discharges of dredged or fill material into tidal waters will be minimized or avoided to the maximum extent possible at the project site and will be consistent with all permit requirements for such activity. No discharge of		X				

[6] Dates are from District's USACE Regional Permit 4, July 31, 2007.

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
unsuitable material (e.g., trash) will be made into waters of the United States, and material that is discharged will be free of toxic pollutants in toxic amounts (see Section 307 of the Clean Water Act). Measures will be taken to avoid disruption of the natural drainage patterns in wetland areas.						
10. Discovery of historic or archeological remains will be reported to USACE and all work stopped until authorized to proceed by the appropriate regulatory authorities/resource agencies.		X				
11. Ditching that drains high marsh ponds will be minimized to the extent possible in order to protect the habitat of native salt pan species.		X				
12. No spoils sidecast adjacent to circulation ditches will exceed 8 inches above the marsh plain to minimize risk of colonization of spoils by invasive, nonnative plants and/or the spoils lines from becoming access corridors for unwanted predators (e.g., dogs, cats, red fox). Sidecast spoil lines exceeding 4 inches in height above the marsh plain will extend no more than 6 feet from the nearest ditch margin. Any spoils in excess of these dimensions will be hydraulically redispersed on site (e.g., by rotary ditcher), or removed to designated upland sites (per conditions of resource agency issued permits). Sidecast spoil lines will be breached at appropriate intervals to prevent local impediments to water circulation.		X				

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
13. If review of the proposed work plan by USACE, USFWS, or CDFW determines the proposed maintenance is likely to destroy or damage substantial amounts of shrubby or sub-shrubby vegetation (e.g., coyote brush, gumplant) on old sidecast spoils, the District will provide a quantitative estimate of the extent and quality of the vegetation, and provide a revegetation plan for the impacted species prepared by a biologist/botanist with expertise in marsh vegetation. The USACE- approved revegetation plan will be implemented prior to April 1 of the year following the impacts.		X				
14. Small ditch maintenance work will be performed by hand, whenever possible, using handheld shovels, pitch forks, etc., and small trimmers such as "weed-eaters." (Note: the majority of small ditch work performed by the District is by hand.)		X				
15. Work will be done at low tide (for tidal areas), and times of entry will be planned to minimize disruption to wildlife.		X				
16. In marshes which contain populations of invasive nonnative vegetation such as pepperweed or introduced Spartina, sidecast spoils will be surveyed for the frequency of establishment of these species during the first growing season following deposition of the spoils. The results of the surveys will be reported to the USACE, USFWS and CDFW. If it is determined the sidecasting of spoils resulted in a substantial increase in the distribution or abundance of the nonnative vegetation which is detrimental to the marsh,		X				

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
the District will implement appropriate abatement measures after consultation with the USACE, USFWS and CDFW.						
17. When possible (i.e., with existing labor and vehicles), refuse such as tires, plastic, and man-made containers found at the work site will be removed and properly discarded.		X	X			
H. Applications of Pesticides, Surfactants, and/or Herbicides						
1. District staff will conduct applications with strict adherence to product label directions that include approved application rates and methods, storage, transportation, mixing, and container disposal.			X	*	X	
2. District will avoid use of surfactants when possible in sites with aquatic nontargets or natural enemies of mosquitoes present such as nymphal damselflies and dragonflies, dytiscids, hydrophilids, corixids, notonectids, ephydrids, etc. Surfactants are a least preferred method but must be used with pupae. Use a microbial larvicide (Bti, Bs) or IGR (e.g., methoprene) instead or another alternative if necessary.			X		X	
3. Materials will be applied at the lowest effective concentration for a specific set of vectors and environmental conditions. Application rates will never exceed the maximum label application rate.			X	*	X	

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
4. To minimize application of pesticides, application of pesticides will be informed by surveillance and monitoring of vector populations.			X		X	
5. District staff will follow label requirements for storage, loading, and mixing of pesticides and herbicides. Handle all mixing and transferring of herbicides within a contained area.			X		X	
6. Postpone or cease application when predetermined weather parameters exceed product label specifications, when wind speeds exceed the velocity as stated on the product label, or when a high chance of rain is predicted and rain is determining factor on the label of the material to be applied.			X	*	X	
7. Applicators will remain aware of wind conditions prior to and during application events to minimize any possible unwanted drift to water bodies, and other areas adjacent to the application areas.			X	*	X	
8. Spray nozzles for the application of larvicides or herbicides will be adjusted to produce larger droplet size rather than smaller droplet size. Use low nozzle pressures where possible (e.g., 30 to 70 pounds per square inch). Keep spray nozzles within a predetermined maximum distance of target weeds or pests (e.g., within 24 inches of vegetation during spraying). For application of adulticides, use ULV sprays that are calibrated to be effective and environmentally compatible at the proper droplet size (about 10-30 microns).			X	*	X	

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Best Management Practice (BMP)	Alternative					
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
9. Clean containers at an approved site and dispose of at a legal dumpsite or recycle in accordance with manufacturer's instructions if available.			X	*	X	
10. Special-Status Aquatic Wildlife Species: – A CNDDB search was conducted in 2012, updated in 2015, and the results incorporated into this PEIR. District staff communicates with state, federal, and county agencies regarding sites that have potential to support special-status species. Many sites where the District performs surveillance and control work have been visited by staff for many years and staff is highly knowledgeable about the sites and habitat present. If new sites or site features are discovered that have potential to be habitat for special-status species, the appropriate agency or landowner is contacted and communication initiated. – The District uses only pesticides, herbicides, and adjuvants approved for aquatic areas or manual treatments within a predetermined distance from aquatic features (e.g., within 15 feet of aquatic features). Aquatic features are defined as any natural or man-made lake, pond, river, creek, drainage way, ditch, spring, saturated soils, or similar feature that holds water at the time of treatment or typically becomes inundated during winter rains.			X	*	X	

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
– If suitable habitat for special-status species is found, including vernal pools, and if aquatic-approved pesticide, herbicide, and adjuvant treatment methods have the potential for affecting the potential species, then the District will coordinate with the CDFW, USFWS, and/or NMFS before conducting treatment activities within this boundary or cancel activities in this area. If the District determines no suitable habitat is present, treatment activities may occur.						
11. District staff will monitor sites post-treatment to determine if the target vector or weeds were effectively controlled with minimum effect to the environment and nontarget organisms. This information will be used to help design future treatment methods in the same season or future years to respond to changes in site conditions.			X	*	X	
12. Do not apply adulticides in spray/fog forms over large areas (more than 0.25 acre) during the day when honeybees are present and active or when other pollinators are active. Preferred applications of these specific pesticides are to occur in areas with little or no honeybee or pollinator activity or after dark. These treatments may be applied over smaller areas (with handheld equipment), but the technician will first inspect the area for the presence of bees and other pollinators. If pollinators are present in substantial numbers, the treatment will be made at an alternative time when these pollinators are inactive or absent. Liquid larvicides are applied only to water bodies.			X		X	

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
13. The District will provide notification to the public (24 – 48 hours in advance if possible) and/or appropriate agency(ies) when applying pesticides or herbicides for large-scale treatments that will occur in close proximity to homes, heavily populated, high traffic, and sensitive areas. The District applies or participates in the application of herbicides in areas other than District facilities when a joint effort is most effective and/or efficient.			X	*	X	
14. Provide for buffer zones between herbicide (diuron) application sites and surface and usable groundwater supplies.			X			
15. For rodenticides in sewer systems, deploy bait blocks by suspension to reduce potential dietary exposure to nontarget animals. Apply bait block attachments to the wall just under the manhole cover so that rodents are more likely to perish while still in the sewer and away from predators to reduce secondary exposure.					X	
16. For rodenticides in aboveground sites, use tamper-proof bait stations firmly attached to embedded stakes or duckbill anchors so that bait cannot be accessed or dragged away by nontarget animals.					X	

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
I. Hazardous Materials and Spill Management						
1. Exercise adequate caution to prevent spillage of pesticides during storage, transportation, mixing or application of pesticides. Report all pesticide spills and cleanups (excepting cases where dry materials may be returned to the container or application equipment).			X	*	X	
2. Maintain a pesticide spill cleanup kit and proper protective equipment at the District's Service Yard and in each vehicle used for pesticide application or transport.			X	*	X	
3. Manage the spill site to prevent entry by unauthorized personnel. Contain and control the spill by stopping it from leaking or spreading to surrounding areas, cover dry spills with polyethylene or plastic tarpaulin, and absorb liquid spills with appropriate absorbent materials.			X	*	X	
4. Properly secure the spilled material, label the bags with service container labels identifying the pesticide, and deliver them to a District/Field Supervisor for disposal.			X	*	X	
5. A hazardous spill plan will be developed, maintained, made available, and staff trained on implementation and notification for petroleum-based or other chemical-based materials prior to commencement of vector treatment activities.	X	X	X	X	X	
6. Field-based mixing and loading operations will occur in such a manner as to minimize the risk of accidental spill or release of pesticides.			X		X	

Table 2-8 San Mateo County Mosquito and Vector Control District BMPs to Avoid / Minimize Environmental Impacts by Alternative

Best Management Practice (BMP)	Alternative					
	Surveillance	**Physical Control**	**Vegetation Management**	**Biological Control**	**Chemical Control**	**Other Nonchemical/ Trapping**
J. Worker Illness and Injury Prevention Program and emergency Response						
1. Equip all vehicles used in wildland areas with a shovel and a fire extinguisher at all times	X	X	X	X	X	X
2. Train employees on the safe use of equipment and machinery, including vehicle operation.	X	X	X	X	X	X
3. District will regularly review and update their existing health and safety plan to maintain compliance with all applicable standards. Employees will be required to review these materials annually.	X	X	X	X	X	X

[1] This BMP would also be applied in aquatic habitats other than tidal marshes, although the weed species of concern would differ.

[2] This BMP would also be applied in all habitats.

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