Integrated Mosquito and Vector Management Programs

Alameda County Vector Control Services District Summary November 2015

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Summary

This summary of the Alameda County Vector Control Services District's Programmatic Environmental Impact Report (PEIR) on the continuation of their Integrated Mosquito and Vector Management Program (IMVMP or Program) presents an overview of the PEIR contents. It introduces key components of the Proposed Program and provides a summary of the potential environmental impacts of the Program alternatives. The text of the PEIR is supplemented by five technical reports included as appendices. The District, as Lead Agency under the California Environmental Quality Act (CEQA), has prepared this PEIR for their ongoing program of surveillance and control of mosquitoes and other vectors of human and animal disease and discomfort.

S.1 Background

The District was established in 1984 to reduce the risk of vector-borne disease and discomfort to the residents of its Service Area (i.e., Alameda County, California). The District engages in activities and management practices to control mosquitoes and other vectors and to address specific situations within the county. These management practices emphasize the fundamentals of integrated pest management (IPM), specifically integrated vector management (IVM) wherein source reduction, habitat modification, and biological control are used when appropriate before using pesticides. When pesticides are used, they are applied in a manner that minimizes risk to human and ecological health. To avoid or manage the risk to human and animal health requires effective, proactive vector-borne disease surveillance and control strategies that may fluctuate temporally and regionally. Factors that influence the selected strategies include mosquito and pathogen biology, environmental factors, land use patterns, and resource availability to support production of the vectors in quantities that threaten human and animal health.

S.1.1 Vector-Borne Diseases in Program Area

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 in the Program Area are as follows, by the vector they are associated with:

> Mosquito-transmitted illnesses: West Nile virus, western equine encephalomyelitis, Saint Louis encephalitis, dog heartworm, malaria, and myxomatosis

> Tick-transmitted illnesses: Lyme disease, babesiosis, ehrlichiosis, tularemia, Rocky Mountain spotted fever and other spotted fever group rickettsia (e.g., rickettsia 364D), and anaplasmosis

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

> Other vector-transmitted illnesses: rabies transmitted by bats, 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. Yellow jacket wasps, several mosquito species, and bed bugs within the Program Area are not known to transmit disease pathogens but are still considered vectors (California Health and Safety Code Section 2200[f]) because they can inflict significant discomfort and injury (e.g., secondary infections and severe reactions including anaphylaxis) to residents, pets, and livestock. For example, employing the District's IMVMP to conduct surveillance and monitoring for bed bugs such as *Cimex lectularius* is important

to minimize populations of these true bugs that would otherwise cause discomfort and injury-related issues with citizens, businesses, schools, hotel industry, etc. Furthermore, potential exists for introduction of new disease vectors into the District's Service Area. Examples include the discovery of populations of *Aedes aegypti* (yellow fever mosquito) in the city of Hayward. This mosquito species is a very effective vector of the causative agents of diseases such as chickungunya, dengue fever, and yellow fever.

The District implements its Program primarily within a jurisdiction or Service Area of 825 square miles with 1,554,000 residents. The activities described herein are conducted throughout Alameda County. Service areas include the cities of Alameda, Albany, Berkeley, Dublin, Emeryville, Fremont, Hayward, Livermore, Newark, Oakland, Piedmont, Pleasanton, San Leandro, and Union City, and all unincorporated areas of Alameda County. The District provides vector services countywide and mosquito services for the City of Albany and may be requested in the future to provide additional mosquito services within the District Service Area that may include one or more of the incorporated areas and unincorporated areas of Alameda County. The Program Area includes counties adjacent to the District's Service Area where assistance may be provided upon request: Contra Costa, San Joaquin, Stanislaus, and Santa Clara counties.

S.1.2 Authority to Implement Vector Control

A number of legislative and regulatory actions form the basis for the District's authority to engage in vector control. The District's principal authority is derived from the California Health and Safety Code. It is a regulatory agency formed pursuant to California Health and Safety Code Section 2000 et seq. **State law charges the District with the authority and responsibility to take all necessary or proper steps for the control of mosquitoes and other vectors in the District.**

In accordance with California Health and Safety Code Section 2053:

(a) A district may request an inspection and abatement warrant pursuant to Title 13 (commencing with Section 1822.50) of Part 3 of the Code of Civil Procedure. A warrant issued pursuant to this section shall apply only to the exterior of places, dwellings, structures, and premises. The warrant shall state the geographic area which it covers and shall state its purposes. A warrant may authorize district employees to enter property only to do the following:

  (1) Inspect to determine the presence of vectors or public nuisances.

  (2) Abate public nuisances, either directly or by giving notice to the property owner to abate the public nuisance.

  (3) Determine if a notice to abate a public nuisance has been complied with.

  (4) Control vectors and treat property with appropriate physical, chemical, or biological control measures.

The California Department of Pesticide Regulation's (CDPR's) Pesticide Regulatory Program provides special procedures for vector control agencies that operate under a Cooperative Agreement with the California Department of Public Health (CDPH). The application of pesticides by vector control agencies is regulated by a special and unique arrangement among the CDPH, CDPR, and County Agricultural Commissioners. CDPR does not directly regulate vector control agencies. CDPH provides regulatory oversight for vector control agencies that are signatory to the Cooperative Agreement. Signatories to the agreement use only pesticides listed by CDPH, maintain pesticide use reports, and ensure that pesticide use does not result in harmful residues on agricultural products.

The District maintains a cooperative agreement with CDPH. Its employees are certified by CDPH as vector control technicians, which helps to ensure that employees are adequately trained regarding safe and proper vector control techniques including the handling and use of pesticides and compliance with laws and regulations relating to vector control and environmental protection.

S.2 Program Objectives and Purpose

The District undertakes vector control activities through its Program to control the following vectors of disease and/ or discomfort in the Program Area: mosquitoes, cockroaches, fleas, flies, rats, mice, ticks, yellow jackets, other stinging/biting insects including mites and bed bugs, skunks, raccoons, opossum, feral pigs, turkeys, and other vertebrate animals. The District also performs vegetation management (including control of noxious and/or invasive plants) to facilitate access to vector habitat, improve efficiency and effectiveness of vector control operations, and as a source reduction measure.

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 proactive, effective and environmentally sound vector management by means of:

- Surveying for vector abundance/human contact
- 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 IMVMP 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 and domestic animals.

S.3 Public Involvement Summary

The District distributed a Notice of Preparation (NOP) of a Draft PEIR for their IMVMP pursuant to the CEQA Guidelines (Section 15082) on June 6, 2012. The NOP was sent to 22 agencies, organizations, and individuals, including the following:

> US Department of Agriculture

> California Department of Pesticide Regulation

> California Department of Fish and Wildlife, Region 3

> California Department of Food and Agriculture (CDFA)

> California Department of Public Health

> California Department of Public Health/Drinking Water

> California Department of Toxic Substances Control

> California Department of Water Resources

> Cal-EPA

> California State Water Resources Control Board (SWRCB)

> San Francisco Bay Regional Water Quality Control Board (RWQCB)

> Alameda County Water District

> Alameda County Resource Conservation District

> East Bay Municipal Utility District

> East Bay Regional Park District

> Oro Loma Sanitary District

> Alameda County Public Works Department

> Alameda County Agriculture Department

> City of Albany

The NOP provided a description of the Program, the location of Program activities, and the resources and environmental concerns planned for analysis in the PEIR. The NOP announced a public scoping meeting and requested the comments on the content of the PEIR and the Program alternatives be submitted within 30 days of receipt. The public scoping meeting was held at the following location and time: Alameda County, Department of Environmental Health, Alameda County Vector Control Services District, 1131 Harbor Bay Pkwy, Rm 106, Alameda, CA on June 6, 2012, at 5:30 pm. Comments received during scoping on the content of the PEIR are addressed in the resource chapters.

S.4 Areas of Known Public Concern

CEQA Guidelines Section 15123 requires that the Summary "shall identify areas of controversy known to the lead agency." The areas of greatest public concern and debate are based on comments from public scoping and comments made during other District activities:

> Use of Pesticides for Vector Control: Members of the public are distrustful of pesticide use for vector control. They prefer other methods to eliminate suitable habitat to deal with mosquito problems (including bites) rather than spraying pesticides. If adulticides must be used, ensure use is justified with documented, mosquito-borne disease activity within or within flight range of the tidal marsh. Concern exists about pesticide applications drifting into backyards where the property owner wants to ensure their area is pesticide-free. The concern is not only with impacts to humans and "sensitive populations" but also to domestic animals and wildlife including nontarget insects.

> Use of Herbicides for Vegetation Management: Request for specific vegetation management information about the proposed chemical vegetation control agents (herbicides), the types, amounts and locations of chemical stored, application methods and rates, and their effects on the environment.

> Use of Biological Control Agents: Controversy exists over the use of some proposed biological control agents, in particular the use of mosquitofish and potential for them to impact sensitive species such as the California red-legged frog.

> District's Authority to Enter Public and Private Property for Control Activities: Some public agencies want the District to obtain an Encroachment Permit with notification of Park Supervisors for activities such as surveillance, physical control, or vegetation management where access to parkland is needed. Water districts insist that mosquito abatement materials and practices proposed for use on watershed lands must be thoroughly vetted and approved by CDPH. New legislation in 2014 clarified CDFW's and the District's responsibilities to engage in mosquito abatement in CDFW-owned and/or -managed wildlife refuges.

S.5 Proposed Program Alternatives

S.5.1 Proposed Program

The District's Program is an ongoing series of related actions for control of bed bugs, fleas, mosquitoes, yellow jackets, rodents, and other vector populations to minimize human/vector interactions and the associated risks of 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.

The District has, since its inception, taken a proactive integrated systems approach to mosquito and vector control, utilizing a suite of tools that consist of public education, surveillance, and physical (e.g., source reduction, vegetation management, water management), biological, and chemical control. These Program "tools" or components are described in the subsequent subsection as "Program alternatives" for the CEQA process (except for public education, which is exempt from CEQA). Program implementation is weighted heavily towards physical and biological control, in part, to reduce the need for chemical control. To realize effective and environmentally sound vector management, vector control must be proactive and based on several factors:

> Carefully monitoring or surveying vector abundance 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 combined together encompass the District's Program, it is important to acknowledge that the specific tools District staff use 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) District staff's access 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 larvicide or adulticide resistance in vector populations, (g) landowner policies or concerns, (h) proximity to special-status species, and (i) applicability of Endangered Species Recovery Plans, HCPs, Natural Community Conservation Plans (NCCPs), 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 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. Additional BMPs are part of the District's public education program and outreach to landowners and land managers; these represent measures to control mosquito and vector control used by public and private property owners within the District's Service Area. When the District recommends control measures to landowners and land managers, they are directed to contact and coordinate with resource agencies to address potential special-status species concerns, sensitive habitats and potential permits prior to implementation of recommended vector control work. While similar to mitigation measures under CEQA, these District BMPs are already in use and would continue 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:

> General BMPs

> Albany Beach Shoreline-Specific BMPs

> California Least Tern (CLT)

> Burrowing Owl (BO)

> 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 Program and Emergency Response.

The District will observe all state and federal regulations. The District 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 and where applicable). Although the products the District uses are all tested, registered, and approved for use by the USEPA and/or CDPR, the District provides additional margins of safety with the adherence to additional internal guidance based on their BMPs and the principles embodied in District IMVMP policies, where applicable.

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

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

> All applicators and handlers will use proper personal protective equipment.

The **No Program Alternative** is defined as the District not engaging in any of the control strategies and tools for mosquito and/or vector control. Past practices would not continue into the future. The District would not continue to operate and would close. In the absence of the District, CDPH would provide mosquito and vector “oversight” to local jurisdictions commensurate with budget constraints.

The District anticipates combining the following ongoing alternatives into its Proposed Program, a continuation of its existing Program with adaptations to meet future needs. The six alternatives evaluated in this PEIR are summarized below.

S.5.1.1 Surveillance

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 IMVMP because the information it provides is evaluated against treatment criteria to decide when and where to institute vector control measures. Information gained is used to help form action plans that can also assist in reducing the risk of vector-borne disease transmission and the occurrence of discomfort and injury to humans, pets, and livestock. Equally important is the use of vector surveillance in evaluating the efficacy, cost effectiveness, and environmental impacts of specific vector control actions.

S.5.1.2 Physical Control

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 IMVMP. 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.[1] 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.

S.5.1.3 Vegetation Management

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 Vector Biologists would consider undertaking vegetation management, 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 vector predators, as well as to allow District staff's access to vector habitat for surveillance and other control activities.

For vegetation management, the District would consider using hand tools or other mechanical means (i.e., mower) for vegetation removal or thinning and sometimes would consider applying herbicides (chemical pesticides with specific toxicity to plants) to improve surveillance or reduce vector habitats.

Vegetation removal or thinning would occur in aquatic habitats to assist with the control of mosquitoes but primarily in terrestrial habitats to help with the control of other vectors including rodents and wildlife. To reduce the potential for mosquito breeding associated with water retention and infiltration structures, District staff would if requested systematically clear weeds and other obstructing vegetation in wetlands and retention basins (or request the structures' owners to perform this task). If the District was requested, 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 if requested would also be performed to assist other agencies and landowners with the management of invasive/nonnative weeds (e.g., Spartina, Pepperweed, Arundo, Tamarix, and Ailanthus). These actions would typically be performed under the direction of the concerned agency, which also maintains any required permits.

S.5.1.4 Biological Control

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.

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

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 Saacharopolyspora spinosa. Two bacteria, Bs and Bti, produce proteins that are toxic to most mosquito larvae, while Saacharopolyspora 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 the District applies do not contain live organisms, but only spores made up of specific protein molecules.

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.

Predators

Mosquito predators are represented by highly complex organisms, such as insects, fish, birds, and bats that may consume larval or adult mosquitoes as prey. Within a typical aquatic environment that produces mosquitoes, predators are distributed among different substrates. For example, the surface of the pond supports water striders, planaria, and spiders. Below the water surface, backswimmers, predaceous diving beetles, water scavenger beetles, and fish live and feed. If the pond contains vegetation, then the plant surfaces (periphyton) will support hydra, damselfly and dragonfly nymphs, and giant water bug nymphs and adults. The benthos supports dragonfly and damselfly nymphs. Together the different predators form a special network that accounts for predation throughout the aquatic environment. Greater potential for an acceptable level of mosquito control exists when more predators are present. 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 help control mosquitoes, even when mosquitoes are scarce. Examples of mosquito predators include representatives from a wide variety of taxa: coelenterates, *Hydra* spp.; platyhelminths, *Dugesia dorotocephala, Mesostoma lingua, and Planaria* spp.; insects, *Anisoptera, Zygoptera, Belostomidae, Geridae, 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.

The District's stocking of mosquitofish in mosquito habitat is the most commonly used biological control agent for mosquitoes in the world. The District limits planting of mosquitofish to man-made water bodies including ornamental fish ponds, water troughs, water gardens, fountains, and unmaintained swimming

pools. Limiting the introduction of the mosquitofish to these sources should prevent their migration into habitats used by threatened, endangered, or rare species.

S.5.1.5 Chemical Control

Chemical control is a Program tool that consists of the application of nonpersistent (i.e., breaking down in less than a few days to a week) insecticides (and potentially herbicides) to directly reduce populations of larval or adult mosquitoes and other invertebrate threats to public health (e.g., yellow jackets) 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. All of the chemical tools the District uses are evaluated in Appendix B, Ecological and Human Health Assessment Report.

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 and other insect larvae, and "adulticides," which are used to control adult mosquito populations. 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. 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. 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 District BMPs to avoid affecting nontarget species including bees. The District has not had to perform any ground or aerial adulticiding operations to control mosquito populations in the City of Albany since 1984.Timing of applications (when mosquitoes are most active), avoiding sensitive areas, working and coordinating efforts with California Department of Fish and Wildlife (CDFW) or United States Fish and Wildlife Service (USFWS), and following label instructions all result in effective mosquito control practices.

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.

The District's use of rodenticides is a result of an extensive rodent surveillance program and in response to District resident's requests for services. The District's Vector Control Biologists in 2014 committed more than 9,900 service support visits to residential or commercial properties, totaling more than 5,500 hours for rodent suppression support (District 2014 Annual Report). The District currently conducts rodent baiting within sewers in the city of Oakland. In sewer baiting, bait blocks containing bromadiolone (a second generation, single-feeding anticoagulant rodenticide) are suspended by wire above the water line on a ledge to encourage rodent feeding.

S.5.1.6 Nonchemical Control/Trapping

This tool includes the trapping of rodents and/or trapping of yellow jackets that pose a threat to public health and welfare. For both vector species, tamper-resistant or baited traps are used. District staff place the trap(s) primarily at the request of the property owner or manager. When requests for rat and yellow jacket pest removal in or on structures occur, citizens are referred to a directory of local private pest control companies, because the District is not licensed for these types of activities.

Trapping is also used for the removal of nuisance wildlife such as bats, raccoons, skunks, and opossums when these animals pose a threat to public health and safety. 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 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 Biologist will survey the property and provide guidance and recommendations on exclusion methods to minimize their impact on the property.

S.5.2 Alternatives Eliminated From Further Consideration

These alternatives are identified and evaluated in the District's Alternatives Analysis Report (Appendix E) and summarized in Section 15.2 of this PEIR. In summary, the District determined that of the 19 potential tools, the following 8 methods were not immediately available or viable for use in its IMVMP: biological control pathogens (viruses), biological control (parasites), biological control plants, mass trapping, attract and kill, inundative releases, regulatory control, and repellents.

> *Biological Control Pathogens (viruses)* is deemed infeasible for mosquito, yellow jacket wasp, tick, and rodent control at present. This method is not commercially available in California, and there are currently many efficacy-related issues.

> *Biological Control (parasites)* is deemed infeasible, as this method is not commercially available in California. Research on the use of parasites for mosquito control has also shown several limitations related to efficacy. Although the use of parasites as a means for managing vector populations shows promise, much work concerning their biology, cultivation, mass production, transport, and release remains to be done.

> *Biological Control Plants,* or carnivorous plants, whether terrestrial or aquatic, use a wide range of invertebrate prey and are not specific predators of mosquitoes. What little data exist indicates that carnivorous plants, especially terrestrial species, are inefficient for the control of mosquitoes and other invertebrate vectors.

> *Mass Trapping* is not considered by the District to be a practical, effective, reliable method of controlling vector populations. Operational difficulties exist in placing out and retrieving large numbers of traps for most vectors, the least of which are the volume of traps required, numbers of staff, amount of staff time, access, and travel necessary for this tool to be effective. Mass trapping of mosquitoes has proven to be both costly and in most instances ineffective. Mass trapping of yellow jackets also has a limited effect on the abatement of yellow jackets, with the traps sometimes becoming an attractive nuisance.

> *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 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 either sterilized or genetically altered predators or vectors, 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. The use of any genetically altered organisms, even mosquitoes, may also not be acceptable to the public.

> *Regulatory Control* is not considered feasible because adoption of regulations is lengthy, time intensive, expensive and uncertain as to the regulatory outcome. This approach is not focused sufficiently on control of existing populations. Moreover, regulatory controls are dependent upon state and federal agencies to initiate and implement, and thus this approach cannot assure that any project objectives would be achieved. Additionally, regulatory actions have the potential to create as well as eliminate additional vector habitats.

> *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 vector population in an area. Repellents also require proper application, timely use, and discipline concerning their use to achieve optimal effectiveness. Unfortunately, the use of repellents does not guarantee the elimination of human vector interactions and potential vector-borne disease transmission.

S.5.3 Environmentally Superior Alternative

Table S-1 presents a summary of all the impacts associated with each Program alternative and, therefore, the overall 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 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 one exception.

There is only one potentially significant impact. The Chemical Control Alternative 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 well within safety limits. Pesticides currently used or proposed for future emit phenols (e.g., lambda-cyhalothrin, deltamethrin, etofenprox, or permethrin). Materials such as Bti liquid 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), 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 temporarily 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.

Section 15.4 describes two "Reduced Program Alternatives:" 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 completely the potentially significant impacts associated with some pesticide products by using 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. 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. However, it was determined to be inconsistent with Program objectives and IVM principles, and it could lead to substantial impacts to human and ecological 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.

S.6 Summary of Environmental Impacts and Mitigation Measures

Table S-1 provides a summary of all of the environmental impacts and mitigation for the Program alternatives. The existing condition (2012) sets the baseline against which the alternatives are evaluated for CEQA. Impact statements are presented in their entirety in the resource sections. For Table S-1, impact areas or environmental concerns are merely listed using brief terms for ease of comparison. Symbols used in the table for CEQA determinations of impact are:

SU = Significant and Unavoidable Impact
SM = Potentially Significant but Mitigable Impact
LS = Less-than-Significant Impact
N = No Impact
na = Not Applicable

Table S-2 presents the only potentially significant impact for the Program alternatives, the mitigation required, and the significance following mitigation implementation. The Program alternative with potentially significant but mitigable impacts is Chemical Control. Mitigation measures represent actions the District will take to reduce the impact to a level of insignificance. (If mitigation were not feasible or practical to implement, or simply not enough to reduce the impact to less than significant, then the impact would be "significant and unavoidable.") **The potentially significant impact associated with the Proposed Program's Chemical Control Alternative can be mitigated to a less-than-significant level.**

Table S-3 presents a comparison of the Reduced Chemical Control Program and the No Chemical Control Program with the Proposed Program.

Table S-1 Alameda County Vector Control Services District Summary Comparison of Impacts of Alternatives

Environmental Concern	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
3. Urban and Rural Land Uses						
Quantity and/or quality of recreational opportunities	LS	LS	LS	N	LS	LS
Conflict with applicable land use regulations	N	N	N	N	N	N
4. Biological Resources – Aquatic						
Special-status species	LS	LS	LS	N	LS	N
Sensitive natural community	LS	LS	LS	N	N	N
Federally protected wetlands	LS	LS	LS	N	N	N
Movement of native resident or migratory fish or wildlife species	LS	LS	LS	LS	LS	LS
Conflict with local policies or ordinances	N	N	N	N	N	N
Conflict with HCPs or NCCPs	N	N	N	N	N	N
5. Biological Resources – Terrestrial						
Special-status species	LS	LS	LS	N	LS	N
Sensitive natural community	LS	LS	LS	N	N	N
Federally protected wetlands	LS	LS	LS	N	N	N
Movement of native resident or migratory fish or wildlife species	LS	LS	LS	LS	LS	LS
Conflict with local policies or ordinances	N	N	N	N	N	N
Conflict with HCPs or NCCPs	N	LS	LS	N	N	N
6. Ecological Health						
Nontarget ecological receptors	LS	LS	LS	LS	LS	LS

Table S-1 Alameda County Vector Control Services District Summary Comparison of Impacts of Alternatives

Environmental Concern	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
7. Human Health						
Human health	N	LS	N for physical, LS for herbicides	N	N for some chemicals, LS for other chemicals (see Table 15-1)	N
8. Public Services and Hazard Response						
Increase demand for police, fire, or health-care services	N	N	N	N	N	N
Create a significant hazard to the public or the environment through routine transport, use, or disposal of hazardous materials or through reasonably foreseeable upset and accident conditions (spills)	N	N	N	N	N	N
Expose people or structures to a significant risk of loss, injury, or death involving wildland fires	N	N	N	N	N	N
9. Water Resources						
Impacts on surface water resources	N	LS	LS	LS	LS	N
Impacts on groundwater resources	N	LS	N for physical, LS for herbicides	LS	LS	N
10. Air Quality						
Conflict with air quality plans	LS	LS	LS	LS	LS	LS
Violate an ambient air quality standard	LS	LS	LS	LS	LS	LS
Cumulatively considerable increase of nonattainment pollutants	LS	LS	LS	LS	LS	LS
Expose sensitive receptors to substantial pollutant concentrations	LS	LS	LS	LS	LS	LS
Subject people to objectionable odors	N	N	N	N	**SM**	N

Table S-1 Alameda County Vector Control Services District Summary Comparison of Impacts of Alternatives

Environmental Concern	Surveillance	Physical Control	Vegetation Management	Biological Control	Chemical Control	Other Nonchemical/ Trapping
11. Greenhouse Gases and Climate Change						
Cumulatively considerable amount of GHGs	LS	LS	LS	LS	LS	LS
Conflict with plans and policies	LS	LS	LS	LS	LS	LS
12. Noise						
Exceed noise standards	LS	LS	LS	LS	LS	LS
Substantial increase in noise levels	LS	LS	LS	LS	LS	LS

Table S-2 Alameda County Vector control Services District Significant Impact and Mitigation for Chemical Control Alternative

Affected Resource and Area of Potential Impact	Identified Impact	Mitigation Measures	Significance After Mitigation
10. Air Quality			
Objectionable Odors	**Impact AQ-25:** The Chemical Control Alternative could subject people to objectionable odors. Impacts could be **potentially significant but mitigable.**	The District and its contractors will implement one or more of the following measures as applicable to reduce drift from the ground and aerial applications of odorous treatment compounds: **Mitigation Measure AQ-25a:** When possible, defer application of treatment compounds until such time that favorable wind conditions would reduce or avoid the risk of drift into populated areas. > Location: Areas to receive treatment with pesticides that are near residential and commercial land uses > Monitoring/Reporting Action: District staff to check current land use maps or aerial photos prior to treatments > Effectiveness Criteria: Document odor complaints from the public > Responsible Agency: District > Timing: Prior to chemical treatments **Mitigation Measure AQ-25b:** Use GPS dataloggers that document site-specific compliance with all label requirements for drift mitigation. > Location: Areas to receive treatment with pesticides that are near residential and commercial land uses > Monitoring/Reporting Action: District staff to check current land use maps or aerial photos prior to treatments > Effectiveness Criteria: Document odor complaints from the public > Responsible Agency: District	Less than significant

Table S-2 Alameda County Vector control Services District Significant Impact and Mitigation for Chemical Control Alternative

Affected Resource and Area of Potential Impact	Identified Impact	Mitigation Measures	Significance After Mitigation
		> Timing: Prior to chemical treatments **Mitigation Measure AQ-25c:** Use precision application technology to reduce drift and the total amount of material applied. This measure can include (1) precision guidance systems that minimize ground or aerial spray overlap (e.g., GPS and Real Time Kinetics – GPS/RTK), and (2) computer-guided application systems that integrate real-time meteorological data and computer model guidance to reduce drift from aerial application (e.g., trade names "AIMMS," "Wingman™ GX," and "NextStar™ Flow Control"). > Location: Areas to receive treatment with pesticides that are near residential and commercial land uses > Monitoring/Reporting Action: District staff to check current land use maps or aerial photos prior to treatments > Effectiveness Criteria: Document odor complaints from the public > Responsible Agency: District > Timing: Prior to chemical treatments	

Table S-3 Comparison of Reduced Program Alternatives to Proposed Program

	Proposed Program	**Reduced Chemical Control Program**	**No Chemical Control Program**
Alternative Component			
Surveillance	Included	Included	Included
Physical Control	Included	Included	Included
Vegetation Management > Physical Methods > Herbicides/Adjuvants	All physical methods and chemical options included	All physical methods and chemical options included	Includes physical methods only. > Excludes all herbicides and adjuvants. > Less effective with greater reliance on physical and mosquitofish options
Biological Control	Mosquitofish	Mosquitofish	Mosquitofish
Chemical Control	Use any or all pesticides and adjuvants, surfactants, and synergists listed in Chapter 2	Use less of or eliminate one or more of the following: > Lambda-cyhalothrin > Deltamethrin > Etofenprox > Permethrin > Pyrethrin > Bti liquid	Use none of the pesticides and adjuvants, surfactants, and synergists listed in Chapter 2
Nonchemical Control/Trapping	Included	Included	Included

Table S-3 Comparison of Reduced Program Alternatives to Proposed Program

	Proposed Program	Reduced Chemical Control Program	No Chemical Control Program
Impacts			
Biological Resource Impacts (excluding ecological health)	No Impact or Less-than-Significant Impact	No Impact or Less-than-Significant Impact	No Impact or Less-than-Significant Impact
Physical Resource Impacts (excluding air quality odors)	No Impact or Less-than-Significant Impact	No Impact or Less-than-Significant Impact	No Impact or Less-than-Significant Impact
Air Quality - Odors	Potentially Significant but Mitigable Impact Less-than-Significant after Mitigation	Less-Than-Significant Impact	No Impact
Ecological Health Impacts	Less-than-Significant Impact	Less-than-Significant Impact	Potentially Significant Impacts
Human Health Impacts	No Impact or Less-than-Significant Impact	No Impact or Less-than-Significant Impact	Significant and Unavoidable Impacts

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