

INITIAL STUDY & MITIGATED NEGATIVE DECLARATION

INTEGRATED VECTOR MANAGEMENT PROGRAM OF THE GREATER LOS ANGELES COUNTY VECTOR CONTROL DISTRICT

Greater Los Angeles County Vector Control District
12545 Florence Ave.
Santa Fe Springs, CA 90670
T: 562.944.9656
F: 562.944.7976
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INTEGRATED VECTOR MANAGEMENT PROGRAM

PART I. INTRODUCTION

This document is a Draft Mitigated Negative Declaration and Initial Study for the sphere of influence of the Greater Los Angeles County Vector Control District (District). The District provides services under its Integrated Vector Management program. This document was prepared by the District in accordance with Section 15162 of California Environmental Quality Act (CEQA) Guidelines and contains the following:

Draft Mitigated Negative Declaration.

The Draft Mitigated Negative Declaration briefly summarizes and states the conclusions of the Initial Study (Part III), including potential impacts and mitigation measures to insure non-significance. Because the Project avoids significant impacts or includes measures that reduce potential impacts to levels of non-significance, the determination has been made that a Mitigated Negative Declaration is the appropriate document.

Initial Study. This portion of the document is organized with the following sections:

1. The Lead Agency's Determination, which is the statement of the overall significance of the Project's impacts and the identification of the appropriate environmental review document.
2. Environmental Checklist Form, which provides specific information about the Project's purpose and scope, the specific Project activities, actions taken by the District to keep potential environmental impacts of the Project at non-significant levels, and other required approvals.
3. Evaluation of Environmental Impacts, which contains the standard checklist where each environmental issue is defined, impacts are assessed, and determination is made of the level of significance of each potential impact. Explanations in support of the conclusions are also provided.
4. Detailed Technical Review of the Project, which contains narrative description of the Project Impact Area and Project activities, focusing on potential environmental impacts of Project activities and on the policies and practices adopted to ensure that impacts are not significant.
5. References cited or used in preparation of this Study.
6. Appendix. The District's Preliminary CEQA Review.

Comments regarding this report should be addressed to:

Greater Los Angeles County Vector Control District
12545 Florence Ave
Santa Fe Springs, CA 90670
CEQA@glacvcd.org

PART II. FINAL MITIGATED NEGATIVE DECLARATION

Los Angeles County Mosquito and Vector Control District

February 18, 2011

Project Title: INTEGRATED VECTOR MANAGEMENT PROGRAM

**Project Proponent: GREATER LOS ANGELES COUNTY
VECTOR CONTROL DISTRICT**

Project Location:

The District's activities are conducted within a 1,330 square mile jurisdiction contained within Los Angeles County, California. The areas that will be actually or potentially impacted by District activities include:

1. The incorporated cities of Artesia, Bell, Bellflower, Bell Gardens, Burbank, Carson, Cerritos, Commerce, Cudahy, Diamond Bar, Downey, Gardena, Glendale, Hawaiian Gardens, Huntington Park, Lakewood, La Habra Heights, La Mirada, Long Beach, Los Angeles, Lynwood, Maywood, Montebello, Norwalk, Paramount, Pico Rivera, San Fernando, San Marino, Santa Clarita, Santa Fe Springs, Signal Hill, South Gate, South El Monte and Whittier
2. Certain unincorporated areas of Los Angeles County (see District service area map Appendix A)
3. Contracting city La Canada-Flintridge

In addition, the District periodically cooperates with adjoining Mosquito & Vector Control Districts and/or County and State Health Departments on activities that cross normal District boundaries; in these situations, the District or Department with jurisdiction over the locations where specific activities are performed has primary responsibility for these activities.

Project Description:

The project consists of providing the following types of activities within the entire District service area: 1) **Surveillance** for vector populations, vector habitats, disease pathogens, and public distress associated with vectors; this includes trapping and laboratory analysis of vectors to evaluate populations and disease threats, direct visual inspection of known or suspected vector habitats, the use of all-terrain vehicles, maintenance of paths, and public surveys; 2) **Public Education** to encourage and assist in the reduction or prevention of vector habitat on private and public property; 3) Minor **Vegetation Management** to provide access to vector breeding sites and improve surveillance; 4) Provision to the public of the "mosquito fish" *Gambusia affinis*; application of the bacterium *Bacillus thuringiensis israelensis* or *B. sphaericus*, ("**Biological Control**"); and 4) Application of non-persistent selective insecticides to reduce populations of larval or adult mosquitoes and other invertebrate threats to public health ("**Chemical Control**").

In 2006 USEPA adopted a regulation that exempted pesticides applied to waters of the United States in order to control pests (mosquito larvae, aquatic weeds, or other pests) and pesticides applied to control pests that are present over waters of the United States, including near such waters, where a portion of the pesticides will unavoidably be deposited to waters in order to target the pests effectively (e.g. to control adult mosquitoes or other pests), from NPDES permitting requirements. On January 7, 2009, the Sixth Circuit Court determined that this USEPA exemption was not a

reasonable interpretation of the Clean Water Act. A two-year stay of the effect of the decision in order to provide agencies time to develop, propose, and issue NPDES general permits for pesticide applications covered by the ruling was granted such that the USEPA exemption will remain in place until April 9, 2011. As a result, California State Water Board staff is currently drafting a vector control NPDES permit to include both larviciding and adulticiding activities. In an abundance of caution, the District is preparing this CEQA review for its integrated vector management activities.

General Plans:

All Designations (Heavy Industry, Open Space, Parks, Residential, Commercial, Agricultural, etc.)

Zoning: All Zoning Districts

Potential Environmental Impacts and Mitigation:

Because of the nature of the project activities, the District's Integrated Vector Management Program does not and could not cause significant impacts to aesthetics, agricultural resources, land use and planning, mineral resources, population and housing, public services, recreation, transportation and traffic, or utilities and service systems. In addition, District policies and the limited scale and frequency of project activities ensure that no significant impacts occur regarding air quality, cultural resources, geology and soil, hydrology and water quality, or noise. The Project includes controls (District policies and practices) to minimize potential impacts to biological resources and hazards and hazardous materials, which could include:

1. Disturbance to natural communities, plants or animals, including special status species, associated with use of all-terrain vehicles, helicopters, and/or boats on and near wetlands;
2. Non-target pesticide impacts on plants or animals, including special status species; and
3. Impacts to special status species by mosquitofish in the environment.

Established District policies require vector surveillance and the use of treatment criteria prior to chemical, biological, or physical control; monitoring and reporting of activities to appropriate agencies; and other measures to minimize potential environmental impacts. Additional mitigation measures to ensure that these potential impacts remain insignificant will include:

1. Maintenance of maps and other information from the California Department of Fish and Game Natural Diversity Data Base and other reliable sources on the location of Special Status Species and designated Natural Communities in the Project Service Area;
2. Coordination of District activities with approved Habitat Conservation Plans and Endangered Species Recovery Plans;
3. Adoption of new policies as needed and provision of continuing training to field personnel to ensure minimization of specific mosquito control activities and/or the use of alternative mosquito control methods at times and in places where those specific mosquito control activities might otherwise significantly impact Special Status Species or designated Natural Communities.

District Determination:

In accordance with District policies regarding implementation of the California Environmental Quality Act (CEQA) and the CEQA Guidelines, the District conducted a Preliminary Review of its vector management activities in Los Angeles County in September 2010 and concluded that all

administrative, support, educational, and emergency activities were exempt from further CEQA review. Because some elements of the Integrated Vector Management Program are not expressly exempt from further CEQA review, the District has conducted an Initial Study to determine whether the District's Integrated Vector Management Program may have a significant effect on the environment. On the basis of that study the District hereby finds:

Although the on-going project could have a significant adverse effect on the environment, there is no significant adverse effect in this case because the mitigation measures described in the accompanying pages reduce impacts to insignificant levels or eliminate them. A Mitigated Negative Declaration is, therefore, the appropriate CEQA document for this Project.

The environmental document that justifies the Mitigated Negative Declaration and provides the basis for this determination is the Initial Study, which is attached and hereby made part of this document

PART III. INITIAL STUDY

SECTION 1. CEQA DETERMINATION

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

	Aesthetics		Agricultural Resources		Air Quality
	Biological Resources		Cultural Resources		Geology / Soils
	Hazards & Hazardous Materials		Hydrology / Water Quality		Land Use / Planning
	Mineral Resources		Noise		Population / Housing
	Public Services		Recreation		Transportation / Traffic
	Utilities / Service Systems		Mandatory Findings of Significance		

DETERMINATION.

On the basis of this initial evaluation:

I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

Signature

Kenneth L. Bayless
General Manager
Greater Los Angeles County Vector Control District

February 18, 2011

Date

SECTION 2. ENVIRONMENTAL CHECKLIST FORM

This document is an Initial Study of the potential environmental impacts of the Integrated Vector Management Program (IVMP) of the Greater Los Angeles County Vector District (District). This Initial Study was prepared pursuant to the California Environmental Quality Act (CEQA) of 1970, as amended, and in accordance with the CEQA Guidelines. The primary purpose of the Initial Study is to determine and document whether District activities will have a significant or potentially significant effect on the environment.

3.2.1 PROJECT TITLE:

INTEGRATED VECTOR MANAGEMENT PROGRAM OF THE GREATER LOS ANGELES COUNTY VECTOR CONTROL DISTRICT

3.2.2 LEAD AGENCY NAME AND ADDRESS:

Greater Los Angeles County Vector Control District
12545 Florence Ave.
Santa Fe Springs, CA 90670

3.2.3 CONTACT PERSON AND PHONE NUMBER:

Susanne Kluh
Director of Scientific-Technical Services
(562) 944-9656

3.2.4 PROJECT LOCATION:

The District's activities are conducted within a 1,330 square mile jurisdiction contained within Los Angeles County, California. The areas that will be actually or potentially impacted by District activities include:

1. The incorporated cities of Artesia, Bell, Bellflower, Bell Gardens, Burbank, Carson, Cerritos, Commerce, Cudahy, Diamond Bar, Downey, Gardena, Glendale, Hawaiian Gardens, Huntington Park, Lakewood, La Habra Heights, La Mirada, Long Beach, Los Angeles, Lynwood, Maywood, Montebello, Norwalk, Paramount, Pico Rivera, San Fernando, San Marino, Santa Clarita, Santa Fe Springs, Signal Hill, South Gate, South El Monte and Whittier
2. Certain unincorporated areas of Los Angeles County (see District service area map Appendix A)
3. Contracting city La Canada-Flintridge

In addition, the District periodically cooperates with adjoining Mosquito & Vector Control Districts and/or County and State Health Departments on activities that cross normal District

boundaries; in these situations, the District or Department with jurisdiction over the locations where specific activities are performed has primary responsibility for these activities.

3.2.5 PROJECT SPONSOR'S NAME AND ADDRESS:

Greater Los Angeles County Vector Control District
12545 Florence Ave.
Santa Fe Springs, CA 90670

3.2.6 GENERAL PLAN DESIGNATION:

All general plan designations found within Los Angeles County.

3.2.7 ZONING:

All zoning designations found within Los Angeles County.

3.2.8 DESCRIPTION OF PROJECT:

The project consists of providing the following types of activities within the entire District:

- **Surveillance** for vector populations, vector habitats, disease pathogens, and public distress associated with vectors; this includes trapping and laboratory analysis of vectors to evaluate populations and disease threats, direct visual inspection of known or suspected vector habitats, the use of all-terrain vehicles, maintenance of paths, and public surveys;
- **Public Education** to encourage and assist in the reduction and/or prevention of vector habitats on private and public property;
- Applications of the “mosquitofish” *Gambusia affinis*, the bacteria *Bacillus thuringiensis israelensis* and *B. sphaericus* and possibly use of other predators or pathogens of mosquitoes (“**Biological Control**”); and
- Application of non-persistent selective insecticides to reduce populations of larval or adult vectors (“**Chemical Control**”).

Descriptions of these activities, including their typical annual frequency and intensity, and general District policies and procedures to ensure that they result in no significant environmental impact, are provided below. Detailed technical descriptions of these activities, including an extensive literature review and material-specific or site-specific District policies and procedures, including application criteria, are discussed in detail in Part IV (Technical Review).

A. Purpose and Need

The District's activities are conducted within a 1,330 square mile jurisdiction contained within Los Angeles County (see map, Appendix A). The District exists to reduce the risk of vector-borne disease or discomfort to the residents of its Service Area. Besides being nuisances by disrupting human activities and the use and enjoyment of public and private areas, certain insects and animals may transmit a number of diseases. The diseases of most concern in the Project Service Area are West Nile virus (WNV), Western equine encephalomyelitis (WEE), St. Louis encephalitis (SLE), dog heartworm, and malaria, which are transmitted by mosquitoes.

The California Health and Safety Code defines a vector 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” (Section 2200(f)). The District undertakes activities through its Integrated Vector Management Program to control the following vectors of disease and/ or discomfort in the Service Area:

1. Mosquitoes.

Fourteen species of mosquitoes frequently occur within the service area of the District. (Appendix D). The reader is referred to the publications by Bohart and Washino (1978), and Meyer and Durso (1993) for detailed information concerning the biology, ecology, and diseases vectored by these mosquitoes.

Certain species of mosquitoes found in Los Angeles County can transmit malaria, St. Louis encephalitis, Western equine encephalomyelitis, West Nile Virus and potentially other viruses. A few species of mosquitoes are also capable of transmitting dog heartworm. Although some species of mosquitoes have not been shown to transmit disease, most species can cause human discomfort when the female mosquito bites to obtain blood. Reactions range from irritation in the area of the bite to severe allergic reactions or secondary infections resulting from scratching the irritated area. Additionally, an abundance of mosquitoes can cause economic losses, and loss of use or enjoyment of recreational, agricultural, or industrial areas.

2. Black Flies.

Black flies breed in flowing water from rivers and streams to irrigation ditches. After mating, the female black fly deposits her fertilized eggs on rocks or other substrate in swift flowing water. They are usually found from spring through fall, with the greatest numbers appearing in the late spring and summer. Adults live two to three weeks and are small, menacing, biting flies that are a nuisance to people and animals living, working, or playing near rivers and streams. Pain and swelling from the bites can occur due to allergic reactions to foreign proteins and toxins that the female injects when feeding. In the tropics, black flies transmit diseases such as River Blindness. Fortunately, they do not transmit any diseases to humans in California, but can cause extreme discomfort and irritation due to their biting habits and great numbers.

3. Non-biting Midges.

Midge larvae develop and breed in aquatic habitats similar to those of mosquitoes. The adults are flying insects which emerge in masses and become especially bothersome for residents near sources such as flood control channels, lakes, ponds, reservoirs or spreading basins from April to September. When midges emerge as adults in enormous numbers, they invade nearby residences, disrupt outdoor and indoor activities, and create stressful living conditions in

affected areas. Swarms can cause discomfort or irritation by entering the eyes, ears, nose, and mouth. Although these insects do not transmit diseases, they have been documented to cause allergic reactions, to lessen real estate value in residential areas and can interfere with processing of food, paper products, plastic, and automotive refinishing operations in industrial situations, causing significant economic impact.

Most of the vectors mentioned above are extremely mobile and cause the greatest hazard or discomfort away from their breeding site. Each of these potential vectors has a unique life cycle and most of them occupy different habitats. In order to effectively control these vectors, an integrated vector management program 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.

B. General Vector Management Strategy

As described in the Preliminary Review (Appendix G), the District's activities address vector management through a general strategy including identification of vector problems; responsive actions to control existing populations of vectors and prevent new sources from developing; an educational component on measures that minimize vector production or interaction with vectors; and the provision and administration of funding and institutional support necessary to accomplish these goals.

In order to achieve effective and environmentally sound vector management, the manipulation and control of vectors must be based on careful surveillance of their abundance, habitat (potential abundance), pathogen load and/or potential contact with people, the establishment of treatment criteria (thresholds) (Appendix E, F), and appropriate selection from a wide range of control methods. This dynamic combination of surveillance, treatment criteria, and selection between multiple control activities in a coordinated program is generally known as Integrated Pest Management (IPM) (Glass 1975, Davis et al 1979, Borror et al 1981, Durso 1996, Robinson 1996).

The District's Integrated Vector Management Program (IVMP), like any other IPM program, by definition involves procedures for minimizing potential environmental impacts. The District's Project employs IPM principles by first determining the species and abundance of vectors through evaluation of public service requests and field surveys of immature and adult vector populations; and 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, the District also uses biological control such as the planting of mosquitofish in ornamental ponds. When these approaches are not effective or are otherwise inappropriate, then pesticides are used to treat specific vector-producing or harboring areas or vector populations.

Vector control activities are conducted at a wide variety of sites throughout the District's Project area. These sites can be roughly divided into: (1) those where activities may have an effect on the natural environment either directly or indirectly ("Environmental Sites"), and (2) sites where the potential environmental impacts are negligible ("Non-Environmental Sites"). Examples of "Environmental Sites" in the Project area include tidal marshes, lakes and ponds, rivers and streams, wetlands, stormwater detention basins, flood control channels, spreading grounds, street drains and gutters, wash drains, and roadside ditches. Examples of "Non-Environmental Sites" include animal troughs, artificial containers, tire piles, fountains, ornamental fish ponds, and neglected swimming pools.

The District's IVMP principles for mosquitoes apply similarly to other pestiferous vectors, including assessing the threat to surrounding organisms, proximity to populated regions, pesticide use in strict accordance with label requirements, eradication of breeding sources to avert re-infestation, educating the general public on preventative measures to prevent future colonization, administration of funding and institutional support necessary to accomplish these goals, and cooperation with other agencies.

The intensity of biological or chemical control activities in the District Service Area in general, or in any particular vector source, varies annually and seasonally because of weather conditions, size and distribution of vector populations, disease patterns, known or potential pesticide resistance, and in response to other variables. Therefore, the scopes of work discussed in the sections below are illustrative of typical District activities levels.

C. CEQA-Exempt District Activities

All District activities have been evaluated in the District's CEQA Preliminary Review. In the Preliminary Review, the District concluded that most activities conducted by the District are statutorily or categorically exempt from further CEQA review. It was also determined that some specific activities within the District's Integrated Vector Management Program might exceed the scope of the exemptions to CEQA, or might trigger one or more of the exceptions to the exemptions, primarily because of their potential impacts on endangered species or in critical wetland habitats. Therefore the District has undertaken this Initial Study. To ensure that no potentially significant cumulative effects are missed, the entire IVMP Program is evaluated here, with the exception of the Education activities that are clearly exempt from further CEQA review, as described in the Preliminary Review. In addition, all administrative support activities are exempt and are not discussed further in this document.

In the event of emergency conditions (actual or imminent disease outbreak), District actions are also exempt from CEQA (see Preliminary Review), and are therefore not covered by this document. It should be noted, however, that reasonably foreseeable actions in the event of emergencies vary from the routine operational actions of the District only in scope or intensity, and as such are not expected to result in any significant environmental impact.

D. Surveillance

The District's responsibility to protect public health and welfare involves monitoring the abundance of vectors, vector habitat, vector-borne pathogens, and interactions between vectors and people over time and space. Collectively, these monitoring activities are termed Vector Surveillance. 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 there are, and if they are carrying disease or otherwise affecting humans. Vector surveillance is critical to an Integrated Vector Management Program because the information it provides is evaluated against treatment criteria to decide when and where to institute control measures. Equally important is the use of vector surveillance in evaluating the efficacy, cost effectiveness, and environmental impacts of specific control actions.

The Greater Los Angeles County Vector Control District routinely uses a variety of traps for surveillance of adult mosquitoes, regular field investigation of known mosquito sources, flocks of

sentinel chickens for arbovirus¹ testing, public service requests for mosquitoes and other insect vectors; and low ground pressure all-terrain vehicles to access these sites.

The District's vector and disease surveillance activities are conducted in compliance with accepted Federal and State guidelines, and the reader is referred to the volumes by Moore et al. (1993), Durso (ed.). (1996), and Reisen et al. (1995) for further information on specific surveillance techniques. These guidelines recognize that local conditions vary, and are thus flexible in the selection and specific application of methods. Therefore, the District's specific activities and their potential environmental impacts are described below.

E. Biological Control

The District uses the mosquitofish *Gambusia affinis* in ornamental fishponds and swimming pools as a biological control of mosquitoes through direct predation of larvae. The District stocks about 150-200 pounds of mosquitofish annually in swimming pools and ornamental ponds.

Other biological control methods available to the District include the application of the biological insecticide *Bacillus thuringiensis israelensis* and *B. sphaericus*. Because potential environmental impacts of applying the *Bacillus thuringiensis israelensis* and *B. sphaericus* relate to the possibility of disturbance associated with the mode of application, and the possibility of non-target toxicity, these materials will be discussed below under Chemical Control.

F. Chemical Control (Pesticide Application)

When field inspections indicate the presence of vector populations which meet District criteria for chemical control (including abundance, density, species composition, proximity to human settlements, water temperature, presence of predators and other criteria), District staff apply pesticides to the site in strict accordance with the pesticide label instructions. The total number of applications and weight or volumes of pesticides applied by the District in 1997-2001 are shown in Appendix B.

1. Larvicides.

Depending on time of year, water temperature, organic content, mosquito species present, larval density, and other variables, pesticide applications may be repeated at any site at intervals ranging from weekly to annually.

Larvicides routinely used by the District include *Bti* (*Bacillus thuringiensis israelensis*), *Bs* (*Bacillus sphaericus*), Methoprene (Altosid), Spinosad, Golden Bear 1111 and BVA.

¹ Arbovirus is a conventional term used to refer to ARthropod-BORne Viruses (Reisen et al 1995).

Bti is a bacterium that is ingested by larvae and disrupts their gut lining, leading to death before pupation. *Bti* is applied by the District as a liquid or is 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 relative to the larval instar. Therefore, use of *Bti* requires frequent inspections of larval sources during periods of larval production, and may require frequent applications of material.

Bs is a spore producing bacterium that is ingested by mosquito larvae. Only when activated by the larva's specific gut PH and enzymes do the spores become toxic, causing damage to the gut of the mosquito. *Bs* is applied by the District as a liquid or is bonded to an inert substrate (sand or corncob granules) to assist penetration of vegetation. The product is quick acting and highly effective against a number of mosquito species, and its lasting residual makes it ideal for use in a wide number of permanent aquatic habitats.

Methoprene, or Altosid, is a synthetic juvenile hormone designed to disrupt the transformation of a juvenile mosquito into an adult. It is applied either in response to observed high populations of mosquito larvae at a site, or as a sustained-release product that can persist for up to approximately four months.

Spinosad or Natular is a fermentation product of a naturally-occurring soil bacteria. It breaks down quickly and does not bioaccumulate in the environment. Spinosad alters the function of insect nicotinic acetylcholine receptors in a unique action that causes continuous nervous impulses. This constant involuntary nervous stimulus causes larval paralysis and death. The action results primarily by ingestion, as well as by contact with the active ingredient. It is applied either in response to observed high populations of mosquito larvae at a site, or as a sustained-release product that can persist for up to approximately six months.

Golden Bear Oil 1111 is a petroleum distillate with low phytotoxicity and fast environmental breakdown that forms a thin film on water and kills larvae through suffocation and/or direct toxicity. It is typically applied by hand, ATV, or truck.

Agnique is the trade name for a recently reissued surface film larvicide, comprised of ethoxylated alcohol, that kills mosquito larvae and pupae in much the same manner as Golden Bear 1111. The District uses Agnique as an alternative to Golden Bear 1111.

BVA 2 is highly refined oil with low phytotoxicity that forms a thin film on water and rapidly interrupts the air-water interface and suffocates the larvae. This quick action makes it an effective larvicide and pupicide for any program and provides a short residual period of 1 to 3 days.

2. Adulticides.

In addition to chemical control of larvae, the Greater Los Angeles County Vector Control District also conducts aerosol applications of pesticides for control of adults. Specific criteria for application include species composition, population density, proximity to human populations, and/or human disease risk (Part IV). As with larvicides, adulticides are applied in strict conformance with label requirements. Adulticides used by the District include the synthetic pyrethroids Resmethrin and Permethrin.

3.2.9 SURROUNDING LAND USES AND SETTING:

The Project Service Area has a diverse set of climatic conditions, land uses, and habitats, including salt marsh, riparian areas, oak woodland, chaparral, open grassland, wastewater treatment ponds, urban development and urban parks.

Because of the diversity of vector habitat, vector control activities are conducted in a wide variety of ecosystems and habitat types throughout the District's Project area. Mosquito control activities are associated with wet areas of all types and sizes. This includes marshes, ponds, creeks, seasonal wetlands, wastewater ponds, storm-water detention basins, ditches, ornamental fishponds, impound areas, etc., as well as individual homes or commercial buildings.

3.2.10 OTHER PUBLIC AGENCIES REVIEW/APPROVAL REQUIRED:

The District's IVMP Program as a whole, including the registration and continuing education of state-certified field personnel, is reviewed and approved by the **California Department of Public Health**, through a formal Cooperative Agreement that is renewed annually.

For work on state lands and riparian zones, wetlands or other sensitive habitats, the District coordinates and reviews activities with the **California Department of Fish & Game**, the **U.S. Fish & Wildlife Service** and the **Army Corps of Engineers**.

For chemical control activities, the District reports to and is periodically reviewed by the **Los Angeles County Agricultural Commissioner**, **Los Angeles Regional Water Quality Control Board**, and **Department of Pesticide Regulation**.

SECTION 3. EVALUATION OF ENVIRONMENTAL IMPACTS

This section presents the detailed environmental checklist and a discussion of potential environmental impacts of the project. The checklist includes questions relating to 17 areas of concern, and following each subject category an explanation is provided to support the basis of the impact finding. In preparing this Section, the District has conformed to the CEQA Guidelines.

3.3.1 AESTHETICS.

Would the project:	Potentially Significant	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Have a substantial adverse effect on a scenic vista?				X
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?				X
c) Substantially degrade the existing visual character or quality of the site and its surroundings?			X	
d) Create a new source of substantial light or glare, which would adversely affect day or nighttime views in the area?				X

Explanation:

Potential Environmental Impacts and Project Features that Avoid a Significant Impact

Mosquito control activities will generally have no significant or long-term effect on scenic vistas or resources as specified under 3.3.1 (a) and (b) since none of the project activities permanently alter the appearance of treatment locations such as wetlands or riparian zones. Inspection and control activities using wheeled vehicles on soft ground or in vegetated areas may temporarily disturb tall or stiff plants on the marshlands, but this is a short-term phenomenon that is generally not visible except from a short distance. In addition, the District typically uses ATV routes that minimize visual impacts or the quality of the site and its surroundings (c). The program does not create any sources of substantial light or glare.

Mitigation and Conclusion:

Because the project will not create any significant adverse impacts to aesthetic resources, no mitigation is required. Impacts are less than significant.

3.3.2 AGRICULTURE AND FORESTRY RESOURCES.

<p><i>In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to the California Department of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment Project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board.</i></p> <p>Would the project:</p>	Potentially Significant Impact	Potentially Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
<p>a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?</p>				X
<p>b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?</p>				X
<p>c) Involve other changes in the existing environment, which, due to their location or nature, could result in conversion of Farmland to non-agricultural use?</p>				X

Explanation:

Setting

According to the 2007 Census of Agriculture, Los Angeles County includes approximately 108,463 acres of agricultural lands, most of which fall within the IVM Program Service Area.

Potential Environmental Impacts and Project Features that Avoid a Significant Impact

Mosquito control activities will not convert any agricultural lands to other uses, nor conflict with any Williamson Act contracts.

Mitigation and Conclusion:

Because the project will not cause any significant adverse impacts to agricultural resources, no mitigation is required. Impacts are less than significant.

3.3.3 AIR QUALITY.

Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?			X	
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?			X	
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions, which exceed quantitative thresholds for ozone precursors)?			X	
d) Expose sensitive receptors to substantial pollutant concentrations?			X	
e) Create objectionable odors affecting a substantial number of people?			X	

Explanation:

Setting

There are currently five pollutants for which the Air Basin that contains the Project Service Area has not attained both Federal and State criteria for ambient air quality: ozone (O3), lead, nitrogen dioxide (O2), particulate matter less than 2.5 micrometers (PM 2.5) and particulate matter less than 10 micrometers in size (PM10) (SCAQMD, 6/25/99). Emissions of volatile organic compounds (VOC's), which are ozone precursors, are thus also considered an environmental problem in the Service Area.

Potential Environmental Impacts and Project Features that Avoid a Significant Impact - Chemical Control

Pesticide applications by the District do not significantly contribute to PM10, because most materials are applied directly to aquatic sources and aerosol applications use liquid droplets, not particulates, as carriers. Applications of GB-1111 or BVA, as well as oil-based aerosols contribute insignificant quantities of VOC's. GB-1111 and BVA, although oil products, are listed as "non-volatile" on their Material Safety Data Sheets (MSDS -- see References).

Larvicide applications consist of liquid or granular materials that are directly added to the treated water body. So there is minimal potential for exposure in the process. In case of an application on private property, such as to a neglected swimming pool, appropriate notice will be given to the property owner.

Ultra low volume (ULV) foggers are used to perform adulticide applications. These treatments are usually performed late at night or early in the morning due to the need for the presence of a temperature inversion in the treatment area, thus greatly limiting public activity in the area at the time. Warning signs announcing time and location of the adulticiding event are posted in advance and the general application area is screened before conducting the application. Most adulticide applications are conducted in open spaces such as wetland areas, nature preserves, recreational

spaces or parks. In case of an application in a residential neighborhood residents will be informed and advised on how to avoid exposure. The control substance breaks down rapidly in sunlight, leaving no residue.

Surface oil application using GB-111 could temporarily leave a faint petroleum odor in the immediate vicinity of the treatment, but this material is generally only used on small manmade sources such as neglected swimming pools so that the temporary odor would be restricted to a single back yard.

Since adulticides are applied as ULV fog, there is the potential for an associated odor depending on the material applied. Short material persistence and application timeframe, however, in combination with the open space location and/or resident notifications minimize the likelihood of public exposure.

Fleet

The District maintains a fleet of 87 vehicles which includes passenger vehicles, light trucks and medium duty trucks. Vehicles provide the means for District staff to perform inspections, surveillance, treatments and to interact with the public. According to Rule 1191 of the Southern California Air Quality Management District for passenger vehicles, light and medium duty on-road vehicles, the District is in compliance. 21 of the District's vehicles are exempt, 42 are low emission vehicles, 31 are ultra low emission vehicles and 3 are super low emission vehicles. According to the calculations found on the SCAQMD website for on-road emissions and the calculated values based on the California Air Resources Board's EMFAC2007 (version 2.3) Burden Model, the District's fleet is well below the allowable daily totals. (see appendix H for calculated pollutant levels)

Mitigation and Conclusion:

Because the project will not cause any significant air quality impacts, no mitigation is required. Impacts are less than significant.

3.3.4 BIOLOGICAL RESOURCES.

Would the project:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?			X	
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or the U.S. Fish and Wildlife Service?			X	
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) Through direct removal, filling, hydrological interruption, or other means?			X	
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?			X	
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?				X
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?			X	

Explanation:

Setting

The Project impact area, primarily urbanized, covers a wide range of natural habitats with an equally wide range of plant and animal communities. Many Significant Ecological Areas (SEA) such as Griffith Park or Harbor Lake Regional Park occur within the District's coverage area. Human activities in the Service Area have led to substantial changes in these habitats and in the populations of the organisms that inhabit them, so that many areas of the District Service Area exhibit some degree of human modification and impact.

Mosquito as well as black fly and midge control activities are associated with wet areas of all types and sizes, and because of the diversity, control activities are conducted in a wide variety of different ecosystems and habitat types throughout the District's Project area. These sites can be roughly divided into those where activities may have an effect on the natural environment either directly or through drainage from an upstream site, and sites where the potential environmental impacts are

negligible. Examples of “Environmental Sites” in the Project area include ponds, rivers, streams, stormwater detention basins, flood control channels, spreading grounds, street drains and gutters and roadside ditches. Examples of “Non-Environmental Sites” include animal troughs, artificial containers, tire piles, fountains, ornamental fish ponds, swimming pools and non-natural harborage (such as residential and commercial landscape, trash receptacles, etc.).

A. Potential Environmental Impacts and Project Features that Avoid a Significant Impact - Endangered and other Special Status Species

The California Department of Fish and Game’s Natural Diversity Database (NDDDB) lists 6 special status species² within the District’s project area (see Appendix C). In almost all cases, the primary explanation for their status is loss of habitat. Because the District’s activities do not involve changes in land use, the District’s activities do not contribute to this process. In the areas where the District’s routine activities do overlap with specific habitat, District policies and practices ensure that no significant impacts can occur.

Of the six species and subspecies listed as “Endangered” or “Threatened” under either the Federal or State Endangered Species Acts (ESA), four occur in habitats where the District has routine operations. This includes the Coastal California gnatcatcher (*Polioptila californica californica*), the Santa Ana sucker (*Catostomus santaanae*), the Arroyo toad (*Bufo californicus*) and the Least Bell’s vireo (*Vireo bellii pusillus*). The District takes extreme care to avoid disturbance to listed endangered species. Habitat descriptions and current maps of distribution and potential habitat of all endangered species in the Service Area are maintained by the District and incorporated into the operational guidelines of field personnel. These sensitive habitats as well riparian corridors that have received special protection by the California Department of Fish and Game, are well known to District staff, and vector surveillance and control methods used in these areas avoid use of bulky equipment and rely upon careful inspection and treatment, using small volumes of highly selective pesticides to minimize potential environmental impacts.

The District maintains detailed maps and databases of all areas where mosquito production takes place in the Service Areas, and the location is recorded for all surveillance and control activities. Therefore, the District has a detailed long-term database that allows evaluation of the intensity of control efforts, and their relationship to specific wetland or riparian sites. We have not observed degradation of these sites associated with District activities.

There is no credible substantial evidence other project elements (ATV use; Biological Control; and/or Chemical Control) may pose a threat to some endangered, threatened, rare, or other special status species in other areas. Specifically, a thorough review of the IVM Program and the relevant scientific literature does not find substantial evidence to support these suggestions. Instead, the available credible information indicates that the Program/Project is very unlikely to have a significant impact on special status species or other biological resources within the Service Area. A detailed discussion and documentation to support these conclusions and the following observations is provided in the Project Technical Review (Part IV).

- The Project consists of a number of **ongoing activities**, each of which has been carried out by

² Under the Federal and State Endangered Species Acts, the word “species” may also mean subspecies or other taxonomic groupings.

the District in the current Service Area for between 10 and 58 years without observed or demonstrated significant impacts on biological resources.

- Where adverse changes in biological resources have been observed in the current Service Area or regionally, there is **no documented relationship**, geographic or temporal, between District activities and these changes.
- There is **no substantial evidence of significant impacts** to biological resources caused by the specific project methods and materials, separately or cumulatively, at any level of application consistent with District policies and guidelines and Federal and State label requirements.
- The **scope** and **scale** of the District's activities are limited and insignificant in comparison to other similar activities in the Project Area, including commercial and household pesticide use.
- The District **complies strictly with pesticide labels** that are written to ensure that no significant impact to biological resources can occur.
- The District's activities are **highly selective in space and time**, based on a detailed list of potential mosquito sources, pre-control surveillance for mosquito abundance, and threshold criteria for control applications.
- The District's field technicians are **highly-trained** pesticide applicators, **certified by the California Department of Public Health** and required to complete frequent **continuing education** sessions sponsored by the District and by the Mosquito & Vector Control Association of California pursuant to State Regulations.
- The District's field activities are **routinely monitored** for safety, efficacy, and environmental impact by the District's Manager, by the Los Angeles County Agricultural Commissioner, and by permit-issuing agencies.
- The District and the Mosquito & Vector Control Association of California routinely fund and collaborate with researchers from the University of California and other academic institutions on **research projects** to evaluate activities and to ensure that practices are used with the least potential impact on biological resources consistent with operational requirements.
- The District's activities are **consistent** with the Los Angeles County General Plan Conservation and open space Elements, such as Air, Water or Biotic Resources and all known Habitat Conservation Plans, Endangered Species and Sensitive Habitat Recovery Plans, and City Plans in the Service Area.
- District staff routinely **coordinates and consults** with other responsible agencies, including the California Department of Public Health, the California Department of Fish and Game, the U.S. Fish and Wildlife Service, the Coastal Conservancy, the Los Angeles Regional Water Quality Control Board, and the U.S. Army Corps of Engineers, to ensure that Project activities do not result in significant impacts to biological resources.

Furthermore, District activities in riparian areas or near streams are conducted almost exclusively on foot, and control operations are conducted using small volumes of highly selective pesticides to minimize potential environmental impacts.

In addition to these general conclusions, the District makes the following specific findings:

1. ATVs

The District uses All-Terrain Vehicles (ATVs) to deliver and apply pesticides. In each case, the potential impacts of the ATVs are similar, and consist of noise and other disturbance to nearby wildlife, trampling of vegetation and/or nests, and compaction of soils. The IS/MND concludes that

the use of ATVs by the District does not and will not have a significant effect on the environment. Specifically, 1) the low frequency of usage at any particular site reduces the disturbance and noise impacts to less than significance; 2) District training and policies prevent significant risk of disturbance to nesting birds or other wildlife; 3) on land, most vehicles travel mainly on established trails; 4) most vegetation types rebound rapidly from single ATV passes especially since the amphibious, all-terrain Argo, for example, has eight 25” diameter, low-pressure tires with wide, soft tread and its low weight and low pressure tires leave a light footprint on sensitive terrain; 5) all vegetation types re-grow completely following ATV use by the District, with no evidence of long-term impact (the District has been in operation since 1952 and has many years of experience with the same types of machinery which have not shown any evidence of long-term or significant impacts); 6) the low ground pressure of District ATVs precludes significant soil compaction or erosion; 7). the District also uses a SCAT Hovercraft, which creates less drag and hull contact on the water by using low-pressure air to form an air cushion beneath the craft, does not pierce the surface over which it travels; therefore there is less friction and need for fuel and minimal disturbance to the environment, the wake created by the hovercraft is minimal, thereby minimizing any river bank erosion and damage to shores, unlike many boats, engine exhaust fumes are not directed into the water; and 8.) all field personnel that use these vehicles are extensively trained on the proper use of such vehicles.

2. Biological Control

The IS/MND concludes that there is no credible or substantial evidence suggesting that the omnivorous feeding habits of mosquitofish (*Gambusia affinis*) pose a threat to the juvenile forms of the federally-threatened California Red-legged Frog (*Rana aurora draytonii*) and although the California Red-legged Frog is present in Los Angeles County, critical habitat for this species is located outside District boundaries. In addition, (1) the District ensures separation between mosquitofish and potentially present immature Red-Legged Frogs by stocking fish only in artificial sources such as backyard fish ponds or unmaintained swimming pools; (2) the U.S. Fish and Wildlife Service acknowledges that they “cannot determine whether mosquitofish are harmful to California red-legged frogs.” (USFWS 1996); (3) recent university research indicates that there is no direct (mortality) impacts of mosquitofish on Red-Legged Frogs in intense interactions in naturalistic settings, and that the only indirect impact seen in this research was a slight lowering of body weight at the transition from tadpole to adult, with no evidence that this had any biological significance (Lawlor 1999); (4) mosquitofish and red-legged frogs have been repetitively seen to coexist in natural settings outside of the District Service Area (USFWS 1996; Karl Malamud-Roam & Ron Keith, pers. comm. 1999); and (5) alternative and more plausible explanations exist to explain the observed historic decline in Red-legged frogs in California (USFWS 1996, Lawlor 1999).

Furthermore, District activities are undertaken in coordination with other agencies involved in management of natural resources and the environment, and are carried out pursuant to a framework of federal and state regulations. The following specific observations support our conclusion that existing District controls are effective to avoid significant environmental impact:

- The District has used mosquitofish in the current Service Area for over fifty years without any apparent relationship, geographic or temporal, between our activities and observed environmental changes;

- The District's use of mosquitofish is limited to artificial sources such as swimming pools and ornamental ponds;
- The District's field technicians are highly-trained, certified by the California Department of Public Health, and are required to complete frequent continuing education sessions sponsored by the State, the District, or the Mosquito & Vector Control Association of California;
- The District's field activities are routinely monitored for safety, efficacy, and environmental impact by the District's Manager, by the Los Angeles County Agricultural Commissioner, and by permit-issuing agencies;
- The District's activities are consistent with the Conservation Policies of the Los Angeles County General Plan and identified Habitat Conservation Plans, Endangered Species and Sensitive Habitat Recovery Plans, and City Plans in the Service Area; and
- District staff routinely coordinate and consult with other responsible agencies, including the California Department of Public Health, the California Department of Fish and Game, the U.S. Fish and Wildlife Service, to ensure that Project activities do not result in significant impacts to biological resources.

3. Chemical Control

When mosquito numbers exceed District control thresholds and other control methods would be ineffective, contrary to permits or other environmental protections, or otherwise inappropriate, the District utilizes specific insecticides that are registered for use in California and that possess a current EPA label. At the outset, it is important to note that, typically, the District applies larvicides to less than one percent of the total District Service Area in any year.

As required by the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), each pesticide used by the District has been tested for acute and chronic effects using good lab practices on an array of non-target species and under laboratory and field conditions. These tests, as well as studies conducted by qualified researchers at universities and other research institutions, have produced a wealth of literature showing no long-term adverse effect to non-target biological resources when applied selectively and consistently with the labels. A detailed technical summary of the literature on pesticides used or contemplated by the District is presented in the Program Technical Review (Part IV). Furthermore, there are other practices inherent in the District's chemical control program that protect the environment:

1. There are numerous federal and state laws and regulations that strictly control and regulate the storage, transport, handling, use and disposal of the pesticides in order to protect against surface and groundwater contamination and other impacts to the environment and public health. (E.g., Federal Insecticide, Fungicide and Rodenticide Act; Cal. Food & Agric. Code divisions 6 & 7; Cal. Code of Regs., title 3, division 6.) The District and its staff consistently comply with these laws and regulations and are routinely inspected by the county agricultural department for compliance.
2. The District only uses pesticides registered by the U.S. Environmental Protection Agency and California Department of Pesticide Regulation. The District then strictly complies with the pesticide label restrictions and requirements concerning the storage, transport, handling, use and disposal of the pesticides.

3. Consistent with the District's integrated mosquito management principles, when using pesticides, the District selects the least hazardous material that will meet its goals. The District does not use Category 1 pesticides, and only uses Category 2 pesticides in emergency conditions.
4. The District regularly calibrates the output of all of its pesticide application equipment.
5. The California Department of Public Health (CDPH) regulates the District and its employees. Mosquito control activities are coordinated with CDPH pursuant to an annual Cooperative Agreement, under which the District commits to comply with certain standards concerning mosquito control and pesticide use. State law and the Cooperative Agreement require District mosquito control employees to be certified by CDPH as a mosquito control technician. This certification helps to ensure that the employees are adequately trained regarding safe and proper mosquito control techniques, including the handling and use of pesticides and compliance with laws and regulations relating to mosquito control and environmental protection. The District also works in close coordination with the county agricultural commissioner, including periodic reporting of its activities.

In addition to general District policies and practices noted earlier, to protect listed insects and crustaceans the District does not routinely apply insecticides other than Bti or Methoprene to areas with known populations of these organisms. As discussed in Part IV of the Program Technical Review, these materials have no detectable effect on listed stream or vernal pool fauna. Because of the hydrology and habitat types in these specific areas, the District finds it highly unlikely that it would use other insecticides in these areas except under emergency conditions, and would do so only in consultation with the appropriate agencies.

Two specific assertions of links between chemical pesticides used by the District and special status species will be addressed briefly here because of recent associated publicity, despite the lack of any substantial evidence to support them:

First, it has recently been suggested that Altosid (S-methoprene) may be associated with deformities in frogs that have been observed in a number of States. The District has performed an exhaustive review of the literature (see Program Technical Review, Part IV) and the IS/MND thus concludes that there is no credible substantial evidence to support this suggestion. Specifically, 1) there is no evidence of a spatial or temporal relationship between Altosid use and amphibian deformities; 2) in particular, there is no evidence of frog deformities at all in the District's Service Area, and no significant evidence of frog deformities anywhere in California where methoprene is used; 3) well-documented alternative explanations for frog deformities, that are more consistent with the epidemiological patterns observed, have been reported; 4) the observations discussed to support the assertion have not been duplicated by any other researchers; 5) severe deficiencies in methodology and/or interpretation exist in the few reports that make this assertion; and 6) recent exhaustive reviews of this literature by independent analysts in Minnesota and New Zealand unconditionally agree with the District's findings on this question.

Second, questions have been raised for a number of years about whether insecticides used against mosquitoes could cause indirect impacts on higher organisms through impacts on food chains, and specifically if larvicides could reduce the populations of *Chironomid* or other midges to a degree significant to waterfowl or wading birds. The District has performed an exhaustive review of the literature (see Program Technical Review, Part IV) and concludes that there is no substantial evidence to support this suggestion. Specifically, the IS/MND concludes that 1) there is no

evidence of a spatial or temporal relationship between larvicide use and population dynamics of waterfowl or wading birds; 2) Golden Bear 1111 has no effect on midge larvae (the species of concern in our area are primarily benthic); 3) Bti has no detectible effect on midge larvae when applied at label rates for mosquito control; 4) Methoprene, at label rates for mosquito control, can prevent adult emergence of midges but does not directly kill mosquito or midge larvae and therefore does not remove them from the food chain; 5) no bioaccumulation (food chain magnification) of larvicides in larval predators has been demonstrated for larvicides used by the District; and 6) the District does not plan to use other larvicides in areas where midges might be a significant portion of the food chain, except under emergency conditions.

4. Mitigation Measures

Although the District does not find substantial evidence that the current Program could significantly impact special status species, the following additional mitigation measures will be adopted as a prudent action to ensure that impacts remain insignificant:

1. Maintenance of maps and other information from the California Department of Fish and Game Natural Diversity Database and other reliable sources on the location of Special Status Species and designated Natural Communities in the Project Service Area;
2. Coordination of District activities with approved Habitat Conservation Plans and Species Recovery Plans; and
3. Adoption of new policies as needed and provision of continuing training to field personnel to ensure minimization of specific mosquito control activities and/or the use of alternative mosquito control methods at times and in places where those specific mosquito control activities might otherwise significantly impact Special Status Species or designated Natural Communities.

B. Potential Environmental Impacts and Project Features that Avoid a Significant Impact - Riparian and other Sensitive Habitats

District activities in sensitive habitats are essentially restricted to riparian corridors, which are addressed in this subsection, and to wetland areas, which are discussed in subsection 3.4(C) below. In riparian areas, the only District activities with any potential for environmental impacts are 1) vegetation management for maintenance of access; and 2) pesticide use. The only identified potential environmental impact of biological control in riparian zones is on sensitive species, which was discussed in A2 above (see also Program Technical Review, Part IV). Each of the other three is discussed individually below.

1. Vegetation Management

Vegetation Management activities in riparian zones consist essentially of pruning brush and trees to facilitate access for mosquito and mosquito habitat surveillance and control. The District occasionally clears plant matter preventing access to mosquito breeding sites or preventing good water management practices that would minimize mosquito populations. “Brushing” is usually limited to weeds and brush; live, mature trees are never removed by the District staff. Surveys for special status plants, coordination with the landowner, and acquisition of necessary permits are completed before any work is undertaken. 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. 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 light of the precautionary measures imposed by the permit process and District policies and practices, the District does not find substantial evidence that either of these classes of activities could have a significant environmental impact.

2. Chemical Control

The potential environmental impacts associated with chemical control in riparian zones are discussed in A3.

C. Potential Environmental Impacts and Project Features that Avoid a Significant Impact - Wetland Habitats

District activities in non-riparian wetland habitats are addressed in this subsection. In these areas, the only District activities with any potential environmental impacts are 1) ATV use; 2) vegetation management for maintenance of access; and 3) pesticide use. The only identified potential environmental impact of biological control in non-riparian zones is on sensitive species, which was discussed in A2 (see also Program Technical Review, Part IV). Each of the other four is discussed individually below.

1. ATVs

The District uses All-terrain vehicles (ATVs) on wetlands to deliver and apply chemical pesticides. The general potential environmental impacts of ATV use were discussed in A1 above.

2. Vegetation Management

As is true in riparian zones (discussed in B1 above), vegetation management in other wetlands is accomplished primarily to facilitate access for mosquito surveillance and control, and with the same protections in place.

3. Chemical Control

In addition to directly applying insecticides on wetlands for the control of larval mosquitoes, the District also sprays other pesticides for the control of adult mosquitoes, which might cause pesticide drift into the water. Based on the District's routine low application intensity, strict compliance with label criteria, and substantial research on non-target effects of the materials used operationally by the District, no significant impact does or can generally result through this mechanism. District policies to ensure no significant environmental impacts will occur on non-target invertebrates in wetlands are described in A3 above (see also Program Technical Review, Part IV).

D. Potential Environmental Impacts and Project Features that Avoid a Significant Impact - Corridors and Nursery Sites

District activities have no known impact on any wildlife migration corridor, except as discussed in Section A.

E. Local Policies and Ordinances

District activities have no apparent conflicts with any local environmental protection policies and ordinances. Specifically, District activities are consistent with the Conservation Elements of the Los Angeles County General Plan.

F. Potential Environmental Impacts and Project Features that Avoid a Significant Impact - Habitat Conservation Plans

Currently there is only one Natural Community Conservation Plan (NCCP) in place within District boundaries. The NCCP – Palos Verdes Peninsula 2004 includes specific policies for the protection of vegetative and wildlife resources. While the District service area extends into the very eastern portion of the Palos Verdes Peninsula, none of the NCCP Reserve Parcels fall within District jurisdiction.

Mitigation and Conclusion:

The project will not cause any significant impacts to biological resources, and therefore no mitigation is required. Nonetheless, in an abundance of caution and to further ensure that any impacts remain below the level of significance, the following mitigation measures are proposed; with the inclusion of these measures, potential impacts will remain less than significant.

1. Maintenance of maps and other information from the California Department of Fish and Game Natural Diversity Database and other reliable sources on the location of Special Status Species and designated Natural Communities in the Project Service Area;
2. Coordination of District activities with approved Habitat Conservation Plans and Species Recovery Plans; and
3. Adoption of new policies as needed and provision of continuing training to field personnel to ensure minimization of specific mosquito control activities and/or the use of alternative mosquito control methods at times and in places where those specific mosquito control activities might otherwise significantly impact Special Status Species or designated Natural Communities.

3.3.5 CULTURAL RESOURCES.

Would the project:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?				X
b) Cause a substantial adverse change in the significance of an archaeological resource as defined in §15064.5?				X
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?				X
d) Disturb any human remains, including those interred outside of formal cemeteries?				X

Explanation:

Setting

Greater Los Angeles County includes historical and archaeological resources, possibly including prehistoric human and animal remains, in sites that date back thousands of years.

Early Native American tribes arrived in Southern California as early as the 3rd Century A.D. and settled in villages in 1500 A.D. in what would become Los Angeles County, but it was not until 1542 A.D. that the first Europeans arrived in the area (www.laalmanac.com).

By the late 1700s, Spanish explorers and settlers had built settlements and a couple of Spanish Missions in modern day Montebello and San Fernando Valley. In fact, many historical sites from the Spanish and Mexican period of California history remain today.

Los Angeles was established as one of California’s original counties in 1850 and since then, the region has experienced dramatic growth and change.

Potential Environmental Impacts and Project Features that Avoid a Significant Impact

Los Angeles County has become one of the largest urban cultural centers in the U.S., and is characterized by rapid development and urban sprawl. It is highly unlikely that mosquito control activities will have any substantial impact on the ample cultural and historical resources that exist in the region because project activities do not implicate cultural resources, and instead focused on reducing natural vectors

Mitigation and Conclusion:

Because the project will not cause any significant adverse impacts to cultural resources, no mitigation is required. Impacts are less than significant.

3.3.6 GEOLOGY AND SOILS

Would the project:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Expose people or structure to potential substantial adverse effects, including the risk of loss, injury, or death involving:				
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault?				X
ii) Strong seismic ground shaking?				X
iii) Seismic-related ground failure, including liquefaction?				X
iv) Landslides?				X
b) Result in substantial soil erosion or the loss of topsoil?				X
c) Be located on a geologic unit that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?				X
d) Be located on expansive soils, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?				X

Explanation:

Setting

The Project Service Area is located in the Greater Los Angeles County area, which is one of the most seismically active regions in the United States. Southern California consists of a complex network of several hundred active faults. Some regions in the Service Area, including some unstable geological units, are likely to be subject to strong ground shaking, liquefaction, landslides, and possibly ground rupture in the event of a moderate to severe earthquake on any of a number of faults that run through the region.

Although mosquito and vector control activities do not regularly include the construction of any sites that may expose people or structures to the adverse effects of such seismic activities, working and living in a known fault zone subjects employees to inherent risk. All buildings at the District's headquarters in Santa Fe Springs and branch office in Sylmar are built to meet California Seismic Building Codes.

Since the District conducts control based upon Integrated Vector Management techniques, field staff may utilize preventive physical measures to eliminate potential mosquito breeding habitat. This may include the use of all-terrain vehicles for environmental manipulation activities related to source reduction.

Most of the District's mosquito and vector control activities take place in urban developed

areas along streets, public drains, and backyard sources. Part of the Service Area does include some natural sources such as lakes, marshes, and debris basins. The soils underlying some of these mosquito-producing sites are moist and prone to compaction or erosion under substantial dewatering and/or operation of vehicles with high ground pressure (more than approximately three pounds per square inch = psi).

Potential Environmental Impacts and Project Features that Avoid a Significant Impact

The use of all-terrain vehicles on marshes and other natural sites may be criticized on the grounds that they might compact soils, alter hydrologic patterns, increase erosion, or otherwise substantially alter the local geology. The District utilizes low-impact equipment and mitigating techniques during mosquito and vector control activities, thus minimizing any temporary or long-term impacts to the local geology.

Project activities in the aforementioned areas do not pose a problem for the following reasons: 1) Temporary and long-term environmental impacts from the use of amphibious and all-terrain vehicles are minimal due to the model of vehicles and types of tires used (see below); 2) all field personnel that use these vehicles are extensively trained on the proper use of such vehicles; and 3) the District has been in operation since 1952 and has many years of experience with the same types of machinery which have not shown any evidence of long-term or significant impacts.

The District uses the Wolverine, Argo, Polaris and SCAT Hovercraft, throughout the summer mosquito season to facilitate physical control efforts and chemical treatment in areas with difficult terrain. On land, most vehicles travel mainly on established trails.

The amphibious, all-terrain Argo has eight 25" diameter, low-pressure tires with wide, soft tread and is capable of transporting field staff and equipment into remote and environmentally sensitive areas. Its low weight and low pressure tires leave a light footprint on sensitive terrain.

The Polaris is a four-wheeled, all-terrain vehicle with soft tires, which also reduces soil compaction and any permanent impact on the geology of the service environment.

The District also uses a SCAT Hovercraft, which creates less drag and hull contact on the water by using low-pressure air to form an air cushion beneath the craft. The Hovercraft does not pierce the surface over which it travels; therefore there is less friction and need for fuel and minimal disturbance to the environment. Furthermore, the wake created by the hovercraft is minimal, thereby minimizing any river bank erosion and damage to shores. Finally, unlike many boats, engine exhaust fumes are not directed into the water.

On rare occasion and in cooperation with responsible local agencies, the District operates a Bobcat Skid-Steer Loader, but only in improved, hard-bottom channels. Therefore, there is little risk of compaction and other soil impact.

Other District activities have no impact on soils or geology.

Mitigation and Conclusion:

Because the project will not cause any significant adverse impacts to geological resources, no mitigation is required. Impacts are less than significant.

3.3.7 GREENHOUSE GAS EMISSIONS

Would the project:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Generate greenhouse gas emission, either directly or indirectly, that may have a significant impact on the environment?			X	
b) Conflict with any applicable plan, policy or regulation adopted for the purpose of reducing the emission of greenhouse gases?				X

Explanation:

Setting

According to the California Department of Motor Vehicles (DMV), a total of 7,499,722 vehicles were registered in Los Angeles County in 2008. Of those, 5,859,407 were automobiles and 1,152,856 were trucks. The Districts fleet consists of 87 vehicles which include passenger vehicles, light trucks and medium duty.

The Southern California Air Quality Management District is currently developing Thresholds of Significance for Green house Gases (GHG).

Potential Environmental Impacts and Project Features to Avoid a Significant Impact

The District's vehicle fleet of 87 vehicles, which includes passenger vehicles, light trucks and medium duty trucks, constitutes a very minor contribution to the over all traffic volume in Los Angeles County. The fleet is in compliance with Rule 1191 of the Southern California Air Quality Management District for passenger vehicles, light and medium duty on-road vehicles, as 21 of the agencies vehicles are exempt, 42 are low emission vehicles, 31 are ultra low emission vehicles and 3 are super low emission vehicles. In addition, none of the District's vector control activities themselves could result in GHG emissions. The vector control activities involve simple biological controls such as vegetation management or the introduction of mosquitofish, and chemical controls including the application of limited amounts of control products. None of these activities produce any GHG emissions.

Mitigation and Conclusion:

Because the project will not cause any significant adverse greenhouse gas impacts, no mitigation is required. Impacts are less than significant.

3.3.8 HAZARDS AND HAZARDOUS MATERIALS

Would the project:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Create a significant hazard to the public or the environment through the routine transport, use or disposal of hazardous materials?			X	
b) Create a significant hazard to the public or the environment through reasonable foreseeable upset and accident conditions involving the release of hazardous materials into the environment?			X	
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?			X	
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?				X
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?			X	
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?				X
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?				X
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildland are adjacent to urbanized areas or where residences are intermixed with wildlands?			X	

Explanation:

Setting

There is a public airport within the District Service Area, Bob Hope Airport. Although the airport itself is not a site that will need extensive routine mosquito surveillance or control, the District could undertake pesticide applications within and around this site, due to the proximity to human settlements.

Potential Environmental Impacts and Project Features to Avoid a Significant Impact

Minimizing the hazards of mosquito-borne disease depends on effective mosquito control, which can include the use of chemical insecticides. Application of pesticides within label guidelines does not constitute a significant hazard to the public (Cal. Dept. of Pesticide Registration). All pesticides are classified as "hazardous materials" by the State of California, regardless of their acute toxicity. Therefore, routine District activities do pose a risk of release of hazardous materials through accidental releases, and this can occur within one-quarter mile of existing or proposed school sites. District policies and practices, however, ensure that these risks and impacts are not significant.

The District does not use Category 1 or Category 2 pesticides. The pesticides that are routinely used by the District have very low acute toxicities, and very low chronic toxicity at the concentrations and volumes transported and applied by the District.

Second, the volumes of pesticides transported or used by the District are small. Bulk deliveries of pesticides to the District are very infrequent, and are always handled by haulers certified by the Department of Transportation for the materials they are transporting. The District does not transport large volumes of pesticides in its own vehicles. The highest load capacity for a District vehicle is 90 gallons.

Third, all District vehicles that transport or apply pesticides are equipped with all equipment and supplies needed to contain the largest possible spill from that vehicle. All District vehicles are maintained in good condition by full-time mechanics working in fully equipped shops.

Fourth, all District personnel that handle pesticides are registered by the California Department of Public Health as Pesticide Applicators, and are required to complete annual pesticide safety training.

Fifth, the District's equipment and its personnel are routinely inspected by the Los Angeles County Agricultural Commissioner's office to verify that all equipment is calibrated and functioning properly and to assure adequate staff training and knowledge concerning the proper use and handling of all pesticides used by the District.

In addition, all District vehicles carry fire extinguishers and cellular telephones which can be used to summon assistance in the unlikely event that any District action initiates a fire. Although GB1111 is a petrochemical product, its chemical and physical characteristics make it extremely unlikely to ignite during foreseeable circumstances (MSDS), and if it does ignite, the low volumes used in District equipment and the nature of the application sites reduces the probability of a wildfire to insignificance.

Mitigation and Conclusion:

Because the project will not cause any significant adverse impacts in the areas of hazards or hazardous materials, no mitigation is required. Impacts are less than significant.

3.3.9 HYDROLOGY AND WATER QUALITY.

Would the project:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Violate any water quality standards or waste discharge standards?			X	
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g. the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which a permit has been granted)?				X
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner, which would result in substantial erosion or siltation on- or off-site?				X
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner, which would result in flooding on- or off-site?				X
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?				X
f) Otherwise substantially degrade water quality?			X	
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?				X
h) Place within a 100-year flood hazard area structures, which would impede or redirect flood flows?				X
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of a failure of a levee or dam?				X
j) Inundation by seiche, tsunami, or mudflow?				X

Explanation:

Setting

The majority of the District's activities occur in urbanized areas, with minor activity occurring in riparian and other natural areas, as described in Section 3.3.4 (Biological Resources). The District does not carry out any physical control work in natural areas.

A. Potential Environmental Impacts and Project Features to Avoid a Significant Impact – Water Quality

The District's Project activities largely consist of repeat applications of pesticide to water containing mosquito, midge or black fly larvae. Any potential effects on water quality would be seen in impacts on fish and wildlife (discussed under Biological Resources) or through accidental release of pesticides (discussed under Hazards & Hazardous Materials).

On November 20, 2006, USEPA adopted a final regulation providing that NPDES permits are not required for pesticide applications as long as the discharger follows Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) label instructions. According to this regulation, pesticides applied under the following two circumstances were not considered pollutants and, therefore, not subject to NPDES permitting requirements:

- (1) The application of pesticides directly to waters of the United States in order to control pests. Examples of such applications include applications to control mosquito larvae, aquatic weeds, or other pests that are present in waters of the United States.
- (2) The application of pesticides to control pests that are present over waters of the United States, including near such waters, where a portion of the pesticides will unavoidably be deposited to waters of the United States in order to target the pests effectively; for example, when insecticides are aerially applied to a forest canopy where waters of the United States may be present below the canopy or when pesticides are applied over or near water for control of adult mosquitoes or other pests.

After USEPA's regulation was adopted in 2006, lawsuits were filed by both the pesticide industry and environmental groups in 11 of the 13 Circuits, including the Ninth Circuit Court, challenging USEPA's Final Rule. The petitions for review were consolidated in the Sixth Circuit Court by an order of the Judicial Panel on Multidistrict Litigation. On January 7, 2009, the Sixth Circuit Court determined that USEPA's Final Rule is not a reasonable interpretation of the CWA and vacated the Final Rule. USEPA did not request reconsideration of the decision, but did file a motion for a two-year stay of the effect of the decision in order to provide agencies time to develop, propose, and issue NPDES general permits for pesticide applications covered by the ruling. On June 8, 2009, the Sixth Circuit granted the motion, such that the USEPA exemption will remain in place until April 9, 2011. As a result, California State Water Board staff is currently drafting a vector control NPDES permit to include both larviciding and adulticiding activities.

Even during the tenure of the USEPA regulation providing that NPDES permits are not required for pesticide applications as long as the discharger follows FIFRA label instructions, the District had applied for the Statewide NPDES vector control permit for larvicides (Order No. 2004-0008-DWQ) and has every intention to apply for and comply with the new Vector control NPDES permit as it becomes available, but no later than April 9, 2011 to ensure prevention of adverse impact of District activity to water quality.

B. Potential Environmental Impacts and Measures to Avoid Significance – Groundwater

The Project does not involve consumptive use of groundwater.

**Potential Environmental Impacts and Project Features to Avoid a Significant Impact –
Erosion and Siltation**

The Project does not involve any dredging or vegetation removal activities, with the exception of minor brush cutting along existing thoroughfares. The small scales of these activities preclude significant impacts.

**C. Potential Environmental Impacts and Project Features to Avoid a Significant Impact -
Flooding**

Of the Project activities, only vegetation management has any potential to result in flooding, and the small scales of these activities preclude significant impacts.

Mitigation and Conclusion:

Because the project will not cause any significant adverse impacts to hydrology or water quality, no mitigation is required. Impacts are less than significant.

3.3.10 LAND USE AND PLANNING

Would the project:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Physically divide an established community?				X
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?			X	
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?			X	

Explanation:

Setting - Existing Environmental Practices, Plans, and Policies

Because of the size and diversity of the District Service Area, there are a large number of existing environmental practices, plans, and policies, including those of Los Angeles County and the cities in the County. In addition, large institutional land-owners (e.g. the California Dept. of Fish & Game) have adopted land use plans and other environmental policies and practices.

Potential Environmental Impacts and Project Features to Avoid a Significant Impact

All District activity types are compatible with the zoning, City and County general plan designations, and City and County general plan policies of the impact areas. In addition, the County General Plan notes resource management, such as maintaining critical and endangered habitats, as one of the most appropriate uses in “Open Space”.

The activities conducted under the project do not directly result in any changes to land use on or off site. Implementation of the project activities is not expected to adversely affect adjacent uses or directly cause any changes to regional land use. Therefore, the project is compatible with existing land uses. The Project elements, individually and collectively, appear to be consistent with all existing environmental policies and plans of relevance to the District’s Service Area.

Mitigation and Conclusion:

Because the project will not cause any significant adverse land use impacts, no mitigation is required. Impacts are less than significant.

3.3.11 MINERAL RESOURCES.

Would the project:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State?				X
c) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?				X

Explanation:

Setting

The primary mineral resources in Los Angeles County are aggregate resources (sand, gravel and stone deposits).

Potential Environmental Impacts

Project operation does not involve any substantial mineral usage, nor does it interfere with any actual or proposed mineral extraction operations, and consequently there are no potential environmental impacts

Mitigation and Conclusion:

Because the project will not cause any significant adverse impacts to mineral resources, no mitigation is required. Impacts are less than significant.

3.3.12 NOISE.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Would the proposal result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?				X
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?				X
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?				X
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?			X	
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?				X
f) For a project within the vicinity of a private airstrip, airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?				X

Explanation:

Setting

The District encompasses 1,330 square miles of Greater Los Angeles County, incorporating both densely populated urban as well as suburban areas. Primary noise sources in the Service Area include vehicle traffic, train traffic, commercial activities, construction, and residential activities. Ambient noise levels remain high and it is unlikely that District mosquito and vector control operations and activities have any substantial cumulative impacts.

The District uses 87 vehicles in a wide range of environments surrounded by various land uses, including commercial industry, transportation, sewer treatment and utilities, and residential areas.

Potential Environmental Impacts and Project Features to Avoid a Significant Impact – ATVs & Chemical Control

According to Los Angeles County Code 12.08.570 Section H, Public Health Activities, such as those of mosquito and vector control, which are conducted on “public right-of-way, and those situations which may occur on private real property deemed necessary to serve the best interest of the public and protect the public’s health and well-being” are exempt from exterior noise level

restrictions. (source=<http://search.municode.com/html/16274/index.htm>)

Regardless of such an exemption, there is no significant source of noise from the District's vehicles and air compressors to persons more than a few dozen feet from the vehicle. Because the operation of these vehicles and equipment generally occur during normal business hours for very short periods of time at any specific location, the risk of "excessive" noise is essentially non-existent.

During the mosquito season, operation of hovercrafts, helicopters, and ULV spray equipment is infrequent and almost always in open spaces at a distance from residential areas. Any aerial product application activities are coordinated with local and county emergency services and personnel, as needed, to minimize concerns with respect to low-flying aircraft. The District has been conducting these activities since 1952 without receiving noise complaints.

An Underground Storm Drain crew treats underground urban sources accessed from manholes on street surfaces. Air compressors are used for product application; however, any increase in ambient noise levels is temporary and unlikely to reach levels in excess of permitted standards. Furthermore, during the summer mosquito season, routine treatments of underground storm drain systems are conducted during the late night to early morning hours in Downtown Los Angeles where there are few residential sites and little risk of noise disturbance to residents.

Use of vehicles in wetlands and nature preserves may have a potential impact on nesting birds and other wildlife. To mitigate this impact, surveillance and control activities in biologically sensitive areas such as Whittier Narrows, Bixby Wetlands, and Hansen Dam Recreational Area are conducted primarily on foot using hand-held mist dusters or by aircraft.

Mitigation and Conclusion:

Because the project will not cause any significant adverse noise impacts, no mitigation is required. Impacts are less than significant.

3.3.13 POPULATION AND HOUSING.

Would the proposal:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads and other infrastructure)?				X
b) Displace substantial numbers of existing housing [units], necessitating the construction of replacement housing elsewhere?				X
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?				X

Explanation:

Setting

Los Angeles County is the most populated county in the United States, with the City of Los Angeles ranking as the second largest city in the country. The District's Service Area incorporates an estimated population of six million residents. Single-family, multi-family, and other residential housing exists throughout Los Angeles County, along with other urban land uses such as industrial, commercial, and recreational areas. Prior to the creation of the District in 1952, residential and commercial development in some areas, particularly along the Los Angeles River, may have been affected by high densities of mosquitoes and black flies. Currently, there are no areas in the District's Service Area where this is true.

Potential Environmental Impacts and Project Features to Avoid a Significant Impact

No direct impacts on housing and population are anticipated from implementation of mosquito and vector control activities. The Project does not create significant numbers of new jobs or directly induce any growth in the area; thus there would be no influx of workers.

The District responds to the needs and desires of the existing population, and does not act anywhere within the Service Area with the intention of reducing mosquito populations to allow further development.

Mitigation and Conclusion:

Because the project will not cause any significant adverse impacts to population and housing no mitigation is required. Impacts are less than significant.

3.3.14 PUBLIC SERVICES.

a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives of any of the public services:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
Fire protection?				X
Police protection?				X
Schools?				X
Parks?				X
Other public facilities?				X

Explanation:

Setting

Public services including fire protection and emergency medical care are located in cities throughout the Project area. Police agencies with jurisdiction over some or all of the Project area include local Police Departments, the Los Angeles County Sheriff and the California Highway Patrol.

Potential Environmental Impacts and Project Features to Avoid a Significant Impact

The Project places no significant demands on city or county public services.

Mitigation and Conclusion:

Because the project will not cause any significant adverse impacts to public service resources, no mitigation is required. Impacts are less than significant.

3.3.15 RECREATION.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?				X
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?				X

Explanation:

Setting

The District Service Area includes significant recreational resources, including the Griffith Park and areas adjacent to riparian zones or wetlands.

Potential Environmental Impacts and Project Features to Avoid a Significant Impact

The project would not infringe on land upon which recreational uses could occur in the future. There would be no detrimental impact to recreational areas. By reducing mosquito abundance, the Program/Project substantially enhances outdoor recreational values and quality of life.

Mitigation and Conclusion:

Because the project will not cause any significant adverse impacts to recreational resources, no mitigation is required. Impacts are less than significant.

3.3.16 TRANSPORTATION / TRAFFIC.

Would the project:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Conflict with an applicable plan, ordinance or policy establishing measures of effectiveness for the performance of the circulation system, taking into account all modes of transportation including mass transit and non-motorized travel and relevant components of the circulation system, including but not limited to intersections, streets, highways and freeways, pedestrian and bicycle paths, and mass transit?			X	
b) Conflict with an applicable congestion management program, including, but not limited to level of service standards and travel demand measures, or other standards established by the county congestion management agency for designated roads or highways?				X
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?				X
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?				X
e) Result in inadequate emergency access?				X
f) Conflict with adopted policies, plans or programs regarding public transit, bicycle, or pedestrian facilities, or otherwise decrease the performance or safety of such facilities?				X

Explanation:

Setting

The Service Area includes a substantial commuting population and a very large residential population. Much of the traffic occurs during peak commute hours on freeways and surface roads.

Potential Environmental Impacts and Project Features to Avoid a Significant Impact

The relatively small number of District staff as well as District vehicles (<100) relative to the commuting, tourist, and business traffic in the Service Area means that District impacts to transportation and traffic are insignificant.

Mitigation and Conclusion:

Because the project will not cause any significant adverse traffic or transportation impacts, no mitigation is required. Impacts are less than significant.

3.3.17 UTILITIES AND SERVICE SYSTEMS.

Would the project:	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?				X
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?				X
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities the construction of which could cause significant environmental effects?				X
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?				X
e) Result in a determination by the wastewater treatment provider that serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?				X
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?				X
g) Comply with federal, state, and local statutes and regulations related to solid waste?				X

Explanation:

Vector control activities discussed in this report would not result in any increased usage of utilities or service systems. Thus, there would be no demand-related impacts.

Mitigation and Conclusion:

Because the project will not cause any significant adverse impacts to utilities and service systems, no mitigation is required. Impacts are less than significant.

3.3.18 MANDATORY FINDINGS OF SIGNIFICANCE.

	Potentially Significant Impact	Potentially Significant Unless Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?			X	
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?			X	
c) Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?			X	

Explanation:

The established policies and practices of the District's Integrated Vector Management Program together with the mitigation measures identified in other Sections, will ensure that potential impacts to plant and wildlife species remain at a less-than-significant level. The project would not adversely affect any long-term environmental goals.

The project has no unmitigated impacts or any effects that could be cumulatively considerable due to the limited nature and scope of the activities, and the lack of overlap with any other entity performing these same services.

Policies, practices, and mitigation measures have been included in the project that would eliminate the potential for significant project impacts. The project would not adversely affect human beings, either directly or indirectly.

**GREATER LOS ANGELES COUNTY VECTOR CONTROL DISTRICT
CALIFORNIA ENVIRONMENTAL QUALITY ACT**

PART IV - TECHNICAL REVIEW

SECTION 1. INTRODUCTION

The Greater Los Angeles County Vector Control District's Integrated Vector Management Program (IVMP) evaluated in this document is an ongoing program of surveillance and control of mosquitoes and other vectors of human disease and discomfort. This Program consists of a coordinated set of activities, described and discussed in detail below. An extensive body of knowledge exists, both in the District and in published literature on the reasons, specific implementation, mode of action, efficacy, cost-effectiveness, safety, and potential environmental impacts of each. The reader is directed to the extensive attached bibliography, and especially to the publications of the District, the American Mosquito Control Association (AMCA), and the Mosquito & Vector Control Association of California (MVCAC), for general discussions of mosquito control or for detailed information on the rationale, modes of action, and specific application of each vector surveillance and control technique. This Technical Review, on the other hand, only briefly summarizes general information on mosquito and vector control methods, and primarily focuses on the potential environmental impacts of those mosquito surveillance and control activities currently or potentially used by the District, and those aspects of the District's environmental setting, program, and policies that ensure that these potential environmental impacts are insignificant.

In the interest of precision and clarity, both the common and scientific names are initially presented for organisms discussed in this report. In subsequent references to a species or subspecies, the more well-known names will be used consistently. Tables of common and scientific names are compiled for mosquitoes, stinging insects and Special Status Species in the Appendices.

4.1.1 PROJECT/PROGRAM RATIONALE

The California Health and Safety Code defines a vector 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" (Section 2200(f)). The District undertakes activities through its Integrated Vector Management Program to control mosquitoes, biting flies, and other insects as vectors of disease and/or discomfort in the Service Area.

A. MOSQUITOES

Fourteen species of mosquitoes frequently occur within the service area of the District. (Appendix D). The reader is referred to the publications by Bohart and Washino (1978), and Meyer and Durso (1993) for detailed information concerning the biology, ecology, and diseases vectored by these mosquitoes.

Certain species of mosquitoes found in Los Angeles County can transmit malaria, St. Louis encephalitis, Western equine encephalomyelitis, West Nile Virus and potentially other viruses. A few species of mosquitoes are also capable of transmitting dog heartworm. Although some species of mosquitoes have not been shown to transmit disease, most species can cause human discomfort when the female mosquito bites to obtain blood. Reactions range from irritation in the area of the bite to severe allergic reactions or secondary infections resulting from scratching the irritated area. Additionally, an abundance of mosquitoes can cause economic losses, and loss of use or enjoyment of recreational, agricultural, or industrial areas.

B. BLACK FLIES

Black flies breed in flowing water from rivers and streams to irrigation ditches. After mating, the female black fly deposits her fertilized eggs on rocks or other substrate in swift flowing water. They are usually found from spring through fall, with the greatest numbers appearing in the late spring and summer. Adults live two to three weeks and are small, menacing, biting flies that are a nuisance to people and animals living, working, or playing near rivers and streams. Pain and swelling from the bites can occur due to allergic reactions to foreign proteins and toxins that the female injects when feeding. In the tropics, black flies transmit diseases, such as River Blindness. Fortunately, they do not transmit any diseases to humans in California, but can cause extreme discomfort and irritation due to their biting habits and great numbers.

C. NON-BITING MIDGES

Midge larvae develop and breed in aquatic habitats similar to those of mosquitoes. The adults are flying insects which emerge in masses and become especially bothersome for residents near sources such as flood control channels, lakes, ponds, reservoirs or spreading basins from April to September. When midges emerge as adults in enormous numbers, they invade nearby residences, disrupt outdoor and indoor activities, and create stressful living conditions in affected areas. Swarms can cause discomfort or irritation by entering the eyes, ears, nose, and mouth. Although these insects do not transmit diseases, they have been documented to cause allergic reactions, to lessen real estate value in residential areas and can interfere with processing of food, paper products, plastic, and automotive refinishing operations in industrial situations, causing significant economic impact.

Most of the vectors mentioned above are extremely mobile and cause the greatest hazard or discomfort away from their breeding site. Each of these potential vectors has a unique life cycle and most of them occupy different habitats. In order to effectively control these vectors, an integrated vector management program 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.

4.1.2 PROJECT/PROGRAM ACTIVITIES

The District's Integrated Vector Management Program consists of six general types of coordinated activities:

- **Surveillance** for mosquito populations, mosquito habitats, disease pathogens, and public distress associated with mosquitoes. Mosquito surveillance activities include field counting, trapping, and laboratory analysis of mosquitoes, alternative hosts, and pathogens to evaluate

populations and disease threats; field inspection of known or suspected mosquito habitats; maintenance of paths and the use of all-terrain vehicles to access mosquito habitat; analysis of public service requests and surveys; and other data collection methods.

- **Public Education** to encourage and assist reduction and prevention of mosquito and other vector habitats on private and public property. While a critical element of our IVMP (see the attached Preliminary Review), public education activities are categorically exempt from CEQA review [CEQA Guidelines Sec. 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 will not be further reviewed in this document.
- **Vegetation Management.** The District uses hand tools as a means of pruning vegetation along existing trails to allow access to mosquito breeding sites for surveillance and control.
- **Biological Control.** Application of the “mosquito fish” *Gambusia affinis*, the bacterium *Bacillus thuringiensis israelensis* (Bti) or *B. sphaericus* are known as “Biological Control.” *Gambusia affinis*, is used only in swimming pools, ornamental ponds and other artificial settings. *B. sphaericus*, reproduce in natural settings, for at least some time, after release. Bti materials applied by the District contain only spores made up of specific protein molecules produced by the Bti organism, and no live bacteria. Because the potential environmental impacts of *Bacillus sphaericus* or Bti application are generally similar to those of chemical pesticide applications, these materials are evaluated below under Chemical Control.
- **Chemical Control.** In the context of the District’s IVMP, “Chemical Control” is the application of non-persistent selective insecticides to directly reduce populations of larval, adult mosquitoes and other insect vectors.

While these activities are all elements of the District’s IVMP, it is important to note that the specific activities performed by District staff vary considerably. Daily and regional activities fluctuate in response to mosquito species, activity, population size, densities, age, structure, species and spatial distributions, season, climate, vector potential, proximity to human populations, access by District staff to mosquito habitat, abundance of natural predators, availability and cost of control methods, effectiveness of previous control efforts at the site, potential resistance developments in mosquito populations, land-owner policies or concerns, proximity to special status species, Endangered Species Recovery Plans, Habitat Conservation Plans, Natural Community Conservation Plans, and local community concerns. Therefore, the specific actions taken in response to current or potential mosquito activity in any specific place and time depends on factors of mosquito and pathogen biology, biotic and abiotic environmental factors, human settlement patterns, local standards, available control methods, and institutional and legal constraints.

The District regularly reviews its IVMP to ensure that its practices are effective, economical, safe, environmentally sensitive, and responsive to the needs of the public. The District periodically incorporates new materials, methods and treatment criteria. Over the 58-year history of the District, these changes have generally reduced the potential environmental impacts of our activities through the introduction of more selective materials or more subtle or sophisticated interactions with existing ecological and hydrologic processes. Although the District does not foresee adoption of any new general project elements beyond those listed above, it is likely that specific activities and policies discussed below will evolve, and it is certain that their intensity of application will continue to vary from site to site and from year to year. Where the modes of action and the intensity of

proposed activities are similar to those in current use, the potential environmental impacts of the program as a whole should not increase as a result of these changes.

4.1.3 GENERAL VECTOR MANAGEMENT STRATEGY

As described in the Preliminary Review, the District's activities address vector management through a general strategy including identification of vector problems; responsive actions to control existing populations of vectors and prevent new sources from developing; education of land-owners and others on measures to minimize vector production or interaction with vectors; and provision and administration of funding and institutional support necessary to accomplish these goals.

In order to accomplish effective and environmentally sound vector management, the manipulation and control of vectors must be based on careful surveillance of their abundance, habitat (potential abundance), pathogen load, and/or potential contact with people; the establishment of treatment criteria (thresholds) and appropriate selection from a wide range of control methods. This dynamic combination of surveillance, treatment criteria, and use of multiple control activities in a coordinated program is generally known as Integrated Pest Management (IPM) (Glass 1975, Davis et al 1979, Borrer et al 1981, Durso 1996, Robinson 1996).

The District's Vector Management Program, like any other IPM program, by definition involves procedures for minimizing potential environmental impacts. The District's Project employs IPM principles by first determining the species and abundance of vectors through evaluation of public service requests and field surveys of immature and adult pest populations; and 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, and for some vectors (rodents, ticks, fleas) it is the District's only control method. In some situations, the District also uses biological control such as the planting of mosquitofish in swimming pools and ornamental ponds. Where appropriate the District uses the enforcement powers granted to vector control agencies under the authority of the California Health and Safety Code, Sec. 2200 et seq. to eliminate or prevent mosquito habitat. When these approaches are not effective or are otherwise inappropriate, pesticides are used to treat specific vector-producing or vector-harboring areas or vector populations.

A. MOSQUITOES

Mosquitoes are the primary focus of the District's Vector Management Program and account for the majority of resources expended. In order to maximize familiarity by the operational staff with specific mosquito sources in the Project area, the District is divided into zones (currently sixteen). Each zone is assigned a full-time Vector Control Specialist, whose responsibilities include inspection and treatment of known mosquito sources, finding and controlling new sources, and responding to service requests from the public within that zone.

Mosquito control activities are conducted at a wide variety of sites throughout the District's Project area. These sites can be roughly divided into those where activities may have an effect on the natural environment either directly or indirectly (through drainage), and sites where the potential environmental impacts are negligible ("Non-Environmental Sites"). Examples of "Environmental Sites" in the Project area include lakes and ponds, rivers and streams, wetlands, stormwater detention basins, flood control channels, spreading grounds, street drains and gutters or roadside ditches. Examples of "Non-Environmental Sites" include animal troughs, artificial containers, tire

piles, fountains, ornamental fish ponds and swimming pools.

B. OTHER VECTORS

As described in the Preliminary Review, the District's activities also address the management of black flies and non-biting midges. The District's IVMP principles for mosquitoes apply similarly to these other pestiferous vectors, including assessing threat to surrounding organisms, proximity to populated regions, pesticide use in strict accordance with label requirements, eradication of breeding sources to prevent future re-infestation, educating the general public on preventative measures to prevent future colonization, and administration of funding and institutional support necessary to accomplish these goals.

4.1.4 EMERGENCY ACTIVITIES

In the event of emergency conditions (actual or imminent disease outbreak), District actions temporarily vary from the routine operational actions through increases in scope or intensity and potentially through use of legal pesticides, in strict conformance with label requirements, which are not routinely used by the District. Because of their temporary nature and their essential similarity to routine activities, emergency activities are not expected to result in any significant environmental impact. 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 15269, 15359].

SECTION 2. PROGRAM/PROJECT SETTING

4.2.1 INTRODUCTION

The District's activities are conducted within a 1,330 square mile jurisdiction contained within Los Angeles County, California. The areas that will be actually or potentially impacted by District activities include:

1. The incorporated cities of Artesia, Bell, Bellflower, Bell Gardens, Burbank, Carson, Cerritos, Commerce, Cudahy, Diamond Bar, Downey, Gardena, Glendale, Hawaiian Gardens, Huntington Park, Lakewood, La Habra Heights, La Mirada, Long Beach, Los Angeles, Lynwood, Maywood, Montebello, Norwalk, Paramount, Pico Rivera, San Fernando, San Marino, Santa Clarita, Santa Fe Springs, Signal Hill, South Gate, South El Monte and Whittier.
2. Certain unincorporated areas of Los Angeles County (see District service area map Appendix A).
3. Contracting city La Canada-Flintridge.

In addition, the District periodically cooperates with adjoining Mosquito & Vector Control Districts and/or County and State Health Departments on activities that cross normal District boundaries; in these situations, the District or Department with jurisdiction over the locations where specific activities are performed has primary responsibility for these activities.

The Project impact area is predominantly urbanized. There are also areas containing natural habitats hosting diverse plant and animal communities. Human activities in the county, primarily during the last 150 years, have led to substantial changes in these habitats and in the populations of the organisms that inhabit them, so that much of the county exhibits some degree of human modification and impact (see maps in Section 3 of the Los Angeles County General Plan).

Because of the diversity of mosquito habitat, mosquito control activities are conducted in a wide variety of ecosystems and habitat types throughout the District's Project area. Mosquito control activities are associated with wet areas of all types and sizes. This includes ponds, creeks, wetlands, stormwater detention basins, ditches, ornamental fishponds, impound areas, etc., as well as individual homes or commercial buildings.

Mosquito control sites can be roughly divided into those where activities may have an effect on the natural environment either directly through on-site activities or indirectly through drainage to off-site areas, and sites where the potential environmental impacts are negligible. Examples of "Environmental Sites" in the Project area include lakes and ponds, rivers, streams, and wetlands, stormwater detention basins, flood control channels, spreading grounds, street drains and gutters or roadside ditches. Examples of "Non-Environmental Sites" include animal troughs, artificial containers, tire piles, fountains, ornamental fish ponds and swimming pools.

4.2.2 URBAN AREAS

The District services urbanized areas with artificial sources, including fishponds, stormwater detention basins, street gutters and drains, and swimming pools. The District's activities in these areas have little or no impact on sensitive wildlife or vegetation.

4.2.3 WETLANDS AND OTHER SENSITIVE HABITATS

The District's Service Area includes some areas of wetlands and riparian corridors. The District maintains detailed maps and databases of all areas where mosquito production takes place in the Service Areas, and the location is recorded for all surveillance and control activities. Therefore, the District has a detailed long-term database that allows evaluation of the intensity of control efforts, and their relationship to specific wetland or riparian sites. We have not observed degradation of these sites associated with our activities.

A number of specific habitat types that may be considered "sensitive" are found within the District Service Area. This includes habitat for the Braunton's Milk-vetch (*Astragalus brauntonii*), the Arroyo toad (*Bufo californicus*) or the Least Bell's vireo (*Vireo bellii pusillus*). In addition, riparian corridors receive special protection by the California Department of Fish and Game, and can be considered "sensitive habitats". These areas are well known to District staff, and specific vector surveillance and control methods used in these areas are consistent with published management plans and District policies, defined throughout this report, to ensure their protection.

4.2.4 ENDANGERED AND OTHER SPECIAL STATUS SPECIES

The California Department of Fish and Game's Natural Diversity Database (NDDDB) lists 6 special status species³ within the Districts project area (Appendix C). In almost all cases, the primary explanation for their status is loss of habitat. Because the District's activities do not involve changes in land use, the District's activities do not contribute to this process. In the areas where the District's routine activities do overlap with specific habitat, District policies and practices ensure that no significant impacts can occur.

Of the six species and subspecies listed as "Endangered" or "Threatened" under either the Federal or State Endangered Species Acts (ESA), four occur in habitats where the District has routine operations. This includes the Coastal California gnatcatcher (*Polioptila californica californica*), the Santa Ana sucker (*Catostomus santaanae*), the Arroyo toad (*Bufo californicus*) and the Least Bell's vireo (*Vireo bellii pusillus*). The District takes extreme care to avoid disturbance to listed endangered species, as detailed below. Habitat descriptions and current maps of distribution and potential habitat of all endangered species in the Service Area are maintained by the District and incorporated into the operational guidelines of field personnel.

Table 4.2.3 also lists an additional 2 vascular plants, Braunton's Milk-vetch (*Astragalus brauntonii*) and Spreading Navarretia (*Navarretia fossalis*) listed as "Endangered" or "Threatened" respectively

³ Under the Federal and State Endangered Species Acts, the word "species" may also mean subspecies or other taxonomic groupings.

and that have been rated 1B.1 status by the California Native Plant Society (CNPS).

The listed species that are most likely to intersect with District activities are those in Riparian Zones.

A. RIPARIAN ZONES & SPRINGS

Special Status Species in riparian zones (along streams) in the District Service Area are the endangered Arroyo toad and the threatened Santa Ana sucker. District activities in riparian areas or near streams are conducted almost exclusively on foot. Control operations are conducted using small volumes of highly selective pesticides to minimize potential environmental impacts.

SECTION 3. VECTOR AND DISEASE SURVEILLANCE ACTIVITIES

4.3.1 INTRODUCTION

The District's responsibility to protect public health and welfare involves monitoring the abundance of vectors, vector habitat, vector-borne pathogens, and interactions between vectors and people over time and space. Collectively, these monitoring activities are termed Vector Surveillance. 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 there are, and if they are carrying disease or otherwise affecting humans. Vector surveillance is critical to an Integrated Vector Management Program because the information it provides is evaluated against treatment criteria to decide when and where to institute vector control measures. Equally important is the use of vector surveillance in evaluating the efficacy, cost effectiveness, and environmental impacts of specific vector control actions.

The District's vector and disease surveillance activities are conducted in compliance with accepted Federal and State guidelines, and the reader is referred to the volumes by the U.S. Public Health Service (Moore et al 1993), the Mosquito and Vector Control Association of California (Reisen et al 1995, Durso 1996), and by Service (1993) for further information on specific surveillance techniques. These guidelines recognize that local conditions vary, and are thus flexible in the selection and specific application of methods. Therefore, the District's specific activities and their potential environmental impacts are described below.

4.3.2. MOSQUITO SURVEILLANCE

Mosquitoes in nature are distributed within their environment in a pattern that maximizes their survival to guarantee reproductive success. Simply stated, this means that mosquitoes occur where they are likely to survive, mate, and produce young. One interesting aspect of mosquito biology is the fact that 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 mosquito control agencies with unique circumstances that require separate surveillance strategies for the aquatic versus terrestrial life stages. Detailed descriptions of mosquito surveillance activities performed by the District can be found in the publications by Service (1993) and Durso (1996).

A. IMMATURE MOSQUITOES

Immature mosquito stages include eggs, four larval stages, and pupae. Mosquito control agencies routinely target the larval and pupal stages to preclude an emergence of adults. Operational evaluation of the presence and abundance of immature mosquitoes is limited to the larval and pupal stages, although the District may sample eggs for research reasons. Operationally, the abundance of the immatures in any identifiable "breeding" source is measured through direct sampling with a 250ml standard dipper, which provides relative local abundance as number of immatures per unit volume or area of the source. This method requires access by field personnel to within about three feet of larval sites at least every two weeks. The spatial patchiness of larvae may require access to multiple locations within each source.

B. ADULT MOSQUITOES

Mosquito adults, primarily females, are sampled to determine the direct threat posed by their distribution, abundance, species mix, and pathogen status. Direct surveillance is typically accomplished using a variety of traps that are configured to attract mosquitoes to the trap where they are captured by suction and sequestered in an escape-proof net or glass enclosure. Other direct surveillance strategies, less commonly used by the District, include landing counts, and artificial resting units (Service 1993, Durso 1996).

Another important measure of adult mosquito abundance is the number and distribution of service requests from the public. While this number is obviously dependent on other factors beyond absolute mosquito abundance, including recent publicity about the District or about mosquito problems, it is an important indication of where and when the public desires action. In combination with identification of the species causing the disturbance, this can also be a powerful technique in identifying previously unknown mosquito sources, or known sources with resurgent mosquito production.

1. Host-seeking traps

Traps for host-seeking female mosquitoes include standard and modified (e.g. Fay; EVS = “Encephalitis Virus Surveillance”) CDC-type portable light traps, which release carbon dioxide (dry ice and/or compressed gas) at a low rate (typically two pounds/night/trap) to attract female mosquitoes seeking blood meals. Essential trap components include a battery power source, a low ampere motor with suction-type fan housed in a durable plastic cylinder, with a source of carbon dioxide and a collection net for holding captured adults. The number of females collected during each night of trap operation is expressed numerically as the number of females per trap night. Use of these traps requires direct access to the trap site by field personnel on two consecutive days, typically once or twice a month. The District currently uses 30 of these traps every 2 weeks and 101 of them once a month.

2. Gravid traps

Gravid traps (=Reiter/Cummings traps) attract female mosquitoes looking for a place to ovoposit. These mosquitoes have obtained a blood meal, have developed their egg batch and are now looking for a suitable location to deposit their egg raft. Gravid traps are comprised of a basin containing a watery hay and yeast infusion, and a battery powered low ampere motor with suction-type fan housed in a standard tool box, which also contains a collection container for holding captured adults, and is placed above the basin to suck in the ovopositing female mosquitoes. The number of females collected during each night of trap operation is expressed numerically as the number of females per trap night. Use of these traps requires direct access to the trap site by field personnel on two consecutive days, typically once or twice a month. The District currently uses 37 of these traps every 2 weeks and 125 of them once a month.

4.3.3 BLACK FLIES AND NON-BITING MIDGES

Black flies and non-biting midges are being monitored in an attempt to prevent their occurrence above nuisance threshold levels, and while neither of them currently transmit diseases to humans in California, adult black flies are small, menacing, biting flies that are a nuisance to people and animals living, working, or playing near rivers and streams. During mass emergences, non-biting

midge swarms can cause discomfort or irritation by entering the eyes, ears, nose, and mouth, and have even been documented to cause allergic reactions, to lessen real estate value in residential areas and can interfere with processing of food, paper products, plastic, and automotive refinishing operations in industrial situations, causing significant economic impact.

The District conducts surveillance for these “nuisance” vectors indirectly, through analysis of public service requests, as well as by visual examination of potential breeding habitat for the presence of larvae. Inspections are conducted using techniques with insignificant impacts on the environment. Staff routinely uses pre-existing access ways such as roadways, open areas, walkways, and trails.

4.3.4 SURVEILLANCE FOR VECTOR-BORNE DISEASES

A. ARBOVIRAL DISEASES

The primary mosquito-borne human diseases for which routine surveillance occurs in the service area are known as “arboviruses” (= ARthropod-BORne viruses). The primary reservoir for the pathogens that cause these diseases are wild birds. Humans only become exposed as a consequence of an accidental exposure to the bite of infected mosquitoes. The arboviruses of greatest public health concern in California are West Nile virus (WNV), St. Louis encephalitis virus (SLE), and Western Equine encephalomyelitis virus (WEE). Clinical illness caused by WEE is predominately seen in young children while SLE and WNV tend to affect the elderly.

Detecting the presence of these mosquito-borne viruses in nature requires the application of a number of sophisticated methodologies, which are discussed in detail in the technical report by Reisen, et al. (1995). Two methods of encephalitis virus surveillance commonly used by mosquito control agencies in California involve 1) capturing and testing female mosquitoes for the presence of mosquito-borne encephalitis viruses and 2) periodically testing for the presence of encephalitis virus specific antibodies in the blood serum of either sentinel chickens or wild birds that are potentially exposed to infective mosquito bites.

1. Virus isolations from mosquitoes

Female mosquitoes to be tested for the presence of encephalitis viruses are usually captured by gravid or host-seeking traps. Collections are sorted by species and pooled in lots of 12-50. Pools are later tested to determine if virus is present and to what extent virus is disseminated (minimum infection rate) throughout the vector mosquito population.

2. Antibody conversion rates in sentinel birds

In addition to isolating viruses from mosquitoes captured in the wild, the presence of virus in the environment can also be detected by exposing animals that are not affected by infection, but develop neutralizing antibodies to the specific viral pathogen. A number of sentinel systems have been developed, and among those evaluated are domestic chickens in caged flocks consisting of 10-20 animals. Birds used as sentinels are treated humanely, and provided with ample shelter, water and feed. Wild birds can also be tested, and are banded and released into the wild after a small blood sample is taken. The collected blood samples (sera) are subsequently tested for the presence of virus specific antibody.

4.3.5 CONCLUSIONS: POTENTIAL ENVIRONMENTAL IMPACTS OF SURVEILLANCE

The District's surveillance activities require access to mosquito habitat sites, the placement of mosquito traps and sentinel birds in the field, the collection of mosquitoes in the field, and the direct or instrumental collection of physical data. Each of these activities poses a small potential for disturbance to natural or artificial environments.

The potential environmental impacts associated with the District's surveillance activities are insignificant. The State Secretary of Resources has determined that information collection and inspection activities do not generally have a significant impact on the environment [CEQA Guidelines Sections 15306 & 15309], and the available information on the District's surveillance activities are in agreement with this principle.

Surveillance Policy: District policy is to perform essential surveillance activities with the least negative impact on the environment. Technical staff use, whenever possible, pre-existing access ways such as roadways, open areas, walkways, and trails in an effort to minimize off-road travel. At times, vegetation management (e.g., pruning trees and brush) may become necessary where overgrowth impedes freedom of vehicle travel and staff movement on foot. All of these actions only result in a temporary/localized physical change to the environment with regeneration/re-growth occurring within a span of about one year.

District staff involved with performing surveillance duties are instructed to be respectful of the environment and associated wildlife and to limit their impact to only what is necessary to perform their assigned tasks. Willful disregard and attendant abuses of the environment are not tolerated in the District's mosquito control surveillance operations. When off-road travel is necessary, District staff is instructed to avoid threatened and endangered plants and sensitive habitat areas to minimize any environmental damage caused by off-road travel.

Non-invasive Sampling: Non-invasive sampling is considered a type of sampling that does not impact the environment directly. Low impact methods include the placement of host-seeking mosquito traps, gravid traps, and sentinel chicken flocks. In this situation, existing roads, trails, and clearings are usually utilized to accommodate surveillance activity.

Invasive Sampling: Invasive sampling is considered a type of sampling that may impact the environment directly. Obtaining samples of immature mosquitoes involves removal of some negligible quantities of water. This water may also include non-target organisms associated with the immature mosquitoes. Technicians will either make a count of the immatures present or remove a small number for identification at the agency office laboratory, returning the contents of the dipper back into the source once the quantification and identification process is completed. Taking dipper samples also requires the technician to wade into the source and repetitively sample/dip along transects to assess the extent and magnitude of immature mosquito populations. Trampling of some vegetation can occur, but most sampling actions involve either walking the shore line or wading through open water gaps that border emergent vegetation (grasses, tules, cattails, etc.) where immature mosquitoes are most likely to be sampled.

Special Use of Birds to Support Encephalitis Virus Surveillance (EVS) Activities: Placement of sentinel chickens is a necessary component of EVS. Therefore, their physical presence is required at sites where virus activity is to be monitored on a routine basis. Sentinel chickens are sequestered in a coop structure covered with welded wire to exclude access by resident wildlife. Feed and water is

housed within the coop enclosure. Manure is removed as needed to reduce fly production. A wire skirting is placed around the base of the coop to prevent wildlife from directly contacting the feces and foraging on the residual feed (various commercially available chicken feeds). Wild birds like House Sparrows and House Finches are captured using seed baited modified Australian Crow traps. Traps will be left open most of the time to allow birds to come and go at will, but will be closed over night every other week to allow sampling. Water is provided for the trapped birds during that time period.

Transportation and Access Requirements: Normal surveillance necessitates the use of access roads, trails, and clearings to facilitate sampling. Roads allow vehicles to transport needed staff and equipment to specific sites deemed critical. Access trails (2-3 feet in width) to the margins of wetlands, ponds, streams, and rivers are maintained by periodic vegetation removal via simple pruning or trimming if necessary. These vegetation control methods are discussed in more detail in sub-section 4.4 below.

All Terrain Vehicles (ATVs): The District sometimes relies upon the use of all terrain vehicles to facilitate access into areas that are not otherwise accessible by conventional transportation means or by foot. 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 ATV's where environmental conditions (e.g., impenetrable vegetation/terrain) can result in causing an accident, personal injury or significant environmental damage.

SECTION 4. VEGETATION MANAGEMENT

4.4.1 PHYSICAL CONTROL OF VEGETATION

The District occasionally clears plant matter preventing access to mosquito breeding sites or preventing good water management practices that would minimize mosquito populations. “Brushing” is usually limited to weeds and brush; live, mature trees are never removed by the District staff. Surveys for special status plants, coordination with the landowner, and acquisition of necessary permits are completed before any work is undertaken. 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. 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.

SECTION 5. BIOLOGICAL CONTROL OF VECTORS

4.5.1 INTRODUCTION

Biological control of mosquitoes and other pests is the intentional introduction or redistribution of pathogens, parasites or predators to reduce the size of target mosquito populations. Biological control of mosquito larvae is one of the principal components of the District's Integrated Vector Management Program. The District does not use biological control against adult mosquitoes at this time.

Intentional biological control of mosquitoes is a relatively recent development and can largely be traced to observations and ecological studies of fish predation on mosquito larvae beginning in the early 20th century (Smith 1904). Early investigations studied the potential effects of indigenous, and later introduced, fish on mosquito larvae. Results of such studies have been adopted in developing strategies to use mosquito predators in providing economical and sustained levels of control. As resistance to pesticides and environmental concerns associated with their use became more prevalent after the mid 1960's, biological control of larval mosquitoes became used more often as a method of protecting the public from mosquitoes and the diseases they transmit. However, reliable biological control of adult mosquitoes has not been demonstrated, and is not currently pursued by the District. It should also be noted that biological control methods also have potential environmental impacts, and their proper use as one component of an integrated management program based on surveillance, treatment criteria, and selection of the most appropriate control method at the time and place that mosquito control is required.

Predation of mosquito larvae by the mosquitofish *Gambusia affinis* is significant in swimming pools or ornamental fishponds within the District Service Area. District staff members stock or distribute about 150-200 pounds of mosquitofish to the public each year.

Other biological control methods available to the District include the application of the "biological insecticides" *Bacillus sphaericus* ("*B. sphaericus*") and *Bacillus thuringiensis israelensis* (Bti). Because potential environmental impacts of applying either type of *Bacillus* are associated with the potential disturbance related to the mode of application, as well as the potential for non-target toxicity, these materials will also be discussed in the Chemical Control section of this document.

4.5.2 BIOLOGICAL CONTROL AGENTS

Biological control agents of mosquitoes include a wide variety of pathogens, parasites and predators. As a rule, mosquito pathogens and parasites are usually highly specific to their mosquito host, whereas predators are more general in their feeding habits and opportunistically feed on mosquitoes.

A. MOSQUITO PATHOGENS

Mosquito pathogens include an assortment of viruses and bacteria. They 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, densovirus, nuclear polyhedrosis viruses, cytoplasmic polyhedrosis viruses and entomopoxviruses. Examples of bacteria pathogenic to mosquitoes are *Bacillus sphaericus* and several strains of *Bacillus thuringiensis israelensis*. These two bacteria produce proteins that are toxic to mosquito larvae. Both are produced commercially as mosquito larvicides.

B. MOSQUITO PARASITES

The life cycles of mosquito parasites are biologically more complex than those of mosquito pathogens and involve intermediate hosts or 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 suitable host.

Examples of mosquito parasites are the fungi *Coelomomyces* spp., *Lagenidium giganteum*, *Culicinomyces clavosporus* and *Metarhizium anisopliae*; the protozoa *Nosema algerae*, *Hazardia milleri*, *Vavraia culicis*, *Helicosporidium* spp., *Amblyospora californica*, *Lambornella clarki* and *Tetrahymena* spp.; and the nematode *Romanomermis culicivorax*.

C. MOSQUITO PREDATORS

Mosquito predators are represented by highly complex organisms, such as insects and fish that consume larval or adult mosquitoes as prey. Predators are opportunistic in their feeding habits and typically forage on a variety of prey types. This allows the predators 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.); platyhelminths (*Dugesia dorotocephala*, *Mesostoma lingua*, and *Planaria* spp.); insects (Anisoptera, Zygoptera, Belostomidae, Geridae, Notonectidae, Veliidae, Dytiscidae and Hydrophilidae); arachnids (*Pardosa* spp.); fish (*Gambusia affinis*, *Gasterosteus aculeatus*, *Poecilia reticulata*).

D. ENVIRONMENTAL RELATIONSHIPS IN BIOLOGICAL CONTROL

The effectiveness of a mosquito biological control agent lies in its ability to reduce mosquito numbers as quickly as possible. An ideal biological agent 1) feeds preferentially on mosquitoes, 2) exhibits an extremely efficient hunting or parasitizing strategy, and 3) reproduces quickly. These traits determine suitability for practical application. New mosquito sources initially have few predators and other competing aquatic organisms. Mosquito control personnel use this knowledge to develop a control strategy that involves integrated pest management techniques.

Since mosquitoes are capable of colonizing sources within days of flooding, initial control efforts attempt to suppress the first generations of mosquitoes until natural predators or competitors can

control them. Initial treatment includes the selective use of pesticides. Once biological control is established in a “managed” source, periodic inspections at timely intervals are adequate to monitor changes in larval abundance. Periodically, the source may require treatments with pesticides when 1) predators are not effective, 2) aquatic and shoreline vegetation provide too much shelter, 3) the water level changes, or 4) water quality does not support predators.

E. CONSERVATION AND APPLICATION OF PREDATORS

Predation on mosquitoes is a natural process that will occur without human intervention. The ability of predators to control mosquitoes is related to four factors: 1) whether mosquitoes are preferred prey; 2) whether the hunting strategy of the predator maximizes contact with mosquitoes; 3) whether the predator consumes large numbers of mosquitoes; and 4) whether the predator is present in sufficient numbers to control mosquitoes. Predator effectiveness is enhanced when proper conditions are present.

Within a typical aquatic environment that produces mosquitoes, predators are distributed among different substrates. For example pond surfaces support water striders, planaria and spiders. Below the water surface, backswimmers, predaceous diving beetles and water scavenger beetles 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 that feed on organisms associated with silts and organic detritus. Together, the different predators form a spatial network that accounts for predation throughout the pond. Ideally an adequate variety of vegetation should be present to maintain sufficient levels of predator diversity. Greater potential for an acceptable level of mosquito control exists when more predators are present. Care should be taken so that mosquitoes do not have an advantage when too much or too little vegetation is removed.

Most of the currently registered mosquito larvicides minimally impact predators. Making applications at the lower end of the label rate can further minimize any undesirable impacts from these larvicides. The overall objective of using predators is to reduce the frequency of pesticide applications. This minimizes environmental impact and delays the development of mosquito resistance to pesticides.

4.5.3 PRACTICAL APPLICATIONS OF BIOLOGICAL CONTROL AGENTS

A wide range of organisms has been evaluated for their effectiveness as biological control agents against mosquito larvae, but only a relatively small number are currently in use in California. There have been a number of reasons for this, including 1) difficulties in mass production, 2) failure to produce a consistent level of larval control, 3) expense, and 4) restricted application because of environmental concerns. Most agents, particularly predators and parasites, have only demonstrated acceptable control in conjunction with mosquitofish and larvicides. Currently, the only biological control agents in use or consideration by the District are *Bacillus thuringiensis israelensis*, *Bacillus sphaericus* and the mosquitofish *Gambusia affinis*. Mosquitofish will be discussed in the next subsection.

A. MICROBIAL AGENTS AND MOSQUITO CONTROL

Commercial formulations of *Bacillus sphaericus* and *Bacillus thuringiensis israelensis* are

extensively used as mosquito larvicides. Both are highly selective for mosquitoes and are innocuous to associated non-target organisms and predators. *Bacillus thuringiensis israelensis* is also toxic to black flies and non-biting midges at higher application rates.

Bacillus thuringiensis israelensis and *Bacillus sphaericus* are often considered chemical control measures because they are available in commercial formulations that consist of granular, powdered or liquid concentrates. The use of these two microbials is discussed further under Chemical Control (Section 4.7).

4.5.4 MOSQUITOFISH AND MOSQUITO CONTROL

Gambusia affinis is the most commonly used biological control agent for mosquitoes in the world. Careful 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. Although *G. affinis* have naturalized in some areas from historical stocking of creeks and other naturally occurring habitat, the District ceased stocking naturally occurring ponds and creeks and currently places mosquitofish only in swimming pools, ornamental ponds and other artificial sources. For general information on the biology of mosquitofish and their application in mosquito control programs, the reader is referred to Downs (1991) and Swanson et al (1996).

A. USE OF MOSQUITOFISH BY THE PUBLIC

Mosquitofish are also made available to the public for backyard water gardens and ornamental fishponds. Fish can no longer be picked up at District facilities, but will be delivered by District staff upon request to ensure compliance with the restrictions for use of mosquitofish and the California Fish and Game regulations pertaining to the placement of non-native fishes into creeks, lakes or other natural water bodies of the state. The public is also informed on how to properly care for and maintain the mosquitofish that they are provided.

4.5.5 ENVIRONMENTAL CONSIDERATIONS OF MOSQUITOFISH USE

Many species of larvivorous fish have been evaluated as agents to control mosquitoes, including various species of atherinids, centrarchids, cichlids, cyprinids, cyprinodontids, gasterosteids, and other poeciliids. However, mosquitofish are considered best suited from both biological and operational perspectives.

A. ADVANTAGES OF MOSQUITOFISH FOR BIOLOGICAL CONTROL

Mosquitofish possess characteristics which make them efficient predators of mosquito larvae. They thrive in shallow, calm, vegetated waters, the same environment where many mosquitoes prefer to lay eggs, and can tolerate wide ranges of water temperature and quality. Mosquitofish are surface-oriented predators where mosquito larvae are an accessible prey. The small size of the fish enables them to penetrate moderately vegetated and shallow areas within the mosquito source.

Mosquitofish are livebearers that grow rapidly, mature at a young age, and reproduce quickly. This allows the fish to establish a high population in the source shortly after stocking. In many sources, seasonal peaks in mosquitofish activity and population growth coincide with mosquito reproduction times. Because of their omnivorous feeding habits, mosquitofish can thrive in habitats where mosquitoes occur intermittently.

Mosquitofish are hardy and easy to handle, transport, and stock. As a result of extensive research and practical experimentation in California, mosquitofish can be reliably cultured in large numbers. Problems still exist in some areas with winter survival rates and inadequate supplies of fish in the spring. Because the fish reproduce where they are stocked, long-term control can be achieved by stocking relatively few fish, often in a single application. Compared to pesticides, which require repeated applications, mosquitofish can provide inexpensive and safe long term control, sometimes within days after application. Although not all introductions are successful, mosquitofish are an effective biological control component of an Integrated Vector Management Program.

B. LIMITATIONS TO USE OF MOSQUITOFISH FOR BIOLOGICAL CONTROL

Not all types of mosquito sources are suitable for stocking with mosquitofish and mosquitofish are not effective in all situations. Since mosquitofish usually are not stocked in numbers sufficient to cause an immediate effect, they do not control mosquitoes as quickly as pesticides do. In some areas, federal, state, or local agency permission is required to stock mosquitofish.

C. MOSQUITOFISH AND NON-MOSQUITO PREY

Mosquitofish, despite their name, cannot survive solely on a diet of mosquito larvae (Reddy & Pandian 1972). Laboratory and field research have shown that mosquitofish also will eat a wide variety of food, including zooplankton, copepods, cladocerans, and immature stages of many insects, including midges, water beetles, damselflies, and mayflies (Washino & Hokama 1967, Ahmed et al 1970, Reed & Hoy 1970, Miura et al 1979, Farley 1980, Walters & Legner 1980, Bence 1988, Walton & Mulla 1991, Lawlor et al 1999). Hess & Tarzwell (1942) concluded that mosquitofish were true opportunistic feeders, so that the simple availability of prey was the key criteria in prey selection by mosquitofish. As such, the selection of food items by mosquitofish apparently shifts away from specific prey as its abundance drops. The District has been unable to find any substantial evidence of extirpation of any taxa by mosquitofish in creeks or other open or complex natural sites.

Within their generally wide diet, mosquitofish do have some clear feeding preferences, including food at the water surface, prey size ranging from large zooplankton to very small fish or invertebrates, and prey that is not highly mobile (Swanson et al 1996). While mosquitofish can modify food chains in small experimental pools, and can have significant impacts on endemic fish in these settings (Swanson et al 1996, USFWS 1996), there has been no published information on significant effects on reducing food resources for higher predators, reducing other mosquito predators, or reducing Special Status Species in the District Service Area. Because questions have been raised on this last point with regards to the California Red-legged Frog, this species is discussed in additional depth below.

D. MOSQUITOFISH AND RED-LEGGED FROGS

The District does not find credible substantial evidence (either in the literature or from field experience) to support any claim that the omnivorous feeding habit of mosquitofish poses a threat to the juvenile forms of the threatened California Red-legged Frog. Specifically, the U.S. Fish and Wildlife Service (USFWS), after originally issuing statements asserting that mosquitofish have played a role in the historic reduction of Red-legged Frogs, acknowledged in their final Listing document for the species that they have no evidence for a link between mosquitofish and the decline of Red-legged Frogs:

“The Service is aware of several sites where mosquitofish and California Red-legged Frogs are currently coexisting. This evidence suggests that the relationship between mosquitofish and California Red-Legged Frogs is complex. Additional research clearly is needed to fully understand how these two species interact. The final rule has been revised to reflect current knowledge on this issue. The Service cannot determine whether mosquitofish are harmful to California Red-Legged Frogs.” (USFWS Federal Register 5/23/96)

Subsequently, research at the University of California at Davis, partially funded by the USFWS, showed no direct (mortality) impacts of mosquitofish on California Red-legged Frogs in intense interactions in naturalistic settings; the only indirect impact seen in this research was a slight lowering of body weight at the transition from tadpole to adult, with no evidence that this has any biological significance (Lawlor et al, 1999). In addition, as noted by the USFWS, mosquitofish and Red-legged Frogs have been frequently observed by qualified researchers to coexist in natural settings. Finally, alternative and more plausible explanations, including hunting, habitat destruction, and the introduced Bullfrog (*Rana catesbeiana*), apparently explain the observed historic decline in Red-legged Frogs (USFWS 1996, Lawlor et al 1999).

The District service area does not include any California Red-legged Frog habitat.

E. PROJECT CONTROLS TO LIMIT ENVIRONMENTAL IMPACTS TO NON SIGNIFICANCE:

District activities are undertaken in coordination with other agencies involved in management of natural resources and the environment, and are carried out pursuant to a framework of federal and state regulations. The following specific observations support our conclusion that existing District controls are effective to avoid significant environmental impact:

- The District has used mosquitofish in the current Service Area for over fifty years without any apparent relationship, geographic or temporal, between our activities and observed environmental changes;
- The District’s use of mosquitofish is limited to artificial sources such as swimming pools and ornamental ponds;
- The District’s field technicians are highly-trained, certified by the California Department of Public Health, and are required to complete frequent continuing education sessions sponsored by the State, the District, or the Mosquito & Vector Control Association of California;
- The District’s field activities are routinely monitored for safety, efficacy, and environmental impact by the District’s Manager, by the Los Angeles County Agricultural Commissioner, and by permit-issuing agencies;

- The District's activities are consistent with the Conservation Policies of the Los Angeles County General Plan and identified Habitat Conservation Plans, Endangered Species and Sensitive Habitat Recovery Plans, and City Plans in the Service Area; and
- District staff routinely coordinate and consult with other responsible agencies, including the California Department of Public Health, the California Department of Fish and Game, the U.S. Fish and Wildlife Service, to ensure that Project activities do not result in significant impacts to biological resources.

4.5.6 CONCLUSIONS

The District has found biological control in the form of mosquitofish release and redistribution to be an environmentally acceptable mosquito control technique for artificial sources. As a component of an Integrated Vector Management Program, it may be environmentally preferable to no action or the exclusive use of pesticides (World Health Organization, 1982). In addition, the increasingly limited availability of registered pesticides and increasing insect resistance to pesticides increases the need for alternatives including biological control. Though mosquitofish are not native to California, they are now ubiquitous throughout most of the state's waterways and tributaries. In much of the state's wetland areas, mosquitofish are now part of the natural ecosystem. In artificial sources, stocking of mosquitofish has a minimal impact on non-target species.

SECTION 6. CHEMICAL CONTROL

4.6.1 INTRODUCTION

Control of vectors with pesticides (“Chemical Control”) is an essential portion of the District’s Integrated Vector Management Program. When mosquito abundance exceeds District thresholds, and physical or biological control would be ineffective, inefficient, or otherwise inappropriate, selective pesticides to control larval mosquitoes (larvicides) and/or adult mosquitoes (adulticides) are used.

District staff has discretion to select from and apply a range of pesticides when field inspections indicate the presence of vector populations which meet District chemical control criteria and guidelines. Depending on the vector, these criteria and guidelines evaluate vectors’ composition, density, extent, and age (larval instar) structure; proximity to human settlements, including sensitive receptors; weather (water temperature, wind, evaporation rate, air temperature inversion); abundance of predators; regional or local pathogen (disease organism) activity; vegetation; previous control efficacy history at the specific site; and/or potential for development of resistance (Durso 1996, Lawlor 1997, etc.). Pesticide use by the District thus varies spatially and temporally in response to a large number of variables. The total number of applications and quantities of pesticides applied by the District from 2008 through July 2010 are shown in Appendix B.

In addition to the pesticides used routinely by the District, which are all discussed in detail in this Section, there are a large number of other materials, especially organophosphate (OP) larvicides (see below), labeled and registered for use against mosquitoes in California. The District does not use, nor does it plan to use, organophosphate pesticides. Therefore, although these materials are available for use, they will not be discussed in this report. Further information on any California registered pesticide is available from the California Department of Pesticide Registration (DPR 1999).

4.6.2 POTENTIAL ENVIRONMENTAL IMPACTS OF CHEMICAL CONTROL

Any chemical control of mosquitoes or any other pests presents a number of potential environmental impacts, the significance of which can vary. These potential environmental impacts can be conveniently divided into those associated with the pesticide itself, including its inert ingredients and breakdown products, and those associated with its mode of application (noise and other disturbance effects). In addition, potential pesticide impacts are often divided into those that might affect people directly (safety, residue, chronic toxicity), and those affecting other non-target organisms (especially Endangered and other Special Status Species). This sub-section will present generic issues and information on the potential environmental impacts associated with the mosquito control pesticides and pesticide application methods used or under consideration by the District, and the general policies and practices of the District to ensure that these impacts are not significant. Further specific information pertaining to each material or application method follows in the next sub-sections.

Most pesticides used by the District are selective, non-persistent, and pose a low risk to the operator

and the public. The District uses only pesticides registered by the United States Environmental Protection Agency and California Environmental Protection Agency. Pesticide application is always done in strict accordance with the pesticide label instructions (labels and Material Safety Data Sheets = MSDS for all pesticides used by the District are available from the District or from the California Department of Pesticide Regulation). The District's strict compliance with pesticide labels and MSDS's, together with other measures described below, ensure that the pesticides available for mosquito control, when applied in accordance with legal requirements, are safe and cause little or no environmental impact.

A. SAFETY

Pesticides, by their nature, are toxic to some organisms. Their toxicity, however, varies considerably between different species, and to a lesser extent between individuals of the same species, when exposed to identical dosages. The safety of pesticides to humans is primarily assessed through measurements of acute (single-dose) toxicity in other animals, which is summarized using "signal words" on the pesticide label or the "LD-50" values on the MSDS (high values indicate low toxicity; see Durso 1996). The following is an explanation of these signal words. Please note that the District does not use pesticides with a "Warning" or "Danger" label.

CAUTION. This word signals that the product is slightly toxic ("Category 3 or 4"). An ounce to more than a pint taken by mouth could kill the average adult. Any product which is slightly toxic orally, dermally, or through inhalation or causes slight eye and skin irritation, will be labeled "CAUTION".

WARNING. This word signals that the product is moderately toxic ("Category 2"). As little as a teaspoonful to a tablespoonful by mouth could kill the average sized adult. Any product which is moderately toxic orally, dermally, or through inhalation or causes moderate eye and skin irritation, will be labeled "warning".

DANGER. This word signals that the pesticide is highly toxic ("Category 1"). A taste to a teaspoonful taken by mouth could kill an average sized adult. Any product which is highly toxic orally, dermally, or through inhalation or causes severe eye and skin burning will be labeled "DANGER".

Pesticide safety is also evaluated in terms of Chronic Toxicity, or the response of organisms to repeated exposures to the material being tested. The California Department of Pesticide Registration (DPR) requires extensive testing for toxicity as a condition for allowing registration of pesticides in California, and as of July 1999 did not report any studies showing evidence of chronic toxicity associated with any of the pesticides used by the District when used at or near label rates (DPR 1999). DPR has reported "possible adverse" effects associated with repeated exposures at extremely high dosages (exceeding legally allowed label rates and District operations by a factor of 100 or more) of Permethrin, Pyrethrins, Resmethrin, Piperonyl Butoxide, (DPR 1999). District policies and practices, which are discussed in more detail below, ensure that the conditions encountered during these tests cannot occur during District operations.

Finally, standard toxicology measurements show average risk to the population as a whole. Therefore, a substantial margin of safety is incorporated in label instructions and District application policies and practices to protect children, persons with compromised health, and other "sensitive receptors."

Protection of public health and safety and other environmental values is ensured during pesticide applications by rigorous measures, including applicator registration and testing by the California Department of Public Health, ongoing training provided by the District and the Mosquito & Vector Control Association of California, routine equipment calibration, and regular inspections by the Los Angeles County Agricultural Commissioner.

B. NON-TARGET EFFECTS

In addition to potential toxicity to humans, pesticides are evaluated for their potential effects on other non-target organisms. The District uses selective materials with little or no impact on other mammals, birds, and most other vertebrates. Some labeled mosquito control pesticides can have non-target effects on other invertebrates or fish, amphibians, and other aquatic organisms. The Environmental Hazards section on labels of pesticides used for mosquito control instructs applicators about how to avoid and minimize these non-target impacts, and the District rigorously follows these instructions. For example, some adulticide labels instruct the applicator to avoid direct application over water or drift into sensitive areas (i.e., wetlands) due to a potential toxicity of these compounds to fish and invertebrates. Although there is some variation in the habitats to be avoided, they usually include lakes, streams and marshes. The District strictly follows label instructions and carefully monitors environmental and meteorological conditions to maximize effectiveness while avoiding and minimizing non-target exposure and environmental effects.

An additional type of non-target effect that has been reported in the past is the disruption of food chains through the loss of wide ranges of insects or other prey organisms. With the pesticides currently used by the District, their selective toxicity and lack of bioaccumulation generally protect food chains from significant impact. In addition, an exhaustive review of the scientific literature concludes that there is no substantial evidence to support the notion that there are potentially adverse impacts on midges, which are physiologically similar to mosquitoes and are important in the food supply for some waterfowl and wading birds. Specifically, 1) there is no evidence of a spatial or temporal relationship between larvicide use and population dynamics of waterfowl or wading birds (Scientific Peer Review Panel 1996); 2) Golden Bear 1111 has no effect on benthic midge larvae, which do not breathe at the water surface; 3) Bti has no detectible effect on midge larvae when applied at the maximum allowable label rates for mosquito control; 4) Methoprene, at label rates for mosquito control, can prevent adult emergence of some species of midges but does not directly kill mosquito or midge larvae and therefore does not remove them from the food chain; 5) no bioaccumulation (food chain magnification) of larvicides in larva-eating animals has been demonstrated for larvicides used by the District; and 6) the District does not use, and does not plan to use, other larvicides in areas where midges might be a significant portion of the food chain, except under emergency conditions.

C. INERT INGREDIENTS, SYNERGISM, AND ENVIRONMENTAL FATE

Ideally, the safety and environmental effects of pesticides are evaluated not only in terms of the active ingredient(s) of the pesticide, but also with relation to their inert ingredients and the chemicals that are produced as the pesticide is broken down in the environment (environmental fate), and with all possible combinations of other environmental compounds (synergisms). In the past, some persistent mosquito control pesticides (eg. DDT) both accumulated in animal tissues and were concentrated up food chains (bioaccumulation), and also created breakdown products that themselves posed environmental risks (e.g. DDE from DDT). As a practical matter, it has been

impossible for DPR or any other institution to test every possible chemical interaction and breakdown product. However, pesticides are tested as mixtures, together with their inert compounds, prior to their registration by USEPA or DPR, and extensive information has been collected on their total toxicity, bioaccumulation, and environmental fate. Neither EPA, DPR nor any other researchers have found significant environmental effects associated with the inert ingredients, synergisms, or breakdown products associated with materials used by the District. In addition, these materials do not bio-accumulate (see specific material descriptions later in this Section).

D. RESISTANCE AND LOSS OF EFFECTIVENESS

A number of examples of pesticide resistance have been published over the years, and one of the concerns with the development of resistance is the observed tendency of applicators to increase application frequency and/or intensity as pesticide effectiveness drops. The District has not experienced control failures due to resistance while using the current array of pesticides. However, to help guard against the development of resistance, and the monetary or environmental costs that can result, the District makes use of a number of pesticides with different modes of action, closely monitors research on resistance, and is committed to revising application practices if needed to avoid resistance.

E. DISTURBANCE ASSOCIATED WITH APPLICATION METHODS

In order to minimize potential non-target effects, modern pesticides are not only selective, but are also labeled for application directly to the mosquito population or habitat. Therefore, a means of applying the pesticide to the environment is needed and, for remote or large sites, a means of transportation. While small mosquito sources are routinely treated by hand, with a backpack tank or other small container/sprayer, the District also uses trucks, hose reels, ATV's, and/or aircraft as needed for pesticide application. The noise and physical disturbance associated with these vehicles therefore could cause disturbance to wildlife or nearby people, and the District plans its applications to minimize application frequency and disturbance intensity. At times, the desire for pesticides with low environmental persistence must be balanced with the desire to minimize application frequency, and some specific materials (e.g. Altosid pellets, see below) are specifically designed for a long-term slow release of non-persistent pesticides.

F. DISTRICT POLICIES AND PRACTICES TO PROTECT THE ENVIRONMENT

In addition to the environmental protection measures and procedures inherent in the District's IVM program as discussed earlier (especially application thresholds and other criteria), there are other practices inherent in the District's chemical control program that protect the environment:

1. There are numerous federal and state laws and regulations that strictly control and regulate the storage, transport, handling, use and disposal of the pesticides in order to protect against surface and groundwater contamination and other impacts to the environment and public health. (E.g., Federal Insecticide, Fungicide and Rodenticide Act; Cal. Food & Agric. Code divisions 6 & 7; Cal. Code of Regs., title 3, division 6.) The District and its staff consistently comply with these laws and regulations and are routinely inspected by the County agricultural department for compliance.

2. The District only uses pesticides registered by the U.S. Environmental Protection Agency and California Department of Pesticide Regulation. The District then strictly complies with the pesticide label restrictions and requirements concerning the storage, transport, handling, use and disposal of the pesticides.
3. Consistent with the District's integrated mosquito management principles, when using pesticides, the District selects the least hazardous material that will meet its goals. The District does not use Category 1 pesticides, and only uses Category 2 pesticides in emergency conditions.
4. The District regularly calibrates the output of all of its pesticide application equipment.
5. The California Department of Public Health (CDPH) regulates the District and its employees. Mosquito control activities are coordinated with CDPH pursuant to an annual Cooperative Agreement, under which the District commits to comply with certain standards concerning mosquito control and pesticide use. State law and the Cooperative Agreement require District mosquito control employees to be certified by CDPH as a mosquito control technician. This certification helps to ensure that the employees are adequately trained regarding safe and proper mosquito control techniques, including the handling and use of pesticides and compliance with laws and regulations relating to mosquito control and environmental protection. The District also works in close coordination with the County agricultural commissioner, including periodic reporting of its activities.

4.6.4 CHEMICAL CONTROL OF MOSQUITO LARVAE

A. INTRODUCTION

Larviciding is a general term for the application of non-living natural materials or synthetic chemical products to aquatic habitats to kill mosquito larvae or pupae or to otherwise prevent emergence of adult mosquitoes. Materials designed to function in this way are known as larvicides, and they can be applied in a wide variety of formulations using a broad range of application technologies. Larviciding was developed early this century for the control of malaria and yellow fever mosquitoes, and still represents the most extensive set of District chemical control activities.

The District uses larvicides to treat a wide variety of aquatic habitats and communities, ranging from small domestic containers to larger marshland areas. Frequently, the aquatic habitats targeted for larviciding are temporary or semi-permanent, since permanent aquatic sources usually contain natural mosquito predators such as fish and do not require further treatment, unless vegetation is so dense that it prevents natural predation. Temporary sites such as tidal marshes or the margins of creeks produce prodigious numbers of floodwater mosquitoes. While floodwater mosquitoes develop during the first weeks after flooding, it often takes at least two to three weeks for the first macro invertebrate predators of mosquitoes to become established, and therefore biological or chemical control will be needed.

Where chemical control is appropriate, the major advantage of larviciding is the very small amount of larval habitat compared to adult mosquito habitat, and consequently the small acreage requiring treatment. Typically, the District applies larvicides to less than one percent of the total District Service Area in any year.

There are times when larviciding is inappropriate (Durso 1996). Effective larviciding results are not

always easy to achieve, and is critically dependent on timing when using non-persistent pesticides. The size, location, or topography of the mosquito source area may make timely larviciding impossible. Spatial accuracy of the larvicide application is also extremely important. Congregated larvae may be easy targets, but missing a relatively small area containing them is also easy and leads to the emergence of many adults. Finally, larvicide labels allow a range of legal application dosage rates; the selected rate must be sufficiently high to control the targeted mosquito species and sufficiently low to avoid or minimize non-target effects, especially where Special Status Species are present.

Natural fauna inhabiting larvicide application sites in addition to mosquitoes may include amphibians, fish, other vertebrates, and invertebrates, particularly insects and crustaceans, but larviciding causes little impact to these species. Temporarily flooded sites that meet District criteria to larvicide are generally very low in diversity of non-mosquito animal species at those times, due to the time needed for most non-mosquito species to locate and colonize these sites after flooding (Collins & Resh 1989). Also, because the District applies larvicides in limited areas at any time, most of the non-target species that do exploit temporary aquatic habitats are capable of quickly recovering from localized population declines via re-colonization from untreated proximal areas (Lawlor et al 1997).

Impacts of larviciding on flora are insignificant because the materials have no toxicity to plants, because the application methods involve very little disturbance to plants or soil, and because there are a small number of Special Status plants within potential District treatment areas, and District staff is trained to avoid them.

Larvicides routinely used by the District include Golden Bear Oil 1111, BVA 2, Agnique, S-Methoprene (Altosid), Bti (*Bacillus thuringiensis israelensis*) and *B. sphaericus*. Depending on water temperature, organic content, mosquito larval density, and other variables, pesticide applications may be repeated at any site at frequencies ranging from annually to weekly.

Commercially available and experimental larvicides used by the District are discussed below. The presentation begins with the Insect Growth Regulator S-Methoprene, and then follows with Water Surface Films (GB1111, Agnique, or BVA 2), and concludes with Ingested Bacterial Larvicides (Bti and *Bacillus sphaericus*). A discussion of application methods, which are essentially common to all these materials, follows.

B. INSECT ENDOCRINE AGENTS = INSECT GROWTH REGULATORS (IGR'S)

S-METHOPRENE. S-Methoprene (known simply as Methoprene or as its trade name, Altosid) is a synthetic analogue (mimic) of a naturally occurring insect hormone called Juvenile Hormone (JH). JH is found during aquatic life stages of the mosquito and in other insects, but is most prevalent during the early instars. As mosquito larvae mature, the level of JH steadily declines until the 4th instar molt, when levels are very low. This is considered to be a sensitive period when all the physical features of the adult begin to develop. S-Methoprene in the aquatic habitat can be absorbed on contact and the insect's hormone system then becomes unbalanced. When this happens during the sensitive period, the imbalance interferes with 4th instar larval development. One effect is to prevent adults from emerging. Since pupae do not eat, they eventually deplete body stores of essential nutrients and then starve to death. Based on its mode of action, S-Methoprene is considered an insect growth regulator (IGR). This material has no effect on mosquito pupae and must be contacted by larvae to be effective.

Methoprene is applied either in response to observed high populations of mosquito larvae at a site, or as a sustained-release product that can persist for four months or longer. Application can be by hand, ATV, or aircraft. The District applied about 1118 pounds of Altosid Pellets/Briquets and 34.5 gallons of Altosid Liquid Larvicide in the entire 1,330 square mile service area during 2009.

FORMULATIONS AND DOSAGES. S-Methoprene is a very short-lived material in nature, with a half-life of about two days in water, two days in plants, and ten days in soil (Wright 1976 in Glare & O'Callaghan 1999, La Clair et al 1998). The manufacturer has developed a number of formulations to maintain an effective level of the active material in the mosquito habitat (0.5-3.0 parts per **billion** = ppb⁴ (Scientific Peer Review Panel 1996)) for a practical duration, thus minimizing the cost and potential impacts associated with high-frequency repeat applications. Currently, eight S-Methoprene formulations are sold under the trade name of Altosid. These include Altosid Liquid Larvicide (A.L.L.) and Altosid Liquid Larvicide Concentrate, Altosid Briquets, Altosid XR Briquets, Altosid SBG, Altosid XR-G, Altosid WSP and Altosid Pellets. Altosid labels contain the signal word "CAUTION".

ALTOSID LIQUID LARVICIDE (A.L.L.) & A.L.L. CONCENTRATE. These two microencapsulated liquid formulations have identical components and only differ in their concentrations of active ingredients (AI). A.L.L. contains 5% (wt./wt.) S-Methoprene while A.L.L. Concentrate contains 20% (wt./wt.) S-Methoprene. The balance consists of inert ingredients that encapsulate the S-Methoprene, causing its slow release and retarding its ultraviolet light degradation. Maximum labeled use rates are 4 ounces of A.L.L. and 1 ounce of A.L.L. Concentrate (both equivalent to 0.0125 lb. AI) per acre, mixed in water as a carrier and dispensed by spraying with conventional ground and aerial equipment. In sites which average a foot deep, these application rates are equivalent to a maximum active ingredient concentrations of 4.8 ppb, although the actual concentration is substantially lower because the encapsulation does not allow instantaneous dissolution of the entire active ingredient into the water.

Because the specific gravity of Altosid Liquid is about that of water, it tends to stay near the target surface. Therefore, no adjustment to the application rate is necessary in varying water depths when treating species that breathe air at the surface. Cold, cloudy weather and cool water slow the release and degradation of the active ingredient as well as the development of the mosquito larvae.

ALTOSID BRIQUETS. Altosid Briquets were the first solid methoprene product marketed for mosquito control, beginning in 1978. Briquets consist of 4.125% S-Methoprene (.000458 lb. AI/briquet), 4.125% (wt./wt.) R-Methoprene (an inactive isomer), and plaster (calcium sulfate) and charcoal to retard ultra violet light degradation. Altosid Briquets release methoprene for about 30 days under normal weather conditions and, as noted earlier, this means that the concentration of active ingredient in the environment at any time is much lower than the value calculated from the weight of material applied.

Applications are usually made at the beginning of the mosquito season, and under normal weather conditions, repeat treatments occur at approximately 30-day intervals. The recommended application rate is 1 Briquet in non-flowing or low-flowing water up to 2 feet deep. Small sites with any mosquito genera may be treated with this formulation. Typical treatment sites include storm drains, catch basins, roadside ditches, ornamental ponds and fountains, cesspools and septic tanks,

⁴ Note that this concentration is measured in parts per **billion**, and is equivalent to 0.0005 to 0.003 ppm (parts per 100 sq. ft. **million**) when comparing application rates and toxicity studies.

waste treatment and settlement ponds, transformer vaults, abandoned swimming pools, and construction and other man-made depressions.

ALTOSID XR BRIQUETS. This formulation consists of 2.1% (wt./wt.) S-Methoprene (.00145 lb. AI/briquet) embedded in hard dental plaster (calcium sulfate) and charcoal. Despite containing only 3 times the active ingredient as the “30-day briquet”, the comparatively harder plaster and larger size of the XR Briquet change the erosion rate allowing sustained s-methoprene release for up to 150 days in normal weather. The recommended application rate is 1 to 2 briquets per 200 sq. ft. in no-flow or low-flow water conditions, depending on the target species. Many applications are similar to those with the smaller Briquets, although the longer duration of material release can also make this formulation economical in small cattail swamps and marshes, water hyacinth beds, meadows, freshwater swamps and marshes, woodland pools, flood plains and dredge spoil sites.

ALTOSID SBG. This formulation contains 0.2% (wt./wt.) S-Methoprene. A yellowish-brown granule, SBG releases effective levels of insect growth regulator for 5-10 days after application. It is designed for single brood mosquito larvae and applications should be made within 3 to 5 days of expected pupation and can be applied using rotary and fixed-wing aircraft equipped with granular spreaders or ground equipment, which will achieve even coverage, to non-crop areas like snow pools, salt and tidal marshes, freshwater swamps and marshes (cattail, red cedar, white maple marsh), woodland pools and meadows, dredging spoil sites, drainage areas, ditches, waste water treatment facilities, dairy or poultry lagoons, retention ponds, harvested timber stacks, swales, storm water drainage areas, sewers, catch basins, tree holes, water-holding receptacles (e.g., tires, urns, flower pots, cans and other containers) and other natural and manmade depressions.

ALTOSID WSP. This formulation contains 4.25% (wt./wt.) S-Methoprene. ALTOSID PELLETS WSP are convenient ready-to-use packets for treating mosquito breeding sites. The pouches are water-sensitive and when in contact with water, the pouches dissolve, releasing the pellets, releasing effective levels of Insect Growth Regulator for up to 30 days under typical environmental conditions. Pouches can be used to treat small bodies of water such as: catch basins, storm drains, roadside ditches, tree holes, flooded crypts, transformer pits, fish ponds, woodland pools, fountains, septic tanks, ornamental ponds, manmade depressions, animal watering troughs, ditches, and other natural or artificial water-holding containers.

ALTOSID XR-G. Altosid XR-G was approved for use in 1997. This product contains 1.5% (wt./wt.) S-methoprene. Granules are designed to slowly release s-methoprene as they erode. Under normal weather conditions, control can be achieved for up to 21 days. Label application rates range from 5 lbs. to 20.0 lbs. per acre, depending on the target species and/or habitat. The species are the same as listed for the briquet formulations. Listed target sites include meadows, rice fields, freshwater swamps and marshes, salt and tidal marshes, woodland pools, tires and other artificial water holding containers, dredge spoil sites, waste treatment ponds, ditches, and other natural and man-made depressions.

ALTOSID PELLETS. Altosid Pellets were approved for use in April 1990. They contain 4.25% (wt./wt.) S-methoprene (0.04 lb. AI/lb.), dental plaster (calcium sulfate), and charcoal in a small, hard pellet. Like the Briquets discussed above, Altosid Pellets are designed to slowly release S-Methoprene as they erode. Under normal weather conditions, control can be achieved for up to 30 days of constant submersion or much longer in episodically flooded sites (Kramer 1993). Label application rates range from 2.5 lbs. to 10.0 lbs. per acre (0.1 to 0.4 lb. AI/acre), depending on the target species and/or habitat. At maximum label application rates, as with the Briquets, the slow

release of material means that the actual concentration of active ingredient in the water never exceeds a few parts per billion.

The target species are the same as those listed for the briquet and liquid formulations. Listed target sites include pastures, meadows, rice fields, freshwater swamps and marshes, salt and tidal marshes, woodland pools, floodplains, tires and other artificial water holding containers, dredge spoil sites, waste treatment ponds, ditches, and other man-made depressions, ornamental pond and fountains, flooded crypts, transformer vaults, abandoned swimming pools, construction and other man-made depressions, tree holes, storm drains, catch basins, and waste water treatment settling ponds.

ENVIRONMENTAL IMPACTS: Methoprene is a material with very high specificity in its mode of action. Exhaustive reviews of the published literature on this material attest to its lack of adverse environmental impact (Mian & Mulla 1982, Scientific Peer Review Panel 1996, Glare & O'Callaghan 1999, Office of the Minnesota Legislative Auditor 1999). The table following the Methoprene discussion is a list of organisms impacted by S-Methoprene in studies reviewed by Glare & O'Callaghan (1999).

Wright (1976) reviewed the toxicology data collected for Methoprene registration and found no clinical signs of toxicosis in swine, sheep, hamsters, rats, dogs, rabbits, guinea pigs and cattle. Additionally, teratological (birth defect) studies in swine, sheep, hamsters, rats and rabbits showed no observable effects. Hester et al. (1980) found non-target organisms did not exhibit any adverse effects when exposed to treatments of sand granule and liquid formulations of methoprene up to a maximum of three and seven weeks, respectively. The acute, short-term toxicity of ZR-515 (methoprene) was also tested on 35 aquatic organisms including Protozoa, Platyhelminths, Rotatoria, Annelida, Arthropoda, Mollusca, Chordata and Thallophyta, and LC50 values of 0.9 to 5.0 ppm were calculated (250 to 1000 times label rates) (Miura and Takahashi 1973). Dosages used for larval mosquito control produced no adverse effect on the organisms tested, except for some sensitivity in larvae of some aquatic Diptera (Chironomidae, Ephydriidae, and Psychodidae).

Bircher and Ruber (1988) assessed the toxicity of methoprene to all life cycle stages of the salt marsh copepod (*Apocyclops spartinus*) at concentrations ranging from 0.1 to 10.0 ppm. In general the copepods were resistant to concentrations of methoprene used to control mosquitoes, but early nauplii did show some mortalities to methoprene concentrations near the lower margins of mosquito susceptibility. Christiansen et al. (1977) showed a reduction in survival of larvae of the mud-crab *Rhithropanopeus harrisi* (Gould) under a range of salinity and temperature conditions, when exposed to 0.01, 0.1 and 1.0 ppm methoprene. McKenney and Mathews (1988) reported that larval survival, growth and energy metabolism of an estuarine shrimp *Palaemonetes pugio* were altered by exposure to low ug/l concentrations of an insect growth regulator (the juvenile hormone analogue, methoprene).

Finally, an extensive early study of technical (powdered) methoprene on a Louisiana coastal marsh (Breud et al 1977) showed reductions in populations of adult and young scud (*Hyalella azteca*), adult and young opossum shrimp (*Taphromysis louisianae*), adult and young freshwater prawns (*Palaemonetes paludosus*), immature mayflies (*Callibaetis* sp.), larval dance flies (*Notophila* sp.), larval midges (*Chironomidae*), adult and young fresh water snails (*Physa* sp.), immature damselflies and dragonflies (*Enallagma*, *Anax*, and *Belonia* spp.), adult burrowing water beetles (*Suphisellus* sp. and *Hydrocanthus* sp.), adult water scavenger beetles (*Berosus infuscatus*), and immature water scavenger beetles (*Berosus* spp.). On the other hand, populations **increased** for immature water boatmen (*Trichocorixa louisianae*), larval moth flies (*Psychoda* sp.), adult and young crawfish

(*Procambarus clarki* and *Cambarellus* sp.), and adult predaceous diving beetles (*Liodes affinis*) after the methoprene applications. No statistically significant ($P>0.05$) difference was seen between the test and control populations of 28 other aquatic organisms. Interpretation of this study is difficult in part because of the mixed nature of the results, which largely indicate the complexity of ecosystem dynamics in marshlands. Also, the application rate (28gm AI/ha technical powder) was at least twice the highest label rate allowed today, and was effectively much higher when the encapsulation and other coatings on modern formulations are considered.

After examining these and other studies, District staff and the recent reviewers listed above have concluded that 1) applications of methoprene (especially technical powder) at rates significantly higher than allowed by the label can adversely impact a number of aquatic animals; 2) animal species are not extirpated (locally eliminated) by repeated methoprene use except at application rates far higher than District practices; 3) while emergence of adults of some fly species (specifically, some types of midges) can be temporarily reduced at application rates similar to District practices, the patchy distribution of mosquito larvae and thus treated areas leads to maintenance of untreated refugia for non-targets, speeding re-colonization and avoiding impact on the food chain 4) larval flies affected by methoprene are not killed at label application rates, but are prevented from becoming adults; 5) for species that are affected by methoprene, re-colonization and reestablishment of populations from neighboring sites is fast once intense control was relaxed and 6.) no bioaccumulation of methoprene has been seen in animals that have eaten mosquito or midge larvae treated with methoprene.

Furthermore, there is no credible or substantial evidence to support the suggestion that methoprene may be associated with deformities in frogs that have been observed in a number of States (Frognert 1999). Recent exhaustive reviews of this literature by independent analysts in Minnesota and New Zealand also find no evidence to support this claim (Glare & O'Callaghan, 1999; Minnesota State Auditor's Office, 1999). First, there is no evidence of a spatial or temporal relationship between Altosid use and amphibian deformities and, in particular, there is no evidence of frog deformities at all in the District's Service Area, and no significant evidence of frog deformities anywhere in California where methoprene use occurs (Fenn 1999). Second, well-documented alternative explanations for frog deformities, including infection with Trematodes, that are more consistent with the epidemiological patterns observed, have been reported (Sessions 1999). Third, the observations discussed to support the assertion have not been duplicated by any other researchers (Ankley et al 1998, Glare & O'Callaghan 1999). Fourth, consultations with Dr. Mark Jennings (May 1999) and other eminent herpetologists find no professional agreement with the claims of methoprene and frog deformities. Finally, severe deficiencies in methodology and/or interpretation exist in the few reports that make this assertion, including La Clair's failure to compensate for natural degradation of methoprene in the environment (La Clair 1998) and Sparling's failure to evaluate parasitism (Sparling 1998).

C. WATER SURFACE FILMS

INTRODUCTION. Water Surface Film larvicides spread across water surfaces and disrupt larval respiration, killing mosquitoes and some other classes of air-breathing aquatic insects. Water surface film larvicides used by the District include specially refined petroleum distillates (Golden Bear 1111) and BVA 2, as well as ethoxylated Isostearyl Alcohols (Agnique). In addition to being safe and selective agents effective for the control of younger larval instars, these are the only currently registered larvicides used by the District that are effective against mosquito pupae. When

timely larval control is not possible or not successful, pupal control can usually be achieved using these products.

GB-1111 (Golden Bear 1111). This product, generally referred to as Golden Bear 1111 or simply GB-1111, is a highly-refined petroleum based “naphthenic oil” with very low phytotoxicity and no detectible residual products within days after application. Volatility is very low (“non-volatile” according to the MSDS), and environmental breakdown presumably results primarily from natural microbial degradation into simple organic compounds. The label for GB-1111 contains the signal word “CAUTION”. GB-1111 contains 99% (wt./wt.) oil and 1% (wt./wt.) inert ingredients including an emulsifier. The nominal dosage rate is 3 gallons per acre or less. Under special circumstances, such as when treating areas with high organic content, up to 5 gallons per acre may be used.

GB-1111 provides effective control on a wide range of mosquito species. Applied to breeding areas, GB-1111 is an effective material against any mosquito larvae and pupae obtaining atmospheric oxygen at the water surface. It can even be effective in treating adult mosquitoes as they emerge. Where pupal density is high or where warm water indicates that this will occur soon, GB-1111 is used unless other materials are required by site-specific protocols or other application criteria. Low dosages (1 gallon per acre) of oil work slowly, especially in cold water, and can take 4 to 7 days to give a complete kill. Higher dosage rates are sometimes used (up to 5 gallons per acre) to lower the kill time. It is typically applied by hand, ATV, or truck. Aerial application is possible for large areas, but is not routine.

POTENTIAL ENVIRONMENTAL IMPACTS OF GB-1111. Little information has been published on the potential environmental impacts of this pesticide. GB-1111 was re-registered as a mosquito larvicide by the California Department of Pesticide Registration on April 20, 1999 (DPR 1999), and subsequent consultations with the Registration Specialist for this material at DPR indicate that the Department did not find evidence that GB-1111 has any potential significant environmental impacts when applied under label requirements and District application protocols (Duane Schnabel, DPR, pers. comm. May, 1999).

Four studies by Tietze et al (1991, 1992, 1993, 1994) tested three species of fish (Inland Silversides, Mosquitofish, and Sheepshead Minnows) and a range of microorganisms and concluded that this larvicide is not toxic to the tested organisms at label application rates. Mulla and Darwazeh (1981) experimented with GB-1111 in small experimental ponds and found that benthic invertebrates were unaffected while populations of surface breathing insects were temporarily reduced following application of this larvicide. Lawlor (UC Davis, in prep., pers. comm 8/25/99) has recently completed a significant independent study of non-target effects of GB-1111, with financial assistance from USFWS, on the tidal marshes of Newark, CA, and observed the following effects: 1) surface breathing insect populations were reduced at the time of treatment; 2) this effect did not persist beyond a few days (= no residual pesticide effects); 3) those potentially affected animals with high mobility left the site, while some of those that could not leave died (especially water boatmen (Corixidae)); 4) overall populations of invertebrate species were not affected, apparently because of recolonization from neighboring untreated sites.

BVA 2 is another example of a highly refined oil used for the control of mosquito pupae. When applied evenly over the water surface it rapidly interrupts the air water interface and suffocates all immature mosquito stages present. This quick action makes it an effective larvicide and pupicide. According to the label BVA 2 is toxic to fish and other aquatic organisms. It must not be applied

apply directly to water, except when applied for mosquito larvae control; and then only in shallow areas around the border. The responsible State Fish and Game Agency must be consulted before application of this product. According to Vincent (2010) BVA 2 is sufficiently similar to GB-1111, so that EPA, for registration, referred to available data on GB-1111 (see previous paragraphs) and did not require additional environmental impact studies .

AGNIQUE. Agnique is the trade name for a recently reissued surface film larvicide, comprised of ethoxylated alcohol. According to the label, Agnique has very low vertebrate toxicity; an average persistence in the environment of 5-14 days at label application rates; and no toxic breakdown products, skin irritation, carcinogenicity, mutagenicity, or teratogenicity has been reported. Because of its similar mode of action and effectiveness against pupae, Agnique can be used as an alternative to Golden Bear 1111, especially in sites where the moderate temporary sheen associated with GB-1111 might be objectionable. Because the application rate of Agnique is much lower than that of Golden Bear, this potential shift would not include an increase in volume of materials applied.

POTENTIAL ENVIRONMENTAL IMPACTS OF AGNIQUE. A number of efficacy and non-target studies had been conducted on this material when it was registered under the name Aerosurf. The pesticide was reregistered in California in July 1999 and consultations with DPR indicate that the Department did not find evidence that Agnique has any potential significant environmental impacts when applied under label requirements and District application protocols (Duane Schnabel, DPR, pers. comm. May, 1999). Minor proprietary changes in preparation did not apparently change any of the material's potential environmental impacts, and therefore the earlier literature is referenced.

Most published studies conducted with this larvicide tested application rates of 3 to 100 times the maximum label rate. At these rates, no observable effect on mortality or development was noted in tests on green tree frogs, seven species of fresh and salt water fish, two species of shrimp, five species of water beetle, or one species each of fairy shrimp, crayfish, snail, polychaete worm, mayfly naiad, copepod, ostracod, or midge. In addition, no effect was seen on five species of plants. As with GB-1111, air (surface) breathing insects were temporarily adversely impacted. Waterboatmen, backswimmers, and one species of water beetle exhibited increased mortality at application rates above label limits. In addition, a clam shrimp, a crab, an amphipod, and one species of isopod exhibited minor to significant increases in mortality at levels several times the highest application rate allowed by the label. For more information, please see the accompanying table. It should be noted that the greater persistence of this material (up to two weeks) relative to GB-1111 can reduce the need for repeated applications, but might also increase the duration of suppression of other air-breathing insects. Because District larvicide protocols require application of larvicides only in areas with mosquito larvae, and because larval distribution is highly patchy (Service 1993), re-colonization of impacted non-targets from unsprayed areas still occur promptly.

D. BACTERIAL (INGESTION) LARVICIDES

INTRODUCTION. The District uses two types of ingested toxins whose active ingredients are manufactured by bacteria. These control agents are often designated as Bacterial Larvicides. Their mode of action requires that they be ingested to be effective, which can make them more difficult to use than the contact toxins and water surface films. Bacteria are single-celled parasitic or saprophytic microorganisms that exhibit both plant and animal properties, and range from harmless

and beneficial to intensely virulent and lethal. A beneficial form, *Bacillus thuringiensis* (Bt), is the most widely used (especially in agriculture) microbial pesticide in the world. It was originally isolated from natural Lepidopteran (butterfly and moth) die-offs in Germany and Japan. Various Bt products have been available since the 1950's, and in 1976, Dr. Joel Margalit and Mr. Leonard Goldberg isolated from a stagnant riverbed pool in Israel, a subspecies of *B. thuringiensis* that had excellent mosquito larvicidal properties. It was named *B.t. variety israelensis* (B.t.i.) and later designated *Bacillus thuringiensis* Serotype H-14. Either of these two designations may be found on the labels of many bacterial mosquito larvicide formulations used today. Another species of bacteria, *B. sphaericus*, also exhibits mosquito larvicidal properties.

BTI (*Bacillus thuringiensis* var. *israelensis*). B.t.i. organisms produce, when environmental conditions are favorable, five different microscopic protein pro-toxins packaged inside one larger protein container or crystal. The crystal is commonly referred to as delta (d-) endotoxin. If a mosquito larva ingests the d-endotoxin, these five proteins are released in the alkaline environment of the insect larval gut. The five proteins are converted into five different toxins if specific enzymes also are present in the gut. Once converted, these toxins destroy the gut wall, which leads to paralysis and death of the larvae. B.t.i. is toxic to larval stages of all genera of mosquitoes and to black flies (Simuliidae).

B.t.i. is grown commercially in large fermentation vats using sophisticated techniques to control environmental variables such as temperature, moisture, oxygen, pH and nutrients. The process is similar to the production of beer, except that B.t.i. bacteria are grown on high protein substrates such as fishmeal or soy flour and the spore and delta endotoxin are the end products. At the end of the fermentation process, B.t.i. bacteria exhaust the nutrients in the fermentation machine, producing spores before they lyse and break apart. Coincidental with sporulation, the delta endotoxin is produced. The spores and delta endotoxins are then concentrated via centrifugation and microfiltration of the slurry. It can then be dried for processing and packaging as a solid formulation or further processed as a liquid formulation. Since some fermentation medium (e.g. fish meal) is always present in liquid formulations, they generally smell somewhat like the medium.

There are five basic B.t.i. formulations available for use: liquids, powders, granules, pellets, and briquets. Liquids, produced directly from a concentrated fermentation slurry, tend to have uniformly small (2-10 micron) particle sizes, which are suitable for ingestion by mosquito larvae. Powders, in contrast to liquids, may not always have a uniformly small particle size. Clumping, resulting in larger sizes and heavier weights, can cause particles to settle out of the feeding zone of some target mosquito larvae, preventing their ingestion as a food item. Powders must be mixed with an inert carrier before application to the larval habitat, and it may be necessary to mix them thoroughly to achieve a uniformly small consistency. B.t.i. granules, pellets, and briquets are formulated from B.t.i. primary powders and an inert carrier. B.t.i. labels contain the signal word "CAUTION".

The amount of toxins contained within B.t.i. products are reported indirectly as the result of at least two different bioassays and are difficult to equate to one another. Prepared volumes of toxins are applied to living mosquito larvae and the resulting mortality produces through formulae numerical measures known as International Toxic Units (ITU's) and *Ae. aegypti* International Toxic Units (AA-ITU's). These measures are only roughly related to observed efficacy in the field, and are therefore inappropriate to consolidate and report on like other toxicants (active ingredients).

Bti is applied by the District as a liquid or sometimes bonded to an inert substrate (ie: corn cob

granules) to assist penetration of vegetation. Application can be by hand, ATV, or aircraft. Persistence is low in the environment, usually lasting three to five days due to sensitivity to UV light. Kills are usually observed within 48 hours of toxin ingestion. As a practical matter, apparent failures are usually followed with oil treatments.

Timing of application is extremely important in operational use of bacterial toxins. Optimal benefits are obtained when treating 2nd or 3rd instar larvae. Treatments at other development stages may provide poor control. Since fourth instar mosquito larvae quit feeding prior to becoming pupae, it is necessary to apply B.t.i. prior to this point in their development. Although the details are poorly understood, evidence suggests that larvae also undergo a period of reduced feeding or inactivity prior to molting from 1ST to 2ND, 2ND to 3RD, and 3RD to 4TH instars. If we apply B.t.i. at these points in their development, the toxic crystals may settle out of the water column before the larvae resume feeding, and with synchronous broods of mosquitoes, complete control failures may result. With asynchronous broods, efficacy may also be reduced. Therefore a disadvantage of using B.t.i. is the limited application window available.

BTI LIQUIDS. Currently, three commercial brands of B.t.i. liquids are available: Aquabac XT, Teknar HP-D, and Vectobac 12AS. Labels for all three products recommend using 4 to 16 liquid oz/acre in unpolluted, low organic water with low populations of early instar larvae (collectively referred to below as clean water situations). The Aquabac XT and Vectobac 12 AS (but not Teknar HP-D) labels also recommend increasing the range from 16 to 32 liquid oz/acre when late 3rd or early 4th instar larvae predominate, larval populations are high, water is heavily polluted, and/or algae are abundant. The recommendation to increase dosages in these instances (collectively referred to below as dirty water situations) also is seen in various combinations on the labels for all other B.t.i. formulations discussed below.

B.t.i. liquid may also be combined with the Altosid Liquid Larvicide discussed earlier. This mixture is known as Duplex. Because B.t.i. is a stomach toxin and lethal dosages are somewhat proportional to a mosquito larvae's body size, earlier instars need to eat fewer toxic crystals to be adversely affected. Combining B.t.i. with methoprene (which is most effective when larvae are the oldest and largest or when you have various, asynchronous stages of one or more species) allows a District to use less of each product than they normally would if they would use one or the other. Financially, most savings are realized for treatments of mosquitoes with long larval development periods, asynchronous broods or areas with multiple species of mosquitoes.

BTI CORNCOB GRANULES. There are currently two popular corncob granule sizes used in commercial formulations. Aquabac 200G, Bactimos G, and Vectobac G are made with 5/8 grit crushed cob, while Aquabac 200 CG (Custom Granules) and Vectobac CG are made with 10/14 grit cob. Aquabac 200 CG is available by special request. The 5/8 grit is much larger and contains fewer granules per pound. The current labels of all B.t.i. granules recommend using 2.5 to 10 lb./acre in clean water and 10 to 20 lb./acre in dirty water situations.

ENVIRONMENTAL IMPACTS OF BTI. Products containing Bti are ideally suited for use in Integrated Vector Management Programs because the active ingredient has a highly specific mode of action and is therefore extremely selective. Bti does not interrupt activities of most beneficial insects and predators. Bti controls all larval instars provided they have not quit feeding, and can be used in almost any aquatic habitat with no restrictions. It may be applied to irrigation water and any other water sites except treated finished drinking water. Bti is fast acting and its efficacy can be evaluated almost immediately. It can kill larvae within 1 hour after ingestion, and since each instar

must eat in order for the larvae to grow, the Bti usually kills mosquito larvae within 48 hours of application. Bti leaves no residues, and it is quickly biodegraded. Resistance is unlikely to develop simultaneously to the five different toxins derived from the Bti delta-endotoxin since they have five different modes of action. This suggests that this mosquito larvicide will continue to be effective for many years.

Bti labels carry the CAUTION signal word, suggesting the material may be harmful if inhaled or absorbed through the skin. However, the 4-hr Inhalation LC 50 in rats is calculated to be greater than 2.1 mg/liter (actual) of air, the maximum attainable concentration. The acute Dermal LD 50 in rabbits is greater than 2,000 mg/kg body weight and is considered to be non-irritating to the eye or skin. That is equivalent to a 220 lb. individual spilling more than a half gallon of Bti liquid directly onto his/her skin or eyes and not washing it off. Toxicology profiles also suggest that the inert ingredients (not the Bti) in liquid formulations, may cause minor eye irritation in humans. The acute Oral LD 50 in rats is greater than 5,000 mg/kg body weight (similar to an individual drinking over 5 quarts) suggesting the material is practically non-toxic in single doses. Common table salt has an LD 50 of 4,000 mg/kg of body weight.

Bti applied at label rates has virtually no adverse effects on applicators, livestock, or wildlife including beneficial insects, annelid worms, flatworms, crustaceans, mollusks, fish, amphibians, reptiles, birds or mammals (deBarjac et al 1980, Garcia et al 1981, Gharib and Hilsenhoff 1988, Holck and Meek 1987, Knepper and Walker 1989, Leclair et al 1988, Marten et al 1993, Merritt et al 1989, Molloy et al 1992, Miura et al 1980, Mulla et al 1983, Mulla et al 1982, Purcell 1981, Reish et al 1985, Shadduck 1980, Siegel et al 1987, Tietze et al 1993,1992,1991, Tozer and Garcia 1990). However, non-target activity on larvae of insect species normally associated with mosquito larvae in aquatic habitats has been observed. There have been reported impacts in larvae belonging to the midge families Chironomidae, Ceratopogonidae, and Dixidae (Anderson et al 1996, Molloy 1992, Mulla et al 1990, Rodcharoen et al 1991, Tozer and Garcia 1990). These non-target insect species, taxonomically closely related to mosquitoes and black flies, apparently contain the necessary gut pH and enzymes to activate delta-endotoxins. However, the concentration of Bti required to cause these effects is 10 to 1,000 times higher than maximum allowed label rates.

Bacterial spores of Bti are uniquely toxic to nematoceran Diptera (mosquitoes, midges, blackflies, psychodids and ceratopogonids) (Lacey and Mulla 1990). That result was reported after reviewing Bti studies conducted using a variety of Bti formulations and under a variety of test conditions. Lacey and Mulla (1990) concluded that Bti was a highly selective larvicide that produced minimal adverse impact on the environment. Garcia et al. (1981) tested a total of 23 species of aquatic organisms other than mosquito larvae using various formulations of Bti in his laboratory. No mortality was observed for these species with the exception of *Chironomus matorus*, which showed a degree of susceptibility similar to that of mosquito larvae. Miura et al. (1980) found Bti at rates used for mosquito control to be very safe to organisms associated with mosquito breeding habitats. A total of 28 species or species groups were treated with the bacterium under simulated or field conditions, with no adverse effects observed, except for chironomid larvae, which were slightly affected. However, the effect was so light that the population in the field continuously increased after the treatment. Miura et al. (1981) found Bti and *Bacillus sphaericus*, when applied at rates used for mosquito control, very safe to organisms associated with mosquito breeding habitats, including natural enemies of mosquito larvae. When various aquatic organisms were exposed to the bacteria under laboratory, simulated or field conditions, no adverse effect was noted on the organisms with the exceptions of chironomid and psychodid larvae. Chironomid larvae were

slightly affected by Bti treatment at a rate used for mosquito control but psychodid larvae were only affected at the higher concentration (50ppm).

After testing mice, rats and rabbits, Siegal et al. (1987) concluded that Bti was not a virulent mammalian pathogen and that it could be used safely in environments where human exposure was likely to occur. Key and Scott (1992) conducted laboratory studies with Bti and *Bacillus sphaericus* against the grass shrimp *Palaemonetes pugio* and the mummichog *Fundulus heteroclitus*. Their study indicated that both Bti and *B. sphaericus* larvicides have large margins of safety. In a study by Aly and Mulla (1987), aquatic mosquito predators were fed with *Cx. quinquefasciatus* Say fourth-instar larvae intoxicated with either Bti or *Bacillus sphaericus* preparations. Although the mosquito larvae contained large amounts of the bacterial preparations in their gut, no effect upon longevity or ability to molt was observed in the backswimmer *Notonecta undulata*, in naiads of the dragonfly *Tarnetrum corruptum*, or in naiads of the damselfly *Enallagma civile*. Equally, the reproduction of *N. undulata* and the predation rate and ability to emerge normally in *T. corruptum* and *E. civile* were not affected by ingestion of large amounts of bacterial toxins.

At extremely high doses, negative effects of Bti were obtained when solubilized parasporal crystalline proteins were injected into the intra-abdominal space of Japanese quail (Kallapur et al., 1992). Exposure of brook trout *Salvelinus fontinalis* fry to 4500 and 6000 mg/liter Teknar for 45 min resulted in 20 and 86.4% mortality, respectively (Fortin et al., 1986). Again, it should be noted that the rates tested were more than 50X the allowed label rate for mosquito control.

BACILLUS SPHAERICUS. *Bacillus sphaericus* is a commonly occurring spore-forming bacterium found throughout the world in soil and aquatic environments. This bacterium is also grown in fermentation vats and formulated for application using processes similar to that of Bti. Some strains produce a protein endotoxin at the time of sporulation. This endotoxin destroys the insect's gut in a way similar to Bti and the toxin is only active against the feeding larval stages and must be partially digested before it becomes activated.

The molecular action of *B. sphaericus* is now well understood. Isolation and identification of the primary toxin responsible for larval activity has demonstrated that it is a protein with a molecular weight of 43 to 55 kD. A standard bioassay similar to that used for Bti has been developed to determine preparation potencies. The bioassay utilizes *Culex quinquefasciatus* 3rd to 4th instar larvae.

B. sphaericus adversely affects larval mosquitoes but, in contrast to Bti, is virtually non-toxic to Black Flies (Simuliidae). *Culex* species are the most sensitive to *Bacillus sphaericus*, followed by *Anopheles* and some *Aedes* species. In California, *Culex* spp. and *Anopheles* spp. may be effectively controlled. Several species of *Aedes* have shown little or no susceptibility, and salt marsh *Aedes* species are not susceptible. *B. sphaericus* differs from Bti in being able to control mosquito larvae in highly organic aquatic environments, including sewage waste lagoons, animal waste ponds, and septic ditches. Also in contrast to Bti, field evaluations of VectoLex-CG (a commercial formulation of *B. sphaericus*) have shown environmental persistence for 2-4 weeks, and the ability to recycle (grow and reproduce). Persistence varies with a number of environmental parameters, and is low in saline or highly organic environments.

VECTOLEX CG. VectoLex-CG is the trade name for Abbott Laboratories' granular formulation of *B. sphaericus* (strain 2362). The product has a potency of 50 BSITU/mg (*Bacillus sphaericus* International Units/mg) and is formulated on a 10/14 mesh ground corn cob carrier. The VectoLex-CG label carries the "CAUTION" hazard classification. VectoLex-CG is intended for use in

mosquito breeding sites that are polluted or highly organic in nature, such as dairy waste lagoons, sewage lagoons, septic ditches, tires, and storm sewer catch basins. VectoLex-CG is designed to be applied by ground (by hand or truck-mounted blower) or aerially at rates of 5-10 lb./acre. Best results are obtained when applications are made to larvae in the 1st to 3rd instars. Use of the highest rate is recommended for dense larval populations. Larval mortality may be observed as soon as a few hours after ingestion but typically takes as long as 2-3 days, depending upon dosage and ambient temperature.

ENVIRONMENTAL IMPACTS OF *BACILLUS SPHAERICUS*. *B. sphaericus* has been extensively tested and has had no adverse effects on mammals or other non-target organisms. *B. sphaericus* technical material was not infective or pathogenic when administered as a single oral, intravenous or intratracheal dose to rats (Shadduck et al, 1980; Siegel and Shadduck, 1990). No mortalities or treatment-related evidence of toxicological effects were observed. The acute oral and dermal LD 50 values are greater than 5000 mg/kg and greater than 2000 mg/kg, respectively. The technical material is only moderately irritating to the skin and eye. Oral exposure of *B. sphaericus* is practically nontoxic to mallard ducks. No mortalities or signs of toxicity occurred following a 9000 mg/kg oral treatment. Birds fed diets containing 20% w/w of the technical material experienced no apparent pathogenic or toxic effects during a 30-day treatment period. Mallards given an intraperitoneal injection of *B. sphaericus* demonstrated toxicological effects including hyperactivity, tremors, ataxia and emaciation. The LD 50 value was greater than 1.5 mg/kg. Acute aquatic fresh water organism toxicity tests were conducted on bluegill sunfish, rainbow trout and daphnids. The 96 hour LC 50 and NOEC (No Observable Effect Concentration) value for bluegill sunfish and rainbow trout was greater than 15.5 mg/liter; the 48 hour EC 50 and NOEC value for daphnids was greater than 15.5 mg/liter. Acute aquatic saltwater organism toxicity tests were conducted on sheepshead minnows, shrimp and oysters. The 96 hour LC 50 value for both sheepshead minnows and shrimp was 71 mg/liter, while the NOEC value was 22 mg/liter for sheepshead minnows and 50 mg/liter for shrimp. The 96-hour EC 50 value for oysters was 42 mg/liter with a NOEC of 15 mg/liter. The LC 50 and NOEC value for immature mayflies was 15.5 mg/liter. Honeybees exposed to 10E4-10E8 spores/ml for up to 28 days demonstrated no significant decrease in survival when compared to controls. Additional studies on various microorganisms and invertebrates, specifically cladocerans, copepods, ostracods, mayflies, chironomid midges, water beetles, backswimmers, water boatmen, giant water bugs, and crawfish, have shown no adverse effects or negative impacts (Holck and Meek 1987, Miura et al 1981, Mulla et al 1984, Rodcharoen et al 1991, Walton and Mulla 1991, Key and Scott 1992, Tietze et al 1993). Furthermore, Ali (1991) states that although *B. sphaericus* is known to be highly toxic to mosquito larvae, *B. sphaericus* does not offer any potential for midge control. Acute toxicity of *B. sphaericus* to non-target plants was also evaluated in green algae. The 120-hour EC 50 and NOEC values exceed 212 mg/liter.

E. LARVICIDING TECHNIQUES AND EQUIPMENT

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 hand held sprayers and spreaders, truck- or ATV-mounted spray rigs, and helicopters. For a brief description of these application methods, see Durso (1996). District criteria for selecting application methods are attached.

Ground Application Equipment. The District uses conventional pick-up trucks and ARGO All

Terrain Vehicle's (ATVs) as larvicide vehicles. 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 from the truck's cab. 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 hoses and spray tips allowing for application while steering the vehicle. ATVs are ideal for treating areas such as agricultural fields, pastures, and other off-road sites. Additional training in ATV safety and handling is provided to employees before operating these machines.

Additional equipment used in ground applications includes hand-held sprayers and backpack blowers. Hand held sprayers (hand cans) are standard one or two gallon garden style pump-up sprayers used to treat small isolated areas. Backpack sprayers are gas powered blowers with a chemical tank and calibrated proportioning slot. Generally a pellet or small granular material is applied with a backpack sprayer or "belly grinder" machine designed to distribute pellets or granules.

There are several advantages of using ground application equipment, both when on foot and when conveyed by vehicles. Ground larviciding allows applications while in proximity to the actual treatment area, and consequently treatments to only those microhabitats where larvae are actually present. This 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 those for aerial equipment. Ground larviciding applications are less affected by weather conditions than are aerial applications.

However, ground larviciding is impractical for large or densely vegetated areas. There is also a greater risk of chemical exposure to applicators than there is during aerial larviciding operations. Damage may occur from the use of a ground vehicle in some areas. Ruts and vegetation damage may occur, although both these conditions are reversible and generally short-lived. Technicians are trained to recognize sensitive areas and to use good judgment to avoid significant impacts.

Aerial Application Equipment. 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. 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. However, larval production can vary substantially and the District is capable of undertaking more frequent or extensive operations.

There are three advantages to using rotary wing (helicopter) aerial larvicide application equipment compared to ground application. First, it can be more economical for large target areas with extensive mosquito production. Second, by covering large areas quickly, it can free District staff to conduct other needed surveillance or control. Third, it can be more practical for inaccessible areas than ground larviciding.

F. MANAGING LARVICIDE RESISTANCE

Selecting the proper class of larvicide and the formulation are both important in pesticide resistance management. For example, use of sub-lethal dosages (below the lower end of the label recommended application rates) may encourage resistance. Insects with inherent tolerances for weakly applied pesticides may survive to produce tolerant offspring. Also, use of extended-release formulations beyond their recommended use period may encourage resistance by exposing

mosquitoes to sub-lethal concentrations of active ingredients.

G. LARVICIDES AND OTHER CONTROL OPTIONS.

Currently used mosquito larvicides, when applied properly, are efficacious and environmentally safe. These agents have been successfully integrated into the District's programs. Historically, Mosquito and Vector Control Districts have usually viewed larviciding as less effective or less economical than physical control, water management, or biological control; and as more effective than adulticiding. However, this view developed long ago when the values of wetlands were not as widely recognized as they are today, and when relative control costs were different. To some extent, this philosophy has been evolving in recent decades as more selective larvicides have become available, and as physical and biological control have become more constrained by regulatory requirements. While it can be hard to compare the relative environmental impacts of different control strategies, it is now increasingly common to primarily use selective larvicides in relatively undisturbed sites, and to emphasize physical control and biological control primarily in man-made or disturbed areas.

Compared to adulticides, larvicides are generally more selective and pose less risk for drift. Larvicides are usually applied directly into natural and man-made aquatic habitats as liquid or solid formulations, and aerial drift is negligible. Drift in water can result from flushing or rainwater runoff, but under these conditions, rapid environmental breakdown and dilution reduce pesticide concentration and consequently minimizes exposure to non-target organisms.

In 2006 USEPA adopted a regulation that exempted pesticides applied to waters of the United States in order to control pests (mosquito larvae, aquatic weeds, or other pests) and pesticides applied to control pests that are present over waters of the United States, including near such waters, where a portion of the pesticides will unavoidably be deposited to waters in order to target the pests effectively (e.g. to control adult mosquitoes or other pests), from NPDES permitting requirements. On January 7, 2009, the Sixth Circuit Court determined that this USEPA exemption was not a reasonable interpretation of the Clean Water Act. A two-year stay of the effect of the decision in order to provide agencies time to develop, propose, and issue NPDES general permits for pesticide applications covered by the ruling was granted such that the USEPA exemption will remain in place until April 9, 2011. As a result, California State Water Board staff is currently drafting a vector control NPDES permit to include both larviciding and adulticiding activities.

Even during the tenure of the USEPA regulation providing that NPDES permits are not required for pesticide applications as long as the discharger follows FIFRA label instructions, the District had applied for the Statewide NPDES vector control permit for larvicides (Order No. 2004-0008-DWQ) and has every intention to apply for and comply with the new vector control NPDES permit as it becomes available, but no later than April 9, 2011.

4.6.4 CHEMICAL CONTROL OF ADULT MOSQUITOES

A. INTRODUCTION

When physical, biological, and chemical control of larval mosquitoes fails or is otherwise insufficient, the District periodically uses insecticides to directly reduce populations of adult mosquitoes (adulticiding). When adult mosquito populations exceed District thresholds (see District Mosquito Management Plan) District staff use ULV (Ultra Low Volume) sprayers to

generate aerosol mists of very small insecticide droplets, which are allowed to intentionally drift into and across areas harboring the target species. Insecticides for control of adult mosquitoes are known as adulticides, and the District can select from a variety of materials registered for this purpose. District staff can also choose from a variety of adulticide application equipment, ranging from hand-held to vehicle-mounted spray rigs. Please note the distinction between “aerosol” pesticide applications, which describe all District adulticiding activity, and “aerial” pesticide applications, which refer to any application of pesticides from aircraft, regardless of the target.

The effectiveness and efficiency of adulticiding depends on a number of related factors. First, the mosquito species to be treated must be susceptible to the insecticide applied. Some California mosquitoes are resistant or more tolerant to some adulticides thus affecting the selection of chemical. Second, insecticide applications must be made during periods of adult mosquito activity, which varies between species. Some species of mosquitoes are diurnal (biting in the daytime), others are crepuscular (biting at dawn or dusk), and still others are nocturnal (biting at night). Aerosol applications should be made when the target mosquitoes are flying and are maximally exposed to the aerosol mist.

In addition, technical considerations can influence adulticide effectiveness. First, the application must generate a pesticide concentration in the air that is lethal to the target insect. Second, since the aerosol mist must move from the sprayer to the target mosquitoes; the size of the pesticide droplets is critical to ensure proper movement without rapid evaporation, settling to the ground, or drift away from the target site. Studies have shown that droplets within the 8-15 micron diameter range are most effective in controlling adult mosquitoes (Mount 1998). Third, whether the treatment is ground or aerially applied, sufficient insecticide must be distributed to cover the target site with an effective dose. Densely vegetated habitats may require a higher application rate than open areas to allow the wind to sufficiently carry droplets through the foliage.

Finally, environmental conditions may also affect the results of adulticiding. Wind determines how the ULV droplets will be moved from the sprayer to and within the treatment area. Conditions of no wind will result in the material not moving from the application point. High wind can inhibit mosquito activity and will quickly disperse the insecticide too widely to be effective. Light wind conditions (1-10 mph) are the most desirable both because mosquitoes are most likely to be active and because the aerosol is most likely to maintain the proper concentration as it moves through the target area. Also, ULV applications are generally avoided during hot daylight hours because thermal conditions will cause small droplets to rise, moving them away from mosquito habitats and flight zones. Preferred conditions include the presence of a thermal inversion near the ground, which can trap the aerosol in a mist in the lower ten or twenty feet of the atmosphere, maintaining the proper control dose with minimal material use. This practice minimizes exposure of non-target diurnal species such as bees or butterflies. Control of adults of some mosquito species may require modifications of this schedule to accommodate the species flight activity pattern.

District criteria on the use of ULV treatments address mosquito species composition and abundance, pathogen (disease organism) presence, proximity of mosquitoes to human populations, presence of an open (no people) target area, and weather conditions. As with larvicides, adulticides are applied in strict conformance with label requirements.

The adulticide routinely used by the District is Resmetrin a synthetic pyrethroid (Scourg BP 18%+54%MF, about 0.89 gallons applied in 2009).

B. PYRETHRINS AND PYRETHROIDS

INTRODUCTION Pyrethrin (pyrethrum) is a natural insecticide extracted from certain varieties of the flower *Chrysanthemum cinerariaefolium* and consists of six active ingredients collectively known as pyrethrins (Worthing & Hance 1991). This material provides effective control of adult mosquitoes and other insect pests at very low dosage and has little residual activity (persistence) due to its sensitivity to sunlight. The flowers are grown commercially in parts of Africa and Asia. Synthetic analogues of the natural pyrethrins reached commercial success in the 1950's. Like the natural pyrethrins, 'first generation' synthetic pyrethroids such as phenothrin and tetramethrin, are relatively unstable when exposed to light. During the 1960's-1970's, great progress was made in synthetic light-stable pyrethroids. These photostable pyrethroids represent the 'second generation' of these compounds. However, the low persistence of natural pyrethrum means that it is often required in agricultural areas, despite its significantly higher cost.

Pyrethrins and pyrethroids exhibit rapid knockdown and kill of adult mosquitoes, characteristics that are considered a major benefit of their use. The mode of action of these compounds relates to their ability to affect sodium channel function in the insects' neural membranes. Their toxicity in insects is markedly increased by the addition of synergists (primarily piperonyl butoxide) that inhibit detoxification of the pyrethrins in insects. There is no evidence that these synergists increase toxicity in mammals.

Pyrethrins and synthetic pyrethroids are not cholinesterase inhibitors, are non-corrosive and will not damage painted surfaces. They are less irritating than other mosquito adulticides and have a less offensive odor. In comparison to other adulticides, pyrethroids may be effectively applied at much lower rates of active ingredient per acre.

NATURAL PYRETHRIN: Pyrenone 25-5 is a California-registered natural pyrethrin formulation, with a label containing a CAUTION statement. Pyrenone 25-5 contains 5% pyrethrin and 25% piperonyl butoxide. Pyrenone 25-5 is applied as a ULV spray with a dosage per acre of typically 0.87 oz/acre (equivalent to 0.0027 lbs of pyrethrins and 0.0135 pounds of piperonyl butoxide per acre).

RESMETHRIN. Resmethrin is a 1st generation synthetic pyrethroid and is the active ingredient in Scourge. Resmethrin provides rapid knockdown and quick kill of all species of adult mosquitoes, and is also effective against many other flying or crawling insects, although it is slower acting than natural pyrethrins. Resmethrin exhibits very low mammalian toxicity, degrades very rapidly in sunlight and provides little or no residual activity. Resmethrin products are available in several concentrations that range from 1.5% to 40% and may or may not contain piperonyl butoxide. Scourge is labeled with the signal word CAUTION, and has a maximum rate of application of 0.007 lbs per acre of the active ingredient.

PERMETHRIN. Permethrin is a 2nd generation synthetic pyrethroid with a broad spectrum of activity against all mosquito species. It exhibits fast action, low volatility, good photostability, low solubility in water, no odor, and low mammalian toxicity. Its photostability means that permethrin provides some residual activity when applied directly to surfaces. It is formulated as the active ingredient in products such as Permanone and Biomist. Permethrin is a general use pesticide with labels that may contain either the signal word WARNING (Category 2) or CAUTION (Category 3) depending on the particular product. The District does not use Category 2 pesticides except in emergency circumstances. Permethrin products are available in various concentrations, from 1.5% to 57% and may or may not be synergized with piperonyl butoxide. Synergized permethrin

products may contain piperonyl butoxide in various ratios by weight but the maximum rate of application is 0.007 lbs. per acre of the active ingredient.

C. ADULTICIDING TECHNIQUES AND EQUIPMENT

The District applies adulticides, when needed, primarily from truck mounted ULV aerosol equipment, and occasionally from hand-held or ATV-mounted ULV equipment. Adulticide application from the air is possible, but would be used by the District only in emergency conditions. Therefore, aerial aerosol applications are not evaluated in this review.

ULV aerosol machines (“cold foggers”) use a forced air blower to generate a fine mist of technical (pure) or highly concentrated insecticide. ULV machines come in a wide variety of sizes, and 8-12 horsepower blowers are most common. ULV sprayers derive their name from the very low volumes of total material sprayed per acre treated. In mosquito control ground adulticiding operations, application rates rarely exceed 1 oz./acre of particles, each with diameters from 8-15 microns.

The sprayers today use several techniques to meet these requirements. Air blast sprayers, which use either high volume/low pressure vortical nozzles or high pressure air-shear nozzles to break the liquid into very small droplets, are most common. Other forms of atomization equipment include centrifugal energy nozzles (rotary atomizers) which form droplets when the liquid is thrown from the surface of a high speed spinning porous sleeve or disc, ultrasonic equipment which vibrates and throws the droplets off, and electrostatic systems which repel the droplets.

The insecticide metering equipment available on these machines ranges from a simple glass flow-meter and a pressurized tank or electric pump on fixed flow machines to computer controlled, speed correlated, event recording and programmable flow management systems. The fixed flow units are designed to be operated with the vehicle traveling at a constant speed. Most of these use 12 volt laboratory type pumps, which are quite accurate.

Ground adulticiding equipment is normally mounted on some type of vehicle, but the District also has smaller units that can be carried by hand or on a person’s back for small area treatments. Pickup trucks are the most common conveyance for ULV sprayers, but the District also can use ATVs. With the 8-12 hp midsize sprayers described above, a vehicle speed of about 10mph typically generates an acceptable dosage rate.

D. POTENTIAL ENVIRONMENTAL IMPACTS OF ADULTICIDING

Adulticiding poses some potential environmental impacts associated with non-target toxicity, pesticide drift, and with disturbance associated with the applications. The mode of action of pyrethrins and pyrethroids means that these pesticides have a wider spectrum of potential non-target toxicity than the larvicides discussed before (Worthing & Hance 1991). In addition, the need for the aerosol mist to drift through the mosquito harborage (target area) generates some risk that materials will spread beyond the intended target area. However, selective use of these materials, based on the District’s rigorous criteria for selecting and applying these materials and strict adherence to label requirements, limits their potential environmental impacts to insignificant levels.

Pyrethrins and pyrethroids are highly toxic to most insects, moderately toxic to many fish and some birds, and much less toxic to other organisms (Mallis 1990, Worthing & Hance 1991). Worthing & Hance (1991) report acute oral LD50 values of pyrethrin of about 150 ug/bee in honey bees, 584-

9000 mg/kg for rats, and >10,000 mg/kg for mallard ducks⁵. Percutaneous LD50 values for pyrethrin include >1,500 mg/kg for rats and >5,000 mg/kg for rabbits. Toxicity values for Resmethrin in rats include oral LD50 >2,500 mg/kg and percutaneous LD50 >3,000 mg/kg. For Permethrin, typical oral LD50 values are 430-4,000 mg/kg in rats, 40-2690 mg/kg in mice, >3,000 mg/kg in chickens, and >13,500 mg/kg in Japanese quail. In addition, DPR has reported “possible adverse” chronic toxicity effects associated with repeated exposures at extremely high dosages (exceeding legally allowed label rates and District operations by a factor of 100 or more) of Permethrin, Pyrethrins, Resmethrin, and Piperonyl Butoxide (DPR 1999).

Translating these values to a risk assessment of field applications can be difficult because of the complex distributions of both target and non-target species in natural settings. While it is clear that these materials can cause significant immediate mortality in some desired insects, recent studies by UC Davis and USFWS researchers have demonstrated rapid (24 - 48 hour) rebound of impacted insect populations following ULV activities with pyrethroids and malathion in the Central Valley (Lawlor et al, 1997). In general, mosquito distribution is patchy, so adulticide application is discontinuous; this allows non-target organisms both to migrate to untreated areas to escape toxins and/or to recolonize the treated area from nearby untreated areas.

Toxicity in fish is measured as LC50, or the concentration of toxicant in the water that is fatal to 50% of the sample by the end of a fixed time period (often 96 hours). Worthing & Hance (1991) report 96 hour LC50 values for Coho salmon and channel catfish exposed to pyrethrum of 39 mg/L and 114 mg/L respectively. It is not easy to relate these values to the volumes of active ingredient that might drift from a treatment area and settle on water, but the risk has been judged high enough that the pesticide labels for these materials warn not to apply them to lakes, streams, or ponds, or when drift from the application might settle on these areas. However, direct deleterious effects have not been documented for non-targets in aquatic habitats as a result of deposition of currently employed adulticides, probably due to a small mass depositing per unit area and dilution factors such as tidal flushing and water depth (Lawlor et al, 1997).

In addition to label restrictions over drift onto sensitive environmental sites, there are operational limitations on these materials based on the need to minimize potential impacts on some classes of sensitive agricultural resources - in particular, organic farms and honey bees and bee hives. Excessive drift onto organic farms can disrupt agricultural activities and/or lead to loss of organic registration for the farmer. Drift onto honey bees or hives with active bees can kill the bees and destroy the hive.

E. MEASURES TO REDUCE POTENTIAL ENVIRONMENTAL IMPACTS OF ADULTICIDING TO LESS THAN SIGNIFICANT

The most important measure to minimize the potential environmental impacts of adulticiding is spatial and temporal separation of aerosol applications from sensitive species or habitats. In general, this is accomplished by strict compliance with label requirements and District criteria. For example, the Environmental Hazards section on labels of pesticides used as mosquito adulticides instruct applicators to avoid direct application over water or drift into sensitive areas due to a

⁵ 4When an LD50 is reported as greater than a large number, it means that fewer than half of the test animals died at the highest concentration tested.

potentially high toxicity of these compounds to fish and invertebrates. Although there is some variation in the habitats to be avoided, they usually include lakes, streams and marshes. Also, District staff always evaluates the wind speed and direction and the presence of a thermal inversion prior to initiating aerosol activities.

The District typically applies aerosol adulticides between dusk and dawn, when these target species are active. Fortuitously, this is also when temperature inversions and light wind generally make drift easiest to predict and manage, and also when many non-target insects (bees, butterflies) are not active. Conducting ULV operations in early mornings and late evenings increases the efficacy of the control operation and minimizes exposure to people and their pets.

As described for larviciding, spray equipment is calibrated regularly, and at least once a year. Measurements for output and droplet sizes of the pesticides being used are confirmed to maximize efficiency and minimize potential adverse impacts.

All personnel who apply pesticides receive retraining at least once a year. This training consists of an annual review concerning all aspects of the pesticides the applicator will be handling that year. All applicators are certified by the Department of Public Health on the safe and proper use of pesticides. Applicators must also undergo a minimum of 20 hours of formal continuing education every two years to maintain their state certification.

As stated in section 4.6.4. G above the District has every intention to apply for and comply with the vector control NPDES currently being drafted by California State Water Board staff as a result of the January 7, 2009, Sixth Circuit Court interpretation of the CWA, to ensure prevention of adverse impact of District adulticiding activity to water quality.

4.6.5 CHEMICAL CONTROL OF OTHER INVERTEBRATES

As previously discussed, black fly as well as non-biting midge populations will occasionally exceed nuisance levels despite physical control measures such as water flow management. Under those circumstances the District may resort to chemical control measures to suppress larval or adult stages, or both, of these nuisance vectors. Equipment used for these treatments is equivalent to that used for mosquito control. Adulticides and larvicides used are the same materials used for mosquito control. However, larvicides are usually applied at higher application rates than for mosquito control, but always as specified on the product label.

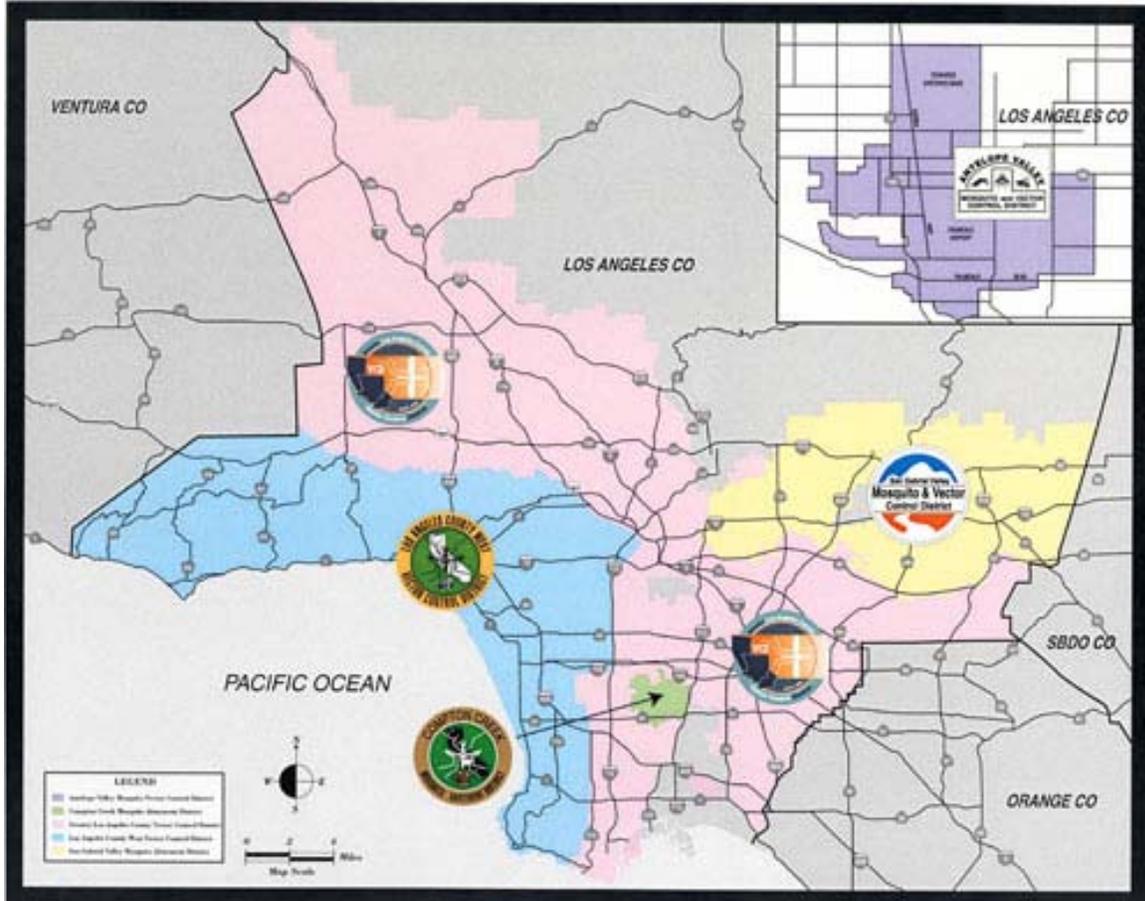
4.6.6 CONCLUSIONS: APPROPRIATE USE OF CHEMICAL CONTROL

The use of pesticides is an effective part of the District's Integrated Vector Management program. The use of larvicides limits the proliferation of mosquito larvae in aquatic sources, while adulticiding reduces harmful levels of adults. Other registered pesticides help control other invertebrate threats to public health and welfare. In concert with public education and biological control, this combination of control methods maintains and protects the human environment so that it is safer, healthier and more comfortable, while recognizing and protecting habitat values for other desired species.

The District contains many sources that produce significant vector populations near populated areas. Without ongoing and effective vector control, the resulting vector activity would significantly and

adversely effect the human environment. The District's program will never eradicate all vectors. Rather, it is a resource maintenance program aimed at striking a balance to allow comfortable and healthful human existence within the natural environment, while protecting and maintaining the environment.

APPENDIX A



- ◆ Greater Los Angeles County Vector Control District
- ◆ Los Angeles County West Vector Control District
- ◆ San Gabriel Valley Mosquito and Vector Control District
- ◆ Compton Creek Mosquito Abatement District

APPENDIX B

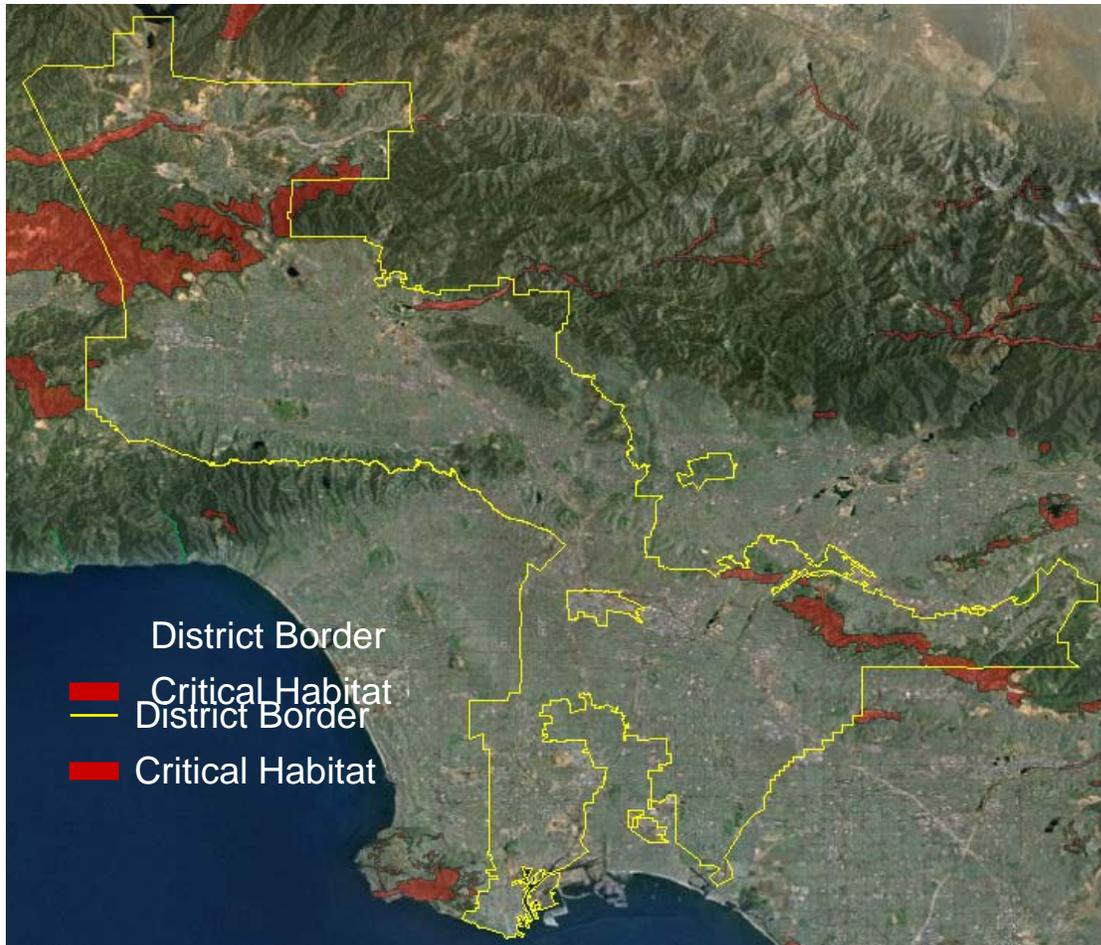
PESTICIDE USE BY GREATER LOS ANGELES VECTOR CONTROL DISTRICT 2008-2010

Pesticide (unit)	2008		2009		2010	
	amount	# applications	amount	# application	amount	# application
Golden bear 1111 (gal)	202.14	3120	117.52	5073	32.3	2099.25
Altosid 30 Day Briq (lb)	593.15	3607	342.16	2280	180.228	1693.968
Altosid All (gal)	55.92	2871	35.34	2839	32.75.	3226
Vectobac G (lb)	14911.97	2035	13230.98	2478	9699.61	2231
Vectolex WDG (lb)	763.45	13976	315.34	6280	383.87	7354
Vectobac 12AS (gal)	1271.98	18296	1229.885	11394	931.42	12701
Dimilin WP 25% (lb)	8.66	32	0.1	1	22.54	8
Scourg BP 18%+54%MF (gal)	6.273	11	0.89	15	2.13	19
Altosid XR Briq (lb)	27.27	150	7.006	58	4.647	58
Altosid SBG (lb)	236.05	81	334.34	68	3338.91	24
Altosid Pellets (lb)	301.3	1360	285.44	3653	274.18	1294
Vectolex CG (lb)	692.8	148	1234.97	688	3281.54	858
Altosid XR-G (lb)	19.25	3	129.125	13	0	0
Abate 4E (gal)	0	0	0	0	0	0
Nuvan Prostrips+	0	0	0	0	8.65	957
BVA-2 (gal)	0	0	0	0	1.401	214
Altosid WSP (lb)	0.6	25	13.8	158	7.24	125
Natular 2EC (lb)	0	0	0	0	2.92	269
Kontrol 4-4 (gal)	2.3	3	0	0	0	0
Anvil 2+2 (gal)	0.7	5	0.16	1	2.31	3
EcoExempt IC-2 (gal)	0	0	0	0	0	0
Agnique MMF (gal)	4.02	4	1044.33	1029	50.71	3705
Vectomax CG (lb)			8671.14	541	3845.70	2058

APPENDIX C

SPECIAL STATUS PLANTS AND ANIMALS NATURAL WITHIN GREATER LOS ANGELES COUNTY VECTOR CONTROL DISTRICT BOUNDARIES

Scientific Name	Common Name	Federal	STATUS		
			California	CNPS	CDFG
<u>Plants</u>					
Braunton's Milk-vetch	<i>Astragalus brauntonii</i>	Endangered	Endangered	1B.1	
Spreading Navarretia	<i>Navarretia fossalis</i>	Threatened	Threatened	1B.1	
<u>Fish</u>					
Santa Ana sucker	<i>Catostomus santaanae</i>	Threatened	Threatened		
<u>Amphibians</u>					
Arroyo toad	<i>Bufo californicus</i>	Endangered	None		
<u>Birds</u>					
Least Bell's vireo	<i>Vireo bellii pusillus</i>	Endangered	Endangered		SE
Coastal California gnatcatcher	<i>Poliophtila californica californica</i>	Threatened	Threatened		



Data retrieved from the U.S. Fish & Wildlife Service Critical Habitat Portal:
Critical Habitat for Threatened & Endangered Species

APPENDIX D

Mosquitoes within Greater Los Angeles County Service Area.

The reader is referred to Bohart & Washino (1978) and Meyer and Durso (1993) for specific biological information on the mosquitoes listed in this table.

Scientific Name	Common Name
Genus <i>Aedes</i> (“Ae.”)	
<i>Aedes sierrensis</i>	Western Treehole Mosquito
<i>Aedes taeniorhynchus</i>	Black Salt Marsh Mosquito
<i>Aedes washinoi</i>	Willow Pool Mosquito
Genus <i>Anopheles</i> (“An.”)	
<i>Anopheles franciscanus</i>	
<i>Anopheles hermsi</i>	Western Malaria Mosquito
Genus <i>Culex</i> (“Cx.”)	
<i>Culex erythrothorax</i>	Tule or Cattail Mosquito
<i>Culex quinquefasciatus</i>	Southern House Mosquito
<i>Culex restuans</i>	
<i>Culex stigmatosoma</i>	Banded Foul-Water Mosquito
<i>Culex tarsalis</i>	Western Encephalitis Mosquito
<i>Culex thriambus</i>	
Genus <i>Culiseta</i> (“Cs.”)	
<i>Culiseta incidens</i>	Cool Weather Mosquito
<i>Culiseta inornata</i>	Winter Marsh Mosquito
<i>Culiseta particeps</i>	

APPENDIX E

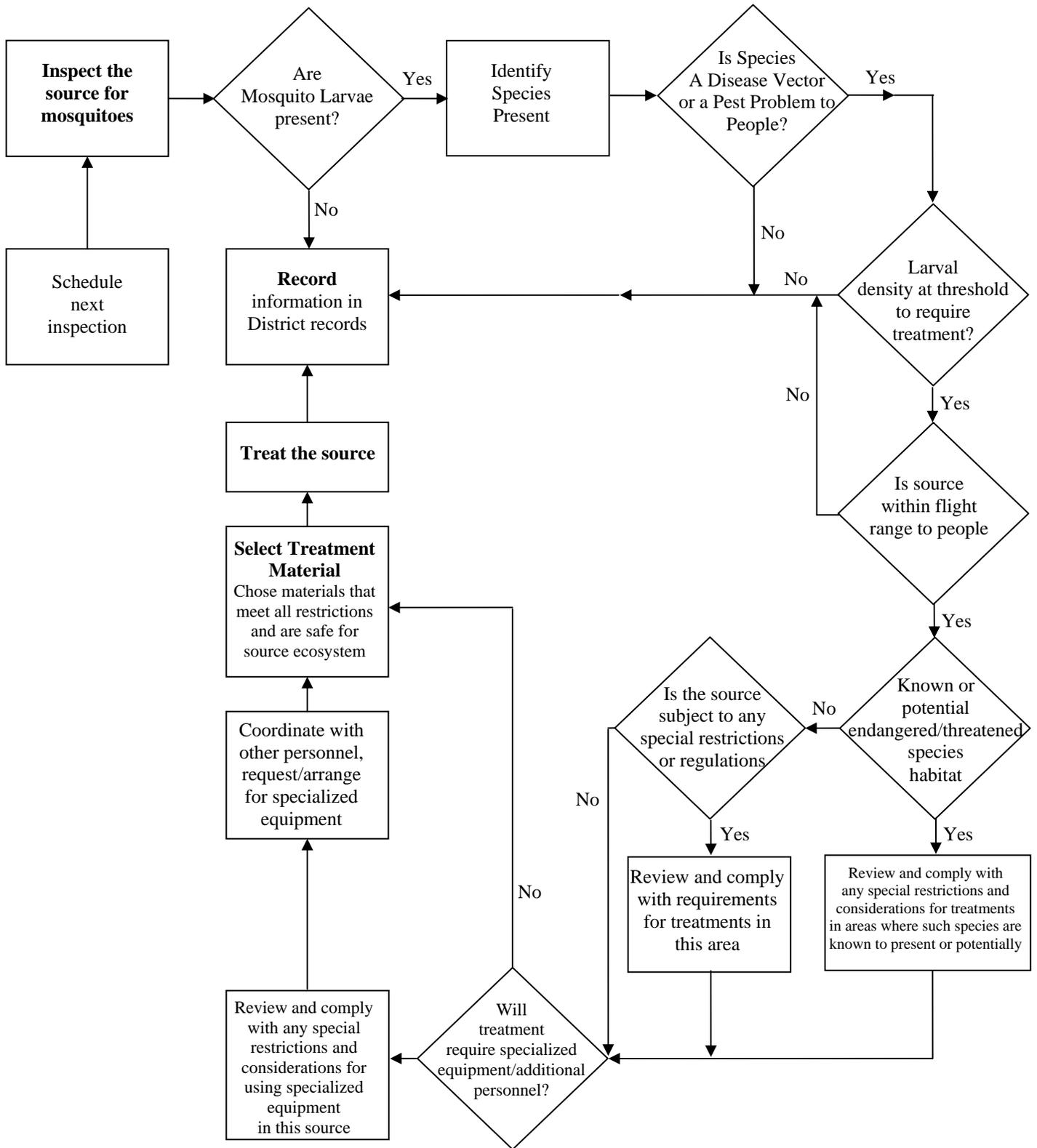
PRE-TREATMENT DECISION-MAKING

Thresholds

Treatment thresholds are established for mosquito developmental sites where potential disease vector and/or nuisance risks are evident. Therefore, only those sources that represent imminent threats to public health or quality of life are treated. Treatment thresholds are based on the following criteria:

- Mosquito species present
- Mosquito stage of development
- Nuisance or disease potential
- Mosquito abundance
- Flight range
- Proximity to populated areas
- Size of source
- Presence of sensitive/endangered species

APPENDIX F



APPENDIX G

GREATER LOS ANGELES COUNTY VECTOR CONTROL DISTRICT CALIFORNIA ENVIRONMENTAL QUALITY ACT COMPREHENSIVE PRELIMINARY REVIEW

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REFERENCES AND APPENDICES

EXECUTIVE SUMMARY

The California Environmental Quality Act (CEQA) was adopted by the California Legislature in 1970. It requires state and local agencies to estimate and evaluate the environmental implications of their actions, and to avoid or reduce the significant environmental impacts of their decisions when feasible.

CEQA generally requires state and local agencies to prepare an environmental document (either an Environmental Impact Report (EIR) or a Negative Declaration) assessing the potential environmental impacts of discretionary projects that may affect the environment, and to adopt mitigation measures for “potentially significant impacts.” CEQA exempts from these requirements certain activities that are not considered “Projects,” projects declared exempt from CEQA by the Legislature (“statutory exemptions”), and other classes of projects that the State Secretary for Resources has determined do not have a significant effect on the environment (“categorical exemptions”).

However, the Act also specifies that certain categorical exemptions may not be used where activities “may impact an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies”; and that none may be used where “the cumulative impact of successive projects of the same type in the same place, over time, is significant,” or “where there is a reasonable possibility that the activity will have a significant effect on the environment due to unusual circumstances.”

The District protects the public from vector-borne disease and discomfort while protecting the environment, through a coordinated set of activities collectively known as our Integrated Vector Management Program. For all vector species, public education is a primary control strategy. In addition, the District determines the abundance of vectors and the risk of vector-borne disease or discomfort through evaluation of public service requests and field and laboratory surveillance activities. If the populations exceed or are anticipated to exceed predetermined criteria (Appendix E), District staff employs the most efficient, effective, and environmentally sensitive means of control for the situation (Appendix F). In some circumstances, the District uses biological control such as the planting of mosquitofish in ornamental ponds. When these approaches are not effective or are otherwise inappropriate, then pesticides are used to treat specific pest-producing or pest-harboring areas.

Based upon the currently available evidence, as demonstrated in this document and in the cited references, the District concludes that most District activities are exempt from further CEQA review. However, it appears that some specific activities within the District’s Integrated Vector Management Program might exceed the scope of the exemptions to CEQA, or might trigger one or more of the exceptions to the exemptions, primarily because of their potential impacts on endangered species or on critical wetland habitats. Therefore, the District will undertake an Initial Study, as described in the CEQA Guidelines, of the extension of its Integrated Vector Management Program to the rest of Los Angeles County.

I. PURPOSE OF PRELIMINARY REVIEW

The purpose of this Preliminary Review is to evaluate whether the Integrated Vector Management Program of the Greater Los Angeles Vector Control District (“District”) is in accord with the California Legislature’s general policy for environmental quality, as defined by the California Environmental Quality Act (“CEQA”).

The District was formed in 1952 as the Southeast Mosquito Abatement District through a citizen petition aimed at controlling mosquitoes emanating from the Los Angeles River, affecting the nearby cities of Maywood, Bell, Huntington Park and portions of Los Angeles County totaling approximately 150 square miles. Over the last 58 years, the District has expanded in scope and geographic coverage. It now controls mosquitoes and other vectors throughout 1,330 square miles most of Los Angeles County, protecting approximately 6 million residents from mosquito-associated diseases and public nuisances. The District’s ongoing program to manage vectors consists of 1) intensive surveillance and monitoring of vector populations and of human contact with potential vectors to ascertain the threat of disease transmission and public nuisance; and 2) use of safe, effective, and environmentally sensitive vector management and control methods, including public education, as needed to protect the public from identified threats. Integrated surveillance and control of vectors has, thus, been an ongoing and longstanding objective of the District. This review is prepared to generally evaluate the application of CEQA and the CEQA exemptions to the District’s activities. This report will:

1. Introduce the California Environmental Quality Act, its rationale, and the CEQA Guidelines, which have been developed by the California Resources Agency to assist implementation of CEQA;
2. Summarize the District’s powers and the current and potential activities that together comprise the District’s Integrated Vector Management Program (IVMP);
3. Determine which District activities, including the elements of the IVMP and supporting administrative functions, fall within one or more of the statutory or categorical exemptions to CEQA;
4. For activities that are categorically exempt, determine if one or more of the exceptions to the use of categorical exemptions set forth in State CEQA Guidelines section 15300.2 applies to the exemptions; and
5. Identify the manner in which the District will comply with CEQA.

A. THE CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA)

The California Environmental Quality Act was adopted by California Legislature in 1970. The basic purposes of the Act “are to (1) inform governmental decision makers and the public about the potential, significant environmental effects of proposed activities; (2) identify the ways that environmental damage can be avoided or significantly reduced; (3) prevent significant, avoidable damage to the environment by requiring changes in projects through the use of alternatives or mitigation measures when the governmental agency finds the changes to be feasible; [and] (4) disclose to the public why a governmental agency approved the project in the manner the agency chose if significant environmental effects are involved” [CEQA Guidelines; Section 15002].

Specifically, in the introduction to CEQA (Cal. Public Resources Code Sec 21000), the Legislature finds and declares:

- (a) The maintenance of a quality environment for the people of this state now and in the future is a matter of statewide concern
- (b) It is necessary to provide a high-quality environment that, at all times, is healthful and pleasing to the senses and intellect of man.
- (c) There is a need to understand the relationship between the maintenance of high-quality ecological systems and the general welfare of the people of the state, including their enjoyment of the natural resources of the state.
- (d) The capacity of the environment is limited, and it is the intent of the Legislature for the government of the state to take immediate steps to identify any critical thresholds for the health and safety of the people of the state and take all coordinated actions necessary to prevent such thresholds from being reached.
- (e) Every citizen has a responsibility to contribute to the preservation and enhancement of the environment.
- (f) The interrelationship of policies and practices in the management of natural resources and waste disposal requires a systematic and concerted effort by public and private interests to enhance environmental quality and to control environmental pollution.
- (g) It is the intent of the Legislature that all agencies of the state government which regulate activities of private individuals, corporations, and public agencies which are found to affect the quality of the environment, shall regulate such activities so that major consideration is given to preventing environmental damage, while providing a decent home and satisfying living environment for every Californian.

Therefore, in Section 21001 (CEQA), the Legislature further finds and declares that it is the policy of the state to:

- (a) Develop and maintain a high-quality environment now and in the future, and take all action necessary to protect, rehabilitate, and enhance the environmental quality of the state.
- (b) Take all action necessary to provide the people of this state with clean air and water, enjoyment of aesthetic, natural, scenic, and historic environmental qualities, and freedom from excessive noise.
- (c) Prevent the elimination of fish or wildlife species due to man's activities, insure that fish and wildlife populations do not drop below self-perpetuating levels, and preserve for future generations representations of all plant and animal communities and examples of the major periods of California history.
- (d) Ensure that the long-term protection of the environment, consistent with the provision of a decent home and suitable living environment for every Californian, shall be the guiding criterion in public decisions.
- (e) Create and maintain conditions under which man and nature can exist in productive harmony to fulfill the social and economic requirements of present and future generations.
- (f) Require governmental agencies at all levels to develop standards and procedures necessary to protect environmental quality.

- (g) Require governmental agencies at all levels to consider qualitative factors as well as economic and technical factors and long-term benefits and costs, in addition to short-term benefits and costs and to consider alternatives to proposed actions affecting the environment.

Pursuant to Public Resources Code section 21083, the California Resources Agency has also issued Guidelines for Implementation of the California Environmental Quality Act, universally known as the CEQA Guidelines [California Code of Regulations, Title 14, Division 6, Chapter 3, Sections 15000 et seq.]; and Discussions of the CEQA Guidelines, which are not part of the California Code of Regulations.

1. Definitions

The State CEQA Guidelines define “environment” as the physical conditions which exist within the area which will be affected by the proposed project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance, including both natural and man-made conditions [Guidelines Sec. 15360]. This means that protecting the public from disease-carrying and noxious pests is a form of environmental protection.

A “project” is an activity subject to CEQA (Guidelines Sec. 15002(d)). More broadly, a project is defined as “the whole of an action, which has the potential for resulting in a physical change in the environment, directly or ultimately” (section 15378).

This definition means that an agency cannot “segment” or “piecemeal” a project into small parts if the effect is to avoid full disclosure of environmental impacts. Specifically, it is forbidden to chop a project into small segments to avoid preparing an Environmental Impact Report (EIR), if one would otherwise be required (*Bozung v. Local Agency Formation Commission* (1975) 13 Cal.3d 263). In addition, related activities must be evaluated in the same CEQA document when either (1) one action is a reasonably foreseeable consequence of the other action; or (2) the actions are integral parts of the same project (Bass, Herson et al. 1996) p20.

In CEQA, a “significant effect on the environment” means a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance [Guidelines Sec. 15382]. This definition means that substantial beneficial changes in the environment are not considered “significant” by CEQA, and do not require avoidance or mitigation to comply with the Act.

If any of the following conditions occur, the lead agency must make a “mandatory finding of significance” and prepare an EIR:

1. The project has the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of an endangered, rare or threatened species, or eliminate important periods of California history or prehistory.

2. The project has the potential to achieve short-term environmental goals to the disadvantage of long-term environmental goals.
3. The project has possible environmental effects which are individually limited but cumulatively considerable.
4. The environmental effects of a project will cause substantial adverse effects on human beings, either directly or indirectly [Guidelines Sec. 15065].

“Regulatory Agencies” are discussed but not defined in either the CEQA statutes or Guidelines. Under the California Health and Safety Code, Sec. 2200 et seq., the District clearly has broad powers to promulgate and enforce standards for the management of water and potential vector habitat by landowners, and as such might be considered a Regulatory Agency under CEQA.

B. EXEMPTIONS FROM CEQA

CEQA generally requires state and local agencies to prepare an environmental document (either an Environmental Impact Report (EIR) or Negative Declaration) assessing the potential environmental impacts of discretionary projects that may affect the environment, and to mitigate “potentially significant impacts”. CEQA exempts from this requirement certain activities that are not considered “Projects,” projects declared exempt by the Legislature (“statutory exemptions”; listed at CEQA Guidelines sections 15260-15282), and other classes of projects that the State Secretary for Resources has determined do not have a significant effect on the environment (“categorical exemptions”; listed at CEQA Guidelines sections 15301-15332)

1. Statutory Exemptions

Statutory exemptions from CEQA, provided by the legislature, which may apply to actions of the District include “non-projects,” ongoing projects, feasibility and planning studies, ministerial projects, emergency projects, and establishment of rates, tolls, fares, and other charges by public agencies to meet operating expenses and financial reserve needs and requirements.

Some activities by government agencies are not considered “projects” under CEQA [Guidelines Secs. 15061(b)(3), 15378(b)(1), 15378(b)(3), 15378(b)(5)]. “Non-projects” must generally be either specifically exempted from CEQA by state law, or involve activities for which “it can be seen with certainty” that no environmental effect will occur (Bass, Herson et al. 1996), p21. Examples relevant to the District include “continuing administrative or maintenance activities, such as purchases of supplies, personnel-related actions, and general policy and procedure making (except as they are applied to specific instances [which might have environmental impact]” [15378(b)(3)].

Ongoing projects are activities that were being carried out by a public agency prior to November 23, 1970 [Guideline Sec. 15261(a)]. This exemption is not valid if either “A substantial portion of public funds allocated for the project have not been spent [by that date], and it is still feasible [at that date] to modify the project to mitigate potentially adverse environmental effects, or to choose feasible alternatives to the project” [Guidelines Sec. 15261(a)(1)], or if the public agency modifies the Project after that date so that the project might “have a new significant effect on the environment” [Guidelines

Sec. 15261(a)(2)]. Most current District activities predate November 23, 1970, and some of these have remained essential and unchanged during this time. Specifically, there are no feasible alternatives to the long-standing practices of direct field surveillance for standing water and vector populations, or maintenance of access paths to surveillance sites, and therefore these activities are apparently exempt from further CEQA requirements.

Projects are exempt if they involve only feasibility or planning studies for possible future actions which the District and its Board has not approved, adopted, or funded [Guidelines Sec. 15262].

Ministerial projects are governmental decisions involving little or no personal judgment by the public official as to the wisdom or manner of carrying out the project [Guidelines Secs. 15268, 15357, 15369]. The public official merely applies the law to the facts as presented but uses no special discretion or judgement in reaching a decision. Ministerial projects conducted by the District may include determinations that nuisances exist, orders of compliance with notices, and liens on property for cost to the District in abating nuisances which are provided by law in the California Health and Safety Code, commencing with section 2274.

Emergency projects are actions taken due to a sudden, unexpected occurrence involving a clear and imminent danger, to prevent or mitigate loss of or damage to life, health, property, or essential public services [Pub. Res. Code Secs. 21080(b)(2), (3), (4), 21060.3; Guidelines Secs. 15269, 15359]. Emergency projects can include actions required to prevent or mitigate an emergency [Guidelines Sec. 15269(c)]. CEQA does not require a formal declaration of an emergency to invoke this exemption. Emergency projects conducted by the District may include extraordinary measures for the control of mosquitoes, in response to known disease activity.

CEQA does not apply to the establishment, modification, structuring, restructuring, or approval of rates, tolls, fares, and other charges by public agencies which the public agency finds are for the purpose of meeting operating expenses, purchasing or leasing supplies, equipment, or materials, meeting financial reserve needs and requirements, and obtaining funds for certain capital projects [Guidelines Sec. 15273]. The District collects property taxes, has an ongoing benefit assessment, and negotiates contracts with large land owners, all to provide for the District's operating expenses, equipment and supplies, capital projects, and financial reserves. These activities are exempt from CEQA.

2. Categorical Exemptions

Categorical exemptions are exemptions from CEQA for a class of projects based on a finding by the Secretary of Resources that the class of projects does not have a significant effect on the environment, except in exceptional circumstances. Categorical exemptions which may apply to actions of the District include existing facilities (class 1), replacement or reconstruction (class 2), new small facilities or structures (class 3), minor alterations to land (class 4), information collection (class 6), actions by regulatory agencies for protection of natural resources (class 7), actions by regulatory agencies for protection of the environment (class 8), inspections (class 9), enforcement actions by regulatory agencies (class 21), educational or training programs involving no physical changes (class 22), normal operations of facilities for public gatherings (class 23), leasing

new facilities (class 27), and minor actions to prevent, minimize, stabilize, mitigate or eliminate the release or threat of release of hazardous waste or hazardous substances (class 30).

Class 1 consists of the operation, repair, maintenance, or minor alteration of existing public or private structures, facilities, mechanical equipment, or topographical features, involving negligible or no expansion of use beyond that previously existing. District activities which are within the scope of this exemption include operation, repair, maintenance, or minor alteration of existing District facilities; public facilities, such as existing drainage works or sewer treatment facilities; and private facilities, such as ornamental fish ponds, swimming pools and maintenance of existing landscaping, native growth, and water supply reservoirs.

Class 2 consists of replacement or reconstruction of existing structures and facilities where the new structure will be located on the same site as the structure replaced and will have substantially the same purpose and capacity as the structure replaced. District activities which are within the scope of this exemption include replacement or reconstruction of existing facilities of the District or others, including the structures and utility systems of drainage systems, levees, culverts, pumps, and other water control structures, providing the replacement or reconstruction is substantially the same size, purpose, capacity and involving negligible or no expansion of capacity.

Class 3 consists of construction and location of limited numbers of small facilities or structures necessary or advisable for the provision of required services, and the installation of new, small equipment and facilities in small structures for the provision of such services. District activities which are within the scope of this activity include construction and location of vector surveillance stations, and others of similar scope and nature.

Class 4 consists of minor public or private alterations in the condition of land, water, and/or vegetation which do not involve removal of mature, scenic trees. District activities which are within the scope of this exemption include new landscaping at District facilities, removal of minor vegetation or sediment in creeks and other natural channels, drainage ditches, other ditches and flood control channels, storm water retention basins, spreading grounds, and other environments to assist in water flow which prevents breeding of mosquitoes; and minor vegetation removal to access vector breeding.

Class 6 consists of basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource. District activities which are within the scope of this exemption include collection of animals, such as mosquitoes, wild birds, ticks, etc., for vector borne disease surveillance; placement of sentinel chicken flocks for mosquito-borne disease surveillance; collection of other insects, such as mosquitoes and mosquito predators to determine population density; and most other research activities undertaken by the District.

Class 7 consists of actions taken by regulatory agencies as authorized by state law or local ordinance to assure the maintenance, restoration, or enhancement of a natural resource where the regulatory process involves procedures for protection of the

environment. Because District practices involve detailed procedures for protection of the environment, District activities which might be within the scope of this exemption include all vector surveillance and control activities in areas of natural resources, such as wetlands.

Class 8 consists of actions taken by regulatory agencies, as authorized by state or local ordinance, to assure the maintenance, restoration, enhancement, or protection of the environment where the regulatory process involves procedures for protection of the environment. Because District practices involve detailed procedures for protection of the environment, District activities which might be within the scope of this exemption include all vector surveillance and control activities throughout the District.

Class 9 consists of activities limited entirely to inspections, to check for performance of an operation, or quality, health, or safety of a project. District activities which may be within the scope of this exemption include inspections for the presence of vectors throughout the District, and other activities to determine the efficacy of specific control operations.

Class 21 consists of actions by regulatory agencies to enforce laws, general rules, standards, or objectives, administered or adopted by the regulatory agency. District activities which are within the scope of this exemption include enforcement of the California Health and Safety Code, commencing with section 2200, District Resolutions, and other federal, state, and local laws, regulations, ordinances, and resolutions.

Class 22 consists of the adoption, alteration, or termination of educational or training programs which involve no physical alteration in the area affected or which involve physical changes only in the interior of existing school or training structures. District activities which are within the scope of this exemption include the District's public education program which includes newsletters, exhibits at city and other local fairs and special events, elementary education program available to public and private schools, and public speaking engagements. In addition, staff training, as required by the California Occupational Safety and Health Administration, California Department of Food and Agriculture, California Environmental Protection Agency Department of Pesticide Regulations, and the California Department of Public Health, may be exempt under this class.

Class 23 consists of normal operations of facilities for public gatherings. District activities which may be within the scope of this exemption include public meetings at the District offices.

Class 27 consists of leasing new facilities where the local governing authority has determined that the building was exempt from CEQA.

3. Exceptions to the Categorical Exemptions

Categorical exemptions may not be used in any of the following situations [Guidelines Sec 15300.2]:

- (a) Categorical exemption classes 3, 4, 5, 6, and 11 may not be used where the project "may impact on an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant

to law by federal, state, or local agencies.”

- (b) All classes of categorical exemptions “are inapplicable when the cumulative impact of successive projects of the same type in the same place, over time, is significant.”
- (c) A categorical exemption may not be used for an activity “where there is a reasonable possibility that the activity will have a significant effect on the environment due to unusual circumstances,” or
- (d, e,f) if the project could damage scenic resources, is located on a hazardous waste site, or may cause substantial adverse change in the significance of a historical resource

In the remainder of this CEQA Preliminary Review, the District evaluates the CEQA exemption status of its ongoing and proposed activities in light of these exceptions and specific conditions in the Project Area.

II. DISTRICT POWERS

The District is an agency with broad powers, formed pursuant to section 2200 et seq of the California Health and Safety Code. Pursuant to Section 2270, the District Board may do any or all of the following:

- A. Take all necessary or proper steps for the control of mosquitoes, flies, or other vectors, either in the district or in territory not in the district but so situated with respect to the district that mosquitoes, flies, or other vectors may disperse from the territory into the district.
- B. Abate as nuisances all standing water and other breeding places for mosquitoes, flies, or other vectors, either in the district or in territory not in the district but so situated with respect to the district that mosquitoes, flies, or other vectors from the territory disperse into the district.
- C. Purchase the supplies and materials, employ the personnel and contract for the services which may be necessary or proper in furtherance of the objects of this chapter.
- D. If necessary or proper in the furtherance of the objects of this chapter, build, construct, repair, and maintain the necessary dikes, levees, cuts, canals, or ditches upon any land and acquire by purchase, condemnation, or by other lawful means, in the name of the district, any lands, rights-of-way, easements, property, or material necessary for any of those purposes.
- E. Make contracts to indemnify or compensate any owner of land or other property for any injury or damage necessarily caused by the use or taking of property for dikes, levees, cuts, canals, or ditches.
- F. Enter upon any property without hindrance or notice, either within the district or so reasonably adjacent thereto that vectors may disperse into the district, for any of the following purposes:
 1. To inspect to ascertain the presence of vectors or their breeding places.
 2. To abate public nuisances in accordance with this article, either directly or by giving notice to the property owner to abate a nuisance.
 3. To ascertain if a notice to abate vectors has been complied with.
 4. To treat property with appropriate physical, chemical or biological control measures.
- G. Sell or lease any service, land, rights-of-way, easements, property or material acquired by the district. Equivalent properties may be exchanged, if it is in the best interests of the district to do so.
- H. Borrow money in any fiscal year and repay it in the same or in the next ensuing fiscal year. The amount borrowed in any fiscal year shall not exceed fifteen cents (\$0.15) on each one hundred dollars (\$100) of assessed valuation of property in the district.
- I. Issue warrants payable at the time stated in the warrant to evidence the obligation to repay money borrowed or any other obligation incurred by the district. Warrants so issued shall draw interest at a rate fixed by the board not to exceed 5

- percent per year, payable annually or semiannually as the board may prescribe.
- J. Provide a civil service system for any or all employees of the district.
 - K. Assess civil penalties, as determined in the discretion of the board, but not to exceed five hundred dollars (\$1000) per day for each day that a notice or hearing order to abate a nuisance has not been complied with. Any sum which may be collected shall become part of the district's general fund to be used solely for vector control purposes.
 - L. Levy, by resolution or ordinance, a service charge against any or all parcels of land within the district to pay for the cost of vector surveillance and control. The schedule of charges shall be made, reviewed, and adopted annually after notice and hearing in connection with the schedule. Following the hearing, the board may classify parcels of property according to their use in relation to the cost of vector surveillance and control. The board may bill for the charges annually or more frequently. The charges shall be collected and paid by the county in the same manner as property taxes by the county. The service charge shall be reasonably related to the district's cost for providing vector surveillance and control and shall not be deemed a tax of any kind. Any sum collected shall be used solely for purposes of vector surveillance and control.
 - M. Set the tax or assessment rates which are necessary to carry out the purposes of this article.
 - N. Do any and all things necessary for, or incident to, the powers granted by, and to carry out the objects specified in, this chapter.

Within this broad list of potential District powers, and pursuant to the Health and Safety Code, Section 2281 et seq., the District's Board of Trustees has adopted policies defining the District's scope of activities, which are directed at 1) the surveillance and control of mosquitoes and other insects of public health significance, in our service area, and 2) the surveillance of vector-borne diseases in our service area; as well as 3) the provision of essential administrative support for these vector management programs. Further, the Board and the General Manager have adopted specific practices consistent with these program definitions, the public needs, and other District policies.

III. DISTRICT ACTIVITIES

The District protects the environment by protecting the health and safety of the people living and working within our service area, and by conducting vector control activities in a manner that minimizes adverse impacts to other environmental functions.

A. JURISDICTION/ SERVICE AREA

The District's activities are conducted within a 1,330 square mile jurisdiction contained within Los Angeles County, California. The areas that will be actually or potentially impacted by District activities include:

1. The incorporated cities of Artesia, Bell, Bellflower, Bell Gardens, Burbank, Carson, Cerritos, Commerce, Cudahy, Diamond Bar, Downey, Gardena, Glendale, Hawaiian Gardens, Huntington Park, Lakewood, La Habra Heights, La Mirada, Long Beach, Los Angeles, Lynwood, Maywood, Montebello, Norwalk, Paramount, Pico Rivera, San Fernando, San Marino, Santa Clarita, Santa Fe Springs, Signal Hill, South Gate, South El Monte and Whittier
2. Certain unincorporated areas of Los Angeles County (see District service area map Appendix A)
3. Contracting city La Canada-Flintridge

In addition, the District periodically cooperates with adjoining Mosquito & Vector Control Districts and/or County and State Health Departments on activities that cross normal District boundaries; in these situations, the District or Department with jurisdiction over the locations where specific activities are performed has primary responsibility for these activities.

B. VECTORS AND VECTOR-BORNE DISEASES IN THE DISTRICT SERVICE AREA

The District exists to reduce the risk of vector-borne disease or discomfort to the residents of our Service Area. Besides being nuisances by disrupting human activities and the use and enjoyment of public and private areas, certain insects and animals can transmit a number of diseases. The diseases of most concern in the Project Service Area are St. Louis encephalitis (SLE), Western equine encephalitis (WEE), West Nile virus (WNV), malaria, and dog heartworm transmitted by mosquitoes.

The California Health and Safety Code defines a vector 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” (Section 2200(f)). The District undertakes activities through its Integrated Vector Management Program to control the following vectors of disease and/ or discomfort in the Service Area:

1. Mosquitoes

Control of mosquitoes is the primary focus of the District's IVM program. Certain species of mosquitoes found in Los Angeles County can transmit malaria, St. Louis encephalitis, Western equine encephalitis, West Nile virus and potentially other encephalitis viruses. A few species of mosquitoes are also capable of transmitting dog heartworm. Although some species of mosquitoes have not been shown to transmit disease, all species can cause human discomfort when the female mosquito bites to obtain blood. Reactions range from irritation in the area of the bite to severe allergic reactions or secondary infections resulting from scratching the irritated area. Additionally, an abundance of mosquitoes can cause economic losses, and loss of use or enjoyment of recreational, agricultural, or industrial areas.

2. Black Flies.

Black flies breed in flowing water from rivers and streams to irrigation ditches. After mating, the female black fly deposits her fertilized eggs on rocks or other substrate in swift flowing water. They are usually found from spring through fall, with the greatest numbers appearing in the late spring and summer. Adults live two to three weeks and are small, menacing, biting flies that are a nuisance to people and animals living, working, or playing near rivers and streams. Pain and swelling from the bites can occur due to allergic reactions to foreign proteins and toxins that the female injects when feeding. In the tropics, black flies transmit diseases, such as River Blindness. Fortunately, they do not transmit any diseases to humans in California, but can cause extreme discomfort and irritation due to their biting habits and great numbers.

3. Non-biting Midges.

Midge larvae develop and breed in aquatic habitats similar to those of mosquitoes. The adults are flying insects which emerge in masses and become especially bothersome for residents near sources such as flood control channels, lakes, ponds, reservoirs or spreading basins from April to September. When midges emerge as adults in enormous numbers, they invade nearby residences, disrupt outdoor and indoor activities, and create stressful living conditions in affected areas. Swarms can cause discomfort or irritation by entering the eyes, ears, nose, and mouth. Although these insects do not transmit diseases, they have been documented to cause allergic reactions, to lessen real estate value in residential areas and can interfere with processing of food, paper products, plastic, and automotive refinishing operations in industrial situations, causing significant economic impact.

Most of the vectors mentioned above are extremely mobile and cause the greatest hazard or discomfort away from their breeding site. Each of these potential vectors has a unique life cycle and most of them occupy different habitats. In order to effectively control these vectors, an integrated vector management program 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.

C. INTEGRATED VECTOR MANAGEMENT

The District's activities address vector management through a general strategy including identification of vector problems; responsive actions to control existing populations of vectors and prevent new sources from developing, education of land-owners and others on measures to minimize vector production or interaction with vectors; and provision and administration of funding and institutional support necessary to accomplish these goals.

In order to accomplish effective and environmentally sound vector management, the manipulation and control of vectors must be based on careful surveillance of their abundance, habitat (potential abundance), pathogen load, and/or potential contact with people; the establishment of treatment criteria (thresholds); and appropriate selection from a wide range of control methods. This dynamic combination of surveillance, treatment criteria, and selection between multiple control activities in coordinated program is generally known as Integrated Pest Management (IPM) (Glass 1975, Davis et al 1979, Borror et al 1981, Durso 1996, Robinson 1996).

The District's Vector Management Program, like any other IPM program, by definition involves procedures for minimizing potential environmental impacts. The District's Project employs IPM principles by first determining the species and abundance of vectors through evaluation of public service requests and field surveys of immature and adult pest populations; and 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, and for some vectors (rodents, ticks) it is the District's only control method. In some situations, the District also uses biological control such as the planting of mosquitofish in ornamental ponds. When these approaches are not effective or are otherwise inappropriate, then pesticides are used to treat specific vector-producing or vector-harboring areas or vector populations.

Vector control activities are conducted at a wide variety of sites throughout the District's Project area. These sites can be roughly divided into those where activities may have an effect on the natural environment either directly or indirectly (through drainage), and sites where the potential environmental impacts are negligible ("Non-Environmental Sites"). Examples of "Environmental Sites" in the Project area include tidal marshes, lakes and ponds, rivers and streams, wetlands, stormwater detention basins, flood control channels, spreading grounds, street drains and gutters, wash drains, or roadside ditches. Examples of "Non-Environmental Sites" include animal troughs, artificial containers, tire piles, fountains, ornamental fish ponds, neglected swimming pools and non-natural harborage (such as residential and commercial landscape, trash receptacles, etc.).

The District's IVMP principles for mosquitoes apply similarly to these other pestiferous vectors, including assessing threat to surrounding organisms, proximity to populated regions, pesticide use in strict accordance with label requirements, eradication of breeding sources to avert re-infestation, educating the general public on preventative measures to prevent future colonization, and administration of funding and institutional support necessary to accomplish these goals.

1. Surveillance and Site Access

Besides being nuisances by disrupting human activities and causing our environment to be uninhabitable, certain insects and animals may transmit a number of diseases. The diseases of most concern in the District are West Nile Virus (WNV), St. Louis encephalitis (SLE) and western equine encephalitis (WEE) transmitted by mosquitoes.

a. Mosquitoes

Mosquitoes are the primary focus of the District's Vector Management Program and account for the majority of resources expended. In order to maximize familiarity by the operational staff with specific mosquito sources in the Project area, the District is divided into zones (currently sixteen). Each zone is assigned a full-time Vector Control Specialist whose responsibilities include inspection and treatment of known mosquito sources, finding and controlling new sources, and responding to service requests from the public.

Mosquito populations are surveyed using a variety of field methods and traps. Small volume mosquito "dippers" and direct observation are used to evaluate larval populations, and service requests from the public. Carbon dioxide baited Encephalitis Virus Surveillance (EVS) and hay-infusion baited Reiter/Cummings Gravid traps are used to evaluate adult populations.

Mosquito-borne diseases are surveyed using sentinel chickens, adult mosquitoes, and wild birds. Coops with sentinel chickens are maintained on the property of willing landowners. The District employs standard practices of good animal husbandry to ensure the health and well-being of the sentinel animals.

Adult mosquitoes are collected and tested for infection with SLE, WEE and WN virus. Collections are made with carbon dioxide (dry ice) baited Encephalitis Surveillance (EVS) and hay-infusion baited Reiter/Cummings Gravid trap. Although the traps must be placed in vegetated areas, care is taken to ensure that placement of traps does not significantly damage any vegetation.

The District collects wild birds for sero-sampling in modified Australian crow traps that are designed specifically for the collection of small birds such as sparrows and finches. When in use, the crow traps are supplied with food and water kept in good repair to protect the birds from predators. Birds are banded under Federal Bird Banding Permit #22763 issued to the Centers for Vectorborne Disease Research and UC Davis and District Vector Ecologists hold Scientific Collecting Permits issued by the CA Department of Fish and Game to obtain blood samples. The District strictly complies with all requirements of those permits. After obtaining a blood sample from a wild bird, the bird will be released.

Surveillance is also conducted to determine mosquito breeding habitat (e.g. standing water) and the effectiveness of control operations. Inspections are conducted using techniques with insignificant impacts on the environment. Staff routinely uses pre-existing accesses such as roadways, open areas, walkways, and trails. Vegetation management (i.e., pruning trees and brush) is conducted where overgrowth impedes safe access. All of these actions only result in a temporary/localized physical change to the environment with regeneration/re-growth occurring within a span of six to nine months.

b. Other Vectors

The District's activities also address the management of other vector species such as black flies and non-biting midges. Surveillance for these "nuisance" vectors is conducted by visual examination of potential breeding habitat for the presence of larvae. Inspections are conducted using techniques with insignificant impacts on the environment. Staff routinely uses pre-existing access ways such as roadways, open areas, walkways, and trails. Vegetation management (i.e., pruning trees and brush) is conducted where overgrowth impedes safe access. All of these actions only result in a temporary/localized physical change to the environment with regeneration/re-growth occurring within a span of six to nine months.

In order to access various sites throughout the District for surveillance and for control, District staff utilizes specialized equipment such as light trucks, all terrain vehicles and boats.

Disposable supplies that are contaminated while collecting blood are stored in appropriate biohazard containers in the District's laboratory and disposed of in accordance with all applicable laws. Reusable items are cleaned and sterilized before they are used again. The disposal of animal carcasses is in compliance with all Federal, State, and local laws and regulations.

2. Education

The primary goal of the District's education activities is to prevent vectors from reaching public nuisance or disease thresholds by managing their habitat while protecting habitat values for their predators and other beneficial organisms. Vector prevention is accomplished through public education, including site-specific recommendations on water and land use.

The District's education program teaches the public how to recognize, prevent, and suppress vector breeding and harborage on their property. This part of the Project is accomplished through the distribution of brochures, fact sheets, and newsletters, participation in local fairs and events, presentations to community organizations, contact with Technicians in response to service requests, and public service announcements and news releases. Public education also includes a school program to teach future adults to be responsible by eliminating vector-breeding sources, and educate their parents or guardians about District services and how they can reduce vector-human interaction.

D. CONTROL OF MOSQUITOES

When a mosquito source produces mosquitoes above District treatment thresholds (see District Mosquito Management Plan), the Technician will generally work with the land-owner or responsible agency to reduce the habitat value of the site for mosquitoes. If this is ineffective, then the Technician will determine the best method of further treatment, including biological control and chemical control.

1. Biological Control

The mosquitofish, *Gambusia affinis*, is the District's primary bio-control agent used against mosquitoes. Mosquitofish are not native to California, but have been widely established in the state since the early 1920's, and now inhabit most natural water bodies. The District maintains mosquitofish in tanks. District specialists place mosquitofish only in man-made sources such as ornamental fishponds, water barrels, horse troughs, and abandoned swimming pools. Mosquitofish are also made available to the public to control mosquito production in artificial containers.

2. Chemical Control

The District also uses chemical insecticides to control mosquito production where observed mosquito production exceeds District thresholds. The primary types of insecticides used against mosquitoes are selective larvicides, which are described in the following section. In addition, if large numbers of adult mosquitoes are present and/or public health is threatened, the District may apply selective, low persistence aerosol adulticides, described in the following section.

E. CONTROL OF OTHER VECTORS

1. Black Flies.

When black fly larval densities exceed District treatment thresholds (see District Mosquito Management Plan), control measures will be initiated. Black fly larvae can be controlled by interrupting the water flow of the infested water way, if discharge amounts can be modified. Most frequently, however, flow modification is not a viable treatment option and the District uses selective larvicides, which are described in the following section, to control black fly larvae.

2. Non-biting Midges.

When non-biting midge larval densities exceed District treatment thresholds (see District Mosquito Management Plan) or residential complaints/service requests increase, control measures will be initiated. Midge larvae can be controlled through proper water management and rotation. Only if this option is unavailable will the District use larvicides described in the following section, to control non-biting midges before their emergence. If nuisance levels are particularly high, the District may apply selective, low persistence aerosol adulticides, described in the following section.

F. DISTRICT FUNDING

The District's activities are funded through ad valorem property taxes and special benefit assessments, service contracts, and civil liabilities, pursuant to Health and Safety Code Sections 2291.2 et seq. The District also maintains service contracts with some large land-owners and/or water dischargers.

IV. CEQA ANALYSIS OF PROGRAM

The District's Integrated Vector Management Program includes surveillance and site access, education, biological and chemical control activities for mosquitoes, black flies and non-biting midges. The potential application of CEQA requirements, exemptions, and exceptions to each of these classes of activities is analyzed.

A. SURVEILLANCE AND SITE ACCESS

No endangered or threatened species or other legally protected animals are used to test for the presence of disease. For those species that are used, sample sizes are small relative to the indigenous population. Surveillance and inspection activities do not impact an environmental resource of hazardous or critical concern, do not cause a cumulative impact, and do not have a significant effect on the environment and are, therefore, exempt under class 6 and class 9 categorical exemptions.

Equipment is generally operated using existing passageways such as roads and trails. In some cases, there are no existing roads or trails, but low ground pressure all-terrain vehicles can be used with minimal environmental impacts. If vegetation clearing is needed for foot access to sites, only minor vegetation is removed, excluding healthy, mature, scenic trees. If an area does not have an existing passageway, and one is required, the District contacts the landowner or agency with appropriate jurisdiction to request that access be made available; in these cases the landowner or agency is responsible for determining the environmental impact of constructing an access road or trail. Use of all-terrain vehicles and the removal of minor vegetation, excluding healthy, mature, scenic trees, do not generally have a significant effect on the environment, and are generally exempt from CEQA under the class 4, 6, or 9 categorical exemptions.

B. EDUCATION

Because the public education component of the Project does not have the potential for causing a significant effect on the environment, it does not meet the State CEQA Guidelines definition of a "project" and is, therefore, exempt from CEQA. Furthermore, class 22 categorical exemption cover the adoption, alteration, or termination of educational or training programs which involve no physical alteration in the area affected or which involve physical changes only in the interior of existing school or training structures. Therefore, the District's education activities are exempt under the class 22 categorical exemption. 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 our educational programs that they have specific environmental obligations, including compliance with CEQA and permit requirements.

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 vectors. The District is not a permitting agency and 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 require CEQA review.

C. BIOLOGICAL CONTROL ACTIVITIES

Mosquitofish are opportunistic feeders and, in addition to mosquitoes, will readily prey on their newborn young, other small fish, and other small aquatic organisms (see Technical Review). Specifically, some researchers have claimed that mosquitofish are implicated in the extirpation of Red-legged Frogs and other protected species. In order to protect threatened and endangered species and beneficial organisms, the District only stocks mosquito fish in man-made sources and does not release mosquitofish into environmental sites. Members of the public seeking mosquitofish will not be handed any fish, but fish will be delivered by area technicians to requesting residents and released according to district guidelines.

The District's biological control activities, including fish stocking, constitute an ongoing project. Biological control projects conducted by Mosquito and Vector Control Districts may be exempt from further CEQA requirements under the class 7 and class 8 categorical exemptions, and may be exempt under statutory exemptions for emergency projects to control vectors which present imminent danger to the health and comfort of the residents of the District.

D. CHEMICAL CONTROL (PESTICIDES)

Chemical control of mosquitoes will be performed with either larvicides (pesticides that kill the organism in the larval stage) or adulticides (pesticides that kill the organism in the adult stage). Larvicides will be chosen to be highly selective with little or no effect on non-target organisms, not harmful to plants, biodegradable, non-toxic to mammals, birds, amphibians, and fish, effective, and reasonably priced. Adulticides will be selected that are biodegradable, non-toxic to mammals and birds, and not harmful to vehicles or built structures. Chemical control of other insects will generally use specific, low-persistence pesticides. Every regular employee of the District who handles, applies, or supervises the use of any pesticide for public health purposes is certified by the California Department of Public Health as a Vector Control Technician in mosquito control, terrestrial invertebrate vector control, and vertebrate vector control. The District also employs Seasonal Vector Control Extra Help. Pursuant to Title 17 of the California Code of Regulations section 30013, these employees need not be certified by the California Department of Public Health. Seasonal Vector Control Extra Help apply pesticides under the instructions and direct supervision of a Certified Vector Control Technician who is responsible for the actions of that person and who is available if and when needed even though the certified technician may not be physically present at the time the pesticide is applied. All employees who handle and apply pesticides are trained pursuant to Title 3 of the California Code of Regulations section 6724. All regular employees who are certified by the California Department of Public Health attend at least annual continuing education programs pursuant to Title 17 of the California Code of Regulations section 30061. Training activities do not have the potential for causing significant effects on the

environment, directly or ultimately, and are also exempt under a class 22 categorical exemption.

The District uses pesticides that are selective and non-persistent to minimize the risk of significant or cumulative adverse impact on non-target plant or animal life in “environmental sites”. All pesticides are stored, handled, and used in accordance with all State, Federal, and local regulations and the manufacturer’s recommendations and instructions. Adherence to these regulations, instructions, and recommendations, together with the District’s own policies and procedures, will ensure that the District’s use of pesticides will not adversely affect the environment.

Liquid pesticide application equipment is equipped with a pressure regulator or other means to measure application volumes and rates, and is calibrated at regular intervals to insure that the proper amount of pesticide is applied. All non-liquid pesticide application equipment is calibrated before use to insure that the proper amount of pesticide is applied.

Some pesticides have different names and slightly different formulations but essentially similar ingredients and modes of action. Therefore, where trade names are listed below, they indicate the current formulations used by the District, but the District reserves the right to change materials at any time, and has determined that new materials with essentially the same formulation, mode of action, and mode of application, are adequately covered by this review.

1. Larvicides

a. Bacillus thuringiensis ssp. israelensis (Bti)

The “Program Evaluation Report” of the Metropolitan Mosquito Control District noted that “our conclusion from reviewing the scientific literature is generally consistent with EPA’s position that Bti and methoprene ... pose little risk to people and most nontarget species” (State of Minnesota, Office of the Legislative Auditor, January 1999, p x).

Pesticides that contain the active ingredient of the bacterium *Bacillus thuringiensis* subspecies *israelensis* (*Bti*), which includes VectoBac[®] G (biological larvicide granules), VectoBac[®] 12AS (biological larvicide aqueous suspension), Teknar[®] HP-D (high potency Dipteran biological larvicide), are used for mosquito control. The active ingredient is composed of viable *Bti* endospores and delta-endotoxin crystals. *Bacillus thuringiensis*, which occurs naturally in soils and aquatic environments globally, has a highly specific mode of action against a narrow host spectrum, more specifically larvae of mosquitoes, non-biting midges and black flies. Larvicidal activity is dependent upon ingestion of these components by the mosquito larvae. Upon ingestion, pH conditions and enzymes in the gut of the larvae rapidly hydrolyze the bacterial endospore material into active subunits which attack the midgut cells. General gut paralysis occurs within a few hours, and the cells of the midgut become extensively damaged causing the formation of holes or ulcers in the stomach wall. The subsequent flow of toxic substances into the larval body cavity causes death within 48 hours.

Biological larvicides, like *Bti*, may be applied to virtually any mosquito breeding source except treated, finished drinking water reservoirs and drinking water receptacles. Oral, dermal, and inhalation toxicity studies have not found any mammalian toxicity (see Technical Review for citations). Numerous studies have been conducted regarding the effect of *Bacillus thuringiensis* on non-target organisms and the environment. When products that contain *Bti* are applied within label rates, no harmful effects have been found against non-target organisms including tree frog tadpoles, toad tadpoles, California newts, mosquitofish, rainwater killifish, two spine stickleback, bluegill, scuds, sideswimmers, purple shore crabs, fairy shrimp, water fleas, mayfly nymphs, damselfly nymphs, dragonfly nymphs, water boatmen nymphs, backswimmers, pygmy backswimmers, scavenger water beetle larvae, predaceous water beetles, flatworms, earthworms, fresh water snails, and mussels. Additionally, some long-term studies in wetland habitats revealed no significant effects on the food chain or inhabitants of the wetlands. Based on the technical data and scientific research, *Bti* is generally considered to have minimal immediate or cumulative impact on the environment, and the District uses this type of pesticide in environmental and non-environmental sites.

If applied at the appropriate higher label rates for black fly and midge control *Bti* can be used to control those vector populations and the District uses this type of pesticide in environmental and non-environmental sites to control both black fly and midge populations.

b. *Bacillus sphaericus*

Insecticides that contain the active ingredient of the bacterium *Bacillus sphaericus*, which includes VectoLex[®] CG (biological larvicide granules), are used for mosquito control in a number of sites, generally where highly organic water or other criteria make *Bti* less appropriate. The mode of action of *Bacillus sphaericus* is the same as *Bti* except that fresh *Bacillus sphaericus* spores that proliferate in the mosquito larvae are released when the larvae dies. These spores are then ingested by other larvae. Oral, dermal, and inhalation toxicity studies have not found any mammalian toxicity [Shadduck, et al, 1980]. When *Bacillus sphaericus* products are applied within label rates, no harmful effects have been found against non-target organisms including dragonfly nymphs, damselfly nymphs, mayfly nymphs, chironomids, water boatmen nymphs, backswimmers, diving beetles, water scavenger beetles, marine amphipods, fairy shrimp, copepods, crawfish, mollusks, and amphibians (Mulla, Darwazeh et al. 1984). This type of pesticide is used in environmental and non-environmental sites. Based on the technical data and scientific research, *Bacillus sphaericus* is generally considered to have minimal immediate or cumulative impact on the environment, and the District may use this type of pesticide in any sites.

c. Methoprene

Pesticides that contain the active ingredient methoprene, which includes Altosid[®] XR Briquets, Altosid[®] Liquid Larvicide, and Altosid[®] Pellets, are used to control mosquitoes and midges. Methoprene is an insect growth regulator which controls

mosquitoes and midges by interrupting normal metamorphosis. Methoprene is a true analog of mosquito juvenile hormone. During the fourth larval instar stage, juvenile hormone levels drop to very low levels. Methoprene artificially maintains juvenile hormone levels at a higher than normal titer. This higher hormonal level during the latter instar stages prevents the insect from developing into a normal pupa. Since the biology of midges and mosquitoes are similar, methoprene is effective on both insects. Oral, dermal, and inhalation toxicity studies have not found any mammalian toxicity. When methoprene products are applied within label rates, no harmful effects have been found against non-target organisms including 35 species of protozoa, earthworms, leeches, water fleas, shrimp, damselflies, mayflies, water beetles, snails, tadpoles, mosquitofish, and algae, and there is no impact on the food chain or ducks, geese, frogs, toads, salamanders, crabs, shrimp, oysters, and clams.

Based on the technical data and scientific research, methoprene is generally considered to have minimal immediate or cumulative impact on the environment, and the District uses this type of pesticide in environmental and non-environmental sites. The District applies methoprene in a variety of formulations, including liquid, pellets, briquets, and mixed with Bti (“duplex”).

If applied at the appropriate label rates for midge control methoprene can be used to control these vector populations and the District uses this type of pesticide in non-environmental sites to control midge populations.

d. Golden Bear 1111 Larvicide[®]

Pesticides that contain the active ingredient aliphatic petroleum hydrocarbons, which includes Mosquito Larvicide GB-1111[®] (“Golden Bear 1111” -- the only petroleum oil currently registered in California), are used to control mosquitoes. Golden Bear 1111 evaporates and photodegrades in the environment, has no residual effect, and is slightly phytotoxic when applied at label rates. Golden Bear 1111 kills primarily by suffocation and can be toxic to some air-breathing aquatic insects (diving beetles, immature dragonflies and damselflies), although it has no documented impact to bottom-dwelling organisms (Mulla and Darwzeh 1981). Studies on a wide range of fish species have demonstrated no toxic effects when applied at label rates (Tietze, Hester et al. 1991; Tietze, Hester et al. 1992; Tietze, Olson et al. 1993; Tietze, Hester et al. 1994). The relatively low persistence of Golden Bear 1111 in the environment indicates that significant movement of this material into open waters is highly unlikely following application to mosquito producing sites.

e. BVA 2

This highly refined oil is another example of used for the control of mosquito pupae. When applied evenly over the water surface it rapidly interrupts the air water interface and suffocates all immature mosquito stages present. This quick action makes it an effective larvicide and pupicide for any program. According to the label BVA 2 is toxic to fish and other aquatic organisms. It must not be applied apply directly to water, except when applied for mosquito larvae control; and then only in shallow areas around the border. The responsible State Fish and Game Agency must be consulted

before application of this product. According to David Vincent (2010) BVA 2 is sufficiently similar to GB-1111, so that EPA for registration referred to available data on GB-1111 (see previous paragraphs) and did not require additional environmental impact studies.

f. Agnique[®]

Pesticides that contain the active ingredient ethoxylated fatty alcohol, which includes Agnique[™] MMF (monomolecular surface film), may be used to control mosquitoes once registered in California. This type of pesticide reduces the surface tension of water and makes it difficult for mosquito larvae and pupae to attach. The film also blocks their breathing tubes and the larvae and pupae drown. Resting adult males and adult egg-laying females that come in contact with the film will also drown. This product can be used in virtually any source of water including potable water and biodegrades into carbon dioxide and water. The lethal inhalation concentration during four hours of exposure is 1.5 to 3.0 milligrams per liter. Ingestion of large quantities may cause gastrointestinal disturbances. Contact with eyes causes irritation which subsides in seven days and prolonged or repeated exposure with skin causes irritation. Studies on non-target effects were conducted on the fresh-water green tree frog, two species of fresh water fish, five species of salt water fish, longnose killifish, grass shrimp, freshwater shrimp, fiddler crab, crayfish, freshwater amphipod, freshwater isopod, fairy shrimp, snails, polychaetes, mayfly nymphs, diving beetles, midges, clam shrimp, backswimmers, water boatmen, water striders, beetle larvae and adults, black mangrove, saltwort, cordgrass, arrowhead, and rice. The only non-target effects observed when the product was applied at label rates were dead adult midges and adult water striders. Based on the available technical data and scientific research, Agnique[™] MMF has no apparent significant or cumulative impact on the environment.

g. Spinosad

Spinosad (spinosyn A and spinosyn D) are a new chemical class of insecticides that are registered by the United States Environmental Protection Agency (EPA) to control a variety of insects. The active ingredient is derived from a naturally occurring soil dwelling bacterium called *Saccharopolyspora spinosa*, a rare actinomycete reportedly collected from soil in an abandoned rum distillery on a Caribbean Island in 1982. The bacteria produce compounds (metabolites) while in a fermentation broth. The first fermentation-derived compound was formulated in 1988. Spinosad has since been formulated into insecticides that combine the efficacy of a synthetic insecticide with the benefits of a biological pest control organism. Spinosad kills susceptible species by causing rapid excitation of the insect nervous system. Spinosad is relatively fast acting. The insect dies within 1 to 2 days after ingesting the active ingredient. Due to this unique mode of action, Spinosad is valued in resistance management programs. Spinosad must be ingested by the insect, therefore it has little effect on non-target predatory insects. The products have practically no odor. Its soil absorption is moderately strong and it degrades rapidly in the environment primarily through photolysis. Its "Caution" signal word indicates a reduced risk to applicators and

workers. Spinosad shows low toxicity when ingested by mammals (male rat LD50 = 3738 mg/kg) and no additional adverse effects from chronic exposure. Studies on spinosad show slight toxicity to birds, moderate toxicity to fish, and slight to moderate toxicity to aquatic invertebrates. It is important to note that toxicity is based on the active ingredient tested; formulations of spinosad in common use today have a very small amount of spinosad active ingredient. In addition, non-target sensitivity is mitigated by the environmental characteristics of spinosad, including rapid dissipation in the water column, sorption and binding of residues with sediment and lack of bioaccumulation in living tissues.

2. Adulticides

a. Pyrethrins, Pyrethroids, Piperonyl Butoxide

Pesticides that contain the active ingredients resmethrin with piperonyl butoxide and permethrin with piperonyl butoxide, which includes Scourge[®] and Biomist[®] 4+12 respectively, are synthetic pyrethroids used to control adult mosquitoes and midges. These products are pyrethroids that initially stimulate nerve cells to produce repetitive discharges and eventually cause paralysis of the insect. Acute toxicity of these materials is low to mammals (Resmethrin oral LD50 = 2,000 mg/kg; permethrin oral LD50 is greater than 4,000 mg/kg). Scientific research has also shown that neither Bobwhite quail or Mallard ducklings are harmed when fed 5,000 part per million of the active ingredients in Scourge[®]. Neither of these products are listed as carcinogens. Recent research in controlled plots in the Central Valley indicated no reductions in the total abundance or biomass of aquatic macroinvertebrates or fish, and a return to previous abundance in 24 hours for flying insects, following label-rate treatments of Pyrethrin and Permethrin [Lawlor, 1997].

The Legislative Audit of Metropolitan MCD concluded that “Studies by EPA and the World Health Organization found that resmethrin and permethrin are broad-spectrum insecticides with the potential to harm other types of insects and aquatic organisms, but they should not be harmful to humans or the environment if applied according to label instructions”. Although generally safe to humans and the environment, these products are generally only used under unusual situations to control adult mosquitoes when diseases may be transmitted by mosquitoes or when the insect population is so high that they interfere with the enjoyment of the environment. Consistent with the Legislature’s policy for environmental quality, control of adult mosquitoes may be necessary for the health and safety of the people and to provide a satisfying living environment.

V. EXCEPTIONS TO THE USE OF CATEGORICAL EXEMPTIONS

As noted above, Pursuant to State CEQA Guidelines Section 15300.2, categorical exemptions to CEQA requirements for environmental assessment and documentation may not be used in any of the following situations:

- (i) Categorical exemption classes 3, 4, 5, 6, and 11 may not be used where the project “may impact on an environmental resource of hazardous or critical concern where designated, precisely mapped, and officially adopted pursuant to law by federal, state, or local agencies.”
- (ii) All classes of categorical exemptions “are inapplicable when the cumulative impact of successive projects of the same type in the same place, over time, is significant.”
- (iii) A categorical exemption may not be used for an activity “where there is a reasonable possibility that the activity will have a significant effect on the environment due to unusual circumstances.”

The District has carefully considered these exceptions. Since CEQA was passed, the potential environmental impacts of routine mosquito and other vector control activities have diminished through the use of increasingly selective pesticides, more extensive surveillance, etc. However, during this same time, there have been dramatic increases in the number of legally protected species associated with wetland habitats, the number of wetland acres that are considered “sensitive”, and in the general awareness of the ecological and recreational values of wetlands.

The definitions of “environmental resources of critical concern” and “unusual circumstances” are unclear, and have apparently have become increasingly broad over recent years. Known or potential habitat for 5 listed Species of Special Concern, including the Arroyo Toad, Least Bell’s Vireo, Santa Ana Sucker and Spreading Navarretia, are all found in areas where District activities may occur.

In addition, a number of researchers have suggested that routine vector control activities have produced or can produce cumulatively significant environmental impacts. For example, there have been several published claims that non-native fish, including mosquitofish, have contributed to the decline of legally-protected species, such as the Arroyo Toad found in Los Angeles County. The relatively selective and non-persistent pesticides used by the District have also been cited as potentially detrimental to important food resources for waterfowl and wading birds. Finally, concerns over the possible detrimental impacts of ATV use have been increasingly issued by the U.S. Fish and Wildlife Service.

Therefore, although these exceptions do not ordinarily apply to the District’s vector surveillance and control activities, it appears that portions of our ongoing and routine actions may now be considered outside the scope of the categorical exemptions.

VI. CONCLUSIONS

Based upon the foregoing discussion and the documents incorporated by reference therein, the District concludes that most District activities are exempt from further CEQA review. However, some specific activities within the District's Integrated Vector Management Program might exceed the scope of the exemptions to CEQA, or might trigger one or more of the exceptions to the exemptions. Therefore the District will undertake an Initial Study as described in the CEQA Guidelines of this Program.

A. DISTRICT FUNDING, PLANNING AND ADMINISTRATION

The District is funded through a variety of mechanisms, as described before. No District funding mechanism or activity meets the State CEQA Guidelines definition of a "project" and therefore, CEQA is not applicable to these activities. Furthermore, CEQA does not apply to the establishment, modification, structuring, restructuring, or approval of rates, tolls, fares, and other charges by public agencies which the public agency finds are for the purpose of meeting operating expenses, purchasing or leasing supplies, equipment, or materials, meeting financial reserve needs and requirements, and obtaining funds for capital projects. Therefore, funding of District programs is statutorily exempt.

Planning and routine administrative activities by the District or its Board are also either "non-projects" or are otherwise statutorily exempt from further review.

B. SURVEILLANCE AND SITE ACCESS ACTIVITIES

The District's surveillance, inspection, and site access activities may be statutorily exempt from further CEQA requirements as ongoing projects. In addition, these activities are generally exempt under the class 6 and class 9 categorical exemptions, and under statutory exemptions for emergency projects to control vectors which present imminent danger to the health and comfort of the residents of the District.

However, evidence exists that under some foreseeable circumstances, use of all-terrain vehicles by the District on some sites might either exceed the scope of these exemptions, or might trigger the exceptions to the categorical exemptions. Therefore, the District will include its surveillance and inspection activities in the proposed CEQA Initial Study.

C. PUBLIC EDUCATION AND CONSULTATION

District public education and training activities do not meet the State CEQA Guidelines definition of a "project" and therefore, CEQA is not applicable to these activities. Furthermore, class 22 categorical exemption consists of the adoption, alteration, or termination of educational or training programs which involve no physical alteration in the area affected or which involve physical changes only in the interior of existing school or training structures. Therefore, the District's education and training activities are exempt under a class 22 categorical exemption.

D. BIOLOGICAL CONTROL ACTIVITIES

The District's biological control activities, including fish stocking, constitute an ongoing project. Biological control projects conducted by Mosquito and Vector Control Districts are exempt from further CEQA requirements under the class 7 and class 8 categorical exemptions, and under statutory exemptions for emergency projects to control vectors which present imminent danger to the health and comfort of the residents of the District.

However, evidence exists that under some foreseeable circumstances, mosquitofish stocking undertaken by the District might either exceed the scope of these exemptions, or might trigger the exceptions to the categorical exemptions. Therefore, the District will explicitly review its biological control activities in the proposed CEQA Initial Study.

E. CHEMICAL CONTROL ACTIVITIES

The District's chemical control activities, including use of larvicides and adulticides, are one part of an ongoing Vector Surveillance and Control Project. Chemical control projects conducted by Mosquito and Vector Control Districts may be exempt from CEQA under the class 7 and class 8 categorical exemptions, and under statutory exemptions for emergency projects to control vectors which present imminent danger to the health and comfort of the residents of the District.

However, evidence exists that under some foreseeable circumstances, pesticide applications undertaken by the District might either exceed the scope of these exemptions, or might trigger the exceptions to the categorical exemptions. Therefore, the District will explicitly review its chemical control activities in the proposed CEQA Initial Study.

References & Appendices

(See References & Appendices for the Initial Study & Technical Review)

APPENDIX H

Calculated values based on:

The California Air Resources Board's EMFAC2007 (version 2.3) Burden Model

Scenario Year: **2009**

All model years in the range 1965 to 2009

Passenger Vehicles (pounds/mile)		Total miles Traveled 2009	Total for Year 2009 (pounds)	Daily Total (pounds)
CO	0.00968562	543,508.00	5,264.21	20.25
NOx	0.00100518	543,508.00	546.33	2.10
ROG	0.00099245	543,508.00	539.41	2.07
SOx	0.00001066	543,508.00	5.80	0.02
PM10	0.00008601	543,508.00	46.75	0.18
PM2.5	0.00005384	543,508.00	29.26	0.11
CO2	1.09755398	543,508.00	596,529.37	2,294.34
CH4	0.00008767	543,508.00	47.65	0.18



South Coast Air Quality Management District

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SCAQMD Air Quality Significance Thresholds

Mass Daily Thresholds ^a		
Pollutant	Construction ^b	Operation ^c
NOx	100 lbs/day	55 lbs/day
VOC	75 lbs/day	55 lbs/day
PM10	150 lbs/day	150 lbs/day
PM2.5	55 lbs/day	55 lbs/day
SOx	150 lbs/day	150 lbs/day
CO	550 lbs/day	550 lbs/day
Lead	3 lbs/day	3 lbs/day
Toxic Air Contaminants (TACs) and Odor Thresholds		
TACs (including carcinogens and non-carcinogens)	Maximum Incremental Cancer Risk ≥ 10 in 1 million Cancer Burden > 0.5 excess cancer cases (in areas ≥ 1 in 1 million) Hazard Index ≥ 1.0 (project increment)	
Odor	Project creates an odor nuisance pursuant to SCAQMD Rule 402	
Ambient Air Quality for Criteria Pollutants ^d		
NO2 1-hour average annual average	SCAQMD is in attainment; project is significant if it causes or contributes to an exceedance of the following attainment standards: 0.18 ppm (state) 0.03 ppm (state)	
PM10 24-hour average annual average	10.4 $\mu\text{g}/\text{m}^3$ (construction) ^e & 2.5 $\mu\text{g}/\text{m}^3$ (operation) 1.0 $\mu\text{g}/\text{m}^3$	
PM2.5 24-hour average	10.4 $\mu\text{g}/\text{m}^3$ (construction) ^e & 2.5 $\mu\text{g}/\text{m}^3$ (operation)	
Sulfate 24-hour average	1 $\mu\text{g}/\text{m}^3$	
CO 1-hour average 8-hour average	SCAQMD is in attainment; project is significant if it causes or contributes to an exceedance of the following attainment standards: 20 ppm (state) 9.0 ppm (state/federal)	

^a Source: SCAQMD CEQA Handbook (SCAQMD, 1993)

^b Construction thresholds apply to both the South Coast Air Basin and Coachella Valley (Salton Sea and Mojave Desert Air Basins).

^c For Coachella Valley, the mass daily thresholds for operation are the same as the construction thresholds.

^d Ambient air quality thresholds for criteria pollutants based on SCAQMD Rule 1303, Table A-2 unless otherwise stated.

^e Ambient air quality threshold based on SCAQMD Rule 403.

KEY: lbs/day = pounds per day ppm = parts per million $\mu\text{g}/\text{m}^3$ = microgram per cubic meter \geq greater than or equal to

(Rev. March 2009)

PART VI

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Each of the General References listed immediately below has an extensive bibliography justifying the general conclusions. To avoid unnecessary repetition, we refer the reader to them for additional literature on mosquito control and its potential environmental impacts.

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