PESTICIDE APPLICATION PLAN

For the Biological and Residual Pesticide Discharges to Surface Waters of the US by the Orange County Mosquito and Vector Control District

FOR WATER QUALITY ORDER NO. 2016-0039-DWQ STATEWIDE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT FOR BIOLOGICAL AND RESIDUAL PESTICIDE DISCHARGES TO WATERS OF THE UNITED STATES FROM VECTOR CONTROL APPLICATIONS (GENERAL PERMIT) NO. CAG 990004

April 29, 2016

Prepared for:

State Water Resources Control Board

Santa Ana Regional Water Quality Control Board (Region 8)

San Diego Regional Water Quality Control Board (Region 9)

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List of Acronyms and Abbreviations

The District	Orange County Mosquito and Vector Control District
The County	Orange County
RWQCB	Regional Water Quality Control Board
SWRCB	State Water Resource Control Board
MVCAC	Mosquito and Vector Control Association of California
BMP	Best Management Practice
IVM	Integrated Vector Management
NPDES	National Pollutant Discharge Elimination System
CDPH	California Department of Public Health
DPR	Department of Pesticide Regulation
CDPH	California Department of Public Health
General Permit	General Permit No. CAG 990004, Permit for Vector Control

Introduction

The Orange County Mosquito and Vector Control District (the District) is a public health agency charged with protecting the citizens of Orange County from vectors and vector-borne disease under Division 3 (Pest Abatement) of the California Health and Safety Code (CAL. HSC. § 2000-2910). The District is an Independent Special District that carries out its mission with a balanced approach focused on protecting public health and the environment. The District's operations are based out of the city of Garden Grove, California, and service all 789 square miles of Orange County, home to more than three million residents. Service is provided to all 34 cities within Orange County as well as unincorporated areas, federal and state lands. The District operates year-round to control mosquitoes, other flies, red imported fire ants (RIFA), and rats.

The District is within the jurisdiction of the Santa Ana Regional Water Quality Control Board (Region 8) and the San Diego Regional Water Quality Control Board (Region 9), and is seeking coverage under the General Permit No. CAG 990004 as "a public entity" that applies biological and residual pesticides for vector control in or near waters of the United States (Exhibit 1). The District has previously obtained coverage under General Permit Order No. 2011-0002-DWQ: WDID # 830346400. The new Order No. 2016-0039-DWQ replaces the previous one and covers application of larvicides (pesticides used to control aquatic larval stages of immature mosquitoes) and adulticides (pesticides used to control adult mosquitoes). Order No. 2016-0039-DWQ covers the point source discharge of biological and residual pesticides resulting from direct larvicide and indirect adulticide aerosol applications for vector control using: 1) larvicides containing monomolecular films, methoprene, *Bacillus thuringiensis* subspecies *israelensis* (or *Bti*), *Lysinibacillus sphaericus* (or *L. sphaericus*), temephos, petroleum distillates, or spinosad; and 2) adulticides containing malathion, naled, pyrethrin, deltamethrin, etofenprox, lambda-cyhalothrin, permethrin, prallethrin, resmethrin, sumithrin, piperonyl butoxide (PBO), or N-octyl bicycloheptene dicarboximide (or MGK-264). Additionally,coverage extends to any minimum risk category pesticides that are FIFRA exempt and registered for use in California and used in a manner specified in 40 C.F.R. section 152.25.

The District utilizes an Integrated Vector Management (IVM) Program strategy to control the production of mosquitoes, filth flies and black flies, red imported fire ants (RIFA), and rats. The IVM Program consists of the following activities: 1) Surveillance for vectors, vector habitats, and associated pathogens/diseases-this includes field and laboratory analysis of vectors in order to evaluate populations and emerging disease threats; 2) Source reduction to limit breeding by vectors-this includes management of vegetation, land, and water with appropriate landowners to minimize vector production; 3) Education and outreach efforts targeted toward the public and private landowners in ways to facilitate source reduction and minimize disease-carrying vectors; 4) Distribution of mosquito fish (*Gambusia affinis*), a biological control measure used to reduce mosquito production in isolated aquatic features, such as neglected residential swimming pools; and 5) Application of pesticides to minimize vector populations and reduce the threat of potential vector-borne disease transmission to humans.

The District is a member of the Mosquito and Vector Control Association of California (MVCAC), a statewide association of over 60 mosquito and vector control agencies. The District is a member of the MVCAC NPDES Coalition Monitoring Program. As required under Section VIII. Pesticide Use Requirements. C., of the General Permit, the District is submitting this document as its Pesticide Application Plan for review and approval by the State Water Resources Control Board (SWRCB).

1 Description of Target Areas

Description of ALL target areas and adjacent areas, if different from the water body of the target area, in to which larvicides and adulticides pesticides are being planned to be applied or may be applied to control vectors. The description shall include adjacent areas, if different from the water body of the target areas.

Orange County (the County) is a coastal county comprised of approximately 789 square miles. It is bordered on the southwest by the Pacific Ocean, on the north by Los Angeles County, on the northeast by San Bernardino County and Riverside County, and on the southeast by San Diego County. The northwestern part of the county includes part ofon the coastal plain of the Los Angeles Basin, while the southeastern end rises into the foothills of the Santa Ana Mountains. With a Mediterranean climate, Orange County has a diversity of land uses ranging from urban/metropolitan centers, agricultural croplands, and residential communities as well as regional parks and national forests. The County also has nearly 40 miles of the Pacific Ocean coastline.

The District applies pesticides for the purpose of vector control to locations within the jurisdiction of two different Regional Water Quality Control Boards (RWQCBs): Santa Ana, Region 8 and San Diego, Region 9 (Exhibit 1). Watersheds of Orange County include the larger Santa Ana River, San Gabriel-Coyote Creek, Anaheim Bay-Huntington Harbor, Newport Bay, Aliso Creek, San Juan Creek, San Mateo Creek, and the smaller San Clemente Coastal Streams, Dana Point Coastal Streams, Laguna Coastal Streams, and Newport Coastal Streams watersheds (County of Orange, 2008) (Figure 1and Table 1 below). All watersheds in Orange County are potentially subject to treatment applications if threshold levels of target vectors are present and all other control alternatives have been considered and determined to be unsuitable.

The receiving water systems in Orange County which are potentially subject to pesticide applications by the District, include any and all navigable waters and their tributaries, waters of the State, and waters of the US, and any waters adjacent to District boundaries that breed mosquitoes, black flies, or midges (Table 1). This includes water features like the Santa Ana River and its tributaries, any and all flood control channels, basins, storm drains, gutters, roadside low spots, backyard pools, ponds, wetlands and any stagnant water feature found to be breeding mosquitoes exceeding threshold numbers.

Below is a list of the receiving waters in Orange County (Table 1). These features, their tributaries, lakes, reservoirs, marshes, unnamed drainages, ditches and the water conveyances and infrastructure throughout the county can be subject to mosquito control applications by the Orange County Mosquito and Vector Control District (Figure 1).

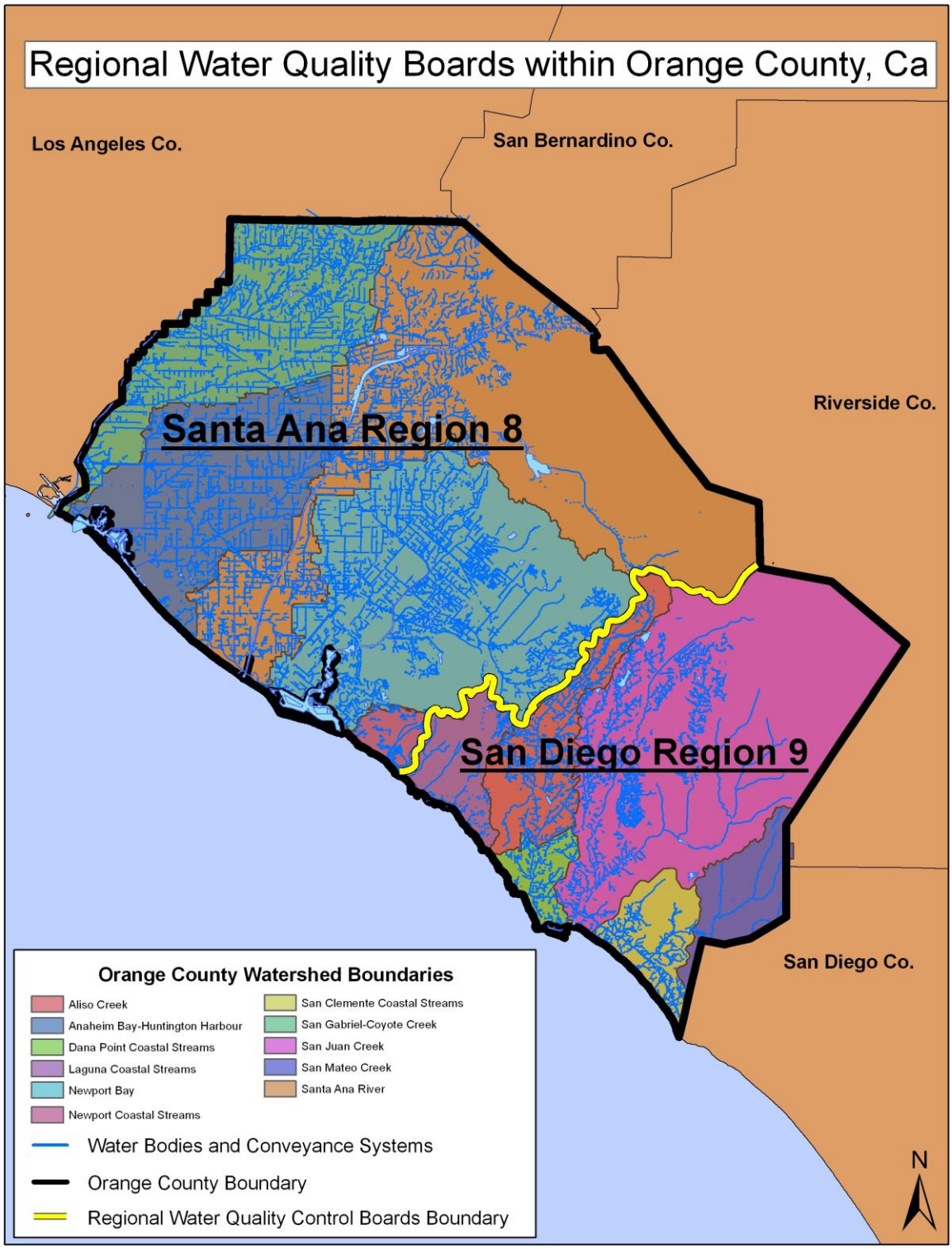


Figure 1. Regional Water Quality Control Board Boundaries, Watershed Boundaries, Water Bodies, and Conveyance Systems in Orange County.

Table 1. List of Orange County Receiving Waters by Water Quality Control Board Regions.

Santa Ana Region 8	**San Diego Region 9**
Anaheim Bay-Huntington Harbor	***Aliso Creek***
Bolsa Chica Channel	Wood Canyon
Bolsa Chica Wetlands	Sulphur Creek
East-Garden Grove Wintersburg Channel	Aliso Hills Channel
Westminster Channel	English Channel
Newport Bay	***Dana Point Harbor***
Big Canyon Wash	***Salt Creek***
Costa Mesa Channel	***Laguna Canyon Creek***
Santa Isabella Channel	Boat Canyon Drainage
Santa Ana Delhi	Blue Bird Canyon Drainage
San Diego Creek	Rim Rock Canyon Drainage
Peters Canyon Wash	Hobo Canyon Drainage
Newport Coast	Emerald Canyon Drainage
Muddy Creek	***Prima Deshecha Canada***
San Gabriel River	***Prima Deshecha***
Coyote Creek	***Segunda Deshecha Canada***
Carbon Creek	***San Juan Creek***
Santa Ana River	Arroyo Trabuco
Santiago Creek	Oso Creek
	San Mateo Creek
Numerous unnamed drainages and tributaries	**Numerous unnamed drainages and tributaries**

For more specific application areas/sites, see Section 4 of this document.

2 Pesticide Selection Factors

Discussion of the factors influencing the decision to select pesticide applications for mosquito vector control.

The District's Board of Trustees adopted an Integrated Vector Management & Response Plan (the IVM Plan) in May of 2010 (Appendix 1). To better address recent epidemics of West Nile virus, a supplement to the IVM Plan called the West Nile Virus Emergency Response Plan was adopted in August of 2015 (Appendix 2). The District's IVM Plan outlines surveillance and control measures for vectors in Orange County. The purpose of the IVM Plan is to provide guidelines to the District's staff and information to stakeholders regarding the various responses made to prevent and control disease vectors as well as introduced diseases and vectors in Orange County. This document details the roles and responsibilities of Management, Administration, Communications, Scientific/Technical, and Operations staff in responding to vector-borne disease threats. The responses are organized by vector species that cause illnesses in humans, domestic animals, and wildlife. The IVM Plan includes guidelines for surveillance for vectors and disease, site assessment, source reduction, biorational and chemical control methods, and public education. The IVM Plan establishes specific thresholds for the initiation of physical and chemical control based on vectors species and their abundance and the presence or absence of infective agents. Treatment thresholds are established for mosquito developmental sites in the IVM Plan where potential disease vector and/or nuisance risks are evident. 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/absence of natural enemies or predators, and presence of sensitive/endangered species IVM Plan (Appendix 1, pages 23-31 for larval mosquito control and pages 32-41 for adult mosquito control).

When thresholds are exceeded, an appropriate control strategy is implemented. Control strategies are selected to minimize potential environmental impacts while maximizing efficacy. The method of control is based on the above threshold criteria but also habitat type, water conditions and quality, weather conditions, cost, site accessibility, size of site and a number of other factors as specified in the IVM Plan (Appendix 1, pages 23-31 for larval mosquito control and pages 32-41 for adult mosquito control).

In following the principles of Integrated Vector Management, it is always the District's focus to first prevent mosquito and vector breeding/harborage through public education-this is also known as Cultural Control, which aims to influence or change the behavior of people so that their actions prevent the development of vector populations or the transmission of vector-borne disease. The next best option can be Physical Control (or Source Reduction)-this practice involves environmental manipulation that results in a reduction of vector development sites. Physical control is not always possible or feasible due to environmental regulations on some habitats and/or access restrictions. Another strategy is Biological Control, involving the use of a biological agent like mosquitofish which the District plants in neglected swimming pools that consume mosquito larvae as an alternative to pesticide use. Some conditions are not favorable or appropriate for mosquitofish use. Finally, after many factors have been considered, the District may need to use Chemical Control as a last resort treatment option.

Additional considerations are also drawn from and in accordance with the California Mosquito-Borne Virus and Surveillance & Response Plan (Appendix 3, pages 8-17). Additionally, each of the control methods and specific vector reduction guidelines (or best management practices) can be found in the District's Vector Reduction Manual: Procedures and Guidelines (Appendix 4, pages 11-35).

3 Types of Pesticide Products

The NPDES Permit for Biological and Residual Pesticide Discharges to Waters of the U.S. from Vector Control Applications was amended to list the approved active ingredients rather than having specific products named (Table 2). All pesticide label restrictions and instructions will be followed for pesticides, which fall under the "minimum risk" category. The minimum risk pesticides have been exempted from FIFRA requirements. Products will be applied by hand can, spray bottle, backpack, truck, all-terrain vehicle (ATV), and aircraft.

The types of pesticides used in mosquito control and the methods of applications are also discussed in detail and listed in the Best Management Practices for Mosquito Control in California (Appendix 5, Appendix A- Mosquito Control and Arbovirus Surveillance, pages 26-34 and Appendix B, Compounds Approved for Mosquito Control in California, pages 35-39).

Table 2 . List of Active Ingredients That May Be Used Under NPDES Permit.

Active Ingredients
Larvicides:
Bacillus thruingiensis subp. *israelensis* (*Bti*)
Lysinibacillus sphaericus (*Ls*) formerly *Bacillus sphaericus* (*Ls*)
Methoprene
Monomolecular Films
Petroleum Distillates
Spinosad
Temophos
Adulticides:
Deltamethrin
Etofenprox
Lambda-Cyhalothrin
Malathion
Naled
N-octyl bicycloheptene dicarboximide (MGK0264)
Piperonyl butoxide (PBO)
Permethrin
Prallethrin
Pyrethrin
Resmethrin
Sumithrin
In addition:
Any "minimum risk category" pesticides that are FIFRA exempt and registered for use in California and used in a manner specified in 40 C.F.R. section 152.25.

4 Description of Application Areas

Description of ALL the application areas and the target areas in the system that are being planned to be applied or may be applied. Provide a map showing these areas.

Any site that holds water for more than 96 hours (4 days) can produce mosquitoes. Source reduction is the District's preferred solution, and whenever possible the District works with property owners to affect long-term solutions to reduce or eliminate the need for continued applications as described in Section 2 above and in detail in the District's Vector Reduction Manual (Appendix 4, for policies see pages 1-7, for specific guidelines to reduce mosquitoes see pages 8-25). Mosquito breeding sources and areas that require adult mosquito control are difficult to predict from year to year based on the weather and variations in local environmental conditions. However, the typical sources treated by OCMVCD are listed in Table 3 below.

The targets for application projects are primarily the immature aquatic stages of insect vectors, including mosquitoes, midges, and black flies, which predominantly breed in standing or slow-moving water. These insect disease vectors may pose a threat to human public heath, especially due to the risk they may spread West Nile virus, and require treatment to eliminate or minimize the health risks. Using the District's IVM Plan (Appendix 1, pages 25-31 for larval mosquito control and pages 34-44 for adult mosquito control) decision matrix, District personnel use pesticides as a last resort to treat water features that have undesirable insect pest vectors exceeding threshold levels. Larvicides are applied at larval mosquito development sites which can include drainage channels, riparian areas, wetlands, roadside ditches, neglected swimming pools, ornamental ponds, catch basins, detention/retention basins, and potentially, any aquatic site or low lying area that has standing water for longer than 96 hours (Table 3). Many of these applications take place in urban watershed storm water conveyance systems. Exhibit 2 depicts the anticipated larviciding application areas within water conveyance systems throughout the County based on historical treatment application data. Additional application areas include breeding locations within the coastal wetlands, and intermittent or ephemeral streams.

Areas requiring larvicide applications are treated, as necessary, primarily from spring to late fall during the warmest months (approximately March – November). However, if vectors are a persistent problem at some locations, applications may be made year-round. Pesticides are applied only to water that will persist for at least 96 hours when a vector is present at threshold levels and when alternative measures are infeasible and/or unsuitable for the given conditions.

Directing our main efforts at controlling mosquito larvae allows the District to localize treatments and use the least toxic alternatives. Adult mosquitoes may occasionally be targeted for control. However, since pesticides must be applied over a greater area and are less selective, the District minimizes there use whenever possible. Currently, there are three sites in the County that are receive adulticide treatment when they exceed threshold levels due to persistent mosquito breeding conditions and their proximity to human populations (Exhibit 3). Those sites include the University of California, Irvine Regents Freshwater Marsh and Big Canyon Lake/Pond at the Upper Newport Bay Ecological Reserve, and Ladera Ranch Marsh near Arroyo Trabuco Creek adjacent to the Ladera Ranch Community in South Orange County.

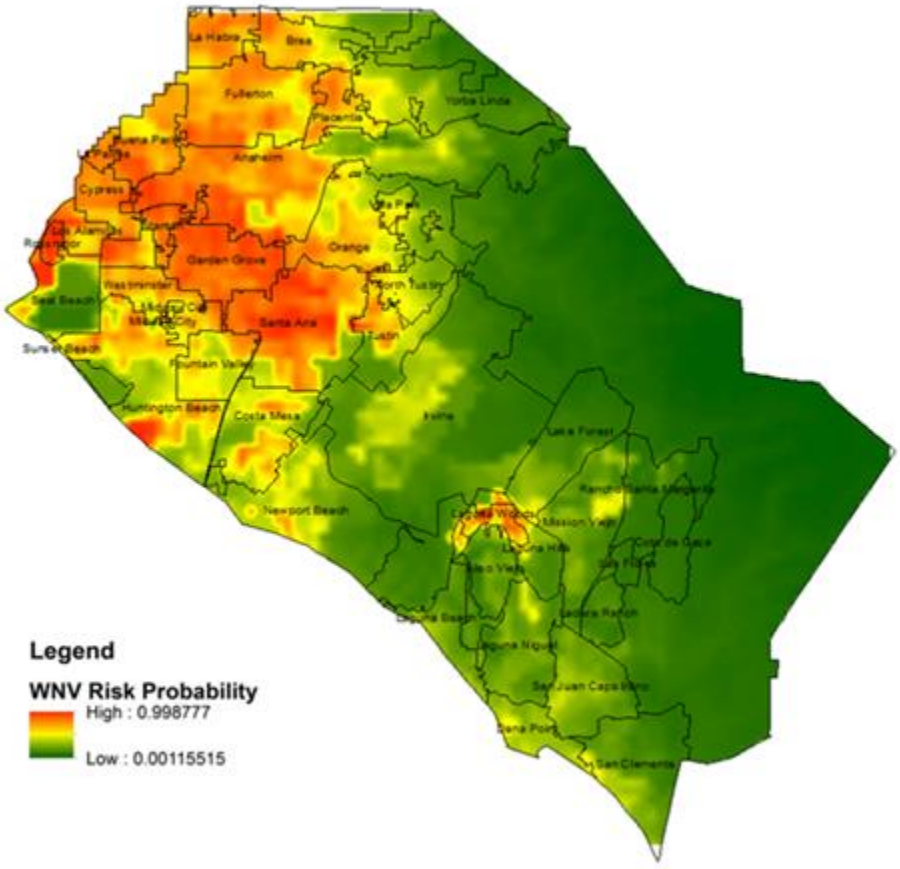
Table 3. List of Typical Sites That May be Targeted for Mosquito Control Applications in Orange County.

Source Type
Above Ground Spas
Agricultural Crop Ditches
Catch Basins
Cemetery Flower Containers
Cemetery Grounds
Containers
Creeks
Dams
Ditches
Drainages
Fish Ponds
Flood Control Channels
Fountains
Freeway Drainages
Freshwater Marshes
Gutters
Holes
Knot Holes
Lakes or Ponds
Misc. Standing Water
Mitigation Sites
Off Street Drains
Ornamental Ponds
Ornamental Streams
Pool and Spa Heaters
Rainwater Depressions
Rain Barrels
Reservoirs
Retarding Basins
Saltwater Marshes
Sewage/Settling Ponds
Sumps
Swimming Pools
Underground Storm Drains
Water Spreading

In 2014 and 2015 Orange County experienced consecutive epidemics of WNV resulting in 377 human infections resulting in 17 deaths. The area in Orange County with the highest risk of human WNV infection is seen in Figure 2 below. The area from where most human infections are reported is a highly urbanized, densely populated, flat landscape with aging stormwater infrastructure. In response to the back-to-back epidemics of WNV in 2014 and 2015, the District

expanded the adult mosquito control program to include the option to make aerial adulticide applications over high risk urban areas to mitigate a mosquito-borne disease outbreak. The triggers for this response option are detailed in the District's West Nile Virus Emergency Response Plan (Appendix 2).

Figure 2. West Nile virus High Risk Area Based on Environmental and Historical Surveillance Factors, 2004-2013.



5 Other Control Methods Used

Other control methods used (alternatives) and their limitations.

With any mosquito or other vector source, the District's first goal is to look for ways to eliminate the source, or, if that is not possible, for ways to reduce the vector potential. The most commonly used methods and their limitations are included in the Best Management Practices for Mosquito Control in California (Appendix 5, pages 4-19). The following is an excerpt from Appendix A of the Best Management Practices for Mosquito Control in California (Appendix 3, [Appendix A- Mosquito Control and Arbovirus Surveillance, pages 26-27]) called Mosquito Control and Arbovirus Surveillance:

Environmental Management

Manipulating or eliminating potential mosquito breeding sources can provide dramatic reductions in mosquito populations. There are three levels of environmental management.

1. *Source elimination: This approach completely eliminates potential habitats for mosquitoes. This strategy is generally limited to artificial habitats created by urbanization. Examples of source elimination include emptying or turning over containers holding water, filling in holes containing water with sand or gravel, cleaning drainage ditches of debris, and covering or inverting structures and vessels that could hold water.*
2. *Source reduction: This strategy aims to alter and sometimes eliminate available habitat for larvae which substantially reduces mosquito breeding and the need for repeatedly applying pesticides. Unlike source elimination, standing water may exist but the total amount of water, or the time the water is left standing, is greatly reduced. Source reduction may require some maintenance (see below) to prevent further mosquito breeding. Examples of source reduction include limiting the growth of emergent vegetation in wetlands and ponds, constructing drainage ditches to remove water from areas prone to flooding, and clearing stormwater channels of silt and debris. Routine larval monitoring can indicate whether these efforts are effective or need further action.*
3. *Source maintenance: When eliminating or significantly altering mosquito breeding sources is prohibited and/or inappropriate, reducing the number of sheltered, predator-free habitats while having minimal impact on the surrounding environment can make an area unsuitable for mosquitoes. Source maintenance can include water management, vegetation management, wetland infrastructure maintenance, and wetland restoration. Strategic, focused plans must be developed for each site.*

Biological Control

Biological control uses predators, parasites, or pathogens to reduce populations of mosquito larvae and is often combined with environmental management to enhance results. The mosquitofish (Gambusia affinis) has been used to control mosquitoes in California since 1921 and is the most widely used biological control agent in the world. These small fish are effective against mosquito larvae because they grow and reproduce rapidly, feed at the water surface where mosquito larvae are found, and tolerate a wide range of temperature and water quality. Other fish are occasionally used with mixed success. Fish are most effective in permanent ponds and wetlands, but are also used in rice fields and stormwater canals with permanent water.

Many local mosquito control agencies propagate mosquito eating fish. Although many other animals have been tested for mosquito control, and in natural wetlands predation is an important factor in reducing mosquito production, biological control by the intentional addition of mosquito predators other than mosquitofish is largely experimental rather than operational.

There are inherent limitations to these alternative control measures. The limiting factors with Environmental Management (also referred to as physical control and/or source reduction) can be complex. In cases where appropriate and feasible, the District conducts or advises on environmental management control strategies like source elimination, source reduction and source maintenance with the cooperation of property owners and land managers, and under appropriate regulatory guidelines. The District's Vector Reduction Program is outlined in the Vector Reduction Manual: Procedures & Guidelines (VRM) (Appendix). This document describes how the District aims to work with property owners to reduce or eliminate vector-favorable conditions by encouraging the implementation of Vector Reduction Guidelines (for specific guidelines to reduce mosquitoes see pages 8-25), which are based on IVM techniques and strategies. Some specific methods used by the District include educating residents that mosquitoes develop in standing water and encouraging them to remove sources of standing water on their property, working with property owners to find long-term water/environmental management strategies that meet their needs while minimizing the need for public health pesticide applications.

The District's Biological Control practices include the use of mosquitofish, *Gambusia affinis*, primarily in neglected swimming pools and other impoundments. The limiting factors to the use of mosquitofish include considerations about appropriate habitat, water quality, persistence of water source, and availability.

6 Anticipated Product Amounts

Approximately how much product is needed/anticipated to be used and how this amount was determined.

The need to apply product is determined by surveillance. Actual use varies annually depending on mosquito abundance. The total amounts of mosquito control pesticides applied to or near waters of the US by the District from January 2015 – December 2015 are shown in Table 4 below. These amounts serve as an approximation of the amount of product anticipated for use in 2016 and subsequent years. Several factors influence the amounts of pesticides applied, which can include rainfall, weather patterns, disease outbreak, and availability of products. Other public health pesticides in addition to those listed below may be used as part of the District's best management practices.

Table 4. Pesticide Usage for Mosquito Control by OCMVCD (January 2015 – December 2015) to or Near Waters of the US.

ACTIVE INGREDIENT	UNITS	AMOUNT USED	No. of Applications
Petroleum Distillate	GAL	8484	902
(S)-Methoprene Liquid	OZ	15	2
(S)-Methoprene Pellets	LBS	12.4	14
(S)-Methoprene XR	BRIQ	469	28
(S)-Methoprene Briquettes	BRIQ	61	3
Monomolecular Films	OZ	205.2	4
Spinosad Liquid	OZ	64.2	14
Spinosad 30 Day Tablet	TAB	143	30
Spinosad XRT	TAB	767	207
Bti Liquid	OZ	2776.1	58
Bti Granules	LBS	4919	441
Bti/Ls Granules	LBS	10196.2	1226
Bti/Ls 180 Dday Briquettes	BRIQ	849	26
Sumithrin	GAL	21.3	72

7 Monitoring Locations

Representative monitoring locations and the justification for selecting these monitoring locations.

Please see the MVCAC NPDES Coalition Monitoring Plan.

8 Evaluation of Available BMPs

Evaluation of available BMPs to determine if there are feasible alternatives to the selected pesticide application project that could reduce potential water quality impacts.

The District uses BMPs described in its own IVM Plan (Appendix 1, pages 3, 6, and 23-40) and Vector Reduction Manual (Appendix , pages 1-7 and 8-25), as well as practices in accordance with state guidelines from the Best Management Practices for Mosquito Control in California (Appendix 5, pages 4-19) and the California Mosquito-borne Virus and Surveillance & Response Plan (Appendix 3, pages 4-8).

The protocol for these evaluations is discussed in the aforementioned documents and in Sections 2 and 5 above. Best management practices are continually evaluated through ongoing inspection and surveillance methods, review or reassessment of alternative control options prior to each pesticide application, treatment effectiveness evaluations, pursuit of long-term or preventative source reduction, educational or biological solutions.

9 Description of BMPs

Description of the BMPs to be implemented. The BMPs shall include, at the minimum.
The District uses BMPs described in its own IVM Plan (Appendix 1, pages 3, 6, and 23-40) and Vector Reduction Manual (Appendix 4, pages 1-7 and 8-25), as well as practices in accordance with state guidelines from the Best Management Practices for Mosquito Control in California (Appendix 5, pages 4-19) and the California Mosquito-borne Virus and Surveillance & Response Plan (Appendix 3, pages 4-8).

Specific elements have been highlighted below under items 9.1-9.6:

9.1 Measures to Prevent Pesticide Spill

District staff monitors application equipment on a daily basis to ensure it remains in proper working order. Spill mitigation devices are placed in all spray vehicles and pesticide storage areas to respond to spills. Employees are trained on spill prevention and response annually. All safety, handling, and use requirements and instructions are followed per pesticide product labels and Safety Data Sheets.

9.2 Measures to Ensure Minimum and Consistent Amount Used

Spray equipment is calibrated each year as stipulated inthe Cooperative Agreement, a Memorandum of Understanding with the California Department of Public Health. All safety, handling, and use requirements and instructions are followed per pesticide product labels and Safety Data Sheets.

9.3 Applicator Education on Adverse Effects of Pesticide Application

The California Vector Control Technician Certification and Continuing Education Guidelines (CPDH, 2007) describes all topics that vector control technicians are trained and certified in. Applicators are required to complete pesticide and safety training annually. Records are kept of these training sessions for review by the local Agricultural Commissioner and/or CDPH. Additionally, District technicians are given an annual Environmental Awareness Training per District CEQA compliance requirements which includes NPDES Permit training.

9.4 Descriptions of Specific BMPs for Each Application Mode

The District calibrates truck-mounted, backpack and handheld equipment each year to meet application specifications. Supervisors review application records daily to ensure appropriate amounts of material are used. Ground-based Ultra Low Volume (ULV) application equipment is calibrated for output and droplet size to meet label requirements. Aerial larviciding equipment is calibrated by the Contractor. Aerial adulticide equipment is calibrated at a minimum of once per year (by the Contractor) and as needed based on the efficacy results and total amount of product used per event. Droplet size are monitored by the District to ensure droplets meet label requirements. Airplanes used in ULV applications are equipped with advanced guidance and drift management equipment to ensure the best available technology is being used to place product in the intended target area.

All safety, handling, and use requirements and instructions are followed per pesticide product labels and Safety Data Sheets.

9.5 BMPs for Pesticide Products Used

Please see the Best Management Practices for Mosquito Control in California (Appendix 5, [Appendix A- Mosquito Control and Arbovirus Surveillance, pages 26-34 and Appendix B, Compounds Approved for Mosquito Control in California, pages 35-39]) for general pesticide application BMPs, and the current approved pesticide labels for application BMPs for specific products.

9.6 BMPs for Environmental Setting

The District uses environmental setting, specific BMPs described in its own IVM Plan (Appendix 1, pages 25-44) and Vector Reduction Manual (Appendix 4, pages 8-25), as well as practices in accordance with state guidelines from Best Management Practices for Mosquito Control in California (Appendix 5, pages 4-19) and the California Mosquito-borne Virus and Surveillance & Response Plan (Appendix 3, pages 4-17).
The District has an agency-specific Vector Reduction Program which is outlined in its Vector Reduction Manual: Procedures & Guidelines (the VRM) (Appendix 4, pages 8-25). This document describes how the District aims to work with property owners to reduce or eliminate vector-favorable conditions by encouraging the implementation of Vector Reduction Guidelines, which are based on IVM techniques and strategies. This document includes specific vector reduction guidelines (or BMPs) for the following environmental settings:

Residential and Commercial Mosquito Sources
Low Impact Developments (LIDs)
Ornamental Ponds and Water Features
Tire Storage
Sprinkler and Irrigation Systems
Nurseries
Cemeteries
Golf Courses
Equestrian Facilities
Agriculture
Wetlands
Stormwater Systems and Urban Runoff
- Above Ground Structures
- Underground Structures
- Flood Channels
- Natural Watercourses
- Freeway Drains
- Wastewater Management

The District works extensively with property owners, land managers, cities, engineers, stormwater programs, regulatory agencies, and other interests to minimize vector production and harborage throughout Orange County and the region.

10 Identification of the Problem

Prior to first pesticide application covered under this General Permit that will result in a discharge of biological and residual pesticides to waters of the US, and at least once each calendar year thereafter prior to the first pesticide application for that calendar year, the Discharger must do the following for each vector management area:

10.1 Establishment of Vector Populations

If applicable, Establish densities for larval and adult vector populations to serve as action threshold(s) for implementing pest management strategies;

Only those mosquito sources that District staff determines to represent imminent threats to public health or quality of life are treated. The presence of any mosquito may necessitate treatment, however higher thresholds may be applied depending on the District's resources, disease activity, or local needs. Treatment thresholds are based on a combination of one or more of the following criteria: mosquito species present, mosquito stage of development, pest, nuisance, or disease potential, disease activity, mosquito abundance, flight range, proximity to populated areas, size of source, presence/absence of natural enemies or predators, and presence of sensitive/endangered species or habitats. This is discussed in detail in the District's IVM Plan (Appendix 1, pages 25-44).

10.2 Identification of Target Vector Species

Identify target vector species to develop species-specific pest management strategies based on developmental and behavioral considerations for each species;

The District addresses this practice as discussed in its IVM Plan (Appendix 1, page 4-6) and Vector Reduction Manual (Appendix 4, pages 8-10), as well as practices in accordance with state guidelines from the Best Management Practices for Mosquito Control in California (Appendix53, pages 2-3 and [Appendix D-Mosquitoes of California, pages 42-45, and Appendix E-Typical Larval habitats of California Mosquitoes, page 46]) and the California Mosquito-borne Virus and Surveillance & Response Plan (Appendix32, pages 4-11) that are used by this agency.

Twenty-fourspecies of mosquitoes occur within Orange County, and their control is the primary focus of the District's activities.Certain species of mosquitoes found within Orange County can transmit West Nile virus (WNV), St. Louis encephalitis (SLE), western equine encephalitis (WEE), malaria, and potentially other viruses to humans. West Nile virus is also a threat to wildlife, primarily birds, and has contributed to thousands of bird deaths, including special status species, in Orange County since 2004. A few species of mosquitoes are also capable of transmitting dog heartworm and other viral diseases, including myxomatosis, to both domestic and wild animals. Although some species of mosquitoes have not been shown to transmit disease, most species can cause human discomfort from bites that are inflicted to obtain a blood meal. Reactions range from irritation in the area of the bite to severe allergic reactions to 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.

In 2015, multiple introductions of two invasive mosquitoes were detected in Orange County. The Asian tiger mosquito (*Aedes albopicuts*) and the yellow fever mosquito (*Aedes aegypti*) are now known to infest several neighborhoods in nine Orange County cities. The likelihood of eradication of these species is low. With their introduction and establishment in the County, these aggressive day-biting mosquitoes bring the potential to spread viruses not currently endemic to the area such as yellow fever, dengue, chikungunya, and Zika. The District is working diligently to educate residents about their role in eliminating backyard sources to suppress these container breeding species.

In general, the District may coordinate (or advise) the flowing with the property owners or land managers based on species-specific vector management strategies:

Standing –Water Mosquitoes prefer water commonly found in ornamental ponds, unmaintained swimming pools, freeway drains, stormwater systems, natural waterways, and flood control channels.

Common Mosquito Reduction Guidelines:

a. Drain standing water.
b. Reduce or eliminate emergent vegetation in and along the edges of the water.
c. Hold water level constant to encourage natural predators or biological control agents (e.g. mosquito fish).

Container Mosquitoes prefer contained areas of water, such as tree holes, buckets, tires, etc. Some standing water mosquitoes will also develop in containers.

Common Mosquito Reduction Guidelines:

a. Drain containers of standing water.
b. Cover, overturn, or create drainage holes that prevent standing water in the container.
c. Identify and prevent water from refilling containers.

Salt Water Mosquitoes lay their eggs on moist soil and vegetation. When they become submerged, due to tidal fluctuations or heavy rains, the eggs hatch.

Common Mosquito Reduction Guidelines:

a. Flood when air temperatures do not encourage rapid mosquito development (late fall rather than summer).
b. Reduce or eliminate emergent vegetation.
c. Flood quickly to encourage all eggs to hatch at once and minimize the need for multiple larvicide applications.

10.3 Identification of Known Breeding Areas

Identify known breeding areas for source reduction, larval control programs and habitat management;

Any site that holds water for more than 96 hours (4 days) can produce mosquitoes. Source reduction is the District's preferred solution, and whenever possible, the District works with property owners to implement long-term solutions to reduce or eliminate the need for continued applications as described in Section 2 above. Further, the District address this practice as discussed in its IVM Plan (Appendix 1, pages 23-41) and Vector Reduction Manual (Appendix 4, pages 1-7), as well as practices in accordance with state guidelines from the Best Management Practices for Mosquito Control in California (Appendix 5 [Appendix A- Mosquito Control and Arbovirus Surveillance, pages 26-32]) and the California Mosquito-borne Virus and Surveillance & Response Plan (Appendix 3, pages 4-11).

10.4 Analysis of Surveillance Data

Analyze existing surveillance data to identify new or unidentified sources of vector problems as well as areas that have recurring vector problems.

The District continually collects adult and larval mosquito surveillance data, dead bird reports, avian seroprevalence test results, and uses them to guide mosquito control activities. The District uses Geographic Information Systems (GIS) technology to analyze these data along with service requests and work records to monitor changes in abundance and distribution of mosquitoes and other target vector species. Also, annual aerial surveillance reveals possible neglected pools and other potential mosquito breeding sources. The District utilizes mosquito surveillance traps on a weekly basis to obtain appropriate mosquito abundance and disease activity data to guide control decisions.

This is further described in the District's IVM Plan (Appendix 1, pages 23-41) and in accordance with the California Mosquito-borne Virus and Surveillance & Response Plan (Appendix 3, pages 4-11).

11 Examination of Alternatives to Treatments

Dischargers shall continue to examine alternatives to pesticide use to reduce the need for applying larvicides that contain temephos and for spraying adulticides. Such methods include:

a. Evaluating the following management options, in which the impact to water quality, impact to non-target organisms, vector resistance, feasibility, and cost effectiveness should be considered:
• No action
• Prevention
• Mechanical or physical methods
• Cultural methods
• Biological control agents
• Pesticides

The District uses the principles and practices of Integrated Vector Management (IVM) as described in its agency specific Integrated Vector Management and Response Plan (Appendix 1, pages 2-3,6, and 23-41), its Vector Reduction Manual: Procedures and Guidelines (Appendix 4, pages 1-7 and pages 8-25) and discussed in Section2 above. As stated in Item 10 above, locations where vectors may exist are assessed, and the potential for using alternatives to pesticides is determined on a case-by-case basis. Commonly considered alternatives include: 1) Eliminate artificial sources of standing water; 2) Ensure temporary sources of surface water drain within four days (96 hours) to prevent adult mosquitoes from developing; 3) Control plant growth in ponds, ditches, and shallow wetlands; 4) Design facilities and water conveyance and/or holding structures to minimize the potential for producing mosquitoes; and 5) Use appropriate biological control methods that are available. Additional alternatives to using pesticides for managing mosquitoes are listed on pages 8-35 of the District's Vector Reduction Manual: Procedures and Guidelines (Appendix 4).

If there are no alternatives to pesticides, dischargers shall use the least amount of pesticide necessary to effectively control the target pest.

b. Applying pesticides only when vector are present at a level that will constitute a nuisance

c. Using the least intrusive method of pesticide application.

d. Public education efforts to reduce potential vector breeding habitat.

e. Applying a decision matrix concept to the choice of the most appropriate formulation.

The District uses the principles and practices of Integrated Vector Management (IVM) as described in its agency specific Integrated Vector Management and Response Plan (Appendix 1 pages 2-3, 6, and 23-41). Implementing preferred alternatives depends on a variety of factors including availability of agency resources, cooperation with stakeholders, coordination with

other regulatory agencies, and the anticipated efficacy of the alternative. If a pesticide-free alternative does not sufficiently reduce the risk to public health, pesticides are considered, beginning with the least amount necessary to effectively control the target vector.

A "nuisance" is specifically defined in California Health and Safety Code (HSC) §2002(j). This definition allows vector control agencies to address situations where even a low number of vectors may pose a substantial threat to public health and quality of life. In practice, the definition of a "nuisance" is generally only part of a decision to apply pesticides to areas covered under this permit. As summarized in the California Mosquito-borne Virus Surveillance and Response Plan, the overall risk to the public when vectors and/or vector-borne disease are present is used to select an available and appropriate material, rate, and application method to address that risk in the context of our IVM program.

12 Correct Use of Pesticides

Users Coalition's or Discharger's use of pesticides must ensure that all reasonable precautions are taken to minimize the impacts caused by pesticide applications. Reasonable precautions include using the right spraying techniques and equipment, taking account of weather conditions and the need to protect the environment.

This is an existing practice of the District, and is required to comply with the Department of Pesticide Regulation's (DPR) requirements and the terms of our California Department of Public Health (CDPH) Cooperative Agreement. All pesticide applicators receive annual safety and spill training in addition to their regular continuing education. All errors in application and spills are reported to the proper authority.

13 Public Notices

Specify a website where public notices, required in Section VIII.B, may be found.

Public notices will be posted on the District website (www.ocvcd.org).

A distribution list of potentially affected government agencies was provided as part of the Notice of Intent Application.

14 References

Best Management Practices for Mosquito Control in California. 2010. Available by download from the California Department of Public Health—Vector-Borne Disease Section at http://www.westnile.ca.gov/resources.php under the heading *Mosquito Control and Repellent Information*. Copies may be also requested by calling the California Department of Public Health—Vector-Borne Disease Section at (916) 552-9730 or the Orange County Vector Control District at (714) 971-2421.

California Department of Public Health. 1989. The California Vector Control Technician Certification and Continuing Education Guidelines (2007 Revision). Accessed 3/03/2011 http://www.cdph.ca.gov/certlic/occupations/Documents/VCTCEGuide.pdf

California Mosquito-borne Virus Surveillance and Response Plan. 2010. [Note: this document is updated annually by CDPH]. . Available by download from the California Department of Public Health—Vector-Borne Disease Section at http://www.westnile.ca.gov/resources.php under the heading *Response Plans and Guidelines*. Copies may be also requested by calling the California Department of Public Health—Vector-Borne Disease Section at (916) 552-9730 or the Orange County Vector Control District at (714) 971-2421.

County of Orange. 2008. Orange County General Plan 2005 (2008 Revision). Accessed 3/03/2011 http://www.ocplanning.net/GeneralPlan2005.aspx

MVCAC NPDES Coalition Monitoring Plan. 2011. Posted on SWRCB website: http://www.waterboards.ca.gov/water_issues/programs/npdes/docs/aquatic/vectorcontrol/mvcac.pdf

Orange County Mosquito and Vector Control District's Integrated Vector Management and Response Plan. 2010. http://www.ocvcd.org/documents/CA_Integrated_VMRG_6-9-10.pdf

Orange County Mosquito and Vector Control District's West Nile Virus Emergency Response Plan. 2015. http://www.ocvcd.org/documents/OCMVCD_Emergency_FINAL.pdf.

Orange County Vector Control District Vector Reduction Manual: Procedures and Guidelines. 2010. http://www.ocvcd.org/documents/VectorReductionFinal.pdf

State Water Resources Control Board (SWRCB), 2011, Water Quality Order No. 2011-0002-DWQ, Statewide General National Pollutant Discharge Elimination System Permit For Biological and Residual Pesticide Discharges to Waters of Waters Of The United States From Vector Control Vector Control Applications (General Permit No. CAG 990004).