COUNTY OF SAN DIEGO

AEDES TRANSMITTED DISEASE STRATEGIC RESPONSE PLAN

Department of Environmental Health
Vector Control Program

2018

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Purpose

The *Aedes* Transmitted Disease Strategic Response Plan provides the basis for implementing an integrated, risk-based response to limit the risk of disease transmission by invasive *Aedes* species mosquitoes, such as *Aedes albopictus* (also known as the Asian tiger mosquito) and *Aedes aegypti* (also known as the yellow fever mosquito). The Plan describes the County of San Diego, Department of Environmental Health - Vector Control Program's strategy to protect residents from diseases transmitted by these mosquitoes.

Introduction

The County Department of Environmental Health Vector Control Program (VCP) is responsible for mosquito and vector-borne disease surveillance and control services in all 18 incorporated cities and the unincorporated areas of San Diego County. The VCP has been reducing and controlling mosquitoes and other vectors and protecting the county against vector-borne diseases for over 40 years. The VCP is funded by a service charge and benefit assessment. The benefit assessment is reassessed and approved by the County Board of Supervisors annually.

In 2003, West Nile virus (WNV) was detected in San Diego (Reisen *et al*., 2004) and a West Nile Virus Strategic Response Plan was created to protect public health. In 2014 and 2015, two non-native invasive mosquitoes, *Aedes aegypti* and *Aedes albopictus*, respectively, were detected in San Diego. The biology of invasive *Aedes* mosquitoes and the diseases they carry differ from the mosquitoes that commonly transmit WNV. *Aedes aegypti* and *Aedes albopictus* are collectively referred to as *Aedes* in this document. They prefer to feed on people, breed in small stagnant water sources often found in and around homes, and aggressively bite during the day. Invasive *Aedes* can transmit dengue, chikungunya, yellow fever, and Zika viruses (referred to as *Aedes*-transmitted-diseases or ATD), and their eggs can survive without water for greater than one year (Faull and Williams, 2015). *Aedes* have been found infected with WNV, however, because they prefer human hosts to bird hosts, they are not considered to be a significant vector of WNV.

There is no simple solution to eradicating *Aedes* or preventing all ATDs. Fortunately, the VCP has employed integrated vector management strategies for many decades to thwart other mosquitoes and the diseases they carry (such as WNV). These strategies have been adapted and applied to prevent the spread of ATDs and are described in this **AEDES TRANSMITTED DISEASE STRATEGIC RESPONSE PLAN** (ATD-SRP). The ATD-SRP is based on published research, current state and federal guidelines, and VCP experience and is updated as new information becomes available.

History

"Invasive" *Aedes* were most likely introduced into the United States, in Hawaii, in the late-19th century. *Aedes albopictus* was discovered in Houston, Texas, in August 1985, and rapidly spread throughout the southern and eastern United States. In California, the discoveries of *Aedes albopictus* in 2011 in Los Angeles County, and *Aedes aegypti* in 2013 in urban areas of Fresno, Madera, and San Mateo counties demonstrated that California is vulnerable to colonization of these highly invasive mosquitoes as well (Zhong et al., 2013; Metzger et al., 2017).

On October 6, 2014, *Aedes aegypti* was detected at the 32nd Street Naval Station in San Diego and one year later, in September 2015, *Aedes albopictus* was found in the Barrio Logan neighborhood. A third invasive *Aedes* mosquito, *Aedes notoscriptus*, was discovered in Monterey Park (Los Angeles County) in 2014; it is the primary vector for Ross River and Barmah Forest viruses in Australia. Although other native species of *Aedes* mosquitoes exist within San Diego County, none are as potentially harmful as *Aedes aegypti* and *Aedes albopictus*, and thus, *Aedes* refers to these two species in this document.

It is not yet known how *Aedes aegypti, Aedes albopictus, a*nd *Aedes notoscriptus* entered California, however, *Aedes aegypti* found in Los Angeles and San Diego counties are genetically similar to *Aedes* found in Arizona, New Mexico, and Mexico (Pless et al., 2016). In contrast, *Aedes aegypti* infestations in northern California match strains endemic in Texas (Gloria-Soria et al., 2014). Furthermore, *Aedes albopictus* infestations in Los Angeles County match the genetic profile of a previous *Aedes albopictus* infestation in Los Angeles in 2001 that arose from lucky bamboo shipments originating from China, thus, it is presumed that the infestation was not eradicated and remained undetected until 2011 (Zhong et al., 2013). *Aedes albopictus* was found in a nursery in San Diego's North County in 2001, which was followed by treatment by VCP. Treatment resulted in the successful eradication of *Aedes* in this area. However, control efforts, including adulticide applications, have not eliminated *Aedes* populations throughout the rest of California.

As of December 1, 2017, *Aedes aegypti* or *Aedes albopictus* have been found in 13 counties (22% of the counties in California) and 209 cities and unincorporated areas in California (*Figure* 1. Invasive Aedes detections in California, 2011-2017.

Figure 2. Aedes disease transmission cycle.Figure 3). The latest results are available at: https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/Aedes-aegypti-and-Aedes-albopictus-mosquitoes.aspx

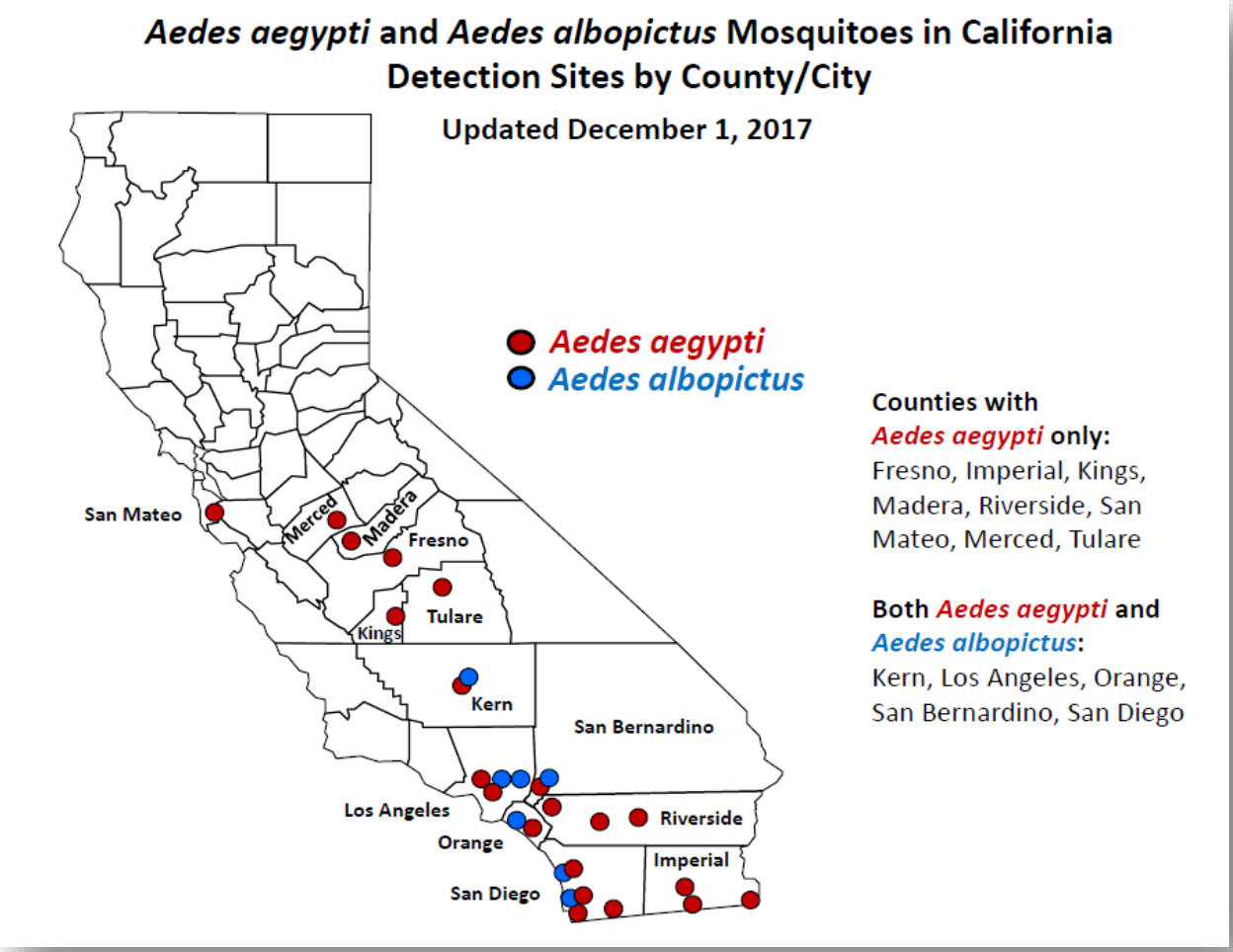

Figure 1. Invasive Aedes *detections in California, 2011-2017.*

Risks

Aedes is the primary vector of human pathogens, such as dengue, chikungunya, yellow fever, Mayaro, and Zika viruses. Unlike WNV, these viruses do not circulate in a wildlife reservoir in the U.S., but are usually brought into the country by people that become infected while visiting a country in which the viruses are circulating. Therefore, containing disease spread relies on quickly identifying infected individuals, determining where they may have been exposed and preventing *Aedes* mosquitoes from biting them while the virus is in their blood (*Figure 2*).

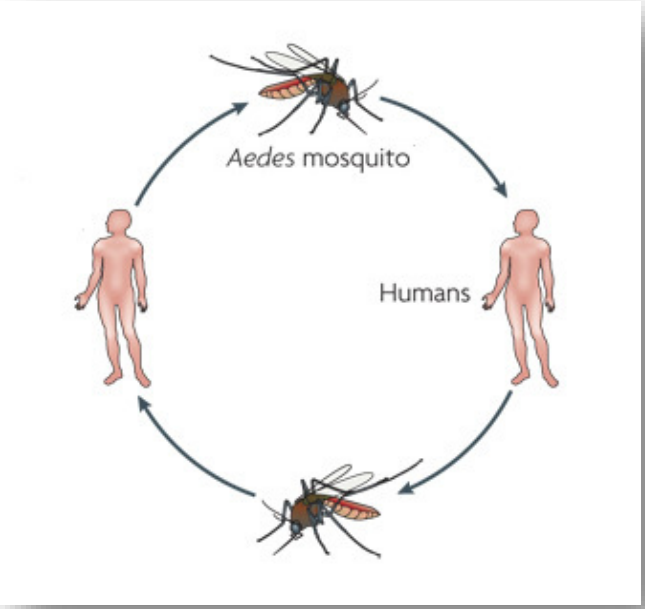

Figure 4. Aedes disease transmission cycle.

Aedes prefer to feed on people and are well adapted to living in close proximity to humans. They breed in small, water-holding containers found around homes, such as pots, unused tires, tubs, tree holes, tarps, rain gutters, fountains, and birdbaths. They may also breed underground in irrigation and storm drains. Larvae can develop in water held by living plants, such as bromeliad axils (phytotelmata). In addition, *Aedes* are aggressive day-biting pests and breed indoors, as well as outdoors. They do not fly far from their breeding site, usually less than 150 meters.

The most notable physical characteristic of *Aedes* is white stripes (scales) on the back of the thorax (scutum) and legs. *Aedes albopictus* (*Figure 3*) has a white stripe down the center of the scutum, while *Aedes aegypti* has a white lyre-shaped marking on its scutum (*Figure 4*).

Figure 7. Aedes albopictus. Credit: University of Florida and Jared Dever, respectively.

Figure 8. Aedes albopictus. Credit: University of Florida and Jared Dever, respectively.

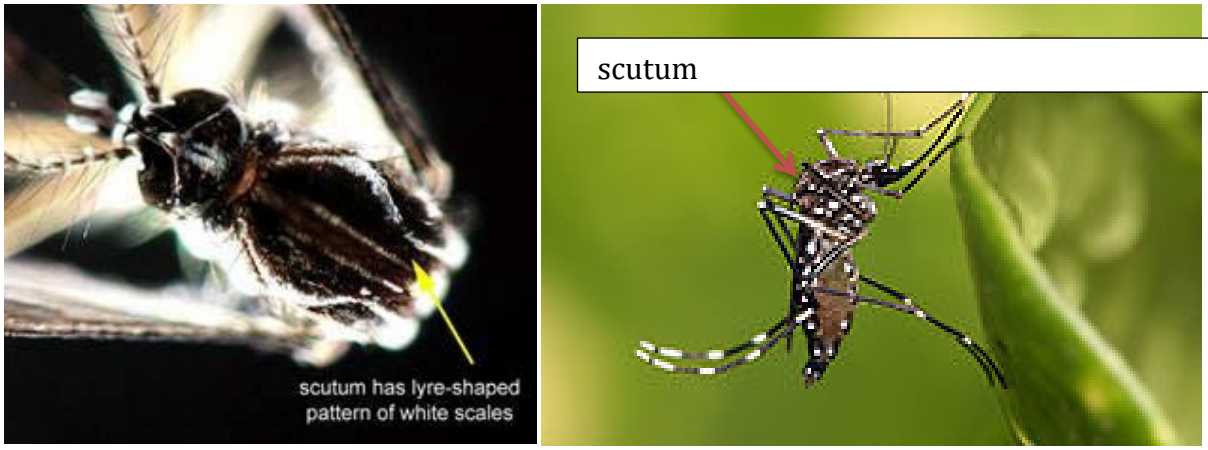

Figure 10. Aedes aegypti. Credit: University of Florida.

Figure 11. Example of possible Zika transmission timeline.Figure 12. Aedes aegypti. Credit: University of Florida.

Goals

Because *Aedes* breed in small, cryptic locations, many of which cannot be found, reached or treated by the VCP, eradication of *Aedes* mosquitoes from San Diego County is unlikely. However, control of *Aedes* breeding in urban and man-made water sources is possible with the participation of County residents through elimination of *Aedes* breeding sources from their properties. The VCP goals are to mitigate the impacts of *Aedes* to the health, well-being, and economy of the County by: 1) limiting *Aedes* numbers, 2) educating residents how to prevent *Aedes* from breeding in their homes, 3) preventing local mosquito transmission of ATD, and 4) preventing sustained transmission of ATD. These goals are met using an integrated pest management approach that encompasses following:

1. **Surveillance** of *Aedes* and human cases of diseases transmitted by *Aedes,* and assessing *Aedes* susceptibility to insecticides
2. **Testing** of *Aedes* for pathogenic viruses
3. **Control** of *Aedes* populations and elimination of small stagnant water sources so that they no longer breed mosquitoes
4. **Outreach** to the public on how to prevent infection and mosquito breeding

1) Surveillance
   a. *Goal: To monitor the levels and distribution of Aedes and Aedes-transmitted diseases in San Diego County and to ascertain their genetic predisposition and/or susceptibility to insecticides.*

   VCP Surveillance will:

i. Set mosquito traps (Biogent sentinel mosquito trap, Autocidal gravid mosquito trap, Encephalitis virus surveillance mosquito trap+lure, Gravid Aedes trap, etc.) to monitor at-risk areas of the County for *Aedes* activity;
ii. Set traps within an approximately 150-meter radius from highly suspect and confirmed ATD cases to test for presence of *Aedes* mosquitoes; and
iii. Periodically test *Aedes* for genetic predisposition and/or susceptibility to insecticides used by the VCP.

2) Testing
   a. *Goal: To rapidly detect dengue, chikungunya, Zika and other viruses in Aedes populations so that the VCP can rapidly respond to elevated health risks.*

   Vector Disease and Diagnostic Laboratory will:
   i. Test female *Aedes* via real-time reverse transcriptase-polymerase chain reaction (RT-PCR) for ATDs. *Aedes* collected from the vicinity of a viremic case will be tested for the same virus that the case is infected with; and
   ii. Send RNA from positive samples to the UC Davis Arbovirus Research and Training laboratory for confirmation.
3) Control
   a. *Goal: To find and eliminate Aedes breeding sources, to decrease the number of immature and adult Aedes and to prevent local mosquito transmission of ATDs.*

   VCP Control will:
   i. Respond to complaints of daytime or indoor biting by mosquitoes by assessing properties for breeding locations; eliminating small stagnant water sources, applying larvicide, and/or residual adulticide products to breeding locations that cannot be eliminated; and, in cases of an elevated health risk, using ultra-low volume (ULV) aerosolized insecticide sprays to kill adult mosquitoes.

4) Outreach
   a. *Goal: To educate the public about Aedes mosquitoes and the diseases they can transmit, how to prevent their breeding, and how to protect oneself from mosquito bites.*

   VCP Outreach will:
   i. Maintain the website (www.sdfightthebite.com) with information on *Aedes* and VCP operations to prevent ATD transmission;
   ii. Provide updated maps of where *Aedes* has been detected in the county;
   iii. Develop brochures, presentations, and media campaigns to educate the public about *Aedes* and how to prevent them from breeding at homes; and
   iv. Inform residents within areas that are scheduled to be treated to control adult mosquitoes by preparing informational door hangers and sandwich boards, posting up-to-date informational web pages, and staff a phone line to answer questions regarding mosquito control operations, (858) 694-2888.

Phases

Response to *Aedes* is structured as a phased, risk-based continuum that is based on parameters described in the Zika Centers for Disease Control and Prevention (CDC) Interim Response Plan (May 2017) and the California Department of Public Health Guidance for Surveillance of and Response to invasive *Aedes* mosquitoes and dengue, chikungunya and Zika in California (Feb. 2017). The continuum includes mosquito season preparedness and graduated action in response to the following:

1. Detection of *Aedes* mosquitoes;
2. Detection of imported cases of *Aedes*-transmitted diseases;
3. Confirmed local transmission of a single, or focal cluster of *Aedes*-transmitted disease; and
4. Confirmed multi-person local transmission and propagation of *Aedes*-transmitted disease.

Table 1. Phase category and response.

Phase	Category	Response
0	*Aedes* detected	Determine extent of *Aedes* infestation by setting traps and performing outreach to potentially affected residences.
1	*Aedes* activity and imported ATD detected or suspect local transmission of ATD	Investigate ATD case residences and sites of possible exposure for presence of *Aedes* mosquitoes. If *Aedes* detected, eliminate and/or treat breeding sites, test female *Aedes* for ATD, notify neighbors, and treat for adult mosquitoes, if necessary.
2	Locally acquired case(s) clustered in a single household and occurring <14 days apart; or ATD detected in mosquito	Same as Phase 1 plus, Notify California Department of Public Health and CDC, determine if CDC Emergency Response Team is needed; determine area at risk for surveillance and treatment operations; and notify residents within the at-risk zone.
3	≥3 local transmission cases of *Aedes*-transmitted diseases with onsets ≥2 weeks apart but <45 days apart within 1 mile diameter area; or ATD detected ≥3 times in mosquitoes tested from the same area and timespan as delimited above	Same as Phase 2 plus, notify residents in active transmission and cautionary zones, (as set by Public Health Services) and implement area-wide application of ULV insecticides and larvicides (truck or aerial) as needed.

Risk Assessment and Response in Phase 1

A description of the phase categories is provided in Table 1Table 1. An elevated risk or imminent threat to public health may occur in Phase 1 when the spread of an ATD could

occur. The VCP continually evaluates the risk of ATD transmission and intervenes using the least invasive measures appropriate for a given risk. When PHS reports to the VCP that a person with a probable or confirmed travel-associated ATD (case) was viremic in San Diego within the prior 30 days, the following actions are taken to assess the risk to public health:

1. A vector control technician (VCT) prioritizes and inspects locations where the case spends a significant amount of time and may have been exposed to mosquitoes, such as residential property, work area, school, and place of worship, as warranted, for *Aedes* breeding sources, immature stages, and adults. The VCT sets two or more mosquito traps in the front and back of the properties that are suspected to harbor *Aedes*. If the VCP cannot make contact or enter a property, the VCT assesses surrounding properties for breeding sources and *Aedes* mosquitoes and sets two or more mosquito traps as close to the property as possible. ATD transmission risk levels are set according to the following:

    a. Low risk
        i. average 1–2 *Aedes* caught per trap, or
        ii. 1–3 adult *Aedes* observed by the VCT on site.
    b. Medium risk
        i. average 3–4 *Aedes* caught per trap, or
        ii. 4–9 adult *Aedes* observed by the VCT on site.
    c. High risk
        i. average ≥5 *Aedes* caught per trap,[1] or
        ii. ≥10 adult *Aedes* observed by the VCT on site, or
        iii. *Aedes* test positively for an ATD.

2. Response Matrix: According to the transmission risk, the following response actions are taken (*Table 2*Table 2).

Table 2. Response Matrix.

Risk Level	Public Education	Source Reduction	Larvicide	Adulticide
Low	X	X	X	
Medium	X	X	X	
High	X	X	X	X

These actions will be applied to different sized areas based on risk level as shown in Table 3. If necessary, the VCP will obtain warrants before entering properties.

[1] Data from an outbreak of Zika virus in Florida in 2016 suggest that an average of 10 *Aedes* caught per trap-night coincided with local transmission (Grubaugh et al., 2017). Since local conditions can alter the risk of transmission, thresholds set by the VCP are 50% lower to err on the side of caution in reducing ATD transmission.

Table 3. Property Access.

Risk Level	Property	Adjoining Properties	All Properties within 150-meter Radius
Low	X		
Medium	X	X	
High	X	X	X

Modifiers: The Response Matrix above assumes that the case is located in an urban or suburban area.

- If the case is located in a rural or industrial area (i.e., with reduced human population or ability for *Aedes* to gain harborage), the risk level is shifted downwards one category and the appropriate responses taken.
- Likewise, if weather conditions are predicted to negatively influence the ability of *Aedes* to fly or survive (e.g., rain, daytime high temperature ≤60 degrees Fahrenheit, sustained wind ≥10 miles per hour), the risk level is shifted downwards one level.

The time when public health may be at risk is dependent on the incubation periods of ATD in people (i.e., called the intrinsic incubation period) and mosquitoes (i.e., called the extrinsic incubation period). These incubation periods create a window of opportunity when vector control interventions will be most effective in reducing the potential for ATD spread (i.e., before infective mosquitoes are circulating). Exact incubation periods vary depending on multiple conditions including host factors and temperature. The following incubation periods are based on published studies[2, 3, 4] and are listed here as guidelines (*Table 4*).

Table 4. Intrinsic and Extrinsic Incubation Periods by Disease Type.

Virus	Viremia Post-symptom onset (from PHS)	Extrinsic Incubation Period (mosquito)
Zika	Up to 7 days	10 days (Boorman, 1956)[2]
Chikungunya	Up to 7 days	2 days (Dubrulle, 2009)[3]
Dengue	2-12 days	7 days (Chan, 2012)[4]

Figure 5 below gives one possible Zika transmission timeline with vector control intervention to prevent Zika virus transmission. The timeline could change depending on the timing of infection, travel, mosquito exposure, temperature and the virus of concern.

[2] Boorman JP, Porterfield JS. 1956. A simple technique for infection of mosquitoes with viruses; transmission of Zika virus. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, 50:238-242
[3] Chan M, Johansson MA. 2012. The incubation periods of dengue viruses. *PLoS One*, doi.org/10.1371/journal.pone.0050972
[4] Dubrulle M, Mousson L, Moutailler S, Vazeille M, Failloux AB. 2009. Chikungunya virus and *Aedes* mosquitoes: saliva is infectious as soon as two days after oral infection. *PloS One*, doi.org/10.1371/journal.pone.0005895

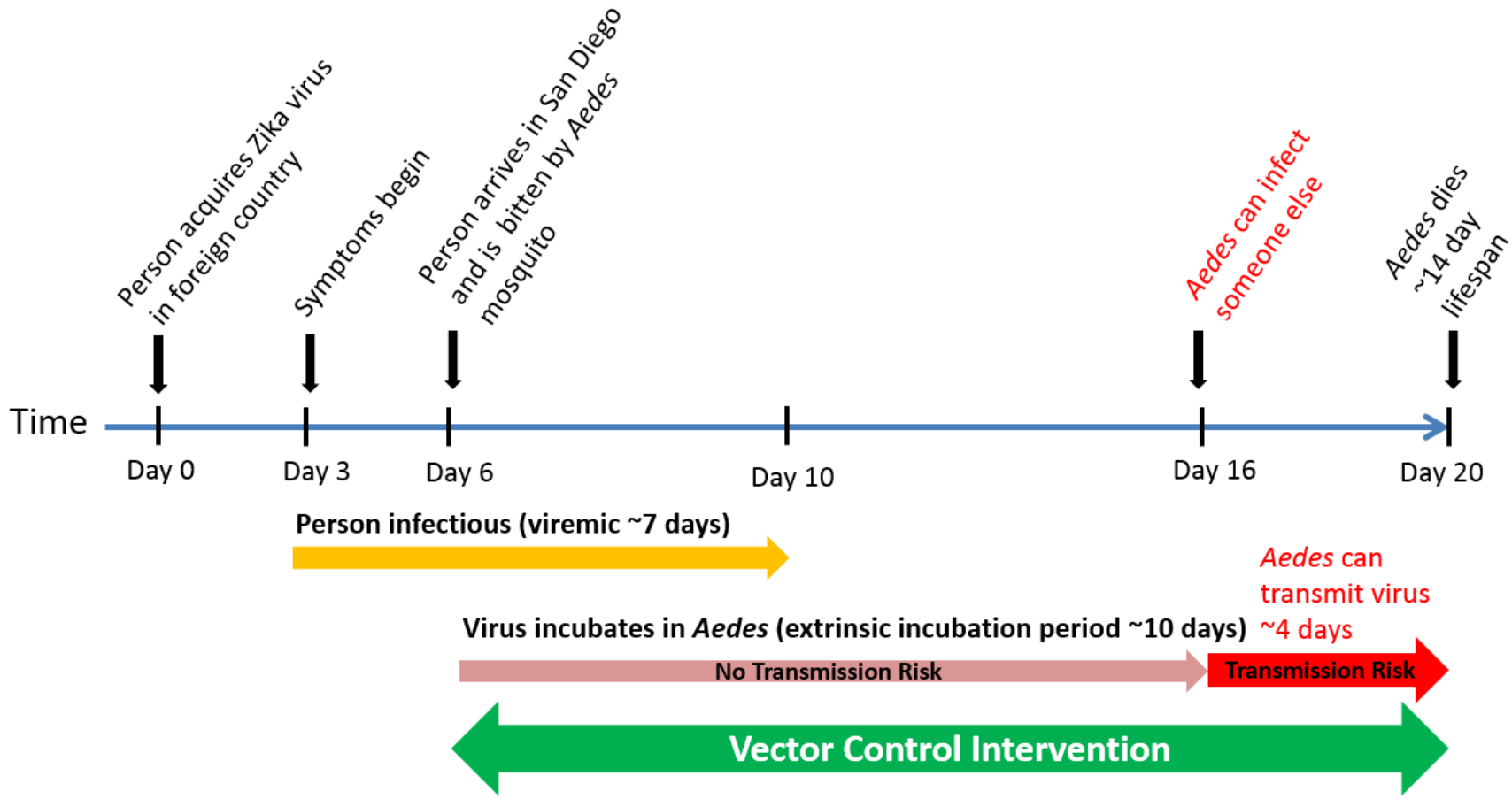

Figure 13. Example of possible Zika transmission timeline.

Optimal vector control intervention occurs during the extrinsic incubation period before an infected mosquito can transmit the virus to another person. The VCP makes all efforts to respond during this period; however, if this is not possible (due to late notification or delayed confirmation of cases), the VCP will respond as quickly as possible once the case has been confirmed and the VCP notified.

Risk Assessment and Response in Phases 2 and 3

In Phases 2 and 3, local transmission has occurred and the Risk Level is graded as high. Public education, source reduction, larvicide and adulticide treatments will occur in, at minimum, a 150-meter radius from the suspected area of transmission, weather permitting. In Phase 3, cautionary and active transmission zones will be designated by PHS in which public education, source reduction, and larvicide and adulticide treatments will be conducted. Wide area aerosol application of larvicides and/or adulticides, via ground or air, may be utilized to stop continued transmission of ATDs.

Communication

Communication and transparency of operations are of paramount importance to prevent the spread of ATD. The County employs a wide spectrum of media to inform the public about the risk of ATD and its operations to control them. In the event of ATD detections that necessitate aerosol larvicide, or aerosol adulticide mosquito treatments, the County will communicate information using the following methods:

- Press releases on the County News Center: http://www.countynewscenter.com/.
- Situation updates and information on the VCP website www.sdfightthebite.com:
    - Aerial maps and descriptions of areas that will be treated, and
    - Insecticide information-Safety Data Sheets, Frequently Asked Questions (FAQs), product labels
- Staffed phone line to answer questions (858) 694-2888

Additional communication measures and notifications that may also be utilized include:

- Informational door hangers on all residences that will be treated approximately 48 hours prior to treatment.
- Informational sandwich boards listing date and time range of treatment at street intersections in neighborhoods where ULV treatment will occur at least 48 hrs. prior to treatment.
- Door hangers placed after treatment on all premises that were treated to indicate that treatment occurred and with what material(s).
- Communications with other governmental and non-governmental agencies where ATD operations will occur (e.g., city governments, USPS, schools, daycare centers, care facilities). The VCP will work with these entities as well as home owners to resolve potential problems or concerns.

Conclusion

The VCP strives to safeguard the public's health as well as to minimize harmful effects on the environment by using an integrated pest management, step-wise, risk-analysis approach to controlling the spread of ATDs. Public communication, education, and transparency of operations are cornerstones of the strategy to combat *Aedes*. This strategic plan will be updated to reflect new research, technologies, and best practices as they become available. The latest information on ATDs and VCP operations can be found at: www.sdfightthebite.com.

Authorization

This ATD-SRP was developed in concurrence with Public Health Services and approved by the Director of Environmental Health and the Public Health Officer. The plan will be updated as new information becomes available and will be reauthorized biennially unless otherwise necessary.

X Elise Rothschild

Elise Rothschild, REHS
Director, Department of Environmental Health

X Wilma J. Wooten, MD

Wilma Wooten, MD, MPH
Public Health Officer, Public Health Services

Signed original on file at the Vector Control Program.

Attachment A Mosquito Control

Larvae

Reducing or eliminating mosquito breeding sources and destroying mosquito larvae and pupae are the most effective means for reducing *Aedes* mosquitoes. Larval mosquito control has three key components: breeding source reduction, biological control, and larvicides.

1. Breeding source reduction involves eliminating stagnant water in and around homes so that mosquitoes cannot breed. Breeding sources are anything that can collect ½ inch or more of standing water including pots, saucers, vases, pet bowls, unused tires, tire swings, buckets, rain barrels, wheelbarrows, birdbaths, non-circulating fountains, toys, garbage cans, hollow uncapped fence posts, landscape drains, clogged rain gutters, and many others. Dumping out, tipping over, covering, screening and/or cleaning up these water collection sources weekly are effective and inexpensive ways to prevent *Aedes* mosquitoes from breeding in them.

2. Biological control entails the use of natural predators, parasites, or pathogens to reduce immature mosquito numbers. Mosquitofish, *Gambusia affinis*, is the most widely used biological control agent in California. These fish can be placed in standing water sources that cannot be drained, such as fountains, ponds, and unused pools. The county provides these fish free of charge to the public to prevent mosquito breeding on their property.

3. Larvicides are products that kill mosquito larvae. There are several mosquito control products that are highly specific for mosquito larvae and have minimal impact on other organisms, such as beneficial insects, fish, pets, plants, and people. These include microbial control agents, such as *Bacillus thuringiensis israelensis* (Bti) alone or in combination with *Lysinibacillus* (*Bacillus) sphaericus* (Bs) (the latter acting as a synergist) as well as natural insecticides such as Spinosad that consists of spinosyn A and D compounds which are derived from a microbial fermentation process.

   Other larvicides include insect growth regulators and surface films. Insect growth regulators, such as methoprene and pyriproxyfen, prevent immature mosquitoes from developing into adults and are sometimes used in shallow, standing water sources (e.g., shallow ponds, areas subject to periodic flooding). Surface films prevent larvae and pupae from breathing at the surface of the water. They are very effective but may suffocate other surface breathing aquatic insects; therefore, they are used judiciously and only with small pockets of calm water.

Adult

When adult *Aedes* populations must be rapidly suppressed in order to reduce a condition of elevated risk to human health, the Director of the Department of Environmental Health, with concurrence by the Public Health Officer, may authorize the use of ultra-low volume insecticides that kill adult mosquitoes to break the disease transmission cycle. Insecticides that kill adult mosquitoes are called "adulticides" and, by nature, are less specific than larvicide products; therefore, whenever possible, they are applied in a manner (via time and space) to maximize the impact on mosquitoes and minimize the effect on other insects. They are applied as regular or ULV sprays that are delivered via ground-based spray equipment (hand-held, backpack or truck mounted spray equipment) or by aircraft. The ULV sprays create microscopic aerosolized droplets that kill *Aedes* mosquitoes that fly into them. Other adulticide sprays are applied directly to breeding sites or resting sites so that when *Aedes* land on these areas they come into contact with the adulticide and are killed. Adulticide products include pyrethrins, which are derived from the chrysanthemum flower, and pyrethroids, which are synthetic versions of pyrethrins. Additional chemicals that act as synergists with the pyrethrins and permethrins may also be used, which have the effect of *lowering* the amount of insecticide needed while *increasing* efficacy of the treatment. The VCP contracts with a certified pesticide applicator to provide aerial applications of mosquito adulticides for mosquito control if needed.

All insecticide applications are performed in accordance with Environmental Protection Agency (EPA) label instructions in conformance with all environmental and pesticide use laws and regulations and may be monitored by the Department of Agriculture, Weights and Measures - Pesticide Regulation Program.

Table 1. Compounds in the VCP Inventory Approved for Mosquito Control

Pesticide Type	Product Name	Use/Action
Larvicide	*Bacillus thuringiensis israelensis* Trade names: Vectobac®, Teknar®	Use: Approved for most permanent and temporary bodies of water. Limitations: Only works on actively feeding stages. Does not persist well in the water column.
Larvicide	Spinosad (spinosyn A and D compounds derived from a fermentation process by certain microbes) Trade name: Natular®	Use: Approved for most water bodies. Good penetration into vegetated areas. Works predominantly on feeding stages (may also have limited contact activity).
Larvicide	*Bacillus sphaericus* and *Bacillus thuringiensis israelensis* combined. Trade name: Vectomax®	Use: Approved for most permanent and temporary bodies of water. Only works on actively feeding stages. May persist and have residual activity in some sites.
Larvicide	Methoprene Trade names: Metalarv S-PT, Altosid®	Use: Approved for most permanent and temporary bodies of water. Limitations: Works best on older instars. Some populations of mosquitoes may show some resistance.
Larvicide	Larvicide oils Trade names: Golden Bear Oil (GB-1111), BVA Chrysalin	Use: Ditches, dairy lagoons, floodwater. Effective against all stages, including pupae. Limitations: Consult California Department of Fish and Wildlife for local restrictions.
Larvicide	Monomolecular Films Trade name: Agnique® MMF	Use: Most standing water including certain crops. Limitations: Does not work well in areas with unidirectional winds in excess of 10 mph.
Adulticide	Pesticides containing natural pyrethrin Trade names: Pyrenone®, Pyrocide®	Use: Wetlands, floodwater, residential areas, some crops. Limitations: Do not apply to drinking water, milking areas; may be toxic to bees, fish, and some wildlife. Some formulations with synergists have greater limitations.
Adulticide	Pyrethroids–synthetic pyrethrin products containing resmethrin, lambda-cyhalothrinpermethrin Trade name: Scourge®, Demand CS	Use: All non-crop areas including wetlands and floodwater. Limitations: May be toxic to bees, fish, and some wildlife; avoid treating food crops, drinking water or milk production.

Attachment B FAQs for Ultra-low Volume Insecticide Use

What is ULV?
"ULV," "fogging," "adulticiding," and "spraying" are terms used for a method of controlling adult mosquitoes using ultra-low volume pesticides that kill adult mosquitoes on contact. The delivery apparatus is a spray that may be mounted on a backpack, truck or aircraft. The spray nozzle emits very small droplets that spread approximately 300 feet creating a mist that the mosquitoes fly into. Spraying is done only in the areas that are at risk for disease outbreak, and will be conducted by certified and licensed applicators.

Why do we need to spray?
The County of San Diego Vector Control Program sprays specific areas to prevent human illness and control disease-transmitting mosquitoes. Mosquitoes may transmit many diseases including West Nile virus, dengue, chikungunya, yellow fever, and Zika. The decision to spray an area is based on finding *Aedes* mosquitoes in an area at a level that indicates a threat to human health. Spraying will be concentrated in areas most at risk for disease.

When is spraying done?
Spraying will be done when adult mosquitoes are most likely to be active. Depending on the mosquito species being targeted, this may be during the day or at night. Spraying will not be done if it is windy or raining. Spraying events may need to occur multiple times to effectively reduce the adult mosquito populations.

What are the benefits of ULV sprays?
ULV sprays work very quickly to reduce adult mosquito numbers. They kill adult mosquitoes on contact. This can often provide immediate relief from mosquito infestations and stop the spread of disease.

What chemicals might be used?

- Pyrenone 25-5 Public Health (EPA registration no.: 432-1050) MSDS #147
- Scourge Insecticide with Resmethrin/Piperonyl Butoxide 4%+12% MF Formula II (EPA registration no.: 432-716) MSDS #191
- Demand CS Insecticide with Lambda-cyhalothrin1 9.7% (CAS No. 91465-08-6) (EPA Reg. No. 100-1066) MSDS #A12690A

These chemicals are all approved by the U.S. Environmental Protection Agency for killing adult mosquitoes. Pesticide products that land on surfaces as part of a mosquito control program (e.g., grass, outdoor toys, and furniture), degrade quickly, particularly once exposed to sunlight.

How effective are ULVs at reducing the number of adult mosquitoes?
The effectiveness of ULV depends on a number of variables that include species/types of mosquitoes present; chemicals used; when and how often the chemicals are applied; current weather conditions; and the density of homes and streets in a community. Under

certain conditions, ULVs can be an effective means of temporarily reducing adult mosquito populations and have been used in the U.S. and other countries for reducing and preventing mosquito-borne diseases.

Why might I see mosquitoes on my street the day after ULV insecticide spraying was done?
There are several reasons why you might see mosquitoes the day after ULV insecticide spraying: 1) The mist of the insecticide cannot reach all mosquitoes, so you could be seeing ones that were active at the time of spraying, but did not come in contact with the droplets of insecticide; 2) some of the mosquitoes you see may have just emerged from their breeding sites; 3) different kinds of mosquitoes are active at different times of the day. ULV insecticide treatments are targeted against specific species of mosquitoes and may be repeated several times in order to maximize their effectiveness.

What is my risk of exposure with spraying?
The risks to the public and the environment are very low. Mosquito insecticides are applied as ULV sprays that create a fine mist. ULV insecticide applications involve small quantities of active ingredient in relation to the size of the area treated, about 3 ounces per acre, which minimizes exposure and risk to people and the environment.

Can some people experience health effects from ULV?
Most people will not experience any adverse health effects after ULV insecticide sprays. However, for some individuals that are highly sensitive to ingredients within the product, short-term effects might be eye, skin, nose, and/or throat irritation; breathing problems; and nausea. Contact your healthcare provider if you believe you are experiencing health problems for any reason.

Can ULVs harm other animals or wildlife?
The U.S. Environmental Protection Agency has evaluated the chemicals used in ULVs for their safety and has determined that they do not pose an unreasonable risk to birds or mammals if used according to the product label directions. These chemicals can kill other insects they contact, not just mosquitoes. Pyrethroid ULVs are also considered highly toxic to fish and bees and would not be applied to or near open water bodies or in sensitive environments such as wetlands unless they posed a high risk to public health.
State-approved vector control programs can use these pesticides without direct notice to and consent by affected property owners, but some public notice would be provided prior to any use. If you are in an area that will be treated and you have a fishpond or beehive, you should cover them to protect your fish and bees from exposure. State law also contains a requirement for direct notification to nearby beekeepers prior to most uses of these pesticides, but use by an approved vector control program is not subject to this requirement. These notice requirements are reduced for vector control programs so that action can be taken quickly when needed to protect public health.

Should I be concerned about covering the swimming pool in my yard?
All types of pesticides used in spraying operations for adult mosquito control break down quickly in sunlight and water. Therefore, no special precautions or waiting periods are

recommended for outdoor swimming pools. However, if a pool is not being used during the summer months (e.g. if it not being chlorinated or filtered), it should be covered or drained. Any standing body of water is a potential breeding ground for mosquitoes.

Will ULV insecticides hurt the paint on my car?
No. Adult mosquito insecticides are applied as ULV sprays. ULV insecticide applications involve small quantities of active ingredient in relation to the size of the area treated, typically less than 3 ounces per acre, which minimizes exposure and risk to people and the environment, including the paint on your car. For more information, refer to the U.S. Environmental Protection Agency's website at:
https://www3.epa.gov/pesticides/chem_search/ppls/000432-01050-20130509.pdf

How will I know if a ULV spray is going to take place in my neighborhood?
Press releases and public notifications will be provided prior to any ULV insecticide application. Door hanger notifications will be placed on affected premises 1 day prior to treatment. Treatment schedules and maps will be posted on the www.SDFightTheBite.com website. Additional information is available by calling the County of San Diego Vector Control Program at 858.694.2888.

What kinds of precautions should I take when ULV application is scheduled for my street?
You can reduce your exposure to the insecticide by staying indoors during spraying. The droplets will dissolve after about 20 minutes.

Other things that you can do to reduce exposure are:

- Keep windows closed and fans off. Shut off air conditioners unless they have a setting for recirculating indoor air. If it is very hot weather, make sure you open the windows and/or turn fans and air conditioners back on about 1 hour after the truck passes through your neighborhood.
- Rinse homegrown fruits and vegetables with water as you would typically do before cooking or eating them.
- Keep pets indoors during ULV spraying.
- Cover ornamental fishponds to avoid direct exposure.
- If skin and/or clothes or other items are exposed to the ULV insecticide, wash with soap and water.
- If the mist gets in your eyes, immediately rinse them with cool, clean water for 15 minutes, and call your healthcare provider.
- Do not allow children to play in areas that are still wet from insecticide spraying, wait at least 1 hour.

Who can I call if I have more questions?
For more information about mosquito control please call the County of San Diego Vector Control Program at (858) 694-2888 or email us at: vector@sdcounty.ca.gov. Please visit our website at www.SDFightTheBite.com for more announcements about ULV insecticide treatments and the areas where it will occur.

What are some other sources of information on pesticides?
You may find additional information at your local library or by searching the following websites.
For more information about pesticides:

- U.S. Environmental Protection Agency, http://www2.epa.gov/pesticides
- National Pesticides Telecommunications Network, http://npic.orst.edu/pest/mosquito/wnv.html
- National Institute for Occupational Safety and Health, Center for Disease Control and Prevention, http://www.cdc.gov/niosh/topics/pesticides/
- Adapco, http://www.myadapco.com/product-category/mosquito-control-products/adulticides/
- Bayer, http://reserve.backedbybayer.com/bayer/cropscience/backedbybayer.nsf/id/EN_Vector_Pyrenone_Application_Handling
- MGK,http://www.mgk.com/professional-pest-control/food-handling/pyrocide-100/

Attachment C Regulatory Authority for Mosquito Control

The legal authority for the Vector Control Program within the Community Health Division of the Department of Environmental Health is derived from statutes and regulations in the California Government Code, California Health and Safety Code, California Civil Code, California Penal Code, San Diego County Code of Regulatory County Ordinances, and the California Environmental Quality Act. The legal authority of a vector control district such as routine surveillance, control, and access issues do not require obtaining a permit from regulatory agencies (e.g. California Department of Fish and Wildlife).

Under the requirements of the State Porter-Cologne Act and the Federal Clean Water Act, the State Water Resources Control Board is delegated authority for protection of surface and groundwater. The Vector Control Program is subject to: State Water Quality Order No. 2016-0039-DWQ, General Permit No. 990004; Statewide National Pollutant Discharge Elimination System Permit for Biological and Residual Pesticide Discharges to Waters of the United States from Vector Control Applications.
(County of San Diego Vector Control Program enrollee number: 937AP00009).

Statutory Exemptions

Actions in response to an imminent threat to public health, as determined by the County Health Officer (delegated to the Director of Environmental Health), are exempt from CEQA and other regulatory permits under the Public Resources Code 21080(b)(4). Vector control programs that have entered into a cooperative agreement with the California Department of Public Health (as San Diego County has) and that meet certain requirements are also exempt from certain pesticide-related requirements when applying approved pesticides for vector control purposes. Exemptions include employee certification requirements (but substitute training is required) and certain notification and permitting requirements (however, this plan retains equivalent notification protocols). See, Education Code § 17613, Food and Agriculture Code § 11408(e), Health and Safety Code § 25174.7(a)(3) and Title 3, California Code of Regulations, sections 6400(c)(2) and 6400(e), 6620, 6651, and 6760

California Government Code
http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=gov
Title 3, Division 2 – Officers, Part 2, Board of Supervisors; and
Chapter 8 Health and Safety, Article 3 Miscellaneous

California Health and Safety Code
http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=hsc
Division 3 – Pest Abatement, Chapter 2, Section 1800;
Division 3 – Pest Abatement, Chapter 5 Mosquito Abatement Districts, Article 1 General Provisions, Section 2200;
Division 3 Pest Abatement, Chapter 5 Mosquito Abatement District, Article 4 District Powers; and
Division 13 Housing, Part 1.5 Section 17920.3 Substandard Building Conditions

California Civil Code
http://www.leginfo.ca.gov/cgi-bin/displaycode?section=civ&group=03001-04000&file=3479-3486.5
Sections 3479 and 3480

California Penal Code
http://www.leginfo.ca.gov/cgi-bin/displaycode?section=pen&group=00001-01000&file=369a-402c
Sections 372 and 373 (a)

San Diego County Code of Regulatory County Ordinances
http://www.amlegal.com/nxt/gateway.dll?f=templates&fn=default.htm&vid=amlegal:sandiegoco_ca_mc
Title 6 Health and Sanitation Division 4 Disease Control, Chapter 1 General Provisions Nuisances, Sections 64.101-64.106; and
Division 4 Disease Control, Chapter 2 Mosquitoes and Flies Sections 64.201 *et seq*. Division 4 Disease Control, Chapter 3 Sections 64.301*et seq.*

Municipal Codes for all 18 incorporated cities within San Diego County (e.g. City of San Diego Municipal Code)

California Environmental Quality Act
http://www.calrecycle.ca.gov/SWFacilities/Permitting/ceqa/Overview/Purpose.htm
Public Resources Code sections 21000-21004;
California State CEQA Guidelines, California Administrative Code (Guidelines), sections 15002, 15086, and 15087

Attachment D Glossary

Aedes	*Aedes aegypti* and *Aedes albopictus* mosquitoes, invasive Aedes mosquitoes
ATD	Aedes-transmitted disease such as Zika, dengue, chikungunya
Bs	*Bacillus sphaericus (Lysinibacillus sphaericus)*
Bti	*Bacillus thuringiensis israelensis*
CEQA	California Environmental Quality Act
EPA	U.S. Environmental Protection Agency
FAQ	frequently asked questions
PHS	Public Health Services
RT-PCR	Reverse transcriptase polymerase chain reaction
SWRCB	State Water Resources Control Board
ULV	Ultra-low volume
USPS	United States Postal Service
VCP	Vector Control Program
VCT	Vector Control Technician
VDDL	Vector Disease and Diagnostic Laboratory
WNV	West Nile virus

Attachment E References

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Attachment F Revision History

Date	Author	Revision Summary
3/11/20	N. Gurfield	Page 3. Order of detection of *Ae. aegypti* and *Ae. albopictus* corrected.