

SUFFOLK COUNTY DEPARTMENT OF PUBLIC WORKS  
DIVISION OF VECTOR CONTROL



2019 ANNUAL PLAN OF WORK

Introduction: The Suffolk County Department of Public Works, Division of Vector Control, is responsible under the County Charter to use every means feasible and practical to suppress mosquitoes, ticks and other arthropods which are vectors of human disease requiring public action for their control §C8-4(B). The Division's responsibility is to control infestations of mosquitos, ticks and other arthropods that significantly threaten public health, or create social or economic problems for the communities in which they occur. The Division meets its responsibilities in consultation with the Suffolk County Department of Health Services (SCDHS) and appropriate federal, state and local agencies.

MOSQUITO RESEARCH SURVEILLANCE AND CONTROL

Background: Suffolk County has a long history of mosquito control efforts that first began under the United States Department of Agriculture (USDA) in 1900 with experimental projects for malaria and salt marsh mosquito control. Additional control efforts were often undertaken by owners of large estates and resorts located along the coastline seeking control of salt marsh mosquitoes through private ditch construction. Demand for a structured mosquito control program grew in Suffolk as effective levels of mosquito control were seen in Nassau County, New York City and New Jersey through both wetland filling and the ditching of marshes. In 1933, a countywide mosquito control began under the Suffolk County Emergency Work Relief Bureau, which provided jobs during the Great Depression. The Suffolk County Mosquito Extermination Commission was later created in 1934 to unite the individual town and private control efforts under a central agency. A significant increase in mosquito control efforts was further funded under the Federal Works Project Administration (WPA) in 1937 employing over 650 workers to assist the Suffolk County Mosquito Extermination Commission. It was during the years of 1933-1938 that the majority of our 9.5 million feet of mosquito ditches were created throughout Suffolk.

In 1974, the Suffolk County Charter was amended transferring the mosquito control functions and authority from the Mosquito Control Commission to the Suffolk County Department of Health Services, Division of Public Health, Bureau of Vector Control. During 1992, due to budget deficits, the county legislature transferred Vector Control from Health Services to the Department of Public Works, Division of Vector Control.

## 2019 ANNUAL PLAN OF WORK- DIVISION OF VECTOR CONTROL

### Vector Control Annual Plan of Work:

The Suffolk County Charter and New York State law requires an annual Vector Control plan of work for the succeeding year be submitted by resolution for legislative approval each year. This Plan of Work has been prepared pursuant to and in compliance with the Vector Control and Wetlands Management Long Term Plan and Generic Environmental Impact Statement (the Long Term Plan). The Long Term Plan was approved by the County Legislature as Resolution 285-2007 on March 20, 2007 and signed by the County Executive on March 22, 2007. The 2019 Annual Plan of Work is therefore governed by State Environmental Quality Review Act (SEQRA) Regulation 617.10(d)(1) which provides the following: "When a final generic EIS has been filed under this part (1) no further SEQR compliance is required if a subsequent proposed action will be carried out in conformance with the conditions and thresholds established for such actions in the generic EIS or its findings statement." This issue is also discussed in the Findings, appended hereto, pages 7 and 58. The 2015 Plan of Work added the use of a new active ingredient, prallethrin, which required a modification of the Long Term Plan. In accordance with the Findings, a SEQR review of prallethrin was conducted in order to allow the use of the new active ingredient. This review was completed with the issuance of a Negative Declaration as CEQ Resolution 34-2014 and the modification of the Long Term Plan approved by the Legislature as Resolution 706-2014. This Annual Plan complies with the reporting requirements in Executive Order 15-2007 (Suffolk County Vector Control Pesticide Management Committee) and Resolution 285-2007 (which adopted the Findings Statement for the Long-Term Plan). The reporting requirements of Resolution 285-2007 are satisfied within this Annual Plan, and the Pesticide Management Committee submits a report to CEQ independently to satisfy Executive Order 15-2007.

### 2018 SUMMARY OF VECTOR CONTROL ACTIVITIES

1. Service Requests: For 2018, over 1,150 service requests were taken by office staff concerning mosquito issues and over 650 e-mail requests were sent in via our web app (<http://dpw.suffolkcountyny.gov/vectorcomplaint/>). Incorporating the web app has allowed residents to report on mosquito issues of concern 24/7 and reduces staff time spent taking telephone calls.
2. Public Education: Vector Control staff continue to give presentations to community associations and commercial pest control applicators on mosquito and tick issues including the expanding Asian Tiger mosquito and tick surveillance and control. Education of homeowners also occurs when field crews conduct inspections of private property advising residents on steps they can take around their home to reduce mosquito and tick encounters. If no one is home during an inspection, crews will leave an educational flyer on mosquito control to help inform residents. Health Services staff also holds informative meetings, post to social media and updates the County website with information and findings on mosquito borne diseases, steps homeowners can take and updating postings for mosquito spray events.
3. Water Management: Wetland activities conform to the guidelines set forth in the Long Term Plan and follow the GEIS Finding statement's Wetlands Best Management Practices

## 2019 ANNUAL PLAN OF WORK- DIVISION OF VECTOR CONTROL

(BMP's). The Wetlands Stewardship Program finalized the Wetlands Stewardship Strategy in 2015 and Vector Control works under the programs guidance. Maintenance of existing structures (select ditches and culverts) are conducted as described in BMP's 2, 3 and 4 in the Findings Statement and Long Term Plan. Water management projects beyond BMP's 2, 3, and 4 undergo review through SEQRA, and are subject to Suffolk County's Council of Environmental Quality (CEQ) and legislative review.

With the Wetlands Stewardship Strategy finalized, the County is undertaking several Integrated Marsh Management (IMM) projects as called for under the plan. The County has received \$1.3M in Sandy funding from the National Fish and Wildlife Foundation Coastal Resiliency grant for IMM work to be done in the Town of Islip in cooperation New York State Department of Environmental Conservation. Marsh restoration projects will be undertaken at Gardiner's County Park in West Islip, West Sayville County Park, and at Timber Point DEC wetlands in Great River. These projects have received all required permits and are in NEPA review. Once the NEPA review has been completed, work will begin during the 2018-2019 winter season. The County has also received \$560,000 from a Federal Hazard Mitigation Grant Program under FEMA for IMM work at Smith Point County Park in Shirley for costal marsh resiliency. Permits have also been secured for from the NYSDEC for this project with NEPA review and construction targeted for winter of 2019-20 completion.

The Beaverdam Creek County Park in Brookhaven Hamlet is being studied for the re-establishment of a wetlands complex at a dredge spoil impacted marsh. This project is a cooperative undertaking between several County agencies and the Post Morrow Foundation. The goal of this restoration project is to return tidal circulation to a diked marsh that is a mostly phragmites and several low areas that breed salt marsh mosquitoes. A tidal creek will be created through the dike to allow for the return of salt marsh vegetation, phragmites control and a reduction in mosquitoes by allowing killifish access to the low areas of the site.

A cooperative project with the Town of East Hampton, the East Hampton Trustees and The Nature Conservancy is underway to map mosquito breeding activity in Accabonac Harbor with the goals of pesticide reduction and preliminary design work for potential wetlands restoration project. The cooperative project began in 2017 with Stony Brook University Student Interns using GPS to plot mosquito breeding locations, with the locations mapped and characterized by level of activity. In 2018, the East Hampton Trustee's expanded the cooperative program to utilize additional samplers and to cover 190 acres of Accabonac Harbor marshlands. Using the data, aerial treatment zones were remapped allowing for Vector Control to greatly reduced pesticide use while continuing to protect human health and quality-of-life. The cooperative project is expected to continue in 2019, with the goal of using the data to collaborate on work for the next phase of the project to begin planning for wetland restoration. Restoration planning using the identified mosquito hotspots will further reduce or potentially eliminate the need to treat Accabonac Harbor using pesticides on a regular basis. This pilot project will be used as a guide to invite other cooperators to develop similar programs at marsh complexes within their jurisdictions. This program will greatly benefit the County through cost savings from reduced pesticide and helicopter usage and through restoration of wetlands resulting in environmental benefits to the marsh community and those who depend on its flora and fauna. Estimated cost savings to the County from the

## 2019 ANNUAL PLAN OF WORK- DIVISION OF VECTOR CONTROL

2018 Accabonac Harbor wetland project is \$18,000 from reduce pesticide applications and helicopter hours treating the marsh. This savings was achieved by reducing the treatment blocks at Accabonac from approximately 190 acres to only the 70 acres identified as active mosquito breeding hotspots.

A NYSDEC grant for the restoration of a former Terry Creek marsh at the Indian Island County Park in Riverhead is being reevaluated for fiscal feasibility. Plans for the restoration include restoring a historic tidal creek at the site, establishing tidal wetland vegetation and installing a culvert over an active park roadway. The project is under review due to the high costs associated with moving the dredge spoil material off-site.

Suffolk County was awarded a \$795,000 USDA - NRCS grant for restoring 25 Sandy impacted parcels within the Mastic Beach area to their former historic wetland condition. There are 3 damaged homes and bulk heading that will also be removed under this grant to restore the wetland ecosystem. Vector Control will be undertaking the wetland restoration of these parcels and work with other DPW Divisions on the removal of the structures.

4. Larval Control: Crews perform approximately 7,450 inspections of larval sites. Checked and treat as required 20,000 catch basins in communities with past history of West Nile virus positive pools or human cases. Vector Control crews also investigated over 110 reported abandoned swimming pools that were reported from the public and municipal agencies to be investigated by staff.

Treated approximately 20,000 acres with the biorational larvicides: *Bacillus thuringiensis israelensis* (Bti), *Bacillus sphaericus* or methoprene depending on mosquito stage of development, weather, coastal tides and virus findings [See table of pesticide usage on the last page of the Plan]. Improvements to the aerial larval control program through incorporating the product VectoPrime FG, a granule with a Bti/methoprene mix allowed for better targeting application sites with reduced drift issues compared to the liquid products. The granule also allows applications over upland vegetated transition zones, where tree cover makes application using liquids difficult. VectoPrime FG is a quick acting, non-residual product that does not persist in the environment. Cost per acre is more expensive using the VectoPrime FG, but savings are anticipated in the reduced need for follow-up adult control (ULV fogging) through improved targeting of the larval breeding sites.

5. Adult Control: We conduct adult control when infestations are severe and widespread and/or necessary to respond to the presence of mosquito-borne pathogens. Community-wide requests for adult control were reduced in 2018, with the notable exception of the communities of Mastic, Mastic Beach, South Shirley and Brookhaven Hamlet that border the Fire Island National Seashore and William Floyd Estate. While marshlands within the neighboring US Fish and Wildlife Refuge at Wertheim allow for regulated mosquito control activities under a special use permit, the National Park Service does not allow Vector Control to treat their land holdings, except under tiered conditions for virus response. This creates unique hardships on the neighboring communities to the Fire Island Seashore from

## 2019 ANNUAL PLAN OF WORK- DIVISION OF VECTOR CONTROL

immense numbers of biting mosquitoes migrating into these areas and results in the need for repeated adult ULV spraying of adjoining residential areas.

6. Research and Surveillance: Vector Control field crews and lab staff collect and identify over 100,000 larval and adult mosquito samples each season, depending on mosquito population and local viral activity levels. In addition, Health Services Arthropod-Borne Disease Laboratory (ABDL) collects and process approximately 50,000 mosquitoes for arbovirus surveillance. Vector Control responds to virus isolations in consultation with the Health Commissioner and staff and evaluates the effectiveness of treatments in cooperation with the ABDL. Vector staff perform special studies of new mosquito problem areas, monitoring for pesticide resistance, identifying the sources of unusual infestations or researching introduced vector species, including the Asian Tiger Mosquito.

### Technical and Institutional Framework for Vector Control

To achieve this goal, the Division employs an integrated control program also referred to as integrated pest management or IPM. Control measures are employed in a hierarchical manner that emphasizes prevention of the concern, and are guided by a surveillance program to ensure that control measures are only directed to address a clear need. Control proceeds from the long-term, environmentally sound measures such as wetland management and biological control to the use of highly specific larvicides, and only incorporates chemical control by adulticiding if other measures prove to be either insufficient or not feasible. This integrated approach is recognized as the most effective and environmentally sound manner in which to conduct a mosquito control program.

Because mosquitoes are of high public health importance, the Division works closely with SCDHS Arthropod Borne Disease Laboratory (ABDL). The ABDL concentrates its efforts on surveillance for mosquito-borne pathogens, primarily the arboviruses West Nile Virus (WNV), Zika and Eastern Equine Encephalitis (EEE). The Vector Control Division conducts laboratory work that concentrates on estimating populations of mosquito adults and larvae identification. The Division also conducts laboratory work related to special projects designed to improve the control program and to evaluate the impacts of wetlands management. The results of this surveillance are used to guide and evaluate the Division's ongoing control work.

During times of a declared public health threat, the Division comes under the operational control of SCDHS. However, these declarations are rare and are issued by the New York State Health Commissioner as was the case in 2017 for the finding of EEE in Manorville.

The New York State Department of Health (NYSDOH) provides important support to the program by analyzing mosquito samples for pathogens, providing technical advice and guidelines and determining when a public health threat declaration is required. NYSDOH also provides significant assistance with public education, as well as financial aid for vector surveillance and control. Because mosquito control involves work in environmentally sensitive areas and the use of pesticides, environmental compliance and protection are important components of the program. The Division is heavily regulated and subject to inspection under a series of New York State Department of Environmental Conservation (DEC) permits, as well as

## 2019 ANNUAL PLAN OF WORK- DIVISION OF VECTOR CONTROL

regulations pertaining to the use of pesticides and licensing of applicators. Close contact is maintained with DEC, United States Fish and Wildlife Services (USFWS), EPA and other agencies throughout the year to ensure that all work is conducted to a high environmental standard.

### 2019 PROGRAM COMPONENTS

WATER MANAGEMENT: Field personnel conduct this component from January 1 to April 30, and October 1 to December 31 (varies due to seasonal weather). Water management during the winter months is a functional way to reduce the need for pesticide applications during the summer, by keeping mosquito ditches and creeks free of blockages. The Division expects to conduct water management in each of the County's ten towns, as needed. Highest priority is assigned to larval habitats where adult mosquito infestations have the greatest potential for negative impact. In particular, areas that had virus isolations or showed unexpectedly high infestations in 2018 will have high priority over the coming winter. Water management activities will be carried out in such a manner so that the primary goal of the work will be to protect the health of the marsh, while also reducing mosquito numbers.

Water management minimizes mosquito production through maintaining or improving systems of tidal channels, ditches, culverts and other structures that drain off surface water and/or allow access to potential larval habitats by predatory fish. In some cases, the current ditch system has become an important component of the wetland as it exists today, and maintenance of the system is necessary to maintain tidal flow, fish habitat, or existing vegetative patterns. Much of this is maintenance work that may not require a permit, but is nonetheless conducted after consultation with the New York State Department of Environmental Conservation (DEC) to ensure consistency with conservation of the wetland. More extensive work to rehabilitate wetlands in a manner that restores and preserves resource values while also reducing mosquito production is now underway under the umbrella term Integrated Marsh Management (IMM). In accordance with the Long Term Plan, all water management activities are conducted with appropriate notification to and oversight by the Council for Environmental Quality (CEQ), as outlined in the Findings Statement of the Suffolk County Legislature that was adopted by Suffolk County Resolution 285-2007.

The Wetlands Stewardship Committee completed its work in establishing standards for wetlands Best Management Practices (BMP's) and a Wetlands Stewardship Strategy was issued by Executive Order 01-2015 on July 13, 2015. With that Strategy in place, plans for 2019 include more extensive grant sponsored marsh restoration projects. These are projects that restore and enhance the natural resource values of the wetlands while also reducing or eliminating the need for pesticides to control mosquitoes. All work is planned in partnership with the landowner and NYSDEC, USFWS and other natural resources agencies and undergoes SEQRA/CEQ review as required.

CONTROL OF MOSQUITO LARVAE: All field personnel conduct larval control during the active mosquito season. Most crews conduct ground larviciding, while a heavy equipment crew assists in helicopter larvicide applications. This component is conducted during the active mosquito season of May 1 to October 1. Larval control is required when water management has

## 2019 ANNUAL PLAN OF WORK- DIVISION OF VECTOR CONTROL

not been able to completely prevent mosquito production or is not appropriate for the site. Larval control is the Division's second most important control method. Ground crews visit known larval habitats, check for the presence of larvae, obtain larval specimens for identification in the laboratory and apply larvicide if necessary. Field crews also eliminate larval habitats by unclogging pipes, removing containers or otherwise eliminating standing water. While the acreage of these sites is often small, their proximity to residential areas makes them important sources. Ground crews also respond to complaints from the public. The Division's most intense efforts are directed to the major salt marshes and wetland complexes, which require use of the helicopter. These large marshes are surveyed weekly, or after extreme flood tides. If larvae are discovered, a contract helicopter applies larvicide. For salt marshes and similar habitats, either Bti (*Bacillus thuringiensis israelensis*), Altosid (methoprene), or a combination of materials are applied, based on larval stage, temperature, and weather conditions. Larval control is employed if inspection of a site reveals larval production is occurring.

The larval control products to be used in 2019 and the conditions under which they are used are described as follows:

Altosid Liquid Larvicide Concentrate (methoprene, EPA 2724-446) – Aerial application to tidal and freshwater marshes.

Altosid Liquid Larvicide (methoprene, EPA 2724-392) – Ground application to tidal and freshwater marshes, as well as other temporarily flooded areas.

Altosid Pellets (methoprene, EPA 2724-448) – Ground application to intermittently or permanently flooded areas such as freshwater swamps, catch basins, drainage areas and recharge basins, provided that they are not fish habitats.

Altosid XR-G (methoprene, EPA 2724-451) – Ground or aerial application to tidal wetlands; ground application to intermittently flooded freshwater areas; aerial application in freshwater areas in response to Eastern Equine Encephalitis (EEE) or West Nile Virus (WNV) with required approval by DEC.

Altosid XR Briquets (methoprene, EPA 2724-421) – Catch basins and other drainage or artificial structures that are not fish habitats.

Aquabac 200G (Bti, EPA 62637) – Ground application to intermittently flooded freshwater and tidal areas.

Sphaeratax SPH (50G) (*B. sphaericus*, EPA 84268-2) – Ground application to freshwater and brackish areas that hold stagnant water such as ditches, impounded marshes, swamps, puddled areas, sewage lagoons; late season application to catch basins.

Valent BioSciences Vectobac 12 AS (Bti, EPA 73049-38) – Aerial application to tidal and freshwater marshes; ground application to intermittently flooded areas such as tidal and freshwater marshes.

## 2019 ANNUAL PLAN OF WORK- DIVISION OF VECTOR CONTROL

Summit B.t.i. Briquets (Bti, EPA 6218-47) – Catch basins, ground depressions, artificial sites.

Fourstar Briquets 90 (Bti plus B. sphaericus, EPA 83362-3) – Catch basins, ground depressions, artificial sites

Valent VectoPrime (Bti and methoprene EPA 73049-501) – Ground and aerial application to tidal and freshwater marshes, as well as other temporarily flooded areas.

Valent VectoBac WDG (Bti EPA 73049-56) – Ground and aerial application to tidal and freshwater marshes, as well as other temporarily flooded areas.

The equipment to be used for larval control includes various trucks for crew transportation, samplers such as dippers and mosquito traps, truck-mounted hydraulic sprayers, backpack sprayers and granular blowers, plus specially-equipped helicopters for larvicide applications on areas too large or inaccessible for ground treatment. All pesticide applications use USEPA and NYSDEC registered materials and are conducted under appropriate Article 15 Protection of Waters and Article 24 Freshwater Wetland DEC permits and in accordance with label directions and other relevant State and Federal law.

The Division has developed technical guidelines for larval surveillance and control that determine where and when larvicides are used and what materials are selected for a particular situation. These guidelines emphasize the use of bacterial products when possible and reserve methoprene for those situations where bacterial products are unlikely to be effective. As per the Findings for the Long Term Plan and Executive order 15-2007, the Pesticide Management Committee has reported on the results of its review of literature on methoprene and potential impacts, as well as on research sponsored by the County. The Committee found no significant new concerns regarding the use of methoprene. The County is committed to implementing a Pesticide Reduction Action Plan, that will seek to further accelerate pesticide reduction. As part of this Pesticide Reduction Action Plan, the County will continue to work with technical experts to further refine protocols related to larval monitoring and larvicide usage, consistent with the Long-Term Plan and GEIS. The County is not aware of any new data, studies or reports which contravene research, reports and Findings of the Long Term Plan with respect to larval treatment guidelines or thresholds. Therefore, those Findings are still valid, and govern this Annual Plan.

In accordance with the Division's priorities and goals, approximately 1,500 major larval habitats known to the Division are regularly surveyed and controlled as necessary throughout the active season. These known historic mosquito habitats consist primarily of freshwater wetlands and salt marshes, as well as roadside ditches, recharge areas and other non-wetland sites. The remaining major larval habitats and the countless artificial container larval sites will be controlled on a service requested basis, as resources permit. Maps showing major larval habitats requiring control are on file at the Division's office in Yaphank.

**CONTROL OF ADULT MOSQUITOES:** This control method is conducted generally from May through September, but is highly weather dependent. It is carried out only when adult infestations constitute an immediate threat of mosquito-borne disease or there is a severe and widespread infestation of vector species, as determined by surveys and/or numerous public



## 2019 ANNUAL PLAN OF WORK- DIVISION OF VECTOR CONTROL

complaints. While the need for adult control can be reduced by the other program components, it is not possible to control all larval sites in Suffolk County for a variety of reasons including shifting weather patterns, disease findings and storm events. In addition, some Federal lands are restricted as Wilderness including extensive portions of Fire Island National Seashore and William Floyd Estate in Mastic Beach. It is also not appropriate to treat for adult mosquitoes in every area where residents express a concern, nor is it reasonable to treat small areas or individual properties for adult mosquitoes. Adult control is conducted only when it is clear, based on complaints, Division trap surveillance and/or SCDHS consultation that a substantial portion of a community is infested with vector species or there is a threat of mosquito-borne disease. Then, the entire affected area is treated so as to give relief to the greatest number of residents in an environmentally sound and cost effective manner. The guidelines for adult control in this Plan are consistent with those described in the GEIS Findings Statement.

Adult control can be deemed to be necessary under two separate operational scenarios in the GEIS. One is defined as a “Vector Control” (public health nuisance) application, the other is defined as “Health Emergency” application. Vector Control adulticide applications are made to reduce excessive numbers of human biting mosquitoes that could impact public health and quality of life by their biting activities. These high populations also represent potential vectors if a pathogen is present or appears in the area. Health Emergency applications are made when an unacceptably high risk of disease transmission to humans is detected, based on the ongoing presence of pathogens in mosquitoes. In either case, pesticide use decisions are only made on the basis of scientifically-determined surveillance data.

The need for responding to a Health Threat is determined under the New York State Department of Health West Nile Virus Response Plan and the County’s Zika Action Plan, adapted for local conditions by staff experts at Vector and Health Services. Because of the persistent presence of WNV in the County, the County perpetually begins each year in Risk Category 2. The New York State Department of Health has determined that there is an ongoing threat to the public health from West Nile Virus, and no longer declares health threats each year. The determination of when the threat of west Nile rises to the level that requires adulticiding is made by the County Vector Control staff in consultation with the Health Commissioner and ABDL staff. As additional pathogens including Zika virus becomes established in the US; the CDC, NYS Health and Suffolk continually reevaluate the risk to County residents. Currently, only travel related Zika cases have been reported in Suffolk, but Health ABDL continues to monitor Asian Tiger mosquitoes that have shown competence to carry Zika.

The need for adulticiding in response to WNV varies greatly from year to year. An analysis of Suffolk County’s WNV history during the years 2000-2017 indicates that most years, (10 of 17) the number of human cases of WNV was low, 0-4 cases. Under such conditions, the WNV human transmission risk level is low, even when WNV is found in the County. In these low risk years, determining exactly where and when to adulticide is nearly impossible with limited data. As a result, in low years, adulticiding is usually not warranted due to the difficulty in delineating specific areas to target. High risk years are caused largely by environmental conditions favorable to virus amplification in birds and mosquitoes, such as a warm spring and a hot dry summer weather. These conditions manifest themselves in late June and early July through higher than normal numbers of positive mosquito samples and calculated infection rates. WNV history also

## 2019 ANNUAL PLAN OF WORK- DIVISION OF VECTOR CONTROL

demonstrates that, in years when WNV activity is higher than normal, human cases are more likely to occur in certain parts of the County than other areas. In years with early indicators of high risk, adulticiding targeted to these high risk areas can measurably reduce the risk of human transmission and is therefore warranted. When a high risk year is identified, these WNV applications generally take place in late July and August during peak transmission. Responding to early indications of high risk is important, because adulticiding should occur before peak human transmission occurs in the first 2-3 weeks of August. Waiting to see transmission results in actual human cases is not appropriate because by the time cases are detected, transmission has been ongoing for several weeks and it may be too late to prevent further transmission. Whenever a virus isolation or human case is identified, Vector Control crews are sent to scout the area and treat locations of standing water, including catch basins and recharge basins/sumps.

As indicators of risk of transmission to humans accumulate, Vector Control and Health determines when control measures are best suited to the situation and which areas should be targeted for maximum benefit. The Commissioner of the SCDHS generally makes the final determination of the need for adult control in response to pathogens if a public health threat is declared. This strategy is consistent with the goal in the Findings to reduce the use of pesticides by a targeted tiered approach.

To ensure adulticides are used only when there is a clear need and a likely benefit, the criteria for conducting an adulticide treatment will include:

### **1. Evidence of high numbers of mosquitoes biting residents and visitors (Vector Control):**

- Service requests from public - mapped to determine extent of problem.
- Requests from community leaders, elected officials.
- New Jersey trap counts higher than generally found for area in question (at least 25 females of human-biting species per night).
- Centers for Disease Control (CDC) portable light trap counts of 100 or more.
- Confirmatory crew reports from the problem area or adjacent larval habitat, with landing rates of over one biting mosquito per minute over a five minute period.

### **2. Higher than normal risk of human disease transmission that can be reduced by adulticiding (Health Threat):**

- Indications of a higher than normal year for WNV activity County-wide as determined by such measures as infection rates and/or the number or proportion of positive mosquito samples, especially by late July or early August. In a year with normal or below normal levels of WNV activity, adulticiding is generally not indicated.
- In a high risk year, adulticiding may be warranted when there are indications of higher than normal levels of WNV risk (such as the number of positive mosquito samples, infection rates, vector species populations and history of human transmission) in particular areas. Adulticiding priority will be given to those parts of the County where WNV cases have occurred in multiple years and at high densities compared to the rest of the County.
- Zika response will occur when positive mosquitoes are found in traps or local transmission by mosquitoes is suspected due to acquired cases without travel history.
- Adulticiding will be strongly considered if EEE is detected during July, August or September when human transmission is most likely.

## 2019 ANNUAL PLAN OF WORK- DIVISION OF VECTOR CONTROL

- Adulticiding in response to other pathogens (such as dengue, chikungunya, malaria or other emerging pathogens) will be considered on a case-by case basis based on the vector ecology of the pathogen involved.

### **3. Control is technically and environmentally feasible:**

- A target area can be clearly defined based on geographic features and the distribution of vector species and other risk factors.
- Weather conditions are predicted to be suitable for ULV application when mosquitoes are active. Aerial applications in response to WNV are particularly dependent on weather conditions, and near-ideal conditions of low wind combined with high temperatures and humidity are needed for truly effective results.
- The road network is adequate and appropriate when truck applications are considered.
- Legal restrictions on the treatment of wetlands, open water buffers, and no-spray list members in the treatment zone will not create untreated areas that would prevent adequate coverage to ensure treatment efficacy.
- There are no issues regarding listed or special concern species in the treatment area.
- Meeting label restrictions for selected compounds will not compromise expected treatment efficacy.

### **4. Likely persistence or worsening of problem without intervention:**

- Considerations regarding the history of the area, such as the identification of a chronic problem area for biting mosquitoes or a history of virus transmission.
- Seasonal cycles of pathogen activity, such as whether or not the treatment is in time to prevent WNV transmission or whether it is too late and most transmission has already occurred.
- Determination if the problem will spread beyond the currently affected area absent intervention, based on the life history and habits of the species involved.
- Crew reports from adjacent larval habitats suggest adults will soon move into populated areas.
- Life history factors of mosquitoes present – i.e., if a brooded species is involved, determining if the brood is young or is naturally declining.
- Weather factors, in that cool weather generally alleviates immediate problems, but warm weather and/or the onset of peak viral seasons exacerbate concerns.
- Determining, if the decision is delayed, will later conditions prevent treatment at that time or not. Conversely, adverse weather conditions might reduce the treat of disease transmission.

In essence, criteria 1 and/or 2 are necessary thresholds which should be met, prior to a treatment being considered, while criteria 3 and 4 are countervailing factors that would indicate treatment might not be required. Treatment will not occur unless criteria 1 or 2 are satisfied through a combination of surveillance indicators, although not all surveillance techniques may be feasible in every setting and situation. The County is not aware of any new data, studies or reports which contravene the research, reports and Findings of the Long Term Plan with respect to adulticide treatment guidelines or thresholds. Therefore, those Findings remain valid and guide this Annual Work Plan.

## 2019 ANNUAL PLAN OF WORK- DIVISION OF VECTOR CONTROL

Vector Control applications will normally be made by truck since that technique has been shown to be effective for the most common species involved, although aerial application remains an option for unusually widespread problems or areas with limited road networks. Health Threat applications will generally be done by aerial application due to the need to treat large areas. Necessary public notices will be issued in a timely manner (normally, at least 24 hours pre-application), and appropriate precautions will be made to meet DEC restrictions on applications, and to avoid “No Spray” properties. To protect sensitive resources, buffer areas will be provided as needed between the sensitive area and the application equipment. A 150-foot buffer from freshwater wetlands will be provided to avoid the need for DEC Article 24 (Freshwater Wetlands) permits unless a permit or other authorization from DEC has been received prior to treatment.

In 2009 and previous years, an Emergency Authorization was requested from DEC if freshwater wetlands were involved to eliminate the need for an Article 24 (Freshwater Wetlands) permit. In 2011, NYSDEC issued Vector control an Article 24 permit to allow adulticide applications in freshwater wetlands and adjacent areas, if necessary, to protect the public health and replace the use of Emergency Authorizations. This DEC permit controls the use of adulticides in and adjacent to freshwater wetlands during the term of that permit: 2011-2020. The permit covers Health Threat applications throughout the County and also allow Vector Control applications in and adjacent to some freshwater wetlands in heavily developed areas of southern Brookhaven Town. Appropriate required public notices are issued in collaboration with Health, including CodeRed telephone alerts, website and phone hotline notices and social media updates. If an aerial application is required, the helicopter is equipped with a GPS and weather monitoring guidance technology will be used to optimize the delivery of the pesticide specifically to the targeted zone.

Efficacy measurements will be made following adulticide applications as weather conditions and staff resources allow. The Long-Term Plan also calls for the establishment of resistance testing for the more commonly used compounds. Continued testing of local mosquitoes against resmethrin (Scourge), sumithrin (Anvil) and Duet (sumithrin and prallethrin) in 2016 through 2018 revealed no local resistance to these materials in several species of mosquitoes tested. Species tested included *Aedes albopictus* the Asian Tiger Mosquito (potential carrier for Zika), *Culex pipiens* (WNV) and several salt marsh species including *Aedes sollicitans* (EEE and dog heartworm) and *Aedes taeniorhynchus* (Rift Valley and Venezelan Equine Encephalitis viruses).

The Long-Term Plan proposed a general reliance on resmethrin, a synthetic pyrethroid, as the adulticide pesticide. However, the Federal and State re-registration for resmethrin products is ending by the manufacturer and existing stocks are nearly exhausted. Sumithrin, a similar pyrethroid, was proposed by the Long Term Plan to be the primary back-up to resmethrin, and the primary pesticide for hand-held applications. Sumithrin has now become the Division’s primary adulticide material. Sumithrin, like resmethrin has been found to be an effective pesticide for mosquito control, can be used for ultra-low volume applications for truck and aerial delivery, undergoes rapid decay in the environment, and, as discussed below, has few identified non-target effects when applied as proposed under the Long-Term Plan. The Division has also begun use of Duet, with the Long Term Plan modified to include Duet and its active ingredients, sumithrin and prallethrin. Duet is similar to the Division’s primary sumithrin product, Anvil, in

## 2019 ANNUAL PLAN OF WORK- DIVISION OF VECTOR CONTROL

that both products contain sumithrin and the synergist piperonyl butoxide (PBO). However, in addition to 5% sumithrin and 5% PBO, Duet also contains 1% prallethrin. This amount of prallethrin is not sufficient to control mosquitoes, but it does induce them to fly, a phenomenon known as “benign agitation”. Benign agitation causes mosquitoes that are resting to fly so that they will encounter the aerosol droplets and increase the likelihood mosquitoes would be exposed to a lethal dose of sumithrin. Duet has been shown to be particularly effective against mosquitoes that tend to rest during the optimal time of the day for aerosol treatment, that is, at night. The primary use for Duet will be against the Asian Tiger mosquito (ATM), *Aedes albopictus* and may be used for control of other active daytime species including salt marsh mosquitoes. The ATM is an introduced species that inhabits containers and tends to bite during the daytime, making it a significant biting pest that is difficult to control because it is less active at night.

The Long-Term Plan also identifies two other pyrethroids, permethrin and natural pyrethrins, as potential adulticide compounds. Neither is preferred; however, as permethrin is a widely available product that is manufactured for many homeowner pest and farm uses that may increase mosquito resistance to the material. Natural pyrethrins are identified as a potentially useful compound because its label allows for use over agricultural areas. In addition to the pyrethroids, malathion, an organophosphate pesticide, was identified as a potential adulticide. Malathion would only be considered for use under very specialized conditions, such as in Zika response if a thermal fogging application was required, daylight applications were called for, or if resistance testing indicated pyrethroid applications would be ineffective in meeting the goals for public health protection. All of these pesticides are applied at the label rates, in the best way of achieving effective mosquito control and to avoid the development of pesticide resistance. The adulticides included in this Annual Plan have been fully evaluated in the GEIS for the Long-Term Plan, and this Annual Plan is fully consistent with the attached Findings. Vector Control continually reviews available pesticides and alternatives, including emerging materials and application techniques for the most environmentally suitable control methods.

**PUBLIC EDUCATION:** Mosquito problems resulting from larval habitats around homes and yards, containers, drains and the like, is generally brought to the Division's attention through residents' requests for service. Control of these "domestic" container mosquitoes is promoted through education and appeal to individual property owners to ‘Dump the Water’. Given the Zika and WNV threat posed by these container mosquitoes, especially the Asian Tiger Mosquito *Aedes albopictus* and the House Mosquito *Culex pipiens*, Vector and SCDHS have taken on a leading role in public education. Sanitarians are utilized to require property owners to clean up potential mosquito larval sites. Public education includes the distribution of pamphlets, telephone contact, site visits, media exposure and presentations to various citizens' groups and associations. In addition, the Division offers assistance to residents in eliminating sources of mosquitoes on their property, and leaves “door hangers” with educational information at properties they visit. Educational materials are also available on the County Web site. The appearance of introduced, container-breeding species *Aedes japonicus* and *Aedes albopictus* and continued Zika concern means this component must take on increasing importance, since the public’s cooperation is required to control these backyard container larval habitats.

## 2019 ANNUAL PLAN OF WORK- DIVISION OF VECTOR CONTROL

PUBLIC NOTIFICATION AND THE “NO-SPRAY” REGISTRY: In 2000, the County passed new laws to improve required public notification for adult mosquito control. As a result, there is now an increased use of the media and extensive outreach to local officials. The Health Services and Vector Control Websites are used to post spray notices and maps. For each adulticide application, over e-mails and faxes are sent to various officials and other interested parties. Newsday and News12 often post spray schedules and maps. And Health has begun posting spraying updates to social media including Facebook and Twitter. It is important to recognize that adulticide applications are very sensitive to the weather, especially aerial applications. The need to inform the public needs to be balanced with the need to conduct operations promptly, within weather windows and before the problem spreads and more acreage needs treatment. It is usually not appropriate to provide more than 24 hours’ notice in most cases, because beyond that time, weather forecasts are not very reliable. Attempts to provide more than 24-hour notice often result in aerial spray operations being announced and then cancelled. These cancellations are confusing to the public and difficult to reschedule. Despite these difficulties, the County provides 48-hour notice for aerial adulticide applications whenever possible for non-virus response.

In addition to the previous public notification procedures, the County has implemented a County law, passed in 2010, requiring the use of its “Code Red” automated calling and messaging system to provide more thorough public notice for adulticiding. This system allows automated phone calls to be placed to all landline telephones in an area designated for treatment. These messages provide basic information about the operation, such as spray hours, and refer the recipient to additional sources of information. The system ensures that nearly everyone in the area knows about the operation. Use of the Code Red system has been very successful and provides a new level of public information for the program. Residents can also register their cellphones or e-mail addresses to receive the Code red updates through FRES.

The Division also maintains a “no-spray” registry of residences where adult mosquito control is not desired. During ground applications the application unit is shut off 150 feet prior to passing such a residence and not turned on until 150 feet after. This registry represents an effort to balance the desires of those residents who want control of adult mosquitoes with those who oppose the use of pesticides. In 2018, the “no-spray” registry listed 296 properties, including 31 for health concerns, 35 beekeeper hive locations and 68 were organic farms locations including backyard gardens and 162 opposed to pesticide use. When control is required to deal with a public health threat, the Commissioner of SCDHS can override the list. Even then, list members are contacted prior to applications in their area through the Code Red system or called directly. In addition to this legally required registry, the Division maintains on the list beekeepers and organic farms who register. Beekeepers’ properties are generally avoided and beekeepers are notified via Code Red before treatments so that they can take any additional actions they may deem necessary to protect their hives. In addition, several steps are taken to avoid impacts to bees including timing of applications to the evening hours when bees are not foraging. Vector also uses mosquito control materials least likely to impact bees and through adjustment of spray equipment and technique using an ultra-low volume (ULV) droplet size that will impact mosquitoes, but not injure larger bodied insects, including bees. Certified organic farms are avoided and a buffer zone around the farm is included.

## 2019 ANNUAL PLAN OF WORK- DIVISION OF VECTOR CONTROL

Although not required to do so by law, the County also provides public notification for aerial larviciding. An e-mail notice of the marshes to be treated by helicopter is sent each week to Legislators, local governments and other interested parties. In addition, a list of marshes to be treated is posted each week on the County Web site and the list is sent to the local media.

SURVEILLANCE AND RESEARCH: All control operations are based on information obtained from surveillance and research. This a cooperative effort between Vector Control staff in the Department of Public Works and the Arthropod Borne Disease Laboratory in the Department of Health Services. Knowledge of mosquito populations, species composition and arbovirus activity is used to guide and evaluate control measures. Arbovirus surveillance allows the Division, in cooperation with the County and State Health Departments, to gauge the potential for disease transmission and to take appropriate action.

- A) Mosquito population surveillance: Approximately 12,000 larval and adult mosquito surveys are analyzed each year. These surveys are necessary for locating infestations, directing control efforts and evaluating the effectiveness of those efforts. The mosquito species that breed in various locations are determined from larval samples. Numbers of adult mosquitoes in residential areas are estimated from a network of approximately 30 New Jersey light traps in fixed locations throughout the County. New Jersey traps provide staff with ongoing population trends and are compared with service requests in a community to assist in determining the need for adult mosquito spraying. In 2018, over 110,000 mosquitoes from these traps were identified to species and counted. This tedious work is conducted by the Vector Control mosquito entomologist. In addition, Vector maintains an array of specialized Mosquito Magnet type traps to monitor seasonal cycles and long term trends in populations of the introduced exotic, container-breeding species *Aedes japonicus* and *Aedes albopictus* (The Asian Tiger Mosquito).
- B) Arbovirus surveillance in mosquitoes: Viral surveillance is conducted primarily by the ABDL and will be directed primarily at the main pathogens, WNV, Zika and EEE. Surveillance will be conducted according to the latest CDC and State DOH guidelines, modified for Suffolk County's unique environment. To monitor virus activity, CDC light traps and gravid traps are placed on a weekly or rotating basis at various locations throughout the County. These sites are chosen based on their history of viral activity or the presence of viral indicators such as the finding of birds with WNV in the area. The ABDL and the Division collect and process approximately 50,000 live, adult mosquitoes annually for viral analysis. Mosquitoes collected are sorted by species, frozen, and sent to Albany for arbovirus analysis in the State DOH laboratory.
- C) Human, avian and other surveillance: SCDHS, State DOH, DEC and CDC monitor other WNV and EEE indicators such as unusual bird deaths or the number of dead birds sighted in an area. The presence of WNV-positive birds is an indicator of virus activity in an area, and ABDL picks up selected dead birds for WNV testing. The County conducts a rapid RNA test (the RAMP test) to check for WNV in dead birds. There are also indications that the number of dead bird sightings in an area is a surrogate indicator of risk. SCDHS and NYS also monitor hospitals, blood banks and outreach to physicians to quickly detect human cases of Zika, WNV and other emerging vector borne illnesses.

## 2019 ANNUAL PLAN OF WORK- DIVISION OF VECTOR CONTROL

- D) Efficacy monitoring: While the Division has always monitored the effectiveness of the control program in a variety of ways, there has been an increased effort in this area, based on trial work to develop methods conducted in 2007. In particular, trapping of adult mosquitoes before and after adulticide events is conducted using carbon dioxide baited CDC light traps, NJ traps or reviewing service request logs. In addition, indicators of virus activity before and after treatment are followed to be sure the desired effect is achieved. While the number of adult mosquitoes in New Jersey traps and other traps is a key indicator of the overall success of the larval control program, additional effort will be directed toward before and after sampling of treated areas to confirm the efficacy of the treatment methods used.
- E) Special surveys and field investigations: Vector's Control staff conduct special surveys to determine the source of mosquito problems when these turn up in places where they are not expected. Special surveys of problems that appear early in a season can allow larval crews to prevent further trouble through the summer. Given the somewhat unpredictable ways mosquitoes can cause problems for residents of and visitors to the County, it is important that the Division retain a flexible ability to investigate issues as they are identified.
- F) Support for Wetlands Restoration/Stewardship activities: Vector Control continues to provide support for monitoring and other investigations related several wetland restoration activities. In particular, Division staff assist in the ongoing monitoring of the Integrated Marsh Management (IMM) projects at Wertheim and Seatuck National Wildlife Refuges. In addition, the Division will assist the Wetlands Stewardship Program in identifying and evaluating prospective sites for future IMM projects, particularly those that will help meet Long Term Plan goals for pesticide use reduction. With the completion of the Wetlands Stewardship Strategy and the availability of grant funding, this component of the program will continue in 2019 with several funded restoration projects.

### COOPERATIVE EFFORTS AND OUTREACH:

Other provisions of the Work Plan notwithstanding, Vector Control may participate in research, monitoring, and demonstration projects in cooperation with other levels of government such as the State, Towns or Federal agencies such as the US Fish and Wildlife Service or Army Corps of Engineers. These activities may be subject to separate DEC permitting and SEQRA compliance, and to CEQ and Wetlands Stewardship Committee review as well.

Vector Control will also continue to work with the various local governments, including the cooperative effort with East Hampton Town to provide a framework to develop, plan and construct wetland restoration projects that will restore wetland functions and values, and lead to a reduction in pesticide use, while still protecting human health and quality-of-life through reduced mosquito numbers.

### TICK RESEARCH SURVEILLANCE AND CONTROL:

On October 17, 2013, the County approved Resolution 797-2013 requiring this Plan of Work to include a section on the "steps being taken to reduce the incidence of tick-borne diseases in



## 2019 ANNUAL PLAN OF WORK- DIVISION OF VECTOR CONTROL

Suffolk County”. Accordingly, the 2019 Plan of Work includes a section on current tick surveillance, research and control activities. For 2019, these steps will continue to be limited to planning, information gathering, outreach, technical assistance, and small scale tick control trials and as such will be Type II actions under SEQRA Section 617.5 (c) (20), (21) and (27).

In 2013, the Division began work under Resolution 797-2013 to determine how the County might best be able to reduce the impact of tick-borne diseases. This was a follow-up to the Tick Management Task Force (TMTF) that was submitted to the Legislature in May of 2008 in response to Resolution 1123-2006. In addition, Resolution 132-2014 created the Tick Control Advisory Committee (TCAC) to advise Vector on tick control planning. Large scale effort to reduce the number of ticks on a countywide landscape, such as those described by the TMTF, would have the potential for adverse impacts on the environment and would need full SEQRA review. While no large scale control efforts can be undertaken without an environmental review of tick control under SEQRA and potentially an EIS of the plan, several interim actions are being undertaken. The development of a Tick Control Plan and environmental review, therefore, is a major effort that has yet to be funded. Re-establishment of the TCAC under Resolution 1668-2016 is assisting the County to develop a plan of action and identify the resources needed going forward to fully develop a County-wide environmentally sound tick control plan.

In 2019, Vector Control will continue to work on developing a County-wide tick control plan with the limited resources available. Studies on tick control efforts are currently restricted to research activities that would not require full environmental review under SEQRA. Vector is also working to improve the technical basis for control efforts and provide practical information to the various public and private entities currently undertaking localized tick control programs. These cooperative efforts can help leverage the County’s limited resources through partnership efforts.

The 2019 tick control efforts include:

1. In 2015 the County created a new position and hired an Entomologist for tick-related activities. Having this person devoted full time to tick research and control was a major step forward in understanding the tick problem in Suffolk.
2. Continue to work with the TCAC in 2019 to explore tick control and funding options that may be available to the County. Most importantly, the TCAC will allow for the continued input and feedback from stakeholders needed to gauge what options might be feasible and acceptable for implementation at each local level. This is a significant task, since each of the available control options have their own unique local benefits and drawbacks. Public acceptance of various tick control options may also vary considerably across Suffolk County.
3. Site surveillance at select locations continues on a bi-weekly level since 2015 to more accurately track seasonal changes in tick activity, population and species shifts.
4. Continued assistance to NYS Parks personnel in the selection and design of several grid-based tick surveillance programs in State Parks which are standardized with Vector

## 2019 ANNUAL PLAN OF WORK- DIVISION OF VECTOR CONTROL

Controls efforts and data sharing. Incorporating NYS Parks efforts boosted the overall tick surveillance network in the County considerably with no additional burden on County resources.

5. Vector and SCDOH staff continue pathogen tick surveillance at 10 sites across Suffolk County, originally established in 2016. Sampling from locations throughout Suffolk indicates the extent of virus activity for tick-borne diseases including: Lyme, Powassan, anaplasmosis, babesiosis and ehrlichiosis across the County and track changes.
6. Staff continues its efforts to reach out to local and nationally recognized tick experts for their advice and input on research and control strategies. Staff attend regional seminars and conferences to discuss emerging diseases, introduced species and new developments. These efforts have already proven very helpful in gaining knowledge that may not be published but is highly valuable and allow fostering of mutually beneficial collaborations and potential funding sources.
7. Vector staff will continue to provide technical advice and help design a tick management program for landowners, government agencies, municipalities and civic groups that are conducting tick control or are considering doing so. These activities will continue to provide further opportunities to learn what techniques local entities are interested in adopting, currently using, or which may be useful to the County and others.
8. Vector Control and Cornell Cooperative Extension (CCE) were awarded an \$8,500 grant through NYS Integrated Pest Management (IPM) for additional field acaricide testing. Vector was awarded a student internship in 2018, though CCE and Cornell University which greatly enhancing Vectors tick related efforts with no added county costs. There is an opportunity for another student internship through this program for 2019 as well.
9. CCE and Vector Staff were awarded a grant through NYS IPM for increased surveillance efforts focused on the newly identified invasive long horned tick, *H. longicornis*. This species has been found in close proximity to Suffolk County: NJ, Satan Island and Hudson Valley in NY, PA and several other states. This species has been documented to feed on a wide range of animals, including humans. In addition, vector staff acquired samples of this new tick to aide in identification, if found locally.
10. Vector Control and CCE are applying for state grant funding through the newly launched Northeast Regional Center for Excellence in Vector-Borne Diseases at Cornell University and work cooperatively seeking other potential funding sources to further tick research in Suffolk.

The prevention of tick-borne diseases in the County is a difficult and complex issue. It is particularly difficult because the biology of these vectors and diseases are significantly linked to deer overpopulation, expansion of range and limited management. In addition, tick control technology suitable for large scale application is not as well developed as mosquito control techniques. A proper plan with concurrent SEQRA compliance would require additional resources to undertake an EIS, beyond those currently available to Vector. However, tick-borne

2019 ANNUAL PLAN OF WORK- DIVISION OF VECTOR CONTROL

diseases and the adverse impacts ticks have on the ability of County residents to utilize the outdoors, and even their own property, are important issues that need continued investigation.

The Findings Statement for the Long Term Plan requires Vector Control to provide an annual report of pesticide use to the Legislature. The table below summarizes the use of pesticides by the Division in 2018.

| <b>Suffolk County Vector Control Pesticide Acreage Estimates for 2018</b> |                          |                |                    |              |                               |                    |
|---|--------------------------|----------------|--------------------|--------------|-------------------------------|--------------------|
| <b>Pesticide</b>  | <b>Active Ingredient</b> | <b>EPA#</b>    | <b>Amount used</b> | <b>Units</b> | <b>Air/Ground Application</b> | <b>Total Acres</b> |
| <b>Ground Larvicide</b>   |                          |                |                    |              |                               |                    |
| Altosid 5%  | Methoprene               | 2724-392       | 0                  | GL           | Ground                        | 0                  |
| Altosid pellets   | Methoprene               | 2724-448       | 6.75               | LB           | Ground                        | 1                  |
| Altosid XRG   | Methoprene               | 2724-451       | 20                 | LB           | Ground                        | 4                  |
| Bti briquets - Summit   | Bti                      | 6218-47        | 456                | EA           | Ground                        | 1                  |
| Fourstar 90 briquets  | Bti/ <i>B.sphaericus</i> | 83362-3        | 2044               | EA           | Ground                        | 5                  |
| Aquabac 200G  | Bti                      | 62637-3        | 470.5              | LB           | Ground                        | 47                 |
| VectoPrime FG   | Bti/Methoprene           | 73049-501      | 2167               | LB           | Ground                        | 542                |
| Spheratax 50G   | Bti/ <i>B.sphaericus</i> | 84268-2        | 2152.6             | LB           | Ground                        | 144                |
| Altosid XR briquets   | Methoprene               | 2724-421       | 21372              | EA           | Ground                        | 98                 |
| <b>Ground Larvicide Total Acres:</b>                                      |                          |                |                    |              | <b>Ground Total</b>           | <b>841</b>         |
| <b>Aerial Larvicide:</b>  |                          |                |                    |              |                               |                    |
| VectoPrime FG   | Bti/Methoprene           | 73049-501      | 48369.3            | LB           | Aerial                        | 12,092             |
| Duplex Altosid 20% &  | Methoprene               | 2724-446       | 40.5               | GL           | Aerial                        | 6,912              |
| Duplex VectoBac 12AS  | Bti                      | 73049-38       | 972                | GL           | Aerial                        | 6,912              |
| <b>Aerial Larvicide Total:</b>  |                          |                |                    |              | <b>Aerial Total</b>           | <b>19,004</b>      |
| <b>Total Larvicide Acreage:</b>   |                          |                |                    |              | <b>Total Larval</b>           | <b>19,846</b>      |
| <b>Adulticide:</b>  |                          |                |                    |              |                               |                    |
| Scourge   | Resmethrin               | 432-667        | 0                  | GL           | Ground/Air                    | 0                  |
| Anvil 10+10   | Sumithrin                | 1021-1688-8329 | 76.4               | GL           | Ground/Air                    | 16,299             |
| Duet  | Sumithrin+Prallethrin    | 1021-1795-8329 | 9.29               | GL           | Ground                        | 1,585              |
| Suspend SC (Tick)   | Deltamethrin             | 432-763        | 0.75               | GL           | Ground                        | 5                  |
| <b>Adulticide Acreage:</b>  |                          |                |                    |              | <b>Adulticide:</b>            | <b>17,884</b>      |