SUFFOLK COUNTY DEPARTMENT OF PUBLIC WORKS
DIVISION OF VECTOR CONTROL

2016 ANNUAL PLAN OF WORK

The Suffolk County Department of Public Works, Division of Vector Control, is responsible under the County Charter for controlling mosquito infestations that are of public health importance. The Division's responsibility is to control mosquito infestations 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 the appropriate federal, state and local agencies. 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 2016 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 adopts 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 will submit a report to CEQ independently to satisfy Executive Order 15-2007.

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 Suffolk County". Accordingly, the 2016 Plan of Work will include a section on ticks. For 2016, these steps will be limited to planning and information gathering and as such will be Type II actions under SEQRA Section 617.5 (c) (20), (21) and (27).

2016 SUMMARY

1. Water Management: Water Management activities will conform to the guidelines outlined in the Long Term Plan and GEIS Finding statement's Wetlands Best Management Practices (BMP's). The Wetlands Stewardship Program finalized the Wetlands Stewardship Strategy in 2015. Maintenance of existing structures will be conducted as described in BMP's 2, 3 and 4 in the Findings Statement and Long Term Plan. Water management work beyond those

measures specified in BMP's 2, 3, and 4 will have to undergo review under SEQRA, and would be subject to Suffolk County's Council of Environmental Quality (CEQ) review, as well. Now that the Wetlands Stewardship Strategy is finalized, the County will undertake Integrated Marsh Management (IMM) projects as called for under that Strategy. 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 cooperation with the Towns of Babylon, Islip and Brookhaven and the State. These projects will be planned in late 2015 and early 2016 and construction will commence in late 2016. The County has also received $560,000 from a Federal Hazard Mitigation Grant Program for IMM work at Smith Point Marsh in Shirley for costal resiliency. Planning is underway for that project with construction targeted for late 2017.

2. Larval Control: Perform approximately 15,000 inspections of larval sites. Treat approximately 20,000 acres with Bacillus thuringiensis israelensis (Bti), Bacillus sphaericus or methoprene.

3. Adult Control: Conduct adult control when infestations are severe and widespread and/or necessary to respond to the presence of pathogens.

4. Research and Surveillance: The Vector Control Laboratory will collect and process 10,000-12,000 larval and adult mosquito samples, depending on mosquito populations and viral activity. The Department of Health Services Arthropod-Borne Disease Laboratory (ABDL) will collect and process approximately 50,000 mosquitoes for arbovirus surveillance. The Vector Lab will evaluate the effectiveness of treatments in cooperation with the ABDL The Vector Lab will perform special studies of problem areas, such as checking for pesticide resistance, identifying the sources of unusual infestations or finding larval habitats of problem species.

Technical and Institutional Framework for Vector Control

To achieve this goal, the Division employs an integrated control program. Control measures are employed in a hierarchical manner that emphasizes prevention, 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-lasting, more "environmentally friendly" measures such as water management and biological control to highly specific larvicides, and uses chemical control such as adulticiding only after 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. SCDHS operates the ABDL, with some operational support provided by the Division. The ABDL concentrates its efforts on surveillance for mosquito-borne pathogens, primarily the arboviruses West Nile Virus (WNV) and Eastern Equine Encephalitis (EEE). The Division conducts laboratory work that concentrates on estimating populations of mosquito adults and larvae. 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 control work. During times of a declared public health emergency, the Division comes under the operational control of SCDHS. However, these declarations are rare and must be issued by the New York State Health Commissioner. The State has determined that such declarations are not normally needed for West Nile Virus, since the virus is now established here and its control is not considered a General Public Health activity. Under most circumstances, the Division takes the lead role on control efforts but works in close consultation with SCDHS when there is active virus activity. Under the County's NY State Freshwater Wetlands permit, the Commissioner of Health Services must determine that application of adulticides is required in response to mosquito-borne pathogens before they can be applied to most freshwater wetlands. SCDHS is also responsible for other activities related to mosquitoes and the public health, such as medical surveillance, sanitation, environmental monitoring, community outreach and public education.

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

2016 PROGRAM COMPONENTS

WATER MANAGEMENT: Field personnel conduct this component from January 1 to April 30, and October 1 to December 31 (approximate dates). Water management is a functional way to reduce the need for pesticide applications. The Division expects to conduct water management in each of the County's ten towns. The work will be performed on a priority, as needed basis. Highest priority is assigned to larval habitats where infestations have the greatest potential for negative impact. In particular, areas that showed unexpectedly high infestations in 2015 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. Sometimes, work to restore a system, even within its original configuration, requires a permit. In such cases, work is performed under permit and

in cooperation with the DEC. 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 will be conducted with appropriate notification to and oversight by the Wetlands Stewardship Committee (WSC) and 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, water management in 2016 will not be limited to maintenance activities described in the BMP's. More extensive marsh projects using more intensive BMP's described in the Long Term Plan will be undertaken under the framework of IMM in consultation with CEQ, WSC and DEC. These will be 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 will be planned in partnership with the landowner and NYSDEC, USFWS and other natural resources agencies.

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 September 30 (approximate dates). Larval control is most often employed when water management has not been able to completely prevent mosquito production. It also is used when water management has not been conducted or is not appropriate. 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 small, their proximity to residential areas makes them important. Ground crews also respond to complaints from the public. Over 90% of the larvicide used by the Division is applied in the major salt marshes and other wetlands, by helicopter. These marshes are surveyed at least weekly, or after flood tides. If larvae are discovered, a contract helicopter applies larvicide. For salt marshes and similar habitats, either liquid Bti (Bacillus thuringiensis israelensis) or liquid Altosid (methoprene) is applied, based on larval stage, temperature, and weather conditions. Larval control is used only if inspection of a site reveals or has the potential for significant larval production.

The larval control products to be used in 2016 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 case-by-case approval by DEC.

Altosid XR Briquets (methoprene, EPA 2724-421) – Catch basins and other drainage or artificial structures that are not fish habitats. XR briquets will be used in May and June, with follow up treatments using Vectolex or Altosid pellets as necessary.

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

Sphaeratax SPH (50G) (B. sphaericus, EPA 84268-2) - Aerial or ground application to freshwater and tidal areas that hold water for more than 7 days, such as ditches, impounded marshes, swamps, ponds; catch basins in July and August.

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.

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.

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 will use DEC-registered materials and be conducted under appropriate 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 chosen 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 control this Annual Plan.

In accordance with the Division's priorities and goals, approximately 1,500 of the 2,077 major larval habitats known to the Division will be surveyed and controlled if necessary throughout the

active season. These known 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 100,000+ artificial larval sites will be controlled on a complaint 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 from approximately June 1 through September 15. It is done on an overtime basis; because the need for it is so highly variable it is not efficient to dedicate staff full time to it. This is a tertiary form of control, and the smallest component of the program. 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 public 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 several reasons. Higher than normal rainfall can increase the need for adult control and some sites cannot be expeditiously treated due to independent permitting requirements, as is the case for larval habitats in the Wilderness portions of Fire Island. In addition, new or unexpected larval habitats always seem to occur, despite the best efforts of the program. It is not appropriate to treat for adult mosquitoes in every area where residents express a concern, nor is it appropriate to treat small areas or individual properties for adult mosquitoes. Adult control is conducted only when it is clear, based on complaints, Division surveillance and 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. This strategy treats relatively few areas, but those that are treated receive sufficient control to reduce the problem. 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 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 transmisson 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 Health Emergency treatments is determined by the New York State Department of Health West Nile Virus Response Plan for mosquito-borne disease, 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 on a year-by-year basis for WNV. The determination of when this ongoing threat rises to the level that requires adulticiding is made by the County.

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 2000-2015 indicates that most years, (10 of 16) the number of human cases of WNV is low, 0-4 cases. Under such conditions, the WNV human transmisson risk level is low yet widespread throughout the County. In these low risk years, determining exactly where adulticiding would help is nearly impossible with current data. As a result, in low years, adulticiding is usually not warranted due to the difficulty in delinating an area or areas to target. Higher risk years are caused largely by environmental conditions favorable to virus amplification in birds and mosquitoes, such as warm spring weather and a high water table. These conditions manifest themselves in late July and early August through higher than normal numbers of positive mosquito samples and infection rates. WNV history also demonstrates that, in years when WNV activity is higher than normal, human cases are more likely to occur in some parts of the County than others. 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 year can be identified, these applications should take place in late July or the first 2 weeks in August. Responding to early indications of high risk is important, because adulticiding should occur before human transmisson occurs, that is, in the first 2-3 weeks of August. Waiting to see if transmission results in actual human cases is not appropriate because by the time cases are detected, transmission has been going on for weeks and it may be to late to prevent further transmission. Use of adulticides after late August or early September is usually not indicated because most human transmission has alredy occurred.

As indicators of risk of transmisson to humans accumulate, Vector Control determines which control measures are best suited to the situation and which areas should be targeted for maximum benefit. The Commissioner of the SCDHS makes the final determination of the need for adult control in reponse to pathogens. By limiting the use of adulticides for virus response to only those years and those areas where a benefit is likely, the risks associated with adulticiding can be reduced while still providing a high level of public health protection. This strategy is consistent with the goal in the Findings to reduce the use of pesticides by a targeted 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. Landing rates of one per minute over a five minute period.
- Confirmatory crew reports from problem area or adjacent larval habitat

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

- 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.
- Adulticiding will be strongly considered if EEE is detected during July or August, when human transmission is most likely.
- Adulticiding in reponse 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, if later conditions will prevent treatment at that time or not. Conversely, adverse weather conditions might remove most people from harm's way.

In essence, criteria 1and 2 are necessary thresholds which must be met, prior to a treatment being considered, while criteria 3 and 4 are countervailing factors that would indicate treatment is not

required despite the presence of an infestation or virus activity. With enhanced surveillance, there will be rigorous, numeric validation of mosquito infestations in or near a potentially affected population in all cases. 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 research, reports and Findings of the Long Term Plan with respect to adulticide treatment guidelines or thresholds. Therefore, those Findings are still valid, and control this Annual Plan.

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. Health Emergency applications will be done by aerial application due to the need to treat large areas to make a difference and due to the lack of evidence ground application significantly impacts WNV activity in our setting. 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. If necessary to protect sensitive resources, buffer areas will be provided 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.

In 2009 and previous years, an Emergency Authorization were requested from DEC if freshwater wetlands were involved to eliminate the need for an Article 24 (Freshwater Wetlands) permit. In 2011, NYSDEC issued an Article 24 permit to allow adulticide applications in freshwater wetlands or adjacent areas if necessary to protect the public health and replace the use of Emergency Authorizations. This permit controls the use of adulticides in and adjacent to freshwater wetlands during the term of that permit, 2011-2020. The permit covers Health Emergency applications throughout the County and will also allow Vector Control applications in and adjacent to some freshwater wetlands in heavily developed areas of southern Brookhaven. Appropriate required public notices will be issued. Pre-application mosquito sampling will be conducted (for efficacy determinations). If an aerial application is required, a helicopter using the AG-NAV Flightmaster guidance system or equivalent GPS-based technology will be used to optimize the delivery of the pesticide.

Efficacy measurements will be made following as many adulticide applications as weather conditions and resources allow. The Long-Term Plan also calls for the establishment of resistance testing for the more commonly used compounds. Testing of mosquitoes against sumithrin (Anvil) in 2014 revealed no resistance to this material.

The Long-Term Plan proposed a general reliance on resmethrin, a synthetic pyrethroid, as the adulticide pesticide. However, the Federal and State registrations for resmethrin products end in 2015 and existing stocks were used up or disposed of. Sumithrin, a similar pyrethroid, was proposed by the Long Term Plan to be the primary back-up to resmethrin, and the primary pesticide for any hand-held applications. Sumithrin will now become the Division's primary adulticide material. Sumithirn, 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 will also use a relatively new product, Duet, now that the Long Term Plan has been modified to include it and one of its active ingredients, prallethrin. Duet is similar to the Division's primary sumithrin product, Anvil, in 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 casues mosquitoes that are resting to fly so that they will encounter aerosol droplets and 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*. The ATM is an exotic species that inhabits containers and tend 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, permethrin is a more widely available product that is manufactured by more than one company, and so may continue to be available under conditions when the patented, less-widely used pyrethroids may not be. 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 be used under very specialized conditions, that are unlikely to happen, such if thermal fogging were needed, daylight applications were called for, or if resistance testing indicated pyrethroid applications would be ineffective in meeting the goals of the application. All of these pesticides would be applied at the maximum label rate, as that is the best way of achieving effective mosquito control and is helpful in avoiding 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 Annnual Plan is fully consistent with the attached Findings. The County will continue to review available pesticides and alternatives.

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" mosquitoes is promoted through education and appeal to individual property owners. Given the WNV threat posed by these mosquitoes, especially *Culex pipiens*, SCDHS has 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 the exotic, container-breeding species *Aedes japonicus* and *Aedes albopictus* means this component will take on increasing importance, since the public's cooperation will be needed to control these larval habitats.

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

Web site is used to post spray maps. For each adulticide application, over 150 faxes are sent to various officials and other interested parties. Newsday and News12 post spray schedules and maps. It is important to recognize that adulticide applications are very sensitive to the weather, especially aerial pyrethroid applications. The need to inform the public will need 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 many spray operations being announced and then cancelled. These cancellations are very confusing to the public. Despite these difficulties, the County provides 48-hour notice for aerial adulticide applications whenever possible.

In addition to the previous public notification procedures, the County has implemented the new 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 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.

The Division 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. For aerial control, a system has been devised for identifying and avoiding areas with a minimum radius of ¼ mile, more than 65% of the area is residential and where more than 35% of the residences are on the registry. 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. At this writing, the "no-spray" registry lists several hundred properties, most of which are in areas where serious infestations are rare. When control is required to deal with a public health emergency, the Commissioner of SCDHS can override the list. Even then list members are telephoned prior to applications in their area through the Code Red system. In addition to this legally required registry, the Division maintains listings of beekeepers and organic farms. Beekeepers' properties are generally avoided or beekeepers are notified before treatments so that they can protect their hives.

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.

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 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 29 New Jersey light traps in fixed locations throughout the County. New Jersey traps provide a dead sample three to five times per week. Some 50,000 mosquitoes per year from these traps are identified and counted. This work is conducted by DPW staff. In addition, Vector DPW maintains an array of 5 specialized Mosquito Magnet traps to monitor seasonal cycles and long term trends in populations of the 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 two pathogens, EEE and WNV. 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. In 2016, the samples will be sorted by species, frozen, and sent to Albany for arbovirus analysis in the State DOH laboratory.

C) Bird and other surveillance: SCDHS, State DOH, DEC and CDC monitor other WNV 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, although the usefulness of dead birds as an indicator has declined in recent years as birds adapt to the virus. The County picks up selected dead birds for WNV testing. The County conducts a rapid, field test (the RAMP test). There are also indications that the number of dead bird sightings in an area is a surrogate indicator of risk. There will also be SCDHS monitoring of hospitals and outreach to physicians to quickly detect any human cases.

D) Efficacy monitoring: While the Division has always monitored the effectiveness of the control program in a variety of ways, there will be 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 will be conducted using carbon dioxide baited CDC light traps. 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. For methoprene applications, this requires bringing pupae from the treated areas back to the laboratory to determine if they emerge, something that is very labor intensive.

E) Special surveys and field investigations: Vector's Laboratory Director and other staff also 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. Ongoing studies on mosquito production in catch basins are helping to define appropriate control measures for this important habitat for *Culex* mosquitoes that transmit WNV. In addition, we are developing new techniques to improve surveillance and control for the Asian tiger mosquito, *Ae. albopictus* a species which has become a major biting pest in large portions of the County the last four years. Given the somewhat unpredictable ways mosquitoes seem to find to 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 come up.

F) Support for Wetlands Stewardship activities: Vector Control continues to provide support for monitoring and other investigations related to Wetlands Stewardship activities. In particular, Division staff assists in the monitoring of the Integrated Marsh Management (IMM) project at Wertheim National Wildlife Refuge. 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 increase substantially in 2016.

Other provisions of the Work Plan notwithstanding, Vector Control may participate in limited 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, which are not part of this Plan, will be subject to separate permitting and SEQRA compliance, and would be subject to CEQ and Wetlands Stewardship Committee review as well.

In 2013, the Division began work as required under Resolution 797-2013 to determine how the County might be able to reduce the impact of tick-borne diseases. It's important to remember that this subject was covered in some detail in the report of the Tick Management Task Force (TMTF) that was submitted to the Legislature in May of 2008 in response to Resolution 1123-2006. Most, if not all of these recommendations of this Task Force remain viable and should be strongly considered as County policy makers determine what steps the County might take to reduce the incidence of tick-borne diseases. In addition, Resolution 132-2014 created the Tick Control Advisory Committee (TCAC) to advise Vector on this important issue. Given the important and complex nature of this problem and the fact that the TCAC's input is vital, it would be premature to attempt to present a fully developed plan for tick control at this time. It is also clear that any serious effort to reduce the number of ticks on the landscape, such as those described by the TMTF, would have at least the potential for adverse impacts on the environment. This means that no large scale control efforts can be undertaken without an environmental review under SEQRA. The development of a control plan, therefore, is a major effort that has yet to be funded. It is expected that the TCAC will help the County develop a plan of action and identify the resources needed, but that work remains to be done.

In 2016, Vector Control will continue to work on the tick issue within the limited resources available and not conduct any control activities that would require environmental review under SEQRA. Given these limitations, there are still things Vector can do. In particular, Vector can help improve the technical basis for control efforts and provide that technical information to the various public and private entities currently undertaking tick control. These efforts can leverage the County's limited resources through partnership efforts:

1. The County created a new position and hired an Entomolologist for tick-related activities. Having a person devoting full time to ticks is a major step forward in dealing with this problem.
2. We will continue to work with the TCAC to explore alternatives that might be available to the County. Most importantly, the TCAC will allow for the kind of stakeholder input needed to gauge what options might be feasible and acceptable for implementation. This is a significant task, since all the available options have their benefits and drawbacks.
3. We will continue to search the literature on the subject in order to improve the Division's technical expertise in tick control and the environmental effects thereof.
4. We will continue our efforts to reach out to experts in the field for their advice and input. This process has already begun and has proven very helpful in gaining knowledge that may not be published but is highly valuable. For instance, the details of how surveillance is conducted are very important to ensure quality data, and to learn this, it's best to actually go into the field with experts who are doing this work.
5. We have identified sites and methods and begin baseline surveillance of tick populations. This effort will provide important information to help design control efforts, such as species composition, abundance, seasonal cycles, and pathogens present.
6. Vector staff has begun submitting tick samples collected during population surveys for pathogen testing by NYSDOH and academic researchers.
7. Vector staff will continue to provide technical advice to landowners and government agencies that are conducting tick control or are considering doing so. These contacts will also provide further opportunities to learn what techniques are useful and how the County might use them. A workshop is planned for the fall of 2015 and more will be considered.
8. Vector staff will investigate emerging wide-area tick control methods and conduct field trials as opportunities and resources allow.

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 dictate that the problem is inextricably linked to another difficult problem, deer overpopulation and management. In addition, tick control technology suitable for large scale application is clearly not as well developed as mosquito control technology is. There are emerging technologies that may improve this picture when they become available. Any effort that would seriously reduce the incidence of tick-borne diseases by controlling the vectors will require substantial resources at a time of fiscal scarcity. Even preparing a proper plan with concurrent SEQRA compliance would require resources beyond those currently available at Vector. However, tick-borne diseases and the adverse impacts ticks have on the ability of County residents to utilize the outdoors, even their own property, are important issues.

Pesticide Use in 2015

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 2015. The acres treated are compiled by multiplying the total used by the standard dose. In a Duplex treatment, the acres treated with two products simultaneously are only counted once.

Suffolk County Pesticide Acreage Estimates for 2015

Product	Active ingredient	Amount used	Units	Air/Ground Application	2015 Acreage
Larvicides					
Altosid Liquid Larvicide (5%)	Methoprene	0	gal	Ground	0
Altosid Liquid Larvicide concentrate (20%)	Methoprene	35	gal	Aerial	
Altosid pellets	Methoprene	198	lbs	Ground	40
Altosid XR-G	Methoprene	40	lbs	Ground	8
Valent BioSciences Vectobac 12 AS	Bti	769.5	gal	Aerial	
Summit Bti briquets	Bti	0	ea	Ground	0
Fourstar 90 briquets	Bti/ *B. sphaericus*	2000	ea	Ground	5
Valent BioSciences Vectobac CG	Bti	0	lbs	Ground	0
Aquabac 200G	Bti	4640	lbs	Ground	464
Valent BioSciences Vectolex CG	*B. sphaericus*	0	lbs	Ground	0
Altosid XR briquets	Methoprene	22880	ea	Ground	53
Spheratax 50G	*B. sphaericus*	7840	lbs	Ground	397
Ground Larvicide Total					966
Aerial Larvicide:					
Vectobac 12AS applied alone	Bti	356.25	gal	Aerial	2850
Altosid 20% applied alone	Methoprene	18.36	gal		2350
Duplex Vect 12AS + Altosid 20%	methoprene+Bti tank mix	35 ALL + 844 12AS	gal	Aerial	6000
Total larvicide					12166
Adulticides					
Scourge 18+54	resmethrin	43	gal	Ground/Air	9173
Anvil 10+10 ULV	sumithrin	10	gal	Ground	2133
Duet	sumithrin+prallethrin	11	gal	Ground	1877
Adulticide acreage					13184