DISTRICT OF CENTRAL SAANICH
TSAWOUT FIRST NATION
& CAPITAL REGIONAL DISTRICT

INTEGRATED PEST MANAGEMENT PLAN
PMP # 825-0005-26-31

MOSQUITO POPULATION MANAGEMENT AND CONTROL PROGRAM
2026 – 2031

Plan Prepared by

Duka Environmental Services Ltd.

Surrey, BC

Prepared for
District of Central Saanich
Tsawout First Nation
& Capital Regional District
Victoria, British Columbia

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1.0 PEST MANAGEMENT PLAN SUMMARY

The District of Central Saanich has significant recreational, agricultural, environmental, and ecological value and is comprised of several community centres. Farming, walking, cycling, camping, bird watching, sports, golfing and gardening are just a few of the outdoor summer activities available to residents and visitors. Adult mosquito annoyance can often conflict with the enjoyment of such activities and potentially impact public health. Besides the negative impacts on the lifestyle and well-being of residents and visitors, there can be also considerable economic impact from mosquito annoyance on local businesses and workers. An integrated pest management (IPM) approach to mosquito population management and control can reduce overall annoyance levels and co-exist with these valuable resources.

This approach focuses on the timely detection and treatment of larval mosquito populations using biological products and methodologies. Where possible, and appropriate, physical or cultural controls are recommended, and implemented, that would reduce larval habitat and enhance or conserve natural mosquito predators. Where required, larval mosquito populations would be controlled using the biorational larvicide products VectoBac 200G (*Bacillus thuringiensis var. israelensis*, serotype H-14, strain AM 65-52, PCP #18158) and VectoLex (*Lysinibacillus sphaericus*, 2362, serotype H5a5b, strain ABTS 1743, PCP # 28008 & # 28009). A similar *Bti* product, AquaBac 200G (*Bacillus thuringiensis var. israelensis*, Serotype H-14, Strain BMP-144, PCP #26863) may be used. All treatments would be completed in accordance with the methodologies and procedures prescribed in the BC Ministry of Environment-accepted Pest Management Plan (PMP) for Mosquito Control (this document), prepared for the District of Central Saanich, Capital Regional District and the Tsawout First Nation by *Duka Environmental Services Ltd,* for the years 2026-2031.

Mosquito control services are provided to residential and rural property owners, businesses, municipal and regional parks, sports fields, campgrounds and other outdoor recreational and tourist facilities located within the District of Central Saanich, CRD Parks and Tsawout First Nation lands . The goal of the annual mosquito control program is to reduce the potential for widespread adult mosquito annoyance for the benefit of residents, workers, and visitors to Central Saanich.

The Mosquito Population Management and Control Program Pest Management Plan, PMP # 825-0005-26-31 (this document), is presented in a format which adheres to the requirements of British Columbia's Integrated Pest Management Act and Regulation, including amendments, the Mosquito Management Sector Review Paper and BC Ministry of Environment, Indigenous Engagement: A Guide for Integrated Pest Management Act Proponents (2023). Copies of these documents may be accessed through the BC Ministry of Environment home page at https://www2.gov.bc.ca/gov/content/environment/pesticides-pest-management. Common themes of larval development prevention, and control necessary to achieve program goals, while ensuring environmental conservation, are repeated throughout this document.

This PMP is 'owned' by the District of Central Saanich and partners, the Tsawout First Nation and Capital Regional District. It would remain in place for the purposes of larval mosquito population management and control for the five year period, 15 April 2026 to 14 April 2031. The mosquito control program and methodologies developed within this PMP are a hybrid of approaches adapted from collaboration with mosquito and vector control professionals worldwide. It has been carefully and specifically designed for the unique conditions of the program areas and is a model of environmental compatibility. This PMP meets all the requirements of the Integrated Pest Management Act and will replace the previously approved, and soon to expire (April 2026), PMP # 825-0004-21-26. The mosquito control program proposed for the years 2026-2031 is largely unchanged from that of past seasons and focuses on larval control and reduction of populations.

This PMP reviews mosquito biology, the types of larval mosquito habitats affecting the program area and the local mosquito species complex. An IPM approach to mosquito population management and control can reduce overall adult mosquito annoyance levels through education, prevention and biological controls. This PMP outlines the procedures and methodologies of an IPM approach which will reduce local mosquito populations for the purpose of preventing mosquito annoyance for area residents, workers and visitors.

A professional, experienced, environmental services firm (the consultant) is retained by the District of Central Saanich to deliver these specialized services and to ensure adherence to the Pest Management Plan. The consultants for the Central Saanich mosquito control program would have Registered Professional Biologists (R.P.Bios.) as program managers and senior biologists. All program personnel would be appropriately certified as pesticide applicators with the BC Ministry of Environment, Integrated Pest Management Program.

Public relations and ongoing program education would be accomplished through regular contacts with residents, businesses and community visitors. Information on mosquitos, their control, and prevention, is available to the general public in a variety of forms including informational brochures, websites, newspaper articles, open-houses, council meetings and farmer's markets etc. Resident requests for service are followed up with telephone contact and site inspection. Physical reduction, elimination or alteration of larval mosquito development habitats is an important aspect of the control program. Wherever possible, and practical, property owners are advised of measures they can complete to reduce mosquito development and adult mosquito annoyance.

1.1 Geographic Boundaries of this Pest Management Plan

The District of Central Saanich (Central Saanich) is located approximately 20 kilometres north of Victoria, between the District of Saanich and the District of North Saanich, on Vancouver Island. It encompasses a total area of some 41.42 km^2 and a population in excess of 17,385. The District contains two main community centres, Saanichton, a near-continuous developed area along the East Saanich Road, and the second community centre on the east coast of the Saanich Peninsula, at Brentwood Bay.

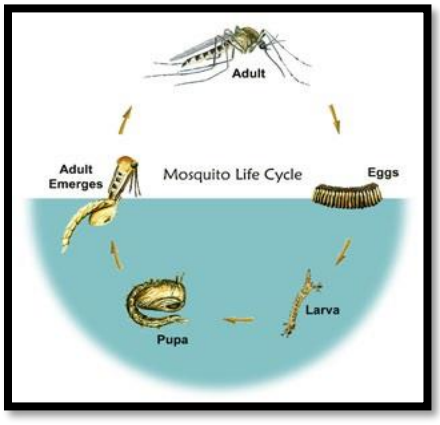
The Tsawout First Nation is a distinct community adjacent to the municipal boundaries of Central Saanich, with its main community located in Saanichton on the East Saanich Reserve #2. The population is approximately 1600 people, with 1/3 being registered band members and others being residents who are leasing lands from the landowners. East Saanich IR #2 is approximately 241 hectares in total area (www.Tsawout.com). The Capital Regional District (CRD) manages the large Island View Beach Regional park (~57 hectares) located directly to the south of, and contiguous with, the East Saanich Reserve # 2.

The Tsartlip First Nation's main community is located on the South Saanich Indian Reserve # 1 in Brentwood Bay. It has a total area of 333.8 hectares and an on-site population of approximately 650 members. The Tsartlip First Nation do not participate in the annual Mosquito Population Management and Control Program.

The Central Saanich area, including the CRD and Tsawout, contain a unique mixture of farmlands, forested areas, creeks, swamps, ponds, coastal beaches and salt marshes. Over 80% of the District is zoned as Agricultural, Park, Rural or First Nation lands. These economic, recreational and natural resources enhance the outdoor enjoyment of residents, businesses, workers and visitors to the area. Recreational summer activities include organized sports, camping, hiking, fishing, boating, bird watching, sightseeing, photography, cycling and golfing. Widespread annoyance from adult mosquitos detracts from outdoor enjoyment and worker safety.

1.2 Mosquito Biology

Mosquitos are found world-wide in standing water of all possible descriptions. Mosquitos belong to the order Diptera, along with other pests such as the common house fly and the black fly. There are over sixty species common to Canada and over thirty are found in British Columbia. Mosquitos undergo four distinct development stages: egg, larvae, pupae and adult. Larvae and pupae are aquatic. Eggs are laid on the water surface or on soil and vegetation adjacent to water. The eggs of some species of mosquitos, such as *Aedes*, can survive for upwards of 20 years and will hatch after a period of winter freezing and upon being inundated.



Mosquito larvae undergo four larval instars (or moults), each time emerging larger, but virtually unchanged from the previous instar. This is the feeding stage of the aquatic mosquito. The mosquito pupa, like a butterfly chrysalis, is a non-feeding stage and is where the once aquatic, larval mosquito undergoes metamorphosis to emerge as the winged, terrestrial adult mosquito. This

process can occur in as little as 5-7 days, although it often requires 10-14 days, depending on temperatures. Adult mosquitos feed on plant nectar and other fluids, and it is only the female which requires a necessary blood meal to complete the development of her eggs. Female mosquitoes will typically fly less than 0.5-1km in search of a blood meal, although distances of 5 km are not uncommon. Mosquitos have been found 30 km from their origin and at heights of 10,000 meters. While these are the extreme, and rare distances, the impact of winds on mosquito dispersal can be significant.

Mosquito development occurs in a wide range of larval habitats ranging from snowmelt and precipitation-influenced flood and seepage water pools and channels along rivers and lakes to freshwater, ponds, marshes, ditches and catch basins. Birdbaths, plugged rain gutters, livestock watering troughs and any man-made container capable of holding water for a period of 7 to 21 days can provide suitable larval mosquito habitat.

1.3 Need for Mosquito Control

The purpose of the annual mosquito control program is to provide residents, workers and visitors to the Central Saanich area with relief from extreme and/or persistent adult mosquito annoyance using an Integrated Pest Management (IPM) approach to surveillance and population management. The control program is not intended to, nor is it possible to eradicate local mosquito populations. An effective, pro-active mosquito control program which focuses on the identification, prevention, or timely control of larval mosquito populations, also contributes to the protection of public health.

In addition to negative impacts on the lifestyle and general health of residents, a large population of mosquitos can have a negative economic impact on local businesses. Worker safety, comfort and efficiency can be compromised by adult mosquito annoyance and distraction. Milk, beef, and egg production in farming communities can be reduced when animals are unable to feed or rest because of extreme mosquito annoyance or through a reaction to mosquito saliva-borne toxins or disease. Farm, orchard and crop harvesting can be affected by nuisance impacts on pickers and field workers. Reduced use and enjoyment of hotel and restaurant outdoor patios, sports fields, golf courses, campgrounds and cycling or hiking trails by residents and area visitors directly affects business operations and revenues.

Although not a common occurrence in most areas of British Columbia, mosquitos are capable of transmitting (vectoring) diseases. A well organized and effective larval mosquito control program is important to limit the potential for both, widespread adult mosquito annoyance, and potential for disease transmission. Despite the best of efforts though, some adult mosquito annoyance may still occur during the months of June through August, and residents are encouraged to avoid areas of mosquito harbourage (typically treed, forested or landscaped areas) during certain times of day, and to use repellents and approved adult mosquito control devices and products as per label directions.

Mosquitos are best known as vectors of 'tropical' diseases such as malaria and yellow fever. Although these exotic afflictions are extremely rare in British Columbia, mosquitos can still pose a

serious health concern. Extreme allergic reactions or secondary infections from mosquito bites can occasionally require hospitalization. Diseases such as canine heartworm, Western Equine Encephalitis (WEE) and West Nile virus (WNv) are transmitted from some mosquito species to family pets, humans, and livestock. A few years ago (2019), the mosquito-associated flavivirus disease caused by Zika virus (ZIKV) became a prominent health concern in several areas of the world, including the southern USA. Locally in British Columbia, the recent discovery (July 2025) of a "cluster" of Jamestown Canyon virus and Snowshoe Hare virus infections in several residents of Squamish, BC (BCCDC, July 2025) has increased concerns for invasive species and disease range expansions.

Since mosquitos capable of vectoring diseases to man are often the source of annoyance (human-biting), the control of mosquito populations known to cause nuisance also contributes to the protection of public health by controlling mosquito species also having the potential to vector disease. A few years ago, the mosquito-associated flavivirus disease caused by Zika virus (ZIKV) became a prominent health concern in several areas of the world, including the southern USA. The current status of WNv and ZIKV in British Columbia, Canada and elsewhere in North America is available at www.BCCDC.ca and Health Canada at www.canada.ca/en/health-canada or www.Hc-sc.gc.ca.

The BC Centre for Disease Control (Vancouver) and local health authorities are responsible to coordinate the ongoing surveillance, identification and reporting of WNv, ZIKV, and new or emerging diseases, and their mosquito vectors. As part of this planning the BCCDC has developed the Arbovirus Surveillance and Response Guidelines for British Columbia, and the BCCDC has a provincial database containing all mosquito, bird and human health surveillance data relating to WNv with ongoing updates for other, new vector mosquito species.

Due to the low and stable incidence of WNv it was decided by the BCCDC in the fall of 2014 that it was no longer necessary to conduct active surveillance of mosquitos or other indicators. The provincial decision to eliminate this surveillance was reached at the BC Communicable Disease Policy Advisory Committee meeting in February 2015. Human clinical testing will continue. Human clinical testing continues as part of routine blood donor collection programs. Dead birds such as crows and ravens are tested when WNv is suspected and horses are also tested, on a case-by-case basis, by provincial veterinarians.

1.4 Term of the Pest Management Plan (PMP)

A five-year period, extending from 15 April 2026 to 14 April 2031.

The designated contact for this Plan is Mr. Dale Puskas, Director of Engineering, District of Central Saanich, 1903 Mt. Newton Cross Road, Saanichton, BC V8M 2A9. Telephone # 250-544-4211.

2.0 MOSQUITO CONTROL PROGRAM BACKGROUND

The geographical area covered under the PMP is defined as the boundaries of the District of Central Saanich and includes all lands owned by the Capital Regional District within the municipal boundaries, and the Tsawout First Nation East Saanich IR #2. Larval mosquito habitats within this area include freshwater marshes, ponds and ditches located in low-lying forested areas, farm fields, undeveloped areas and along roadsides and saltwater tidally influenced habitats located on public, private and First Nations lands. Additional larval development habitats include roadside catch basins and temporary sites such as water-filled tire ruts, depressions, un-used or abandoned pools or boats, live-stock watering troughs, and containers.

The largest sources of mosquito development within Central Saanich is the near-continuous salt marsh and old field seepage and floodwater habitats which extend from Cordova Point and the East Saanich IR #2 southwards through the CRD Island View Beach Regional Park and recreational area. Totalling some +57 hectares, these tidally influenced permanent ponds, ditches and temporarily flooded depressions, ponds and channels are recurring sources of larval mosquito development. In addition, some 130 individual site locations comprised of natural and manmade ponds, marshes and ditches along public roadsides, at golf courses, on private properties and in farm and undeveloped lands exist throughout the program area. Ranging in size from less than $10m^2$ to upwards of 1-2 hectares in area, these largely freshwater habitats provide another 30-40 hectares of potential larval mosquito development habitat. Figure 1 in Appendix A at the end of this PMP document presents an overview map of development site locations.

The commencement of larval surveillance and control operations for salt marsh and old field habitats beginning in late January, and early February, is unique to the program area. Initially completed in 2010, and annually ever since, this “early” start is responsible for the significant reduction in adult mosquito nuisance in the eastern portion of the District, at the CRD Island View Beach Regional Park and the Tsawout First Nation residential and recreational camping areas. Freshwater habitats are routinely sampled, and treated where required, beginning in early April, and thereafter on regular basis through to late August and or early September.

In operation for over thirty years the annual program has continued to evolve to increase its environmental compatibility, it effectiveness, and its affordability for area residents. The Central Saanich mosquito population management and control program has always been one of innovation and adaption. Detailed site mapping, larvicide product research and the establishment of predictive indices for larval mosquito development, particularly for species developing in the salt marsh and old field habitats have improved program success, efficiency and sustainability.

The mosquito control program and methodologies (the PMP) developed for District of Central Saanich and partners, the Tsawout First Nations and Capital Regional District are a hybrid of approaches developed through collaboration with mosquito and vector control professionals worldwide. It has been carefully and specifically adapted for the unique conditions of the program

area and is a model of environmental compatibility. A variety of monitoring and control methods, including physical site reduction or modification and the use of biological control products support the principles of an Integrated Pest Management (IPM) approach to mosquito control. They are the most effective means of reducing adult mosquito populations and the potential for annoyance or disease transmission. This IPM protocol consists of five components:

1) Public Education. Explains mosquito biology, the program, and how the public can contribute to successful operations;
2) Surveillance, identification, and distribution of mosquito species;
3) Timely implementation of mosquito controls and preventative measures;
4) Adaptive management of operations during a season in response to observations; and
5) Program evaluation and assessment to ensure sustainable, effective controls have been achieved and the need for modification in future seasons.

Control program operations have always sought to reduce adult mosquito annoyance for residents, businesses and visitors to Central Saanich to acceptable, tolerable, levels. Operating annually for over thirty seasons, this successful program has continued to evolve and increase its environmental compatibility, effectiveness, and affordability for residents.

The annual mosquito population management and control program focuses mosquito surveillance and control efforts in areas where larval populations are known to occur and where past, occasionally notable, adult mosquito annoyance was documented. Mosquito control services are provided to residential and rural property owners, businesses, municipal and regional parks, sports fields, campgrounds, golf courses and other outdoor recreational and tourist facilities.

2.1 Primary Land Use

The primary land uses of the areas contained within the control program are agricultural and undeveloped farm or forest areas. Light industrial and commercial properties (lumber yards, landscaping, shopping malls, campgrounds), recreational (golf courses, passive parks, playing fields, etc.), residential and rural land uses comprise the rest. In addition to agricultural, service and retail services, organized outdoor sports activities (Baseball, soccer, etc.) and recreational activities include walking, hiking, photography, golfing, camping, fishing, boating, sightseeing and bike riding.

2.2 Mosquito Species Identified Within the Area

Mosquito development occurs in a wide range of larval habitats ranging from tidally influenced flood and seepage water pools and channels to permanent freshwater, ponds, marshes, ditches and similar water-holding depressions. Bird baths, plugged rain gutters, livestock watering troughs, equipment storage, surface water run-off collection pond and ditches and any man-made container capable of holding water for a period of 7 – 21 days can provide suitable larval mosquito habitat. . Left undetected, larval mosquitos will complete their development to adult within this time span.

Larval populations are sampled using a standard 350 ml dipper and area recorded as number of larvae/350 ml dip sample, and by their age class; 1st, 2nd, 3rd or 4th instar or pupae.

Some 21 different species of mosquitos have been collected as either larvae or adults at Central Saanich. All of the following species present in the area except *Culex territans* (which feeds on amphibians) can be a nuisance and many species, particularly those which bite birds and mammals other than man, are also capable of vectoring diseases, such as Western Equine Encephalitis (WEE) and West Nile virus (WNv). Mosquito pest species collected locally from Central Saanich include:

Aedes communis	*Aedes increpitus*	*Coquillettidia perturbans*
Aedes dorsalis	*Aedes mercurator*	*Culiseta impatiens*
Aedes excrucians	*Aedes riparius*	*Culiseta incidens*
Aedes fitchii	*Aedes spencerii*	*Culiseta inornata*
Aedes flavescens	*Aedes sticticus*	*Culex pipiens*
Aedes impiger	*Aedes vexans*	*Culex tarsalis*
Aedes implicatus	*Anopheles punctipennis*	*Culex territans*

Larval Mosquitos in 350ml Dipper (200 larvae / dip, 2nd & 3rd instars)

The majority of mosquito species collected from salt marsh and old field habitats are predominantly *Aedes dorsalis*, and to a lesser extent *Aedes sticticus* and *Aedes implicatus*. These mosquitos are aggressive biting pests which prefer habitats such as fluctuating salt marshes (*Aedes dorsalis*), and seepage, floodwater and precipitation runoff accumulations in low-lying fields and deciduous forest areas (*Aedes sticticus* and *Aedes implicatus*). Developing in response to tidal influences and fluctuating water levels in various ponds, depressions and overgrown ditches in the old saltmarsh area, *Aedes dorsalis* mosquitos are the most common species throughout the season, but from February through June they are the most numerous. Decreasing tidal height fluctuations and increasing ambient temperatures, evaporation and decreased precipitation typical to July and August causes many of these habitats dry, drain and disappear.

All *Aedes* mosquitos are aggressive biting pests which prefer flooded, temporary or recurring habitats such as saltmarshes (*Ae. dorsalis*), surface water run-off, and freshwater seepage, floodwater and precipitation accumulations in low-lying fields, backwater sloughs, marshes and deciduous forest areas. *Aedes* mosquitos lay their eggs in moist soil along the edges of recently flooded areas where the eggs can lay dormant for many years. Following a period of wetting, and drying, eggs become "primed" to hatch. *Aedes* larvae, once inundated, can hatch out in large numbers with populations typically ranging from 50-100 larvae/dip sample, although + 200

larvae/dip sample isn't uncommon. This is comparable to upwards of 2000-3000 mosquitos per square meter of surface water. *Aedes* mosquitos are typically the most numerous during the first half of the season, from late April through July. Receding river levels, increasing ambient temperatures, evaporation and decreased precipitation causes many of these habitats to dry, drain and numbers upwards of 200 larvae/350ml dip disappear over the course of a typical summer.

Culex, *Culiseta* and *Anopheles* mosquitos comprise the balance (20-30%) of mosquito pest species for the area. They typically develop later in the season, from June through August, and require a different set of cues to initiate the onset of larval development. They prefer permanent and slow-draining, or frequently refilled sites including natural and man-made ponds, ditches and containers such as stored tires, boats and buckets or livestock watering troughs. *Anopheles* mosquitos prefer permanent sites or slow draining and flowing ditches or stream margins. Larval populations typically range from 1-20 larvae/dip sample and multiple, or recurring hatches are possible with additional egg laying by female adults. Although their populations and individual development sites are not usually as large as the synchronous hatching *Aedes* mosquitos, *Culex* and *Culiseta* can be a source of reportable annoyance since their preferred habitats are common to residential, commercial, recreational and agricultural properties. Species such as *Culex tarsalis* are able to withstand a high degree of pollution and can inhabit areas with high organic content, including septic field seepage, sewage lagoons and livestock hoof prints around barns, feed lots and along creeks. *Culex pipiens*, the "house mosquito", can use a large variety of freshwater habitats including manmade containers and they are the predominant mosquito developing in catch basins.

All of the species listed above are able to develop as multiple hatches (generations) during the season and most of them are capable of causing reportable and often extreme annoyance, particularly *Aedes*. Locally collected *Ae*. *sticticus* and *Ae*. *vexans* are also potential West Nile virus (WNv) vectors. *Culex* and *Culiseta* mosquitos are not only a source of annoyance, but they too are also recognized as vectors of several diseases, including WNv. *Culex tarsalis*, *Culex pipiens*, *Culiseta impatiens,* and *Culiseta inornata* are identified by the BC Centres for Disease Control (BCCDC) and the Centers for Disease Control (Atlanta, USA) as vectors of WNv in North America. Control of locally occurring *Aedes*, *Culex* and *Culiseta* mosquitos not only prevents widespread nuisance for the benefit of residents, businesses and visitors, but also contributes to the protection of public health. Mosquito surveillance, collection and identification are components of an ongoing operational control program. The mosquito species listing and development site database would be updated as required.

2.3 Mosquito Control Program Implementation

In response to resident, workers and visitor reports of recurring adult mosquito annoyance, the District of Central Saanich, the CRD and the Tsawout First Nations have worked together to since 1989 to provide an effective nuisance mosquito control program for residents, workers and visitors to the area since this time. During this time the program has evolved to become an example of environmentally sound and sustainable mosquito control using an Integrated Pest Management (IPM) approach. This methodology incorporates public education, development site identification

and categorization, surveillance, prescriptions for alteration or modification, and where required, larval mosquito control completed using the safest, most effective biological control agents available.

Ongoing mosquito development site surveys, monitoring and identification of larval and adult mosquito specimens updates the local mosquito species complex and development site database. Identified mosquito habitats are monitored throughout the season, typically from early February through September, to assess the abundance and species of mosquitos developing in them. New Jersey or CDC (Atlanta) light traps and standardized mosquito biting and landing counts can be used to sample and monitor adult mosquito populations. During the course of program operations many development habitats have been eliminated and many others created. Routine site surveillance and input from residents, business owners, facility operators and First Nations assists field technicians in locating and identifying new, altered or eliminated habitats.

Within Central Saanich there are currently over 130 properties or site locations where larval mosquito development habitats have been identified for routine surveillance and control as required. Ranging in size from less than $10m^2$ to over 2 hectares in treatment area, these sites vary in description from a single, permanent ditch or irrigation pond to salt marsh and old field habitats which may contain a hundred or more individual temporarily filled depressions, ponds or ditches. Stagnant and non-flowing ponds and ditches, most of them manmade or influenced, provide ideal freshwater larval mosquito development habitat and often have the greatest diversity of species. Flooding and seepage water accumulations from spring and summer tides provide extensive habitat for repeated Aedes dorsalis and Culex tarsalis larval development in area salt marshes and old field habitats.

Other habitats such as bird baths, buckets, stored boats, livestock watering troughs, tires are not treated as part of routine control program operations. When discovered, physical control of these habitats can be easily accomplished by removal of the container or for bird baths or watering troughs, regular drainage and refilling. This prevents larval mosquito development and subsequent adult mosquito annoyance. Public education activities encourage property owners to survey their properties and identify these types of habitats for removal or routine management.

Adult and larval mosquito population monitoring is conducted as part of ongoing operational mosquito management and control programs. This allows for an assessment of larval control effectiveness in reducing nuisance mosquito populations, updates the local species record and contributes to the larval mosquito development site database and information.

The Central Saanich annual Mosquito Population Management and Control Program employs a pro-active, Integrated Pest Management (IPM) approach to reducing mosquito populations. A comprehensive, IPM approach to mosquito control includes property owners, businesses and the general public. The methodologies and operational procedures described within this Pest Management Plan are endorsed by the District of Central Saanich, Capital Regional District, and Tsawout First Nation.

2.4 Control Products (Larvicides) Proposed for Use

The Central Saanich mosquito population management and control program reduces adult mosquito populations by focusing on the identification and suppression of larval mosquito development using an IPM approach. This approach includes site modification or elimination, the conservation and enhancement of natural predators and controls, and when these are ineffective, or inefficient, the use of only biological and biorational control products.

The bacterial mosquito larvicides VectoBac 200G (PCP # 18158), VectoLex CG (PCP # 28008) and VectoLex WSP (PCP # 28009) are the only control products which have been used in the District of Central Saanich mosquito surveillance and control program during its 30+ years of operation. Because of their previous, exclusive use locally, the PMP will focus on VectoBac and VectoLex larvicide use. A similar product to VectoBac 200G, AquaBac 200G (PCP #26863) is also available for use in Canada and may be used by the program contractor, with approval of the District of Central Saanich.

VectoBac 200G and AquaBac 200G are made with different strains of the bacterium, *Bacillus thuringiensis var. israelensis* (*Bti*) Serotype H-14. VectoLex CG and VectoLex WSP are made with *Lysinibacillus sphaericus*. VectoBac 200G, AquaBac 200G contain spores and crystals produced by *Bacillus thuringiensis* and VectoLex (CG & WSP) contains spores and crystals produced by *Lysinibacillus sphaericus*, both naturally occurring soil bacterium, and are classified as biorational control products.

They are very specific to mosquito larvae and have no impact on non-pest insects, fish, amphibians, birds, reptiles and mammals. Extensive product information can be found for VectoBac and VectoLex at the manufacturer's website www.valentbiosciences.com. product information for these and AquaBac 200G can also be found through the Health Canada, Pest Management Regulatory Agency (PRMA) website https://www.canada.ca/en/health-canada/services/consumer-product-safety/pesticides-pest-management.html and the Pesticide Label Search https://pr-rp.hc-sc.gc.ca/ls-re/index-eng.php. Section 3.4.3 Biorational Control, discusses the products further. Other new or equivalent *Bti* or *Lsph* products may be used. These would be identified to the BCMOE with the annual Notification of Intention (NIT) to treat.

3.0 CONTROL PROGRAM METHODOLOGIES

The objective of the annual mosquito control program is to reduce the potential of widespread adult mosquito annoyance for residents, workers, and visitors to the Central Saanich area. A program of this scope is not intended to eliminate the local mosquito population. The total eradication of a widespread, fecund insect pest is not feasible nor desirable. The potential impacts of control products and activities, combined with a need to coexist with a delicate aquatic habitat, necessitates that an integrated approach to mosquito control be undertaken. This approach requires an

assessment of the problem, an in-depth understanding of factors influencing the situation, followed by the use of appropriate control methods.

Control of or prevention of larval mosquito development is preferred over control of the often widely dispersed and mobile adult mosquito. Mosquito larvae are concentrated in one place, must remain there for 7-21 days, and are very susceptible to the biorational control *Bti* and *Lsph* products. Drainage, filling of depressions, restoration of flow in ditches or other physical alterations to appropriate larval mosquito development sites is preferred as it provides permanent control.

Physical site reduction or modifications can be integrated into local public works and construction activities such as roadside grading, ditch maintenance and cleaning. For home and business owners it can include the removal of water-holding containers such as buckets and unused pools, or the regular draining and refilling of livestock watering troughs and bird baths. Only the most environmentally compatible, least toxic and persistent control products would be deployed for use within this annual program.

Adult mosquito populations are monitored at select locations within the control program and in response to resident requests for service. When adult mosquito annoyance is identified, surveillance for potential, and unknown development sites can be undertaken, and controls completed, to reduce mosquito populations before they can disperse to cause increased annoyance.

Routine adult mosquito control applications (adulticiding) for the purposes of nuisance mosquito control **are not** a component of the Central Saanich Mosquito Population Management and Control Program and this Pest Management Plan. The operational components of the PMP and the successful, annual, Mosquito Population Management and Control Program may include the following activities, as detailed in Sections 3.1 through to Section 4.5.

3.1 Public Information and Education

The general public must be advised of control program efforts in their area and provided with the opportunity to have input to their mosquito control program. Public input is invaluable to any community function, and it is a key component of all successful, pro-active mosquito control programs. This is essential since, in the final analysis, it is the general public which must be satisfied with control efforts.

The *Integrated Pest Management Act and Regulation* requires public notification of Pest Management Plan preparation through newspaper notices which must be published twice in a two week period starting at least 45 days before submission of a notice confirming that a pest Management Plan has been prepared according to the legislation. The general public, first nations and other stakeholders are invited through these advertisements to provide comments on the PMP and to consult with the PMP holder or their designated consultant, on PMP contents and the proposed mosquito population management and control program. In addition, those individuals or

groups which had requested information or who have supplied input when the local mosquito control program was last advertised and approved are contacted directly each time the PMP is renewed.

The annual mosquito population management and control program is well known and supported by area residents and businesses. Its highly visible nature using field biologists working along roadsides, fields, in parks, golf courses, along dykes and lake shorelines has ensured that property owners, facility managers and residents remain familiar with their annual program. In annual operation for over thirty five years, it has been providing mosquito surveillance, monitoring and larval control services for the benefits of residents, businesses and visitors to the area. Throughout this time, newspaper articles and advertisements, brochures, posters and interactions with field personnel have provided the general public with regular and frequent information on mosquitos and program service access.

Considerable value can be obtained through exposure to the control program and interactions with the public. Residents are encouraged to contact offices of District of Central Saanich, CRD, or Tsawout First Nation to report potential sources of larval mosquitos (a waterbody), or adult mosquito annoyance which can result in the locating of new development sites. Field biologist and technician follow-up provides opportunities to discuss suggestions for physical removal or source reduction on private property which allows the owner to participate on a smaller scale. Once accomplished, physical source reduction, especially of artificial containers, eliminates the need for further attention.

Examples of some various public education and information initiatives which could be employed in the District of Central Saanich in the following the years include:

- Informational Brochures – these review mosquito biology and control, mosquito "myths", program operations and contact information for program biologists.
- Web-based program information and service contact details
- Social media – Facebook, Twitter – another method of public access and information sharing.
- Cardboard Doorknob Hangers – These "Sorry we missed you" doorknob messages are left when residents aren't home during property inspections. They summarize field technician observations and have return contact information for resident use.

- Laminated posters – durable. Can provide basic information on protection from annoyance. Installation along walking trails, picnic and camping areas is possible.
- Newspaper Display Advertisements – placement in local newspapers from April – September. Provides public information relevant to each month and program contact/access information.
- Newsmedia interviews/articles – TV, Radio provides public with updates on program operations and status, mosquito biology and additional public outreach
- Presentations at Council meetings.
- Information at Open houses, farmers markets

Movement of adult mosquitos, either by active flight or passively by wind, from outside of treated areas into built up and developed areas is always a possibility. Public education further encourages residents and businesses to undertake actions for excluding adult mosquitos and modification of personal behaviours which will reduce the potential for annoyance. Through eliminating development sites on their property and learning to reduce adult mosquito annoyance residents can actively participate in their program. In addition to providing residents with information on how they can reduce larval development and annoyance around their properties, education initiatives help residents understand that the control program can only suppress mosquito populations, not eradicate them, and that some adult mosquito annoyance may be anticipated at certain locations, times of day and during some years.

As part of annual control program start-up in early April and May, program personnel would contact property owners, residents and facility operators listed in the database to determine site status and confirm program participation and property access. As part of these initial contacts, field personnel answer inquiries, supply relevant literature and complete on-site property inspections. Ongoing interactions and conversations with property owners, residents and the general public provides opportunities to discuss program operations, goals and allow for the distribution of public outreach materials. Office and field personnel response to service requests, by telephone, email, and in person provides additional opportunities for public education and information sharing of program operations.

Occasionally individuals may wish to be excluded from the mosquito control program for personal reasons. A record of "AVOID" areas is maintained and updated as required. Meetings and input with concerned residents and special interest groups ensures that activities of control program personnel do not conflict with those of residents. By staying informed of community events such as baseball games, golf tournaments, community or corporate picnics and the like, control personnel can increase efforts prior to an event to reduce potential adult mosquito annoyance.

The cooperation and support of local businesses, the Capital Regional District, Tsawout First Nation, farmers, business and facility operators and other property owners is indicative of true community spirit and support for a successful program which benefits workers, residents and visitors to the area. Prevention of adult mosquito annoyance through pro-active, larval mosquito control provides significant benefit to outdoor worker and recreational uses.

3.2 Protection of Archaeological Sites

Archaeological sites on both public and private land are protected under the Heritage Conservation Act (HCA) and must not be altered without a permit. Archaeological sites are non-renewable and have cultural, historical, scientific and educational value. The HCA automatically protects all archaeological sites that predate AD 1846, with exception of burial sites and rock art sites which are protected regardless of age. Any individuals working in the annual Mosquito Surveillance and Control Program that believe they may have encountered materials or items of archaeological importance will follow the procedures below:

- All work in the vicinity of the items/objects will cease immediately and any archaeological and/or human remains will not be disturbed.
- Will contact their supervisor/program manager.
- No excavation or removal of soil from the area will occur.
- Will isolate, mark, and protect the area from disturbance.
- Take pictures of the artifact, the immediate and adjacent areas.
- Note location (GPS coordinates, location description) and leave all discoveries in place.
- The District of Central Saanich, Tsawout First Nation, CRD, and the provincial Archaeology Branch (email: Archaeology@gov.bc.ca, or 250-953-3334) will be contacted.

3.3 Mosquito Control Program Data Collection and Reporting

The environmental consultant (contractor) managing the annual mosquito population management and control program for the District of Central Saanich is responsible to follow the data collection and reporting requirements of the PMP and the *Integrated Pest Management Act and Regulations*.

The District of Central Saanich, Capital Regional District and the Tsawout First Nations would be regularly informed of control program activities of this contractor/consultant through personal contact, telephone, facsimile or e-mail with program managers and field personnel. In addition, written progress reports summarizing weather conditions, surveying and monitoring results, treatment areas and interactions with the public are typically prepared by the program consultants and submitted on a regular basis during operational phases of the control program.

At the conclusion of each annual mosquito control program season a summary report detailing all activities and pesticide treatments completed under the PMP and it's BC Ministry of Environment (BCMOE) issued confirmations is produced by the consultant. All pesticide use reporting required

under the *Integrated Pest Management Act*, the approved PMP and as requested during the season by government regulatory agencies, including the BC Ministry of Environment would be completed by the consultant as requested and necessary. At a minimum, the contractor would maintain the following information for their use in managing the program and to complete the reporting and information requirements of the District, the PMP and the Pesticide Management Program, the IPM Act and Regulations, and the BC Ministry of Environment:

- A mosquito development site database with information including property ownership, address, contact telephone number, public access information (paths, trails, roadways), development site maps, photographs, GPS identification, records of monitoring and treatment activities, pesticide use daily operation records and other relevant information related to the control program.
- A record of properties identified as 'AVOID' areas, where the owner or residents have indicated through telephone, written, verbal (in person conversation) or electronic (e-mail, facsimile) communication with the District or its consultants, their wish to be excluded from the mosquito control program.
- A list and/or maps identifying 'AVOID' areas of environmental sensitivity, including provincial or regional parks, habitat conservation areas and other identified or designated speciality management areas.
- When the status of a waterbody or other area of potential environmental concern (e.g. bird nesting sites) is unknown, a local representative of Fisheries and Oceans Canada (DFO) or the BC Ministry of Environment (BCMOE), or other agencies where appropriate, may be consulted.

The development site database and avoid area lists are updated during each field season when control program personnel meet with residents, owners and operators of the farms, businesses and recreational facilities. Property ownership, access, development site status, areas of concern and control program operations are reviewed at this time. Regular contact is maintained with these individuals throughout the season to provide updates on control program operations and opportunities for input and comment on the control program. Ongoing activities related to surveying, monitoring and mosquito control operations are recorded in the historical data section of the database as they occur. Database information would be used to respond to any requests for program information from the public, district and partner representatives or government regulatory agencies.

The consultant is responsible to ensure that all private and personally identifiable information within the database is managed in a secure, ethical, and legally compliant manner. This includes, but is not limited to, names and contact information linked to individuals or private properties, and any other data that could reasonably be used to identify a person. All handling of such information must adhere to the requirements set out in both the Personal Information Protection and Electronic

Documents Act (PIPEDA) and the Personal Information Protection Act (PIPA). These Acts govern how private-sector organizations collect, use, disclose, and protect personal information in the course of commercial activities.

3.4 Surveying and Monitoring of Mosquito Populations

As part of the annual program start-up, and throughout the season, program field biologists conduct regular, comprehensive surveys of the program area by ground and air, as appropriate. The goal of these surveys is to confirm the extent and locations of existing, known mosquito development sites and to identify any new, or previously undetected, larval habitats. Surveying and monitoring of larval development sites (always waterbodies) determines the presence of larval mosquitos, the need for control and allows for regular update of the database. Where observed, larvae are collected and enumerated using a standard 350 ml white larval mosquito dipper. Preserved larval specimens are identified to the species when possible.

Mosquito development varies from year to year and throughout the season depending on environmental conditions and habitat availability. Environmental cues interact to affect both the timing and magnitude of mosquito development, and adult mosquito survival. Provincial and regional snowpack accumulations and rate of melt, river level fluctuations, precipitation and temperatures are reviewed as necessary to ensure timely surveying to detect mosquito development.

Monitoring and correlation of fluctuating temperatures and precipitation levels over several seasons allows for the determination of 'thresholds' which aid in the prediction of larval development and distributions. Review of winter snowpack accumulations, summer weather conditions, and tidal levels, combined with a sound knowledge of mosquito biology and local development site types is necessary to ensure surveying and monitoring activities occur to detect mosquito development. Failure to timely survey and monitor could allow unchecked development of larvae which will result in adult mosquito annoyance. Larval habitats would be monitored throughout the season to assess the relative abundance and species of larval mosquitos found in these habitats. When investigating reports of adult mosquito annoyance or potential larval development sites, a thorough survey of each area would be performed to locate the source of annoyance, and any previously unidentified larval habitat.

3.4.1 Larval Mosquito Monitoring

Larval habitats would be monitored throughout the season to assess the relative abundance and species of larval mosquitos found in these habitats. When investigating reports of adult mosquito annoyance or potential larval development sites, a thorough survey of each area would be performed to locate the source of annoyance, and any previously unidentified larval habitat.

Pre-treatment surveys determine the extent of larval development which ensures that control measures are directed only to those areas containing larvae. In addition to providing pre-application information essential to timely control applications, surveying and monitoring following treatment, 'post-treatment monitoring' allows for an evaluation of the degree of control achieved from a particular application. Environmental compatibility and cost effectiveness of a control program is dependent on proper pesticide use through the application of control measures directed only to those areas requiring them. Post-treatment monitoring to confirm to larval mortalities is typically completed within 2-96 hours of larvicide.

Surveying and monitoring of larval development sites (always waterbodies) determines the presence of larval mosquitos and the need for control. Larval habitats would be monitored throughout the season using a standard 350ml white larval mosquito dipper to assess the relative abundance and species of larval mosquitos found in these habitats. Routine sampling of development habitats is ideally completed on a 6-10 day basis, depending on conditions and observations, throughout the operational season, typically mid-April to early September.

Larval mosquito populations as small as one larva per 350ml dip sample in an area as small as a backyard swimming pool (5m x 10m) can produce thousands of adult mosquitos over the course of a season. Located adjacent to established outdoor recreational facilities including golf courses, sports parks, picnic areas, campgrounds and nearby residential and commercial areas, Central Saanich area salt marsh and old field sites are a major source of mosquito annoyance and a primary focus of the annual nuisance mosquito control program. Other sites including roadside and field ditches, marshes, ponds (both natural and man-made) are scattered throughout the District. Typically located near residences and business operations, these numerous sites can have localized, and far-ranging impacts on residents and visitors, depending on weather conditions including winds, humidity, temperatures and precipitation.

3.4.2 Adult Mosquito Monitoring

To objectively measure the success and effectiveness of larviciding efforts in reducing adult mosquito populations, two internationally accepted sampling methods are employed. The first, a standard biting/landing count, measures the number of mosquitos which land, to bite, on the exposed forearm (from wrist to elbow) in a one minute period. Adult biting counts of three or more per minute, measured between the wrist and exposed forearm, is intolerable for most people. Beyond three bites per minute, outdoor enjoyment and worker performance and safety are affected, and negative economic impacts on recreation and tourism can be expected.

Although it is the accepted world-wide standard, it must be noted that bite counts are not without bias. Clothing and body physiology make some people more or less attractive than others. Also, daily timing for collection is crucial as mosquitos are most active at dusk and dawn, when temperatures are lower and humidity generally higher. For these reasons, collection timing, locations and clothing worn by the observer are standardized as much as possible. When reviewed in conjunction with anecdotal reports from residents, this data is a useful measure of mosquito annoyance levels and facilitates the collection of mosquito species that actively seek a human blood meal.

CDC Light Trap

The second method used for adult mosquito population assessments uses either Standard New Jersey or Center of Disease Control (CDC, Atlanta) Adult Mosquito Light Traps. Both types of traps use a normal incandescent light source as an infrared attractant and are programmed to start collections at sunset and terminate at sunrise. Samples are typically retrieved the following morning and forwarded to the laboratory for enumeration and identification. These traps can be augmented (baited) with CO_2, in canisters, or as dry ice, to increase capture rates as it is another key attractant for female mosquitos. Information gathered from light trap captures can be used to give an indication of the mosquito population size, species complex and the type of development habitat.

Adult mosquito populations would be monitored in harbourage areas adjacent to treated larval development habitats to confirm the effectiveness of larval controls in reducing adult mosquito annoyance. In addition, adult mosquito populations may be monitored at select locations to compare adult mosquito populations between various locations. Given the difference in individual tolerances to mosquito annoyance the success of larval control in limiting adult mosquito populations would be determined through resident reports, interviews and requests for service.

New Jersey or CDC Light traps would be deployed to monitor adult mosquito populations in areas with a history of adult mosquito annoyance problems. Benefits associated with these traps include the collection of a much greater number of specimens than with un-baited traps, or from biting counts, and they provide an objective, reproducible sampling method. These collections complement bite count sampling for annoyance by allowing field personnel to more effectively collect and identify mosquito species present in a particular area. Correlation of this data over several years with larval monitoring and adult mosquito biting count data allows for continued, increased forecasting of mosquito populations. Larval and adult mosquitos would be identified according to the taxonomic keys of Darsie and Ward (1981) and Wood, Dang and Ellis (1979), and others as appropriate.

3.4.3 Mosquito Development in Central Saanich

The largest and most prolific sources of mosquito development in Central Saanich are tidally influenced flood and seepage water accumulations in saltmarshes and old field habitats located on Tsawout and CRD lands in northeastern Central Saanich. Several days of sustained tides exceeding 3.3 metres (as measured at Fulford Harbour), fill sections of the old the ditch system, low-lying areas of the salt marsh and adjacent undeveloped farm fields. Resultant lateral and vertical seepage produces water accumulations in ponds and isolated channels scattered throughout the marsh. Egg eclosion (hatching) occurs within hours of inundation and over the next several days larval development occurs throughout the East Saanich (Island View Beach) saltmarsh and old field habitats and is at its greatest during peak tides in excess of 4.0m. *Aedes dorsalis*, a very pestiferous mosquito species develops in response to these fluctuating water levels.

Tsawout Saltmarsh

Located adjacent to established outdoor recreational facilities including golf courses, sports parks, picnic areas, campgrounds and nearby residential and commercial areas, salt marsh and old field sites are a major source of mosquito annoyance and a primary focus of the annual nuisance mosquito control program Regular monitoring of salt marsh habitats during the season ensures that larval mosquito development does not proceed unchecked. With larval populations averaging between 50-100 larvae/350ml dip sample, multiple hatches in a seasons, and a total treatment area often amounting to over 50% of annual efforts for the Central Saanich area, the control of larval development in salt marshes and old field habitats is essential to prevent widespread adult mosquito annoyance. In addition to developing throughout the summer, salt marsh and old field habitats have been found to support larval mosquito development throughout fall and winter. Larvae have been found in the months of October, November, December and January. Starting in 2010, larval surveillance and treatment has been completed for salt marsh and old field development sites beginning in late January or early February and continuing through to late August or September, depending on weather conditions.

Impounded irrigation, display and water run-off/collection ponds also provide ideal habitat for larval development. Largely permanent, these sites fluctuate in size throughout the season in response to seepage and surface water runoff accumulations from precipitation and human activities including field irrigation, equipment and vehicle washing, dust control and site clean-up. These permanent and temporary development sites can support larval mosquito populations for as long

as they contain water. Typically located near residential and commercial or recreational areas, control of larval development in these sites are of great importance to preventing localized annoyance and under certain conditions, they have the potential to impact residents located several hundred metres to a few kilometres away.

The remaining larval mosquito development habitats common to the are roadside ditches and temporarily flooded areas. Although not as individually large as salt marsh habitats, the locations and distribution of permanent freshwater mosquito development sites such as marshes, ponds and ditches, and temporary sites including tire ruts or seepage near outdoor work sites, recreational areas, businesses and residential properties makes them important sources of localized adult mosquito annoyance if not effectively monitored and controlled. Species collected from manmade and natural, freshwater development sites during the past few years in Central Saanich include *Aedes sticticus, Aedes spencerii, Culiseta impatiens , Culiseta inornata, Culex pipiens, Culex tarsalis,* and *Culex territans* (a non-human biting pest). Sampling and treatment of freshwater development sites (ponds, marshes, ditches) typically begins in early to mid-April and extends through to late August or September depending on conditions.

Although their populations and individual development site sizes are not usually as large as the synchronous hatching *Aedes spp*. mosquitos in salt marsh and river flood and seepage water habitats, *Culex* and *Culiseta* mosquitos make use of permanent sites including marshes and ponds and a large variety of temporary habitats, including containers such as stored tires and equipment, livestock watering troughs, buckets and bird baths. Such habitats are common throughout urban and rural areas and since they are typically located close to residences, businesses and outdoor recreational areas *Culex* and *Culiseta* mosquitos can be a source of reportable, localized mosquito annoyance. When discovered by field personnel during site inspections the presence of water-holding containers would be brought to the attention of property owners for removal, drainage or regular water changes which would eliminate their potential as sources of mosquito development and annoyance.

3.5 Mosquito Control Options

Simple, but established key elements of a sound IPM approach for this, and every effective, and environmentally compatible nuisance and vector mosquito surveillance and control program are:

1) Assessment of need for control using scientifically sound evaluations,
2) Development and applications of the best site-specific controls, and;
3) As a feedback mechanism, assess the results achieved and adapt as required.

Mosquito development varies from year to year and throughout the season depending on environmental conditions and habitat availability. Environmental cues interact to affect both the timing and magnitude of mosquito development, and adult mosquito survival. These factors include overall development site water levels, fluctuations, water and ambient temperatures, humidity, and precipitation.

Each mosquito development site will have its own unique requirements and treatment options. The PMP for this mosquito control program uses a combination of techniques, and an Integrated Pest Management approach, to achieve the management and control of mosquito populations. The best choice for control reduces both mosquito populations, and the potential for adverse effects on people, domestic animals, livestock and natural ecosystems. Sometimes, particularly with man-made habitats such as ditches, irrigation or display ponds and containers, larval mosquito populations can be reduced or effectively limited using physical or natural controls. These control options are discussed here as they would be considered as a potential solution prior to any larvicide applications.

Many of the possible physical and biological control options suggested below may be supported and possibly implemented by local public works personnel and landowners. Private property owners with mosquito development habitat are best motivated to become involved in their control program through public education initiatives and through consultations with program personnel. Once educated about mosquitos and their habitats, property owners can undertake steps to reduce or eliminate larval mosquito habitat and adult mosquito annoyance on their property. A reduction in larval populations contributes to the overall decrease in adult mosquito annoyance.

The preservation or enhancement of balanced wetland habitats has the best opportunity for a meaningful long-term contribution to overall mosquito control program success through reduction of mosquito populations and enhancement of natural controls including insect, fish and birds. Elimination of stagnant water and enhancements in natural or created ecosystems will be of benefit to overall control program efficacy through decreasing larval habitats and increasing natural mosquito predators. The use of a biorational control products such as *Bacillus thuringiensis* var. *israelensis* (VectoBac / AquaBac 200G) and *Lysinibacillus sphaericus* (VectoLex CG / WSP) when natural control are insufficient, or absent, maximizes the effectiveness and environmental compatibility of the program.

IPM-focused mosquito control programs do not have deleterious effects on humans, domestic pets and livestock, wildlife, fish and their food and are routinely conducted throughout British Columbia. There are three larval mosquito control options available to the program. These are physical, biological and biorational product oriented.

3.5.1 Physical Source Reduction and Site Modification

A continued focus for the control program technicians and public education initiatives would be the identification, and reduction or elimination, of larval mosquito development habitats wherever possible. Residents and business operators are encouraged to remove, or alter, standing waters which provide suitable habitat for larval mosquito development. For most property owners this involves eliminating water-holding containers, such as buckets and boats or canoes and the draining, or regular changes of water in bird baths, livestock watering troughs, unused wading pools and display ponds.

When done by the homeowners, this permits residents an opportunity to actively participate in their control program. This can be especially important for residents, as two of the most common West Nile virus vector mosquitos, *Culex tarsalis* and *Culex pipiens*, make ready use of manmade habitats, including containers. Installation and maintenance of window screens, Mosquito Magnets (adult mosquito traps) and the use of mosquito repellents by individuals provides additional protection from adult mosquito annoyance and potential disease transmission. Residents, workers and visitors should minimize outdoor activity at dusk and dawn, wear light-coloured, loose-fitting clothing and minimize the use of fragrant shampoos, perfumes and colognes to further reduce potential adult mosquito nuisance.

Maintaining permanent ditches so they are clear of obstructions or vegetation, replacing failed culverts or grading to effect flow may increase flow, drainage or access by fish or aquatic insect predators. Ditching, grading or filling of roadside depressions may be a suitable solution to decreasing, or preventing, larval development by reducing an area's potential to retain water. When completed as part of routine maintenance activities by public works crews they can be effective means of suppressing local mosquito populations. Any such activities along public roadways, in parks or other publicly owned properties would be coordinated through the appropriate public works and engineering departments. The BCMOE, DFO and other government regulatory agencies, as appropriate, may also need to be consulted prior to any such planned work in area ditches.

Removal or alteration of mosquito producing habitat does not necessarily mean drainage resulting in habitat destruction for other organisms and natural predators such as birds and fish. As part of a comprehensive approach to mosquito control, property owners are encouraged to manage stagnant and non-flowing waters to minimize their use as sources for mosquito development. For example, the removal of emergent shoreline vegetation, combined with either water level management at greater than one metre in depth or a shoreline groomed to a gradient of 3:1 or steeper, effectively eliminates mosquito production in irrigation and settling ponds or other water impoundments. The installation of fountains in man-made golf course and park ponds can reduce their suitability and use as larval mosquito development habitat.

Mosquitos require water to develop, and any efforts to reduce or eliminate standing or stagnant waters, particularly in depressions, tire ruts and containers will prevent larval development and subsequent adult mosquito nuisance. Source reduction around homes and businesses can be easily achieved by residents and owners, allowing them to actively participate in their mosquito control program.

Adult mosquito collection devices such as Mosquito Magnets, which use propane to generate CO_2 will collect adult mosquitos and are marketed by several companies for use by property owners. With a collection range of about ½ hectare (one acre), their ability to reduce mosquito populations sufficiently to provide relief from annoyance on a community level is unlikely without the deployment of numerous units. Their use at a single property/residence though, can have a noticeable impact by collecting adult mosquitos and reducing annoyance.

3.5.2 Biological Control

Biological control involves the use of predators, pathogens, and parasites to reduce mosquito populations. Insects predators, both aquatic (i.e. dragon flies, beetles) and terrestrial (i.e. spiders, wasps), contribute to the natural mortalities of both larval and adult mosquitos. Conserving, or enhancing natural habitats wherever possible, allows these predators to contribute to control program effectiveness.

Of all the various predator control methods tested, only larvivorous fish are used operationally in widespread programs. Regan *et al.* (1982) evaluated the effects of three-spined stickleback fish (*Gasterosteus aculeatus*) on mosquito larvae located in the Fraser Valley. They were found to be effective in reducing larval populations. Their natural fecundity combined with their ubiquitous nature makes these fish an ideal natural (biological) control agent. They are a common occurrence in many of ditch systems.

Introduction of fish (Koi, goldfish) to manmade, self-contained outdoor display or irrigation ponds may also reduce, or eliminate larval mosquito development in such habitats. Most practical in the warm, lower mainland Fraser Valley and Vancouver Island, in areas with very cold winters, this type of control requires considerable work and cost which many include the over-wintering of fish indoors or annual replacement. The relocation, or introduction of fish to any natural water course requires approval and permitting through various governmental agencies including Department of Fisheries and Oceans and the BC Ministry of Environment.

Although flying insects can form a large component of the diet for flying insectivores (*e.g.* bats, swallows, Purple Martins), there is no evidence which suggests they provide a detectable level of mosquito control. Both birds and bats are also opportunistic feeders, and adult mosquitos have been identified as a small component (<2%) of their diet, (Fang 2010 and Gonsalves *et.al.*, 2013). They are not however, scientifically recognized as able to provide any real impact on mosquito populations when used solely as a mosquito population control option.

A one-hectare site, the size of 2 football fields, having a larval population density of just 1 larvae/dip sample, can produce 4,285,714 mosquitos. Reported to eat up to 300 mosquitos a day, a total of some +13,300 birds and/or bats would be required to consume the mosquitos emerging from just one hectare of habitat. Larval populations in much of the program area average between 10-30 larvae/dip sample and can often exceed 100 larvae/dip sample. With between 50 – 100+ hectares of treated habitat, and much of it located within 100-200m of residents and businesses, the sheer potential for adult mosquito populations, likely in the billions, would make a reliance on solely natural controls unlikely to have a noticeable impact on annoyance levels for area residents.

Interested residents would still be encouraged, however, to install bat houses or bird nesting boxes if they wish, since it allows individuals to contribute to a comprehensive, integrated mosquito control program, and in some cases may provide residents with a sense of reduced adult mosquito annoyance.

Pathological agents such as viruses and certain parasites have received much research attention, but none of these are commercially available or approved for use in Canada. The closest form of a naturally occurring control agent which can be readily, easily and safely applied to reduce mosquito populations are products made with the soil bacteria, *Bacillus thuringiensis* var. *israelensis* (*Bti*) and *Lysinibacillus sphaericus* (*Lsph*), which have highly specific insecticidal properties. Theses larvicides are discussed below.

3.5.3 Biorational Control

The control program at Central Saanich would use VectoBac 200G, and VectoLex CG and WSP larvicide products for larval mosquito control. A secondary product, AquaBac 200G, may be used as a substitute when necessary. VectoBac/AquaBac and VectoLex are the closest form of a natural or biological control agent currently available for routine use in operational mosquito control programs. The use of these products maximizes the environmental compatibility of the annual mosquito control program when used in circumstances where other control options such as physical or natural (biological) control are not practical, they support the principles of an IPM approach to control.

VectoBac 200G Granules

Property owners would be consulted with prior to any larvicide applications and for any recommended physical of biological/natural methods. Product brochures, labels, MSDS sheets and website addresses would be supplied and reviewed to ensure residents, business, and facility

operators understand, are comfortable with, and approve, proposed treatments. In the event that a property owner wishes exclusion from the control program this request would be honoured and noted in the development site database. The product VectoBac 200G contains spores and crystals produced by the bacterium (*Bacillus thuringiensis var. israelensis*, Serotype H-14 Strain AM65-52) and, a similar product, AquaBac 200G is made with *Bti* Serotype H-14, Strain BMP144) as such, they are classed as biorational, rather than conventional, pesticides.

VectoBac and AquaBac act on the larval mosquito stomach and must be eaten to be effective. It is very specific, producing rapid lethal effects (within hours) in larval mosquitos. It has no residual activity, does not bio-accumulate and has no impact on beneficial organisms found in mosquito development habitats. Negative or toxic effects on mammals, birds or other wildlife have not been observed. Formulated as a corn cob granule it requires no mixing and is ready to apply by hand, backpack blower or by helicopter. The granule allows the larvicide to penetrate vegetative covers and reach the water surface where the *Bti* is "released" for consumption by mosquito larvae.

VectoBac 200G and AquaBac is recommended by their manufacturers for use in standing water habitats including temporary and permanent pools in pastures and forested areas, irrigation or roadside ditches, natural marshes or estuarine areas, waters contiguous to fish-bearing waters, catch basins and sewage lagoons.

VectoLex CG and WSP also contain naturally occurring, spore-forming soil bacterium. VectoLex contains spores and crystals produced by *Lysinibacillus sphaericus*. It also is classed as a biorational, rather than conventional, pesticide. VectoLex also acts on the larval mosquito stomach and must be eaten to be effective. VectoLex is very specific and produces lethal effects in a narrow range of mosquito species, including *Aedes vexans* and most *Culex* mosquito species. It does not have any effects on man or animals, fish and other insects which may use these aquatic habitats.

Operationally, the important differences between VectoLex and VectoBac or AquaBac are speed of action and persistence in the larval habitat. Larval mortality can take several days for VectoLex versus several hours with VectoBac 200G. This occurs because *L. sphaericus* is more stable, has a slower settling rate in the water column and the unique ability for its spores to germinate, grow and reproduce in dead mosquito larvae. This is known as recycling and is the mechanism which allows VectoLex to provide long-term, extended control of recurring larval mosquito development. VectoLex CG and WSP are recommended by the manufacturer for use in standing water habitats including temporary and permanent pools in pastures and woodlots, irrigation or roadside ditches, natural marshes or estuarine areas, waters contiguous to fish-bearing waters, catch basins and sewage lagoons.

The use of *Bti* and *Lsph* maximizes the environmental compatibility of the annual mosquito control program since both products are species (target) selective and non-toxic to other aquatic organisms which co-exist in these habitats including insects, fish and amphibians. When used in circumstances where other control options such as physical or cultural control are not practical, they support the principles of an IPM approach to mosquito control.

Extensive product information for VectoBac and VectoLex products can be found at the manufacturer's website www.valentbiosciences.com. The product manufacturer/distributor for AquaBac 200G is AFA Environment Inc. Additional information on all the larvicide products proposed for this program can be found through the Health Canada, Pest Management Regulatory Agency (PRMA) website https://www.canada.ca/en/health-canada/services/consumer-product-safety/pesticides-pest-management.html and the Pesticide Label Search https://pr-rp.hc-sc.gc.ca/ls-re/index-eng.php. Copies of the Manufacturer's product labels for VectoBac 200G and VectoLex CG can be found in Appendix B and Appendix C at the end of this document.

3.5.4 Chemical Control

Chemical control products and equipment are predominantly used for the purposes of reducing adult mosquito populations. As with most adult insect control programs, adult mosquitos are typically controlled using a broad-spectrum (adulticide) insecticide. Although there are 'natural' adult mosquito control products made from chrysanthemum flower extracts (pyrethrins) and their synthetic equivalents, all adulticides only provide temporary control and are typically broad spectrum, having a deleterious effect on any insect which may come in contact with them. Unless regular and routine treatment of 'problem areas' is completed, uncontrolled adult mosquitos developing in other areas will often move into these treated areas to again cause annoyance.

Typically applied from the ground using cold aerosol sprayers or misters, and much less commonly, from the air using helicopters of fixed-wing aircraft, their mode of action is on the nervous system following contact with the organism and absorption across through the exoskeleton. Because they are applied to the air, and the fact they are non-specific, such applications will not only control adult mosquitos which come in contact with the spray mist, but other non-target organisms such as moths, flies, flying beetles and other insects. Restrictions on applications include habitat type, timing of applications, mosquito population thresholds weather conditions and areas of identified avoidance.

Because of the variable dispersion patterns of mosquitos, geography, types of vegetation encountered and ambient weather conditions at the time of treatment, it is difficult to provide any more than temporary control of localized adult mosquito annoyance. Unless regular and routine treatment of 'problem areas' is completed, uncontrolled adult mosquitos developing in other areas will often expand into these treated areas to again cause annoyance.

Adulticide applications **ARE NOT** a component of the annual mosquito control program for the District of Central Saanich. The mosquito control program described within this PMP does not utilize any chemical control methods for the abatement (control) of larval or adult mosquitos.

- ***Pesticides and repellents***

Citronella candles, mosquito coils, Konk Automatic Aerosol Sprayers and other such products are marketed as mosquito repellants, or for adult mosquito or biting insect control. These are readily available to residents, campers, and property owners. Property owners may also use items such as these, as required, and as instructed on the product labels. The mosquito control program would continue to use only the least toxic, most environmentally sound control products available. As new products become available and registered in Canada, their suitability for use in annual control program will be reviewed.

3.6 Mosquito Control Program Operations

The goal of the annual Central Saanich Mosquito Population Management and Control Program is to decrease larval mosquito populations sufficiently to reduce, and/or prevent, adult mosquito annoyance for residents, workers and visitors. Property owners and residents are also expected to implement personal protective measures to limit their exposure to adult mosquito annoyance. These include repellent use, clothing choices (long sleeves, light coloured), avoidance of perfumed personal hygiene products (shampoos), window screens and temporal (minimize activity at dusk and dawn) or location avoidance measures which can lessen adult mosquito annoyance.

The general public should be aware that short-lived adult mosquito annoyance may occur during a typical season. The goal of the control program, through pro-active larviciding with VectoBac 200G and VectoLex CG and WSP, is to prevent extreme or persistent, extended adult mosquito annoyance through timely larval surveillance and prevention or control initiatives.

A total of over 80 hectares of potential larval mosquito habitat located at +130 separate development site locations identified within the District of Central Saanich, including CRD parks and the Tsawout First Nation lands. The actual total area that will become infested and require larvicide treatment in each season is dependent on hydrological and meteorological events. Fluctuating water levels in tidal salt marsh habitats and precipitation or seepage-water influenced development sites cause recurrent larval development. Ponds, channels and flooded depressions throughout

area salt marshes, old field habitats and similar freshwater sites in low-lying farm fields and wooded sites typically require multiple treatments to effect control. Permanent irrigation or display ponds and ditches become routinely infested with larval development as their depths fluctuate and temperatures increase with water use later in the season.

The well organized and pro-active integrated pest management approach to mosquito control which has been developed for Central Saanich reduces the potential for adult mosquito annoyance by focusing on the identification and timely control of larval populations occurring within the community and surrounding areas. In situations where physical alteration of development habitats are impractical or undesirable, or where natural controls are insufficient to reduce nuisance mosquito populations, VectoBac and VectoLex applications would be completed to control larval populations. Control of larvae at their source reduces annoyance levels for area residents and visitors. New or previously undetected, larval mosquito development sites, once identified, are monitored, treated as required with permission, and added to the site database for future surveillance and control as necessary.

As required by the *BC Integrated Pest Management Act and Regulations*, all larvicide applications would be completed, and/or supervised by, personnel certified by BC Ministry of Environment as pesticide applicators in the category of *Mosquito and Biting Fly Abatement*, or equivalent. All larvicide treatments would be completed using application rates, equipment and methods recommended by the pesticide manufacturer.

3.6.1 Public, Worker and Environmental Safety During Mosquito Control

To ensure public and worker safety, all conditions and restrictions governing biorational larvicide (VectoBac and VectoLex) applications would be followed. Pesticide applicators will follow the guidance of the approved PMP, with regulations contained in the *Pest Control Products Act*, the *Pesticide Control Act*, the *Integrated Pest Management Act and Regulation*, the *Transportation of Dangerous Goods Ac*t and other relevant government regulations. Larvicide handling, storage and application procedures would conform with those detailed on product labels and endorsed in the '*Pesticide Applicators and Dispensers Handbook*' and associated reference materials supplied through the BC Ministry of Environment.

The “Workplace Hazardous Materials Information System” (WHMIS) is a national system designed to protect Canadian workers from the adverse effects of hazardous materials by providing relevant information. All pest control products intended for use in a workplace require this information on the label or need to have a Safety Data Sheet (SDS) prepared to be eligible for registration.

Pesticide handling, storage and application procedures would conform with those detailed on product labels, Material Safety Data Sheets and endorsed in the 'Pesticide Applicators and Dispensers Handbook' and associated reference materials supplied through the BC Ministry of Environment.

The Central Saanich mosquito population management and control program is intended to provide residents, workers and visitors relief from extreme or persistent adult mosquito annoyance. The control program is not intended to eliminate the mosquito population and as such landowners and residents who want to be excluded from the control are recorded and their wishes respected.

Landowner permission to survey, monitor and treat infested larval mosquito habitats located on private property is confirmed each season. Treatment of developing larval mosquito populations in waterbodies on public lands are permitted under this approved PMP. Program personnel will take all practical precautions to protect application personnel, the environment and the general public during all larvicide applications. Prior to any larvicide application field personnel:

- Verify property ownership, treatment site boundaries, public points of access (paths, trails, roadways), pest presence and population size, both pre- and post-treatment.
- Identify AVOID areas, fish-bearing and flowing waters or areas of environmental sensitivity (i.e. bird nesting sites) and the need for, and size of, any Pesticide Free Zones (PFZs) and Pesticide application Buffer Zones (PBZs), if required.
- Community watersheds can be determined by accessing the BC Ministry of Environment Community Watershed listings and informational website:
    - https://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/community-watersheds
- A listing of registered groundwater Wells and Aquifers and an interactive map of active wells is available at:
    - www.gov.bc.ca/gov/content/environment/air-land-water/water/groundwater-wells-aquifers
- Larvicides will not be applied to finished drinking water and no Pesticide Free Zones (PFZs) are required for bacterial pesticides as indicated in Section 71(12) of The Integrated Pest Management Act and Regulations. Potable (drinking) water well locations and open water intakes will be identified with the property resident/owner prior to any larvicide treatments.
- Review larvicide product label and comply with recommended precautions for handling and application, safety gear, weather restrictions (wind, temperatures, etc.) and other listed precautions.
- Inform the public of larvicide applications through ongoing public notices, news media articles, advertisements, and personal contact.

3.6.2 Larval Mosquito Control, Treatment Thresholds and Application Rates

VectoBac (*Bti, Strain AM 65-52*), AquaBac (*Bti, Strain BMP-144*) and VectoLex (*Lsph*) are only applied when larval mosquitos are present. Larval mosquito surveillance and control protocols would focus efforts on the timely identification and treatment of larval mosquito populations with surveillance

and control efforts targeting 1st through 3rd instar larvae. Given that the most extensive larval development locally involves synchronous hatching *Aedes* mosquitos this strategy ensures maximum control. In addition to treating the most actively growing and feeding instars, it also, allows for retreatment (touch-up) of sites, or portions of sites, that may not have been treated as completely, as desired, because of conditions on the day, changing water levels or because of subsequent hatching. Also, application rates can be lower, and therefore material costs, and overall mosquito larvicide use rates in the environment are reduced. Even though the biorational larvicides containing *Bti* and *Lsph* proposed for use in the program have the safest environmental profiles of any larvicides in common use, decreasing any volume of control product is beneficial and maximizes environmental compatibility.

Treatments targeting mosquito populations with later 3rd or 4th instars under the guise of allowing natural predators to impact some level of control is not encouraged. It is not recommended on *Bti* or *Lsph* product labels, or by the *Municipal Mosquito Control Guidelines (Ellis, 2005)*. Using biorational larvicides to control mosquito larvae at their source, and as 2nd through 3rd instar larvae still contributes to the "food web". Dead larvae become food for many other organisms, including insect detritivores, fungi and bacteria which in turn become food for other aquatic insect and vertebrate predators and grazers. While there may be predation of mosquito species, such as *Culex spp*. or *Culiseta spp.*, which occur in permanent ponds, and are the two most common larvae in these sites, there are typically zero to very few natural predators in *Aedes* mosquito habitats which are typically dry fields and depressions until inundated with water through snowmelt, precipitation, or river seepage.

Delaying treatments to target mosquito populations with later 3rd or 4th instars is not ideal. The potential for reduced feeding rates of later (4th) instar larvae may provide incomplete control, reduced efficacy and may result in a number of other undesirable outcomes:

1) That larvae develop into the untreatable pupal stage, and then onto nuisance causing adults;
2) That field staff may not return at an appropriate time to treat them before this occurs. Changing weather conditions and temperatures over a few days can dramatically accelerate larval development rates; and lastly
3) Product manufacturers recommend that later instar larvae are treated with higher application rates, upwards of 10kg/ha (1 gm/metre), thereby requiring more larvicide, increased field personnel time and reduced environmental compatibility.

Changing weather conditions and temperatures over a few days can dramatically accelerate larval development rates; and lastly product manufacturers recommend that later instar larvae are treated with higher application rates, upwards of 10kg/ha (1 gm/M) for VectoBac 200G and 20 kg/ha for AquaBac 200G (2gm/M), thereby requiring more larvicide, increased personnel field treatment time, reduced environmental compatibility, and increased cost ($) per unit treated.

Aedes hatch in large numbers, typically +300/dip sample, and inhabit temporary pools created by snowmelt, precipitation, river flood and seepage waters which may only last several days or weeks. These types of temporary habitats seldom have established natural predators and where they may occur, they are typically inadequate to deal with larval populations of such extreme magnitude. A pond the size of a back yard swimming pool ($50m^2$), with a larval population of just 1 larvae/350ml dip sample, can produce over 24,000 larvae. A one hectare site, about the size of 2 football fields, with a larval population density of 1 larvae/dip sample can produce 4,285,714 mosquitos.

Typically, upwards of 10 dip samples per development site, depending on site size, are completed. Larger sites will have a greater number of dip samples. Larval mosquito dip samples averaging from 1-3 larvae/350ml dip sample in sites containing predominantly 2nd and 3rd instar larvae would be the minimum treatment threshold for mosquito larvae found in permanent sites, which typically contain a high proportion of *Culex* and *Culiseta* mosquito larvae. A treatment threshold of five, 1st instar larvae/350ml dip sample is utilized when monitoring synchronous, extensive *Aedes sp*. larval development common to early-season, temporary, snowmelt, seepage water and river level influenced habitats. The threshold for 2nd and 3rd instar *Aedes* larvae would be a minimum of 1 -3 larvae/dip sample. Depending on site location, and its size, and permanence a site may be left untreated if the potential for subsequent adult mosquito nuisance is low, regardless of the larval population size.

VectoLex larvicides, which are largely ineffective against *Aedes* mosquitos would only be utilized to control developing larvae in those permanent and temporary sites having *Culex, Culiseta* and *Coquillettidia perturbans* larvae. Larval populations averaging 1-3 larvae/350ml dip sample will be the threshold for treatment using VectoLex larvicides.

These thresholds are based on the "industry standard" used by operational mosquito control programs in the Northwest Mosquito and Vector Control Association (NWMVCA) and American Mosquito Control Association (AMCA). Larval dip sampling, light trap collections and where appropriate, adult mosquito emergence traps would be employed to evaluate post-application larval control results. Larval mortalities of at least 95% would be considered successful. If required, and where indicated by post application sampling, additional, or expanded treatments of nearby areas would be completed to achieve desired efficacy.

VectoBac 200G, AquaBac 200G, and VectoLex CG are the larvicides of choice. The use of *Bti* and *Lsph* maximizes the environmental compatibility of the annual mosquito control program since both products are species (target) selective and non-toxic to other aquatic organisms which co-exist in these habitats including insects, fish and amphibians. When used in circumstances where other control options such as physical or cultural control are not practical, they support the principles of an IPM approach to mosquito control, and they are the most effective, selective, and least persistent larval control agents available.

All Mosquito *Bti* larvicide application rates would be within those recommended by the manufacturer. These rates range from 2.5 to 10.0 kilograms per hectare with applications

completed under this PMP to be conducted at rates ranging from 4.0 to 8.5 kilograms per hectare. Typically, VectoBac and VectoLex application rates average 7.5 kg/ha for ground applications and 4.25 kg/ha for aerial (helicopter) applications. These application rates have been demonstrated as effective under the conditions encountered at Central Saanich. Routine application rates for AquaBac 200G are reported to range from 4.0-13.0 kg/ha. Factors influencing application rates include application method (aerial or ground), larval age classes (instars) and populations, the density and type of vegetation cover at treatment areas (grasses, deciduous forest), organic matter, water depths etc. All application rates would be within the ranges, and recommendations of the PMRA-approved manufacturers labels. All applications are followed with post-application monitoring to confirm the effectiveness of treatments.

Applications of VectoBac 200G, AquaBac 200G and VectoLex to within 10 metres of fish-bearing waters and to waters contiguous to fish–bearing waters is anticipated and as permitted on the Health Canada, Pesticide Regulatory Management Agency (PRMA) approved product labels. Permanent fish-bearing and flowing waters would not be treated. A minimum 10 metre Pesticide Free Zone (PFZ) will be maintained from all potable open water sources, with other buffer zones as required through authorization by the BCMOE. As required by the BC *Integrated Pest Management Act* all larvicide applications are completed by personnel certified by BC Ministry of Environment as pesticide applicators in the category of *Mosquito and Biting Fly Abatement*, or an equivalent, appropriate category.

All ground-based larvicide applications to small and accessible sites are completed, where required, by hand broadcast or backpack spreader during the mosquito control season. Fluctuating water levels in many of these sites cause repeated larval development requiring repeated treatment. Certified applicators achieve the label recommended application rates (kg/ha) by applying the larvicide granules and at the appropriate concentrations of granules/ft^2.

Before treating an area, ground applicators review available site maps, estimate the site size (m^2) and then perform a calculation to determine the volume of VectoBac 200G to be applied. With an application rate of 7.5 kg/ha, and a site size of 1000m^2, the applicator would measure out 750gms of VectoBac. Applicators then do their best to distribute the granules equally across the water surface while they move around the perimeter of larger and deeper sites, or as they walk through shallower (<30cm deep) sites and as they broadcast the granules by hand or with a back-pack applicator. The desired application rate is achieved by modifying the walking or throttle speed, when using a backpack applicator, or by adjusting the frequency and number of “hand broadcasts” for granules being thrown across the surface by applicators.

For catch basins (CBs), VectoLex WSP 10gm satchels, are applied as one per CB. Alternatively, VectoLex CG can be applied to catch basins. If used, VectoLex CG would be applied using a standard measuring spoon to deliver 10 gm of granules/catch basin. VectoLex WSP used for the treatment of cattail swamps and similar, difficult to access sites, would be applied at a rate of one 10gm satchel for every 5m^2- 10m^2 surface water. In permanent

ponds and stagnant ditches with difficult access because of thick, overgrown, or dense vegetation (i.e. blackberries and Typha sp. cattails), the long-acting VectoLex WSP may be used for treatments. These 10gm satchels (2cm X 2cm) can be readily thrown into these sites where the bio-degradable, glucose-based bag quickly dissolves, and the granules disperse across the water surface. Application to the water surface is at rates of 1 x 10gm satchel/5m^2 to 10m^2 area.

3.6.3 Post Application Monitoring

Within 2-96 hours after (post) treatment with VectoBac 200G, larval mortalities would be confirmed through monitoring using a standard 350 ml mosquito dipper. The goal is for larval population reductions of 95%, or to levels with sampling results mostly measured at zero larvae/350ml dip sample and averaging much less than 1 larvae/350ml dip sample. Post-application monitoring confirms treatment success and allows for the 'touch-up' treatment of any areas which may have, for reasons of geography, vegetative cover or access, received inadequate application. Because larval mortality from VectoLex can take several days to occur, and can continue to occur for several weeks, treated larval habitats would be monitored on a regular basis with re-treatment completed as required.

VectoLex post-application monitoring is completed 5-10 days following application, and then weekly to determine if additional treatment is required. VectoLex mortality is not as immediate as VectoBac, and its effectiveness is determined by the absence of developing fourth instar larvae when monitored post application. Because of its recycling in dead mosquito larvae, the appearance of fourth instar larvae indicates that concentration of VectoLex is insufficient to effect control.

4.0 QUALIFICATIONS OF PROGRAM PERSONNEL

This annual program would be managed by environmental consultants experienced in integrated pest management.

The contractor/consultant supplying mosquito control services to the District of Central Saanich will have all necessary Pesticide Vendor and Pest Control Service Licences. All personnel working in the annual mosquito control program will be certified pesticide applicators in the category of 'Mosquito and Biting Fly Abatement' or equivalent, as accepted by the BC Ministry of Environment.

Control program management personnel should be Registered Professional Biologists. Field personnel should include University and College graduates or senior Co-Operative Education students studying within the disciplines of biology and environmental science or equivalent practical experience with mosquito population management practices and training.

5.0 LARVICIDE HANDLING AND APPLICATION

As required by the *BC Integrated Pest Management Act and Regulations*, all personnel handling and applying larvicides for the annual mosquito control program must be certified by BC Ministry of Environment as pesticide applicators in the category of *Mosquito and Biting Fly Abatement*, or equivalent. Pesticide applicators will comply with regulations contained within the *Pest Control Products Act*, the *Integrated Pest Management Act*, the T*ransportation of Dangerous Goods Act* and other relevant government regulations.

Larvicide handling, storage and application procedures would conform with those detailed on product labels and endorsed in the '*Canadian Pesticide Education Program Applicator Core Manual*', the '*Pesticide Applicators and Dispensers Handbook*' and associated reference materials supplied through the BC Ministry of Environment. This PMP does not attempt to duplicate all the information contained within this handbook and other references. The 'Acts', the Handbook, product labels, manufacturers' websites and any other resource materials detailed in this PMP would be reviewed, as appropriate, before handling, transporting, storing or applying pesticides.

The following sections provide details on procedures and protocols which will protect the public and the environment during larvicide transportation, storage, handling and applications. Only bacterial larvicide products are proposed for use in this mosquito surveillance and control program. No Pesticide Free Zones (PFZs) are required for bacterial pesticides as indicated in Section 71(12) of *The Integrated Pest Management Act and Regulations.*

5.1 Larvicide Transportation

During transportation, all pesticides would be secured to prevent an accidental spillage or theft. Granular VectoBac 200G, AquaBac 200G and VectoLex larvicide products would be secured and handled to prevent tearing of bags, spillage and exposure to adverse weather conditions such as precipitation. They will be transported in secure lockable compartment such as a vehicle trunk, a locked storage box, container or truck canopy.

Applicators would typically only transport the minimum amounts of pesticide required to complete the proposed treatments. With granular products, it is common for field personnel to require less than forty kilograms of VectoBac 200G or VectoLex CG for a typical workday. Applicators will carry within their vehicles a suitable spill clean-up kit, basic first aid and appropriate personal protective safety gear and supplies, as required. For granular products, this is typically a broom and dustpan. Any spilled larvicide would be recovered and applied to active larval treatment sites.

Larvicides would not be transported in the passenger compartment of a vehicle and would remain separate from food, clothing or similar items during transport. Any applicator who has product stolen or removed from his/her vehicle would follow the notification procedures for the appropriate authorities immediately, including police.

5.2 Larvicide Storage

The District of Central Saanich would make available a secure, dry, well-ventilated pesticide storage space for mosquito control larvicides (VectoBac 200G, AquaBac 200G and VectoLex) within their secure public works facility. In an average year, less than 200 kg of VectoBac and VectoLex larvicide may be stored on-site over the fall and winter to be available for program start-up in early February.

Emergency telephone numbers for police, fire, ambulance, CANUTEC, Dangerous Goods Emergency Spills, Poison Control, and the BC Ministry of Environment are posted on-site at the storage facility and available at Public Works offices

5.3 Larvicide Mixing, Loading and Application

Applicators will follow the directions and precautions warranted by pesticide use as described above and in relevant references. All avoidance areas, pesticide free zones and pesticide buffer zones would be established and appropriately identified prior to pesticide application. No mixing is required as VectoBac and VectoLex granular larvicides are formulated as 'ready to apply' and are supplied in thick, plastic bags. All used and empty bags would be disposed of in municipal or regional landfills as directed by the manufacturer on the PMRA approved pesticide label and SDS sheets. Field personnel would wear suitable safety gear, including the appropriate respirator/dust masks, ear protection, rubber gloves, boots and other protective equipment as indicated by larvicide labels, SDS sheets, and manufacturer instructions.

All handling of pesticides would be conducted in level, well ventilated, outside areas under conditions or minimal winds and no precipitation. In the event of accidental spillage personnel would follow accepted spill containment, clean-up and reporting procedures. With granules this typically involves recovery with brooms and dustpans or shovels. This ‘recovered’ larvicide would be used for the treatment of intended habitats.

Weather forecasts would be consulted, and current weather conditions (wind speed, temperature, precipitation) would be noted, and recorded, during all larvicide applications. In the event that wind speeds during larvicide applications are sufficient to cause the displacement, or drift, of granular larvicides outside of the treatment area, applications would be suspended until suitable conditions return. Similarly, should precipitation be sufficient to cause larvicide (corn cob) granules to clump and clog backpack blowers, or similarly affect hand broadcast applications, treatments would be suspended until suitable conditions return. Ground-based applications are seldom impacted, except in conditions of heavy or extreme precipitation and under those conditions applications could be suspended until suitable conditions reoccur. Extreme thunder and or lightning conditions would possibly result in the suspension of ground-based applications until suitable conditions return.

Property owners would be consulted with prior to any larvicide applications and for any recommended physical of biological/natural methods. Product brochures, labels, MSDS sheets and website addresses would be supplied and reviewed to ensure residents, business, and facility

operators understand, are comfortable with, and approve, proposed treatments. In the event that a property owner wishes exclusion from the control program this request would be honoured and noted in the development site database.

Due to the low toxicity of bacterial larvicides, applications may be conducted within riparian areas and sensitive wildlife habitat. Applications of VectoBac and VectoLex to within 10 metres of fish-bearing waters and potable (drinking) water sources is anticipated and as permitted on the Health Canada, Pesticide Regulatory Management Agency (PRMA) approved product labels. Pesticide free zones are not required and applications of VectoBac 200G and VectoLex CG may be completed in ephemeral waterbodies that are intermittently contiguous with fish-bearing waters (*i.e.* Impounded, receding flood, seepage or tidal waters).

5.4 Equipment Maintenance and Calibration

Ground-based applications of VectoBac 200G and VectoLex CG are completed by hand broadcast or motorized back-pack type (leaf blower) application. Applicators would adjust their walking speed, and throttle speed if using backpack blowers, to ensure they are achieving the correct application rate/density of granules per square foot of water surface. For an application rate of 7.5 kg/ha this is 4-5 granules per square foot.

6.0 CONTROL PROGRAM SYNOPSIS

The mosquito population management and control program developed for the District of Central Saanich, Tsawout First Nation, and Capital Regional District utilizes a pro-active, integrated approach which focuses on larval mosquito control. The Central Saanich mosquito control program is not intended, nor would it be possible, to eliminate the local mosquito population. An appropriate scope of operations and the prevention or timely treatment of larval mosquitos at their source will reduce local adult mosquito populations.

Public education during the term of this PMP will involve regular news media exposure, public information meetings, pamphlets, doorknob hangers and notice boards, field personnel interaction with residents, visitors and business operators. These initiatives increase the general public's awareness of program operations and goals and encourages the general public to report adult mosquito annoyance, potential larval development sites and to have input into their control program.

Regular monitoring and treatment of larval mosquitos is a key element to mosquito control program success. These development habitats must be identified and regularly surveyed during a control season to ensure timely detection of larval mosquito development. Surveying, monitoring and control of larval mosquito infestations would begin in early February and continue through August, and potentially September, depending on local conditions. Program methodologies would continue to concentrate on larval control initiatives with a goal to reduce the extent of standing water

development habitats. Developing larval mosquito populations would be controlled through the application of the biorational larvicides.

Adult mosquito population monitoring would be conducted as part of routine control program operations. It allows for the evaluation of larvicide efficacy and provides control personnel with information useful in the location of any previously undetected larval development habitat.

Evaluation of the program in terms of effectiveness and ability to satisfy the needs of the general public is conducted as an on-going process. The cooperation and support of local businesses, ranchers, and property owners is indicative of true community spirit and support for a successful program which benefits workers, residents and visitors to Central Saanich.

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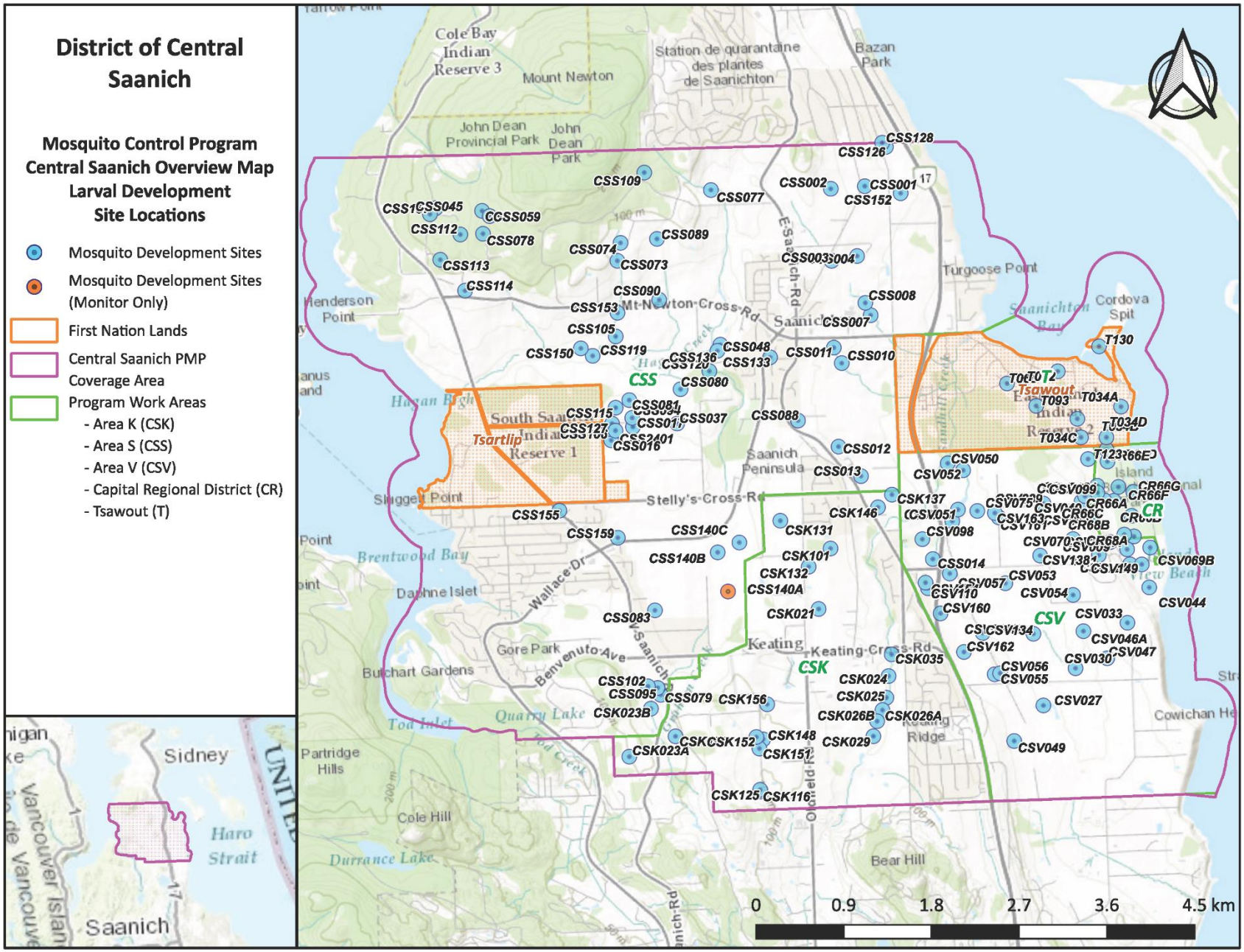

Figure 1: Central Saanich Mosquito Control Program Larval Development Site Overview Map

VectoBac® 200G

BIOLOGICAL LARVICIDE

GRANULE

GROUP	11	INSECTICIDE

RESTRICTED

GUARANTEE:
Bacillus thuringiensis subsp. *israelensis*,
Serotype H-14, strain AM 65-52, 200 International
Toxic Units (ITU) per milligram (0.2 billion ITU/KG)

REGISTRATION NO. 18158
PEST CONTROL PRODUCTS ACT List No. 60214-13

INDEX:

READ THE LABEL BEFORE USING
KEEP OUT OF REACH OF
UNAUTHORIZED PERSONNEL
POTENTIAL SENSITIZER
CAUTION EYE IRRITANT

1.0 PRECAUTIONS

KEEP OUT OF REACH OF UNAUTHORIZED PERSONNEL
MAY CAUSE SENSITIZATION
CAUTION EYE IRRITANT

DO NOT apply directly to treated, finished drinking water reservoirs or drinking water receptacles when the water is intended for human consumption.

Avoid contact with skin, eyes, and clothing. Avoid breathing dust/spray mist. Wear a long sleeved shirt, long pants, waterproof gloves, shoes and socks, eye goggles and NIOSH-approved respirator with any N-95, R-95, or P-95 filter for biological products when handling, mixing/loading or applying the product and during all clean-up/repair activities. Applicators may remove gloves, eye goggles and respirators if the design and delivery of the application apparatus reduces exposure to a negligible level (e.g. backpack sprayer with application wands that apply product directly over water surface). Wash thoroughly with soap and water after handling. Remove contaminated clothing and wash before reuse.

2.0

FIRST AID	
If on skin or clothing	Rinse skin immediately with plenty of water. Remove contaminated clothing and wash separately before reuse. If irritation occurs and persists or is severe, seek medical attention.
If in eyes	Hold eye open and rinse slowly and gently with water. Remove contact lenses, if present, then continue rinsing eye. If irritation occurs and persists or is severe, seek medical attention.
If inhaled	Move person to fresh air, apply respiration if needed and seek medical attention.
If swallowed	Rinse mouth and throat with copious amounts of water. DO NOT induce vomiting. Promptly contact a physician or poison control centre. DO NOT give anything by mouth to an unconscious person.
General	Seek medical attention if irritation or signs of toxicity occur and persist or is severe. Take container, label or product name and Pest Control Product Registration Number with you when seeking medical attention.

3.0 TOXICOLOGICAL INFORMATION

Treat symptomatically.

4.0 STORAGE

In order to ensure microbial purity and potency, VectoBac 200G should be stored in the original container at 0 - 25°C and used within 24 months of the date of manufacture.

5.0 DISPOSAL

Triple- or pressure-rinse the empty container. Add the rinsings to the spray mixture in the tank. Follow provincial instruction for any required additional cleaning of the container prior to its disposal. Make the empty container unsuitable for further use. Dispose of the container in accordance with provincial requirements. For information on disposal of unused, unwanted product, contact the manufacturer or the provincial regulatory agency. Contact the manufacturer and the provincial regulatory agency in case of a spill, and for clean-up of spills.

6.0 NOTICE TO USER

This pest control product is to be used only in accordance with the directions on the label. It is an offence under the *Pest Control Products Act* to use this product in a way that is inconsistent with the directions on the label. The user assumes the risk to persons or property that arises from any such use of this product.

NATURE OF RESTRICTION: This product is to be used only in the manner authorized; consult local pesticide regulatory authorities about use permits which may be required.

7.0 DIRECTIONS FOR USE

MOSQUITOES	Suggested Range Rate
Habitat: Standing water	3 – 10kg/ha* (0.3 – 1.0 g/m^2)

Temporary and permanent pools in pastures and woodlots, irrigation or roadside ditches, natural marshes or estuarine areas, water contiguous to fish-bearing water, catch basins and sewage lagoons.

*Use higher rates in deep and/or polluted water, and when late 3rd and 4th instar larvae predominate.

Apply recommended rate by conventional aerial or ground equipment. Uniform coverage is necessary for best results. For aerial application, apply in uniform non-overlapping swaths when conditions do not favour drift or when wind speeds are less than 10 km/h.

A 3 to 14 day interval between applications should be employed. Monitoring will indicate the appropriate retreatment interval. VectoBac 200G Biological Larvicide does not affect non-target, aquatic, invertebrate predators and parasites which are non-filter feeders. Therefore, longer periods of suppression may result since these beneficials would be conserved to aid in mosquito population management.

AERIAL APPLICATION INSTRUCTIONS

Apply only by fixed-wing or rotary aircraft equipment that has been functionally and operationally calibrated for the atmospheric conditions of the area and the application rates and conditions of this label.

Label rates, conditions and precautions are product-specific. Apply only at the rate recommended for aerial application on this label. Where no rate for aerial application appears for the specific use, this product cannot be applied by any type of aerial equipment.

Ensure uniform application by using appropriate marking devices and/or electronic guidance equipment.

Use Precautions

Apply only when meteorological conditions at the treatment site allow for complete and even coverage.

Apply only when meteorological conditions are in compliance with local and/or provincial authorities.

Operator Precautions

DO NOT allow the pilot to mix product to be loaded onto the aircraft. However, loading of premixed product with a closed system is permitted. It is desirable that the pilot has communication capabilities at each treatment site at the time of application. The field crew and the mixer/loaders must wear the personal protective equipment described in the PRECAUTIONS section of this label. When handlers/loaders use closed systems to load product onto the aircraft, the handler requirement for eye goggles and a NIOSH-approved respirator/mask with any N-95, R-95, or P-95 filter for biological products may be waived. When reduced personal protective equipment is worn, the respirator/mask and eye goggles must be immediately available for use in an emergency such as a spill or equipment breakdown. All personnel on the job site must wash hands and face thoroughly before eating and drinking. Protective clothing must be washed before reuse. Decontaminate aircraft cockpit and vehicle cabs if contamination occurs.

Product Precautions

Read and understand the entire label before opening this product. If you have questions, call the manufacturer at 1-800-323-9597 or obtain technical advice from the distributor or from your provincial agricultural or forestry representative. Application of this specific product must meet and/or conform to the aerial uses and rates on this label.

RESISTANCE MANAGEMENT RECOMMENDATIONS

For resistance management, please note that VectoBac 200G Biological Larvicide contains a Group 11 insecticide. Any insect population may contain individuals naturally resistant to VectoBac 200G Biological Larvicide and other Group 11 insecticides. The resistant individuals may dominate the insect population if this group of insecticides are used repeatedly in the same site. Other resistance mechanisms that are not linked to site of action but are specific for individual chemicals, such as enhanced metabolism, may also exist. The following appropriate resistance management strategies should be followed to delay insecticide resistance:

- Where possible, rotate the use of VectoBac 200G Biological Larvicide or other Group 11 insecticides with different groups that control the same pests in a site.
- Insecticide use should be based on an Integrated Pest Management program that includes scouting, record keeping, and considers cultural, biological and other chemical control practices.
- Monitor treated pest populations for resistance development.
- Contact your local extension specialist or certified crop advisors for any additional pesticide resistance management and/or integrated pest management recommendations for the specific site and pest problems in your area.
- For further information or to report suspected resistance, contact Valent BioSciences Corporation at 1-800-323-9597.

Registrant:

VALENT BIOSCIENCES CORPORATION
870 TECHNOLOGY WAY
LIBERTYVILLE, IL 60048 U.S.A.
1-800-323-9597

Canadian Agent:
Valent Canada, Inc.
6-130 Research Lane
Guelph, Ontario N1G 5G3 CANADA

VectoLex® CG

BIOLOGICAL LARVICIDE

GRANULAR

RESTRICTED

GROUP	11A2	INSECTICIDE

GUARANTEE:
Bacillus sphaericus Strain 2362 . . . . . 50 BsITU/mg

REGISTRATION NO. 28008
PEST CONTROL PRODUCTS ACT List No. 05722-13

INDEX:

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PREVENT ACCESS BY UNAUTHORIZED PERSONNEL
POTENTIAL SENSITIZER
CAUTION EYE IRRITANT

1.0 NOTICE TO USER

This pest control product is to be used only in accordance with the directions on the label. It is an offence under the *Pest Control Products Act* to use this product in a way that is inconsistent with the directions on the label. The user assumes the risk to persons or property that arises from any such use of this product.

2.0 NATURE OF RESTRICTION

This product is to be used only in the manner authorised; consult provincial pesticide regulatory authorities regarding appropriate use permits that may be required.

3.0 LIMITATIONS

DO NOT apply directly to treated, finished drinking water reservoirs or drinking water receptacles.

4.0 RESTRICTED USES: DIRECTIONS FOR USE

VectoLex CG is a mosquito larvicide to be applied, without mixing or dilution, by conventional ground or aerial application equipment. Apply to mosquito breeding sites when sampling indicates that mosquito larvae are present. For best results, apply when young larval stages are present. Reapply at a minimum interval of two weeks as needed, if monitoring indicates that further applications are required. Do not reapply within two weeks of application. Do not apply more than six times per treatment site per season.

Aerial Application Instructions:
Apply only by fixed-wing or rotary aircraft equipment which has been functionally and operationally calibrated for the atmospheric conditions of the area and the application rates and conditions of this label. Label rates, conditions and precautions are product specific. Apply only at the rate recommended for aerial application on this label. Where no rate for aerial application appears for the specific use, this product cannot be applied by any type of aerial equipment. Ensure uniform application by employing appropriate marking devices and/or electronic tracking equipment.

Use Precautions:
Apply only when meteorological conditions at the treatment site allow for complete and even coverage. DO NOT apply when wind speed is greater than 16 km/h at flying height at the site of application. Apply only under conditions of good practice specific to aerial application as outlined in the *National Aerial Pesticide Application Manual*, developed by the Federal/Provincial/Territorial Committee on Pest Management and Pesticides.

Operator Precautions:
Do not allow the pilot to mix product to be loaded onto the aircraft. Loading of premixed product with a closed system is permitted. It is desirable that the pilot has communication capabilities at each treatment site at the time of application.

The field crew and the mixer/loaders must wear the personal protective equipment described in the PRECAUTIONS section of this label. All personnel on the job site must wash hands and face thoroughly before eating and drinking. Protective clothing, aircraft cockpit and vehicle cabs must be decontaminated regularly.

Product Specific Precautions:
Read and understand the entire label before opening this product. If you have questions, call the manufacturer at 1-800-323-9597 or obtain technical advice from the distributor or from your provincial agricultural or forestry representative. Application of this specific product must meet and/or conform to the aerial uses and rates on this label. Rinse and flush spray equipment thoroughly following each use.

5.0 MOSQUITO LARVAL CONTROL

VectoLex CG is a mosquito larvicide. It is not effective against mosquito adults and pupae. Apply to mosquito larval breeding sites when sampling indicates that mosquito larvae are present. For best results, apply when young larval stages are present.

For use in:	Mosquito species controlled	Application rate and interval	Application methods
Water bodies: freshwater marshes, salt marshes, flood plains, flooded fields and pastures, wetlands, ponds, storm water detention/ retention and seepage ponds, wastewater sewage effluent, sewage lagoons, oxidation ponds, log ponds, impounded waste water, septic ditches, drainage ditches including open storm sewers and irrigation ditches	*Culex* spp. *Culiseta* spp. *Aedes vexans* (Other *Aedes* spp. and *Ochlerotatus* spp. have variable degrees of susceptibility to VectoLex CG)	5.6-16.8 kg product/ha (0.56-1.68 g product/m^2) of water surface area. Use the higher rate in water polluted with sewage, water with high organic content and water with a high level of suspended solids. Reapply at a minimum interval of two weeks as needed, if monitoring indicates that further applications are required. Do not reapply within two weeks of application. Do not apply more than six times per treatment site per season.	Apply by ground or aerial application equipment capable of uniform delivery of VectoLex CG Biological Larvicide over the water surface.
Waste tires	*Culex* spp. *Culiseta* spp. *Aedes triseriatus*	0.56-1.68 g product/ m^2 of water surface area. Use the higher rate in water with high organic content and water with a high level of suspended solids.	Apply by hand or ground application equipment to individual tires which contain standing water.

5.0 MOSQUITO LARVAL CONTROL (CONT'D)

For use in:	Mosquito species controlled	Application rate and interval	Application methods
Waste tires	*Culex* spp. *Culiseta* spp. *Aedes triseriatus*	Do not reapply within one week of application. Reapply at a minimum interval of one week as needed, if monitoring indicates that further applications are required.	Use with other mosquito management techniques such as shredding waste tires, removing standing water and covering the stacked tires.
Water bodies: freshwater marshes, flood plains, flooded fields and pastures, wetlands, ponds, storm water detention/ retention and seepage ponds, wastewater sewage effluent, sewage lagoons, oxidation ponds, log ponds, impounded waste water, septic ditches, drainage ditches including open storm sewers and irrigation ditches	*Coquillettidia perturbans* (may reduce the number of larvae)	8-16.8 kg product /ha (0.8-1.68 g product/ m^2) of water surface area. Use the higher rate in water polluted with sewage, water with high organic content and water with a high level of suspended solids. Reapply at a minimum interval of two weeks after application; however, the effects on larval numbers may not be evident for up to three weeks after application. Reapplication should be based on larval monitoring. Do not reapply within two weeks of application. Do not apply more than six times per treatment site per season.	Apply by ground or aerial application equipment capable of uniform delivery of VectoLex CG Biological Larvicide over the water surface.

6.0 RESISTANCE MANAGEMENT RECOMMENDATIONS

Mosquito populations may contain individuals naturally resistant to VectoLex CG. The resistant individuals may dominate the mosquito population if VectoLex CG is used repeatedly as the sole means of control in the same geographic location/use area.

To delay/avoid the resistance of mosquito populations to VectoLex CG it is recommended that users:

- Rotate the use of VectoLex CG with other mosquito larvicides currently registered in Canada, which do not contain *Bacillus sphaericus* as the active ingredient, providing they are registered for use in control of the same pests in the same sites.
- Treat a portion of the target area with a *Bti* formulation or an alternative insecticide ensuring the continual existence of populations of mosquitoes not exposed to VectoLex CG within a given geographic location.
- Insecticide use in mosquito control should be based on an IPM program that includes scouting, record keeping, and considers cultural/habitat, biological and chemical control practices suitable for the area to be treated.
- Monitor treated pest populations for resistance development.
- For further information or to report suspected resistance contact Valent BioSciences Corporation at 1-800-323-9597 or at www.valentbiosciences.com.

7.0 PRECAUTIONS

PREVENT ACCESS BY UNAUTHORIZED PERSONNEL.

May cause sensitization. May irritate eyes. Avoid contact with skin, eyes or clothing. Mixer/loaders and applicators not in enclosed cabs or aircraft must wear a long-sleeved shirt, long pants, shoes plus socks, eye goggles, waterproof gloves and a dust/mist filtering respirator (MSH/NIOSH approval number prefix TC-21C) or a NIOSH approved respirator with any N-95, R-95, P-95 or HE filter for biological products when handling, mixing/loading or applying the product and during all cleanup/repair activities. Wash thoroughly with soap and water after handling. Remove contaminated clothing and wash before reuse.

8.0 FIRST AID

IF SWALLOWED: Call a poison control centre or doctor immediately for treatment advice. Have person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control centre or doctor. Do not give anything by mouth to an unconscious person.

IF ON SKIN OR CLOTHING: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control centre or doctor for treatment advice.

IF INHALED: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably by mouth-to-mouth, if possible. Call a poison control centre or doctor for further treatment advice.

IF IN EYES: Hold eye open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control centre or doctor for treatment advice.

Take container, label or product name and Pest Control Product Registration Number with you when seeking medical attention.

GENERAL: IMMEDIATELY seek medical attention if irritation or signs of toxicity occur and persist or are severe.

9.0 TOXICOLOGICAL INFORMATION:

Treat symptomatically.

10.0 STORAGE

Store at temperatures between 0°C and 25°C. Store container upright and keep tightly closed when not in use. Material must be used within 12 months of the Date of Manufacture.

11.0 DISPOSAL

1. Completely empty the bag into the application equipment.
2. Follow provincial instruction for any required additional cleaning of the container prior to its disposal.
3. Make the empty bag unsuitable for further use.
4. Dispose of the bag in accordance with provincial requirements.

For information on disposal of unused, unwanted product, contact the manufacturer or the provincial regulatory agency. Contact the manufacturer and the provincial regulatory agency in case of a spill, and for clean-up of spills.

DO NOT contaminate irrigation or drinking water supplies or aquatic habitats by cleaning of equipment or disposal of wastes.

12.0 NOTICE TO USER

This pest control product is to be used only in accordance with the directions on the label. It is an offence under the *Pest Control Products Act* to use this product in a way that is inconsistent with the directions on the label. The user assumes the risk to persons or property that arises from any such use of this product.

Registrant:

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870 TECHNOLOGY WAY
LIBERTYVILLE, IL 60048 U.S.A.
1-800-323-9597

Canadian Agent:
Valent Canada, Inc.
6-130 Research Lane
Guelph, Ontario N1G 5G3 CANADA