

# PEST MANAGEMENT PLAN

May 18, 2018

RDOS-MOS-PMP-2018/2023

## Nuisance Mosquito Control Plan

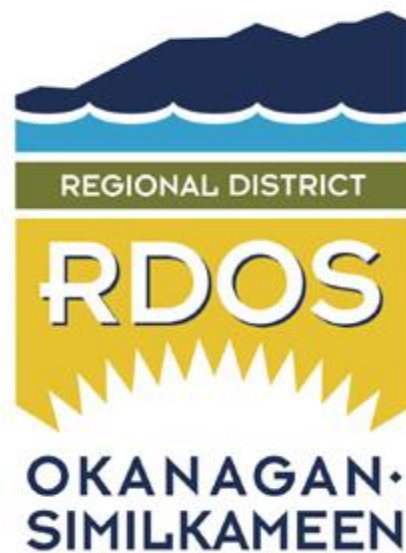
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## 1.0 Introduction

This plan recognizes that the regional government and local municipalities operate on the unceded, traditional territory of the Syilx peoples. This plan also recognizes that ongoing communication and information sharing will be an integral component of the Mosquito Control Program.

The overall objective of the Regional District of the Okanagan-Similkameen (RDOS) nuisance mosquito control program is to ensure public health and safety through appropriate levels of mosquito control that will meet with maximum tolerance of biting insect populations. The RDOS has conducted a nuisance mosquito control program for over twenty-eight years. The program is based on the principals of Integrated Pest Management (IPM) in that the most environmentally sensitive methods of control are considered first. The RDOS intends to include the following activities in its program: mosquito larval habitat reduction and manipulation (where appropriate), public education, and mosquito larval control using species-specific larvicide applied by hand, backpack applicator and helicopter. **Adulticiding will not be conducted in the RDOS under this PMP.**

In areas adjacent to extensive larval development habitat, mosquito populations can become extremely high. When this happens, quality of life for residents in the area can decrease because of severely limited outdoor activity. In some cases, human and animal health can be affected, as some mosquito species are capable of transmitting illnesses such as Western Equine Encephalitis, Canine Heartworm and West Nile Virus. Further, nuisance mosquitoes can have potential economic impacts with reduced tourism, losses in the cattle industry (cattle growth is reduced as mosquitoes cause annoyance and interfere with cattle feeding), and reduced property values.

Prevention and reduction of mosquito larval development sites is the first objective of the RDOS program, as preventing a problem is always better than trying to control the problem once it occurs. However, in reality, there are few instances in which habitat prevention is possible and therefore the vast majority of the RDOS

mosquito control campaign is focused on controlling mosquitoes while they are in their larval stages, (as opposed to their adult stage) for two primary reasons. Firstly, larval control is much more efficient than adulticiding – it is possible to treat very high numbers of larval mosquitoes when they are contained in their water habitats, while adult mosquitoes tend to disperse soon after emerging over a much wider area. Secondly, larvicide such as Aquabac, Vectobac, Altosid and VectoLex are species-specific, affecting only aquatic members of the Order Diptera, which includes mosquitoes, black flies and midges, and do not affect non-pest and beneficial insects such as pollinators and predators.

**Note:** The program, as robust as it is, is not capable of eradicating mosquito populations, but rather it attempts to reduce the numbers in densely populated areas, to a livable level.

The BC *Integrated Pest Management Act* and the *Integrated Pest Management Regulation* require pesticides to be applied pursuant to the principles of IPM. This in turn requires the development of a Pest Management Plan (PMP) (this document) and the use of pesticides in accordance with the terms and conditions of the *Integrated Pest Management Regulation* and the commitments made in this PMP.

## **1.1 Geographic Boundaries of this Pest Management Plan**

The RDOS covers a land base of 10,400 km<sup>2</sup> and includes six municipalities, four First Nations groups (Upper and Lower Similkameen Indian Bands, Osoyoos Indian Band and Penticton Indian Band), and eight Electoral Areas. This PMP covers the City of Penticton, the District of Summerland, and the Towns of Osoyoos, Oliver, Keremeos and Princeton. The Electoral Areas A, B, C, D, E, F, G and H are also included in this PMP. Within the participating municipalities and Electoral Areas, private, public and crown lands are all included. **However, no mosquito control (habitat modifications or larviciding) will be conducted without the permission of the applicable owner, agency or authority.** A map of the geographic boundaries to which this PMP applies can be found in Appendix A. Detailed maps displaying the locations of individual larval

development sites can be viewed at the Regional District Okanagan-Similkameen office located at 101 Martin Street, Penticton, B.C., V2A 5J9.

## **1.2 Responsibility for the Integrated Mosquito Control Program**

The person responsible for managing pests within the RDOS and therefore the primary contact for information relating to this Pest Management Plan is the Manager of Public Works. Zoe Kirk is the Mosquito Control Program Supervisor and can be contacted at (250) 250-492-0237.

## **1.3 Time period of this PMP**

This PMP shall be in force for a five-year period from the date that a Pesticide Use Notice (PUN) has been submitted to the BC Ministry of Environment, and confirmation of the plan has been received. It is anticipated that this project will run from May 18, 2018 through May 18, 2023.

## **1.4 Outline of this PMP**

The content of PMP's prepared in the province of British Columbia is legislated under the *Integrated Pest Management Regulation* (Section 58) and the checklist provided in the *Regulation* is included in Appendix B. This PMP will describe the RDOS nuisance mosquito control Integrated Pest Management program including monitoring activities, treatment decisions, treatment options, and treatment evaluations. It will also outline the operational procedures conducted by the RDOS to ensure safe methods of transporting, storing, handling, and applying the pesticides used in this program. This PMP will address the RDOS's policies for disposing of empty pesticide containers and unused pesticide, as well as for responding to pesticide spills. There will be a discussion of the RDOS's strategies for the protection of community watersheds, domestic and agricultural water sources, fish, wildlife, riparian areas, and food intended for human consumption. Finally, this PMP will outline the commitments of the RDOS with respect to maintaining pesticide records and submitting annual reports and notices.

## 2.0 Integrated Pest Management

A requirement of all PMP's in British Columbia is an explanation of how the applicant (in this case, the RDOS) will utilize the elements of Integrated Pest Management (IPM). The six elements of an IPM strategy that will be discussed in detail in the following Sections are:

- 1) a strategy to *prevent organisms from becoming pests (Planning)*;
- 2) a method to *identify pests*;
- 3) a *monitoring (surveillance) program*;
- 4) a description of the *injury thresholds* used to make treatment decisions;
- 5) *treatment options* and selection criteria; and
- 6) a method for *evaluating effectiveness* of pesticide use.

### 2.1 Prevention (Planning)

Prevention is one of the most important options for successful mosquito control. The RDOS actively pursues the following preventative measures in its mosquito control program:

1. Reduction and/or modification of mosquito larval development sites and,
2. Public education

#### 2.1.1 Source Reduction/Modification

The RDOS actively encourages the reduction of mosquito larval development sites and water management as effective methods of mosquito control. Without standing water, there are no mosquitoes, as mosquitoes are unable to complete their life cycle without water.

Source reduction is simply the use of physical methods to eliminate standing water by draining or filling in mosquito larval development sites. The RDOS is committed to conservation and any naturally occurring mosquito larval development sites that are also important habitat for other biota will be left unaltered. However, larval development sites such as poorly draining roadway ditches and depressions in irrigated farmland and orchards may be filled in or drained by the RDOS after appropriate consultation with property landowners, habitat protection officers and/or other interested groups.

If draining or filling is not an option, many mosquito larval breeding sites such as storm water retention ponds, sewage treatment ponds, farm dugouts, ornamental ponds, and birdbaths can be made unsuitable for mosquito larval development through a combination of good design (*e.g.*, steeply sloped and graveled shorelines), water level manipulation, control of emergent vegetation and education. In some cases, the RDOS may recommend that semi-permanent ponds that support non-target species intermittently may be excavated or have their edges sloped or cleared of thick vegetation by the land owner (special care and consideration will be made when these are naturally occurring habitats to ensure protection of non-target biota). Bodies of water with sloped, graveled, rocky or sandy shorelines generally will support few mosquitoes, as larvae will be exposed to wave action and predators and will have difficulty obtaining food. In addition, scraping of sediment from the bottom of roadside ditches every few years can make the ditches unattractive for mosquito breeding by enhancing proper drainage. Ditches that are slow to drain may form a series of pocket pools and support lush grasses and weeds, thereby becoming prime larval breeding sites.

The RDOS will encourage landowners to participate in habitat management. Ornamental ponds can be stocked with goldfish and/or water agitators such as fountains can be installed. Screens can be placed over rain barrels to prevent females from reaching the water surface to lay eggs (as well as the emergence of larvae already present in the barrels), and compost piles can be turned frequently to prevent the pooling of water on this nutrient rich environment. Larval development sites such as children's wading pools and birdbaths should be drained and the water replaced at least once per week, so that any larvae present will be killed by desiccation.

In some agricultural areas, over-irrigation or flood-irrigation can produce significant larval development habitat. Proper watering of fields at ranching and hay farming operations will be encouraged by the RDOS through education. Efforts will be made to contact farmers when over-irrigation, flood-irrigation or broken irrigation pipes



are noticed. Farmers will be encouraged to alter their practice and/or repair broken irrigation pipes.

### **2.1.2 Public Education**

Annually, and as situations require, the RDOS engages in public education initiatives including brochures, articles in local newspapers, interviews, radio, television and advertising. The message of these programs is consistent. Reduce standing water around the home (*e.g.* clear eaves troughs of debris so they can drain properly, empty water holding containers, keep water from pooling on swimming pool covers, *etc.*); to practice personal protective measures (wear DEET and long-sleeved shirts and pants); and to learn to recognize mosquito larvae (many people think they are “worms”, “tadpoles” or “little fish”).

The RDOS website includes information describing the mosquito control program at the following URL:

<http://www.rdos.bc.ca/departments/public-works/pest-control/mosquito-control/>

## **2.2 Identification of the Pest**

Mosquito surveillance allows controllers to identify when and where mosquito pests occur. The RDOS has engaged in ongoing larval surveillance and adult surveillance. In the recent past, at least thirty different species of mosquitoes have been captured in adult light traps and as larvae in the Regional District. All of the following species present in the RDOS except *Culex territans* (feeds on amphibians) and *Culex pipiens* (feeds on birds) can be considered nuisance species (although *Culex pipiens* is an excellent vector of mosquito-borne illness among birds). Vector Species will be defined by the BC Ministry of Health Services. There are three primary nuisance mosquitos encountered by the Mosquito Control crews, (the *Aedes Vexans*, *Culex pipiens*, and *Culex tarsalis*), but the following species have been identified in the RDOS:

- |                                     |  |
|-------------------------------------|--|
| 1. <i>Anopheles earlei</i>          | 18. <i>Ochlerotatus euedes</i>                   |
| 2. <i>Anopheles freeborni</i>       | 19. <i>Ochlerotatus excrucians</i>               |
| 3. <i>Anopheles punctipennis</i>    | 20. <i>Ochlerotatus fitchii</i>                  |
| 4. <i>Aedes cinereus</i>            | 21. <i>Ochlerotatus flavescens</i>               |
| 5. <i>Aedes vexans</i>              | 22. <i>Ochlerotatus implicatus</i>               |
| 6. <i>Coquillettidia perturbans</i> | 23. <i>Ochlerotatus increpitus</i>               |
| 7. <i>Culex pipiens</i>             | 24. <i>Ochlerotatus intrudens</i>                |
| 8. <i>Culex tarsalis</i>            | 25. <i>Ochlerotatus melanimon</i>                |
| 9. <i>Culex territans</i>           | 26. <i>Ochlerotatus mercurator</i>               |
| 10. <i>Culiseta impatiens</i>       | 27. <i>Ochlerotatus provocans</i>                |
| 11. <i>Culiseta incidens</i>        | 28. <i>Ochlerotatus pullatus</i>                 |
| 12. <i>Culiseta inornata</i>        | 29. <i>Ochlerotatus punctor</i>                  |
| 13. <i>Culiseta minnesotae</i>      | 30. <i>Ochlerotatus sierrensis</i>               |
| 14. <i>Culiseta morsitans</i>       | 31. <i>Ochlerotatus spencerii var idahoensis</i> |
| 15. <i>Ochlerotatus canadensis</i>  | 32. <i>Ochlerotatus spencerii var spencerii</i>  |
| 16. <i>Ochlerotatus communis</i>    | 33. <i>Ochlerotatus sticticus</i>                |
| 17. <i>Ochlerotatus dorsalis</i>    |  |

In the field, mosquito larvae and adults can be difficult to identify to the species level. For positive identification, mosquitoes need to be examined under a microscope. In the RDOS, the determination as to whether a larva is likely to be a pest species or not, will be based on the habitat where the larvae are found and the time of year. Mosquitoes are selective with their habitats. Different species of mosquitoes tend to choose different types of habitats. The time of year can also give clues to the identity of the mosquito species.

Generally, the mosquito larvae that appear in early spring (sometimes even before ice-off) are of the genera *Aedes* and/or *Ochlerotatus*. *Aedes* is the Greek word for disagreeable, and is an accurate reflection of these species in terms of both numbers and ferocity. *Aedes* and *Ochlerotatus* species lay their eggs at the edges of water bodies. Snowmelt species rely on warm temperatures and/or low oxygen levels in water to induce their eggs to hatch. Larvae of the floodwater species appear as soon as

their eggs are wetted (following snowmelt and then river flooding). Large areas of habitat often become active at once with rising floodwaters along creeks and rivers and in permanent marshes as the snow melts and raises the water level in the marshes. Therefore, huge batches of mosquitoes hatch at the same time. This is due primarily to the fact that eggs laid by most species remain viable for a number of years, and therefore egg concentrations in the soil can become very dense. Whenever habitat along flooding creeks and rivers and in permanent marshes in the spring contains mosquito larvae, it is assumed that these are pest species and treatment of the larvae will be considered.

As the summer progresses, the occurrence of floodwater larvae tends to decrease (unless a large storm event causes flooding, or in the case of agriculture, a farmer over-irrigates, flood-irrigates or fails to repair broken pipes). Water left standing after the spring floods will begin to colonize with species of mosquitoes from the *Anopheles*, *Culiseta* and *Culex* genera. *Anopheles* mosquitoes are easily recognized in the field, as the larvae are much different in appearance from all other larvae in British Columbia. They lay flat on the surface of the water and lack a siphon. All *Anopheles* species in British Columbia can be considered pests and therefore whenever these species are seen, treatment will be considered. *Culiseta* and *Culex* mosquitoes lay their eggs on the surface of standing water and will produce multiple generations over the summer. Some species from each of these genera can be nuisance mosquitoes, so if they are present in high enough numbers, they will be treated. The only exception will be in catch basins. It is well known that catch basins rarely contain any species other than *Culex pipiens*. Since this species is not a pest of humans, catch basins may not be treated under the nuisance control program and this PMP unless deemed necessary by the RDOS. In general, catch basin control will be conducted under the direction of the Minister of Health Services and separated licensing will be accessed for this activity.

## **2.3 Monitoring (Surveillance) Program**

The RDOS conducts three kinds of surveillance as part of their nuisance mosquito control program: they monitor 1) environmental conditions; 2) larval development sites and larval populations; and 3) mosquito predator populations.

### **2.3.1 Environmental Monitoring**

As the first stage of environmental monitoring, the RDOS monitors river levels, snow pack levels and precipitation. Monitoring of each of these variables allows mosquito control staff to estimate the size and number of larval development sites that will appear throughout the season. If a site contains stagnant water *and* the water table or runoff is rising (or expected to rise), the site will be visited weekly to check for new larvae (as new eggs may be wetted and hatching). If a site is dry, and the water table is dropping and there has been no rainfall, the site will be re-visited within 2-3 weeks.

Also, current weather conditions are monitored as these can affect whether or not treatments are carried out on any given day. Hand treatments of granular larvicide is occasionally deferred during high precipitation events or during windstorms. When helicopter applications are planned, wind and precipitation monitoring is especially important as helicopter treatments are halted when wind conditions make it difficult for the pilot to aim granular larvicide at the larval development sites (*i.e.* the pilot is unable to compensate for drift of the granular product due to wind). In addition, helicopter campaigns are not possible during precipitation events as the granular larvicide becomes wet, thus clogging the application equipment. This can result in improper application rates and possible damage to the application equipment.

### **2.3.2 Surveillance of Larval Development Sites and Mosquito Larvae**

An ongoing activity in the nuisance mosquito program is that of searching for and cataloguing mosquito larval development sites. Sites are identified through ground searches, and reports from citizens of the Regional District. The RDOS developed an electronic database and Google Earth ARC GIS mapping database that enables staff to access and amend site data quickly and accurately. This database, is continuously updated with mapping updates using coloured polygons, keeps information both up-to-date and provides an annual, historical overlay. This supplements the written data that is collected in the field. The database includes information as to the owner of the land (private or public), where it is approved to or best access points, hazards, history of treatments, and comments concerning the type of larval development site (permanent marsh, transient floodwater site, etc.). Information such as “no treatment” areas is also included. Examples of “no treatment” or “avoid” areas include those landowners has refused permission; are in environmentally sensitive areas such as wildlife sanctuaries; or are in fish-bearing habitats. This database is updated throughout the season with treatment information and newly located larval development sites. This database is also provided to MFLRNORD to augment their ephemeral water body studies as part of the New Water Sustainability Act. It will also be made available to adjacent local governments, the four Indian Bands lying within the region and the Okanagan Nation Alliance.

Once larval development sites have been located, they are included in a schedule for larval surveillance. Depending on the type of habitat (snowmelt, semi-permanent, irrigation overflow, river runoff), predictions are made as to when they are likely to become active with larvae. The sites are then visited (as per the schedule outlined in Section 2.3.1) and an assessment as to the number and life stage (instar) of the larvae is made. Dippers are used to collect water from the larval development site and the number and life stage of the larvae is determined. Depending on the size of the larval development site a number of “dips” may be taken to determine the mosquito population throughout the site. Information as to the average larval density and life

stage of the larvae is recorded prior to treatment so that a comparison can be made post-treatment when crews return on another day to the treated sites to assess the effectiveness of the larviciding application.

If the larvae are at an appropriate life stage and in sufficient numbers to meet a threshold level (Section 2.4), larviciding activity will be considered. First, the size and characteristics of the site will be examined in order to estimate the amount of larvicide needed (application rates vary depending on the depth of the site and the amount of organic material present). Next, no-treatment areas will be considered, and if they cannot be avoided, plans for treatment will stop. Next, predator populations will be considered to determine if they are sufficient to control the larvae without larviciding. Finally, if possible, the genus of the mosquito will be recorded, however as mentioned earlier, this is rarely possible in the field.

### **2.3.3 Surveillance of Predator Populations**

Predator populations will be monitored during visits to larval development sites. A visual search for aquatic predators will be conducted and qualitative data (*e.g.* none, few, many, etc.) will be kept as to predator presence and abundance. In addition, staff will observe the area for the presence of bats, swallows, and insect predators such as dragonflies. When predator presence is high and larval and adult mosquitoes are at a tolerable level, a technician may determine that larviciding activities may not be necessary. This decision is to be made at the sole discretion of the certified applicator.

## **2.4 Injury Thresholds**

Injury thresholds are pre-set numbers that are used by staff to determine whether pest populations meet high enough level for treatment. The treatment threshold for mosquito larvae is determined by the certified applicator and takes into account a number of variables. The applicator makes a decision as to whether the numbers of larvae present are likely to cause a nuisance if allowed to develop to adults.

As a general guideline, the treatment threshold for mosquito larvae is an average of **three larvae per 300ml dip**. This threshold was selected as it the standard that has been used in British Columbia and other areas of Canada and the United States.

However, the RDOS will consider exceptions to this rule. In some cases, an applicator may decide that an average of three larvae per dip may not be sufficient numbers for treatment. For example, if the larval development site is very small and a good distance from the public, the applicator may decide that allowing the larvae to develop will not pose a nuisance problem and therefore no treatment would be necessary.

Alternatively, perhaps the technician will determine that the site is likely to dry-up prior to the larva emerging. Conversely, a technician may encounter a site that is very large and deep with larvae distributed throughout the water column. In this case, it may be difficult to capture three larvae in a dip, however the cumulative number of larvae in the site can be astounding and treatment could be warranted. Certified applicators working for the RDOS will make the final decision as to whether or not to carry out larval treatment. **No larviciding will be conducted on private property without the consent of the landowner.**

## **2.5 Treatment Options**

Once a technician determines that a threshold for control has been met, there are a number of treatment options available. In the case of larvicide, there are bacterial controls: *Bacillus thuringiensis var israelensis*, (preferred larvicide) and *Bacillus sphaericus*, and insect hormone control (methoprene). Of these, some are short acting while others are longer acting. Of course, there is also the option to perform a physical control, requiring no pesticides at all. These options will be discussed below.

### **2.5.1 Non-pesticide control (physical control)**

A technician may find a larval development site and encourage the site to be drained (*e.g.*, a pool of water in a farmer's field can be ditched or filled-in). In the case of high adult numbers, landowners may be encouraged to wear insect repellent and pants and long-sleeved shirts. Other options for non-pesticide control are outlined in Section 2.1.1 and these will always be considered first, before any pesticide application.

### **2.5.2 Control Options for Larval Mosquitoes**

The RDOS will consider the use of any of the registered mosquito larvicide listed below, and this PMP may be updated with any new larvicide that become registered in

Canada during the course of this PMP. The list of larvicide proposed for use in the RDOS under this PMP is listed in Table 1 and includes formulations of *Bacillus thuringiensis* var *israelensis*, *Bacillus sphaericus* and liquids: methoprene.

**Note:** the RDOS has not required the use of liquid larvicide and finds granular Bti the most effective.

#### **2.5.2.1 *Bacillus thuringiensis* var *israelensis***

The majority of the larval treatment within the RDOS will be with granular larvicide containing the active ingredient *Bacillus thuringiensis* var *israelensis* (*Bti*) (trade names Vectobac, Aquabac and/or Teknar). These products are formulated with byproducts of the metabolism of the bacterium *Bti* and bound with paraffin and crushed corncobs that serve as a carrier. *Bti* produces an endotoxin that contains five different proteins that can be digested in the alkaline gut of mosquito larvae. Once digested the proteins become toxic to the larvae and work to destroy the larvae's gut. The *Bti* products are effective against mosquitoes in the larval stage, and are applied by hand, backpack blower or by helicopter to standing water containing significant populations of mosquito larvae. Application rates vary from 2.5 to 20 kilograms per hectare (with the higher rates applied to polluted or highly organic water), although most sites are treated at about 5 to 10 kilograms per hectare. Liquid formulations of these products are also available and may be used in the RDOS.

The benefits of the *Bti* larvicide are many. *Bti* larvicide are considered to be very specific to mosquito larvae and non-toxic to fish, amphibians, reptiles, mammals and most other insects. They are easy to apply and have no residual effect, along with being the most economical of the larval controls. *Bti* larvicide work best when applied to larvae in their 2<sup>nd</sup> and 3<sup>rd</sup> instars, however control can be achieved when applied to 1<sup>st</sup> and early 4<sup>th</sup> instar larvae as well. Death of the larvae usually occurs within 24 hours. This allows for technicians to be able to assess effectiveness soon after application. *Bti* products can be applied to practically any type of standing water including temporary



and permanent pools, floodwater, snowmelt pools, irrigation pools, sewage lagoons, retention ponds, ditches, natural marshes, and catch basins.

There are very few disadvantages associated with the use of *Bti*. When applied according to the labeled rates, it is virtually non-toxic to all organisms aside from mosquito larvae. However, studies have shown that at application rates 10 to 1,000 times greater than the labeled rates, some effects have been documented on non-target larvae such as chironomids, biting midges and dixid midges. As the *Bti* products have no residual effect, only the larvae present at the time of application are affected. In habitats where multiple generations of larvae appear, more than one application of larvicide may be necessary. Another possible disadvantage is the short window for treatment with optimum control of the larvae in the 2<sup>nd</sup> and 3<sup>rd</sup> instars.

#### **2.5.2.2 *Bacillus sphaericus***

*Bacillus sphaericus* is a relatively newly registered biological larvicide in Canada. It is sold under the trade name VectoLex. The mode of action of the bacteria is similar to *Bti* in that it produces toxins that attack the gut of mosquito larvae.

The benefits of *Bacillus sphaericus* are also similar to those of *Bti* in that it is virtually non-toxic to non-target organisms while being very effective and specific to mosquito larvae. This product works better than *Bti* when applied to highly organic larval habitats and it has the added benefit of maintaining its effectiveness for up to 28 days and thus can control multiple generations of larvae with a single application. This product can be applied to any kind of standing water, as with *Bti* larvicide. The VectoLex Water Soluble Pouches (WSP) are only registered for use in catch basins at this time, and so it is unlikely (although possible) that they will be used as part of the nuisance control program since nuisance mosquitoes rarely develop in catch basins. However, if registration changes allow VectoLex WSP to be applied to standing water other than catch basins, the RDOS will consider using these pouches accordingly. VectoLex CG is a granular product and is registered for use in standing water outside of catch basins.

The greatest disadvantage of *Bacillus sphaericus* is its cost. At present it the most costly of the larvicide and therefore it is economical to only consider its use in

larval development sites where multiple generations of larvae are known to occur. In these cases, the increased cost of the larvicide may be warranted as fewer applications would be required over the course of the summer.

### **2.5.2.3 Methoprene**

The final type of larvicide that may be used by the RDOS is methoprene (trade name Altosid). This larvicide is a mosquito juvenile growth hormone. It is formulated in pellets for use in open water (or catch basins) and as briquettes for use in catch basins. This product slowly releases into larval development sites over a specified time (approx. 30 days for pellets and 60 days for briquettes). The hormone prevents pupal mosquitoes from developing into their adult stage and they die as pupae, unable to feed.

Methoprene has a benefit over the biological products in that the pellets can be applied to water that may periodically dry-up and when wetted again, the product will begin to release methoprene and act on new generations of mosquitoes. It is considered safe for applicators to use without significant protective gear and is environmentally friendly. Because the larvae are allowed to develop to their pupal stage, they are present in the water for a longer time than with the bacteria controls and therefore are available to feed natural predators in the habitat.

There are some disadvantages associated with the application of methoprene. At present, methoprene is much more expensive than *Bti*. In the laboratory, high doses of methoprene have been shown to be slightly toxic to non-target organisms such as some crustacean and fish. Altosid Pellets will only be considered for use in man-made water bodies that would never become contiguous with running water. Ideal locations include agricultural fields that are repeatedly flooded by over-irrigation and thus produce repeated generations of mosquitoes. The greatest disadvantage is that applicators are unable to assess the efficacy of a treatment until after the larvae pupate and therefore if the treatment failed, adult mosquitoes are inevitable.

Altosid briquettes are only registered for use in catch basins and therefore it is unlikely (although possible) that they will be used as part of the nuisance control program as nuisance mosquitoes rarely develop in catch basins.

According to the *Integrated Pest Management Regulation* Section 78(2), a pesticide-free zone is not required around standing water when applying the mosquito larvicide included in this PMP. However, in accordance with Section 78 (1) of the *Integrated Pest Management Regulation*, mosquito larvicide will not be applied in permanent, fish-bearing bodies of water or waters that have permanent, direct, surface-water connections with fish-bearing bodies of water. Larvicide will never be applied to any human drinking water sources. All applications will be done by individuals that hold valid British Columbia Pesticide Applicator Certificates in the Mosquito and Biting Fly Category.

**Note:** The RDOS resists using any larvicide other than BTi, unless extreme situations arise and are directed to do so by Interior Health Authority or Health Canada.

**Table 1. List of larvicide that are included in this PMP (RDOS-MOS-PMP-2008/2013) and may be used within the Regional District Okanagan-Similkameen. Selection of the larvicide will be made by the applicator following assessment of the larva development habitat and available resources.**

Trade Name	Formulation	Active Ingredient	PCP No.	Application Rate	Application Method*
<b>Vectobac 200G</b>	Granules	<i>Bacillus thuringiensis</i> var <i>israelensis</i>	18158	3-10 kg/ha	ground or aerial
Vectobac 1200L	Liquid	<i>Bacillus thuringiensis</i> var <i>israelensis</i>	21062	0.25-1.0 L/ha	ground or aerial
<b>Aquabac 200G (5/8)</b>	Granules	<i>Bacillus thuringiensis</i> var <i>israelensis</i>	26863	2.5-20 kg/ha	ground or aerial
<b>Aquabac 200G (10/14)</b>	Granules	<i>Bacillus thuringiensis</i> var <i>israelensis</i>	27374	0.5-1.0 mL of product per m <sup>2</sup>	ground or aerial
Aquabac XT	Liquid	<i>Bacillus thuringiensis</i> var <i>israelensis</i>	26860	300-2400 mL/ha	ground or aerial
Aquabac II XT	Liquid	<i>Bacillus thuringiensis</i> var <i>israelensis</i>	27376	300-2400 mL/ha	ground or aerial
Teknar HP-D	Liquid	<i>Bacillus thuringiensis</i> var <i>israelensis</i>	19241	0.3-1.2 L/ha	ground or aerial
Teknar Granules	Granules	<i>Bacillus thuringiensis</i> var <i>israelensis</i>	19239	4.5-6.7 kg/ha	ground or aerial
Altosid Pellets	Granules	methoprene	21809	2.8-11.2 kg/ha	ground
Altosid XR Briquettes	36.4g Briquette	methoprene	27694	For catch basins up to 5500 L place 1 briquette per basin	ground
VectoLex WSP	10g water soluble pouch	<i>Bacillus sphaericus</i>	28009	1 pouch per catch basin	ground
VectoLex CG	Granules	<i>Bacillus sphaericus</i>	28008	5.6-16.8 kg/ha in water bodies & 0.56-1.68 g/m <sup>2</sup> of water surface area in tires	ground or aerial
VectoLex WDG	powder to be mixed with water	<i>Bacillus sphaericus</i>	28007	0.56-1.68 kg/ha	ground or aerial

\*Ground applications may be done by hand and/or with blowers and/or with misters. Aerial applications may be with helicopter.

**Red indicates those products used by the RDOS**

### **2.5.3 Selection of a Treatment Method**

Once a decision has been made to conduct a treatment, the applicator must first decide which product they will use. The decision will be based on a combination of the following considerations:

#### *FOR LARVAL TREATMENTS*

- 1) the advantages and disadvantages of each pesticide as discussed in Section 2.5.2;
- 2) the life stage (instar) and species of the larvae (single generation mosquito, or multi-generational mosquito);
- 3) the characteristics of the larval habitat (high organics, intermittently dry, size and location of site, predator presence/absence);
- 4) the availability of the larvicide;
- 5) the cost of the larvicide; and
- 6) the proximity to fish-bearing water and the likelihood of intermittent connection to fish-bearing water.

The applicator must then decide which treatment method to use. In smaller sites, a gloved hand may be used to spread granular larvicide. In larger sites, a backpack blower may be preferred as this equipment can blow granules at greater distances and cuts down on the amount of walking an applicator may have to do. Blowers can also be used to blow larvicide over deep water that an applicator would be unable to wade in.

Finally, aerial control is a component of the RDOS Mosquito Control Program. Aerial campaigns are costly, but are often the only means of finding, accessing and treating large areas of larval development habitat in a short time frame (while larvae are in appropriate instars). When ground water levels peak during spring freshet, huge areas of habitat often become active simultaneously and mosquito control staff is unable to treat all larvae before they pupate. Aerial control is an excellent choice in this circumstance as a broader area of larval development habitat can be treated during each flight.

## **2.6 Treatment Evaluations**

The final component of an Integrated Pest Management approach is that of treatment evaluation. Post-treatment evaluation can help to improve a program over time as applicators learn which pesticides, application rates, methods and timing worked best at each application site. Constant evaluation of a program and its results will allow RDOS staff to improve and refine their nuisance mosquito control program.

The *Integrated Pest Management Regulation* Section 78(4b) specifies that the efficacy of a mosquito larvicide be assessed by conducting pre-treatment and post-treatment larval samples of the water being treated. Certified RDOS pesticide applicators will conduct and record all pre-treatment monitoring as described in Section 2.3.2. Within 14 days following treatment, certified applicators will return to the larval development site to conduct post-treatment monitoring using the same methods of assessing larvae as described in Section 2.3.2 for pre-treatment monitoring. This information will be used to determine if the rate and type of pesticide application chosen for the location was suitable, and if the application failed, it will allow the applicator to plan for alternate methods of control.

## **3.0 Operational Information**

The following sections describe the RDOS's plans for safe handling, preparing, mixing, applying and otherwise using pesticides. Much of the information included in the following sections is drawn directly from the *Integrated Pest Management Regulation* and the Handbook for Pesticide Applicators and Dispensers, 5<sup>th</sup> Ed. (Ministry of Environment, 2005).

### **3.1 Procedures for Safely Transporting Pesticides**

The following procedures for safely transporting pesticides will be practiced by all RDOS staff working under this PMP. The *Integrated Pest Management Regulation* (Section 65(1)) legislates that pesticides must be kept, handled, stored and transported in the container in which it was originally packaged and with the label originally affixed by the manufacturer, or in a container designed for containing the pesticide and labeled

accordingly. Section 33 (2) of the *Regulation* states that a “person who transports or causes or allows the transport of a pesticide must ensure that the pesticide is secured and transported in a manner that prevents the escape, discharge or unauthorized removal of the pesticide from the transport vehicle, and prevents the contamination of food or drink intended for animal or human consumption, household furnishings, toiletries, clothing, bedding or similar items that are transported with the pesticide.”

Further, the Handbook for Pesticide Applicators and Dispensers, 5<sup>th</sup> Ed. (Ministry of Environment, 2005) outlines a number of general precautions to be taken during transport of pesticides, and the RDOS will adhere to the following practices:

- 1) all pesticide containers will be inspected for defects prior to transporting;
- 2) chemical pesticides will not be transported in the passenger compartment of any vehicle, nor will anyone ride in the back of a truck together with these pesticides;
- 3) pesticides will never be transported along with food, feed or consumer goods;
- 4) chemical pesticides will not be transported on wooden truck beds as it is difficult to clean wood in the case of a spill, and future items carried in the truck could become contaminated;
- 5) all pesticide containers will be secured to prevent spillage;
- 6) the driver of any vehicle transporting pesticides will be trained in spill clean-up and will carry, along with the pesticides, necessary equipment to contain and/or neutralize a spill;
- 7) limited amounts of pesticides shall be carried in any one vehicle. The quantity shall be no more than what is necessary for each project, except where transportation occurs between storage facilities;
- 8) pesticides shall be carried in a secure lockable compartment such as a locked storage box or a canopy; and
- 9) pesticides shall be transported separately from food and drinking water, safety gear and people.

### **3.2 Procedures for Safely Storing Pesticides**

The RDOS will adhere to the following standards of the *Integrated Pest Management Regulation* with respect to the safe storing of pesticides:

- 1) a person who stores a pesticide will store it in a manner that minimizes hazards to human health and the environment (Section 33 (1));
- 2) all pesticides will be stored in the container in which it was originally packaged and with the label originally affixed by the manufacturer, or in a container designed for containing the pesticide and labeled with the trade name, chemical name, concentration of active ingredient and Pest Control Product number (Section 65 (1));
- 3) all pesticides will be stored separately from food intended for human or animal consumption (Section 66 (1a));
- 4) according to Section 66 (1b) all pesticides will be stored in a facility that is:
  - (i) ventilated so that pesticide vapors are vented to the outside;
  - (ii) not used for the storage of food intended for human or animal consumption;
  - (iii) locked when unattended; and
  - (iv) accessible only to persons authorized by the person storing the pesticide;
- 5) according to Section 66 (2), each door providing access to a storage facility will clearly bear the words "WARNING: CHEMICAL STORAGE — AUTHORIZED PERSONS ONLY" written in block letters"; and
- 6) according to Section 31, the RDOS will inform the local fire department of the pesticide storage location within 60 days after starting to store pesticides.

### **3.3 Procedures for Safely Mixing, Loading and Applying Pesticides**

Vectobac 200G 1200L, Aquabac XT, Aquabac II XT, Teknar HP-D and VectoLex WDG are the only pesticides listed in this PMP that may require mixing. These pesticides may be mixed with water if this aids the applicator in obtaining a better distribution on the surface of the larval development habitat. The labels specify that the



level of dilution is up to the applicator and is based on weather, the size of the larval development habitat and the method of application.

Typically, the mixing of pesticides is the most dangerous activity with respect to pesticide application, and special care should be taken at all times and mixing should only be done by certified applicators. Because each of the larvicide listed in our PMP that may require mixing, have minimal toxicity to humans, and they are all mixed with water only, these pesticides are not considered hazardous to mix.

Regardless, it is still prudent to follow the provincial recommendations for safe mixing, loading and applying pesticides. At the time of mixing, a spill kit should be nearby. Emergency phone numbers and a telephone will be present. The person mixing the pesticide will wear protective clothing as listed on the product labels, which may include gloves, boots, face shield, and hat. Before pesticides are applied, applicators will inspect all application equipment to ensure there are no leaks or needed repairs.

### **3.4 Procedures for the Safe Disposal of Empty Pesticide Containers and Unused Pesticides**

Empty pesticide containers can be considered a danger to the environment (although the products used in the RDOS are considered to be very safe). RDOS staff will dispose of empty containers (plastic/poly bags) as described on the manufacturer's product label. Also, the recommendations described in the Handbook for Pesticide Applicators and Dispensers, 5<sup>th</sup> Ed. (Ministry of Environment, 2005) will be followed and as a minimum, all pesticide containers will be emptied by draining them for 30 seconds and any that contained liquid larvicide will then be triple rinsed. To prevent someone from attempting to reuse the containers, they will be punctured or crushed and then taken to an approved landfill.

In the unlikely event that the RDOS has pesticide that will not be used, the Waste Management Branch of the Ministry of the Environment will be contacted and consulted as to protocols for disposing of the pesticide.

### **3.5 Procedures for Responding to Pesticide Spills**

Spill treatment equipment will be ready and available at the storage site (including mobile storage), mixing and loading sites, and during all pesticide applications. All persons authorized and trained to work with the pesticides will be familiar with the protocol for containing and responding to spills. The spill equipment will include:

- 1) personal protective equipment;
- 2) absorbent material such as sawdust, sand, activated charcoal, vermiculite, dry coarse clay, kitty litter or commercial absorbent (for liquid formulations);
- 3) a long handled broom;
- 4) a shovel; and
- 5) waterproof waste-receiving container with lid and a pen to label the contents.

If a spill occurs, RDOS staff will follow the recommendations as described in the Handbook for Pesticide Applicators and Dispensers, 5th Ed. (Ministry of Environment, 2005):

- 1) the source of the spill will be contained;
- 2) people and animals will be kept away from the spill site and people will be prevented from walking through, or driving through the spill;
- 3) the product label or knowledgeable agencies will be consulted to determine the best course of action for clean-up of the spill;
- 4) if the spill is small enough to be handled without assistance, clean-up will begin immediately;
- 5) personal protective gear will be worn during clean up;
- 6) the spilled material should be stopped from spreading by creating a barrier with soil, sawdust, newspaper or spill kit dam;
- 7) absorbent material shall be spread over spills, if applicable, to absorb any liquid; and
- 8) the absorbent material shall be collected in water proof containers with the contents clearly labeled with the pesticide name, P.C.P. number and quantity of pesticide;
- 9) spills of granular or pellet formulated larvicide should be swept up and collected with a shovel and placed in a bucket for disposal or future use.

## **4.0 Environmental Protection Strategies & Procedures**

The following sections describe the RDOS's plans for protecting the environment. Much of the information included in the following sections is drawn directly from the *Integrated Pest Management Regulation* and the *Handbook for Pesticide Applicators and Dispensers*, 5<sup>th</sup> Ed. (Ministry of Environment, 2005).

### **4.1 Strategies to Protect Community Watersheds and Domestic and Agricultural Water Sources**

The RDOS will follow the guidelines contained in the *Forest Practices Code of British Columbia Act* to protect community watersheds, and will ensure that each of the steps listed below are conducted:

- 1) the location of community watersheds will be determined by selecting the "Community Watersheds" layer on the provincial interactive mapping site "Online Cadastre"
- 2) an adequate buffer zone will be maintained around no-treatment zones;
- 3) no mixing of liquid larvicide will occur within a community watershed; and
- 4) no pesticides will be stored within a community watershed.

In order to protect domestic drinking water and water for agricultural use, the RDOS will strictly adhere to all standards for pesticide-free zones (PFZs) and no treatment zones (NTZs) as specified in the *Integrated Pest Management Act and Regulations*. Table 2 lists the PFZ's and NTZs for mosquito control applications.

**Table 2. Standards as described in the *Integrated Pest Management Regulation (IPMR)* for Pesticide Free Zones (PFZ) and No Treatment Zones (NTZ) to protect water during mosquito control activities.**

Insecticide	Water Source	Regulation	Applicable Section from IPMR
<b>Bacterial Larvicide</b>	Water supply intake or well used for domestic or agricultural purposes, including water for livestock or for irrigation of crops.	Exempted from PFZ	71(12)
	Bodies of water and streams	Exempted from PFZ however no treatment allowed in permanent, fish bearing bodies of water or waters that have permanent, direct, surface-water connections with fish bearing bodies of water	78(2); 78(1)
<b>Non-Bacterial Larvicide (methoprene)</b>	Water supply intake or well used for domestic or agricultural purposes, including water for livestock or for irrigation of crops.	30m NTZ unless applicator is reasonably satisfied that the smaller zone will ensure that pesticide from the use will not enter the water supply intake or well.	71(3); 71(4)
	Bodies of water and streams	Exempted from PFZ however no treatment allowed in permanent, fish bearing bodies of water or waters that have permanent, direct, surface-water connections with fish bearing bodies of water	78(2); 78(1)

\*Body of water does not include a human-made, self-contained body or structure for water

## 4.2 Strategies to Protect Fish and Wildlife, Riparian Areas and Wildlife Habitat

Riparian areas are defined as the areas around bodies of water. These areas usually contain lush vegetation and high biodiversity (birds, insects, reptiles, amphibians, plants and mammals). Riparian areas are important for stream, lake and marsh health as they support vegetation that maintains bank stability and provides cover for water bodies to help maintain cooler water temperatures. With respect to pesticide applications, mosquito larvicide (as listed under this PMP) are of little concern. It is other *herbicides* that are generally considered the most dangerous pesticides in these ecosystems.

Due to the low toxicity of the bacterial larvicide, applications will be conducted within riparian areas, however care will be taken to keep impacts on vegetation and soil

at a minimum (*e.g.* attempt will be made to stay on paths and avoid trampling vegetation). Also, as per the *Integrated Pest Management Regulation*, fish habitat will be protected as no larviciding will take place in fish bearing waters or waters with continuous surface water connections with fish bearing waters. Finally, all maintenance and fueling of larviciding equipment will be done outside of the riparian areas.

#### **4.3 Strategies to Prevent Contamination of Food Intended for Human Consumption**

The larvicide proposed for use in this PMP will not cause contamination of food intended for human consumption. This is due to their physical properties and their use only in aquatic areas. However, general guidelines for safety will be followed by applicators (*e.g.* applicator will wash hands before eating and food will be stored separately from pesticides and equipment used for larviciding).

#### **4.4 Pre-Treatment Inspection Procedures for Identifying Treatment Area Boundaries**

Prior to larviciding, the applicator will consult maps and speak with landowners (or agency responsible for the land) to ensure that he or she has permission to treat the site, and the applicator will ensure that he or she is not treating in a permanent, fish bearing body of water or waters that have permanent, direct, surface-water connections with fish bearing bodies of water. **No larviciding** will take place on private land without the landowner's permission.

#### **4.5 Procedures for Maintaining and Calibrating Pesticide Application Equipment**

For granular larvicide, the applicator is responsible for determining if the application rate is within the label specifications. All hand, blower and helicopter applications are done using several factors including, weather, wind ("eye-balling" the spread pattern of the granules on the water surface) and then determining the actual weight of the product that was applied.

In order to calibrate the liquid sprayers, they will be filled with pesticide and then tested for flow rate by measuring the volume of liquid pumped through the system

during a one minute interval. The flow rate, and application procedure will be determined by reading the label on the product to be sprayed.

#### **4.6 Procedures for Monitoring Weather Conditions and Strategies for Modifying Pesticide Application Methods for Different Weather Conditions**

RDOS staff will monitor weather and environmental conditions prior to and during larviciding applications. All weather monitoring during the course of the application should be done on site. If wind speeds are too high during larviciding activities, granules or liquid spray can be blown off course and miss the treatment areas, either during ground or aerial applications. It will be up the applicator to determine whether or not they can accommodate for wind speed and still apply the larvicide effectively. Precipitation rarely interferes with ground application of larvicide, however during heavy rain, aerial applications of granules may be stopped as water can cause the granules to clump in the application equipment and therefore application rates can be affected. No applications will be made when the temperature is higher than 35°C as high temperatures can cause degradation of granules stored in trucks and equipment prior to application.

### **5.0 Records and Reporting**

Under the *Integrated Pest Management Regulation*, the RDOS is required to maintain records of all pesticide applications and submit an Annual Record of Pesticide Use and an annual Notice of Intent to Treat.

#### **5.1 Treatment Records**

The RDOS will maintain, for three years from the date of treatment, records of all pesticide applications including:

- 1) treatment location; added colour coded GIS mapping covering several years
- 2) pre-treatment monitoring results (larval counts, instars, etc.);
- 3) treatment date and time;
- 4) type of pest targeted (mosquito larvae);
- 5) trade name of pesticide used and its PCP number;

- 6) method of application;
- 7) rate of application;
- 8) total quantity of pesticide used;
- 9) relevant meteorological conditions (*i.e.* wind, precipitation, temperature);
- 10) results of post-treatment monitoring and evaluation (larval counts and instars post-treatment); and
- 11) if the applicator decides that the 30 m non-treatment zone around a water supply intake or well used for domestic or agricultural purposes may be reduced, the information on which the decision was based.

## **5.2 Records of Larval Development Sites**

The RDOS will maintain updated records of all larval development sites, including:

- 1) ARC Gis, Google Earth Maps, GPS location or description of the location of the site including specialized site-specific notes;
- 2) name, address and phone number of owner or manager of the treatment site; and
- 3) information concerning no-treatment areas or areas where permission has not been granted by the landowner.

## **5.3 Annual Report of Pesticide Use**

The RDOS will submit an Annual Report of Pesticide Use to the Administrator of the *Integrated Pest Management Regulation* by January 31 of every year, as summary of the previous calendar year's use including:

- 1) the name and address of the RDOS and their confirmation number;
- 2) the trade name, PCP registration number, active ingredient name(s) and amount of pesticide product used in kilograms; and
- 3) the total area treated with each product.

## **5.4 Annual Notice of Intent to Treat**

The RDOS will provide a Notice of Intent to Treat to the Administrator *Integrated Pest Management Regulation* 21 days prior to the commencement of the project in



each calendar year of the PMP confirmation. The Notice of Intent to Treat will contain the following information:

- 1) the name and business location of the confirmation holder;
- 2) a description of the proposed treatment locations for the calendar year and a map or diagram that clearly identifies those locations;
- 3) a description of the proposed treatment for each area, including the pesticide to be used and its method of application; and
- 4) the total area of the treatment areas in the proposed treatment locations for the calendar year.

## **6.0 Consultation**

The *Integrated Pest Management Regulation* specifies that person preparing a PMP must conduct public consultations. The *Integrated Pest Management Regulation* specifies that the consultation must include newspaper notices and “reasonable” efforts to contact and consult within individuals who have the potential to be affected by proposed pesticide use under the PMP. The Regional District completed all necessary consultations as described in the following sections.

### **6.1 Consultation Process**

Public consultation with respect to this PMP will be conducted between December 1<sup>st</sup>, 2017 and February 15<sup>th</sup>, 2018. A newspaper advertisement (Appendix C) has been placed in newspapers throughout the Regional District and will print on two occasions in each newspaper within a two-week period (Table 3). The advertisement included all components in accordance with the *Integrated Pest Management Regulation*, including the statement that “persons wishing to contribute information about a proposed treatment site, relevant to the development of the Pest Management Plan, may send copies of the information to the RDOS within 30 days of the publication of this notice.” The newspaper advertisement also included an invitation to attend a public open house at the RDOS on office on Wednesday, Feb 13<sup>th</sup> between the hours of noon and 7 pm. In addition to the required advertisements in the local newspaper, the

RDOS will include a copy of the advertisement on their website for the entire duration of the consultation period. The advertisement informed interest parties that the PMP may be viewed in hardcopy at the Regional District office, or electronically on the web at [www.RDOS.bc.ca](http://www.RDOS.bc.ca).

Copies of the draft PMP will be sent via courier to the Upper Similkameen Indian Band, the Lower Similkameen Indian Band, the Osoyoos Indian Band and the Penticton Indian Band on or before Dec 1<sup>st</sup>. Accompanying letters will invite these First Nation groups to provide information, request a meeting or express concerns they may have with respect to this PMP and its potential effects on their traditional lands, aboriginal rights, treaty rights, or cultural values (Appendix E). If necessary, a follow-up letter will be sent on Feb 7<sup>th</sup>, 2018 and a phone call will be made on February 15<sup>th</sup>, 2018 if no comments or concerns have been received.

**Table 3. Newspapers and publishing dates of the RDOS notifications of the development of a pest management plan (Appendix C) for nuisance mosquito control.**

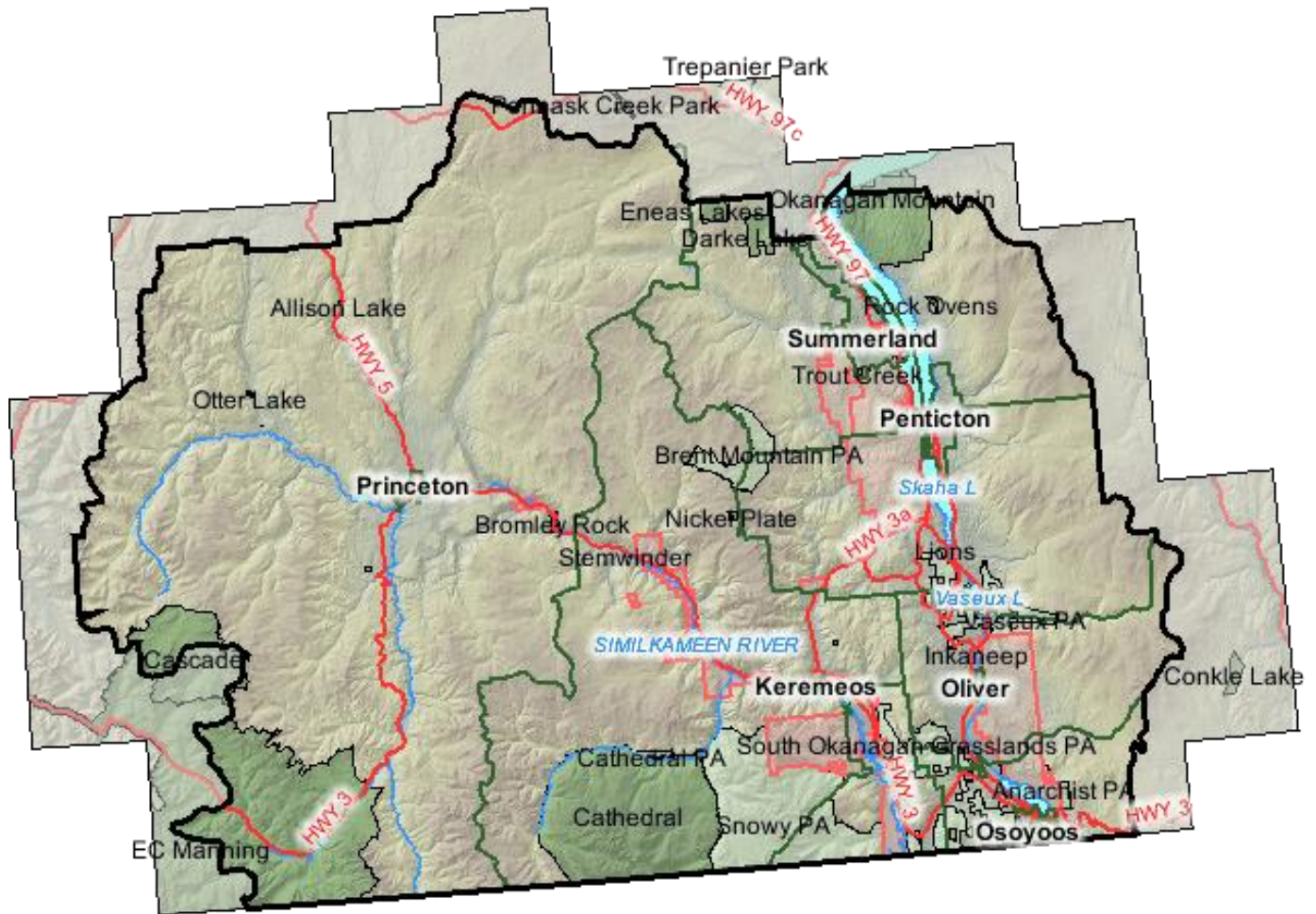
Name of Newspaper	First Publishing Date	Second Publishing Date
Keremeos Review	Thurs, December 7, 2017	Thurs, December 14, 2017
Penticton Western	Wed, December 6, 2017	Fri, December 15, 2017
Oliver Chronicle	Wed, December 6, 2017	Wed, December 13, 2017
Osoyoos Times	Wed, December 6, 2017	Wed, December 13, 2017
Penticton Herald	Mon December 4, 2017	Mon, December 18, 2017
Similkameen News Leader	Discontinued paper	
Similkameen Spotlight (Princeton)	Wed, December 6, 2017	Wed, December 20, 2017
Summerland Review	Thurs, December 7, 2017	Thurs December 14, 2017

## 6.2 Public Response to the Proposed PMP

**General Public:** There were no emails, surveys, telephone calls or letters received (positive or negative) as a result of the three month consultation process.

**First Nations Consultation Process:** Consultation began at the same time as the consultation with the general public. However, this process was undertaken with additional mail out packages, email and telephone follow-up. Details of this process attached.

## Appendix A: Map of the Geographic Boundaries Described within this PMP



The above map shows the boundaries of the Regional District of the Okanagan-Similkameen. Mosquito larva and adult treatments may be conducted anywhere within these boundaries except within the Village of Keremeos and Electoral Area 'E'. Maps detailing the locations of known larval development sites can be viewed at the Regional District Okanagan-Similkameen office.


## Appendix B: Checklist of Required Information for the Development of a Pest Management Plan (from Section 58 if the *Integrated Pest Management Regulation*)

### Checklist for required contents of a Pest Management Plan (from Section 58 of the *Integrated Pest Management Regulation*).

	Section of IPMR	Task	Associated Section Within this PMP
<input checked="" type="checkbox"/>	58 1(a)	Description of geographic boundaries with maps etc.	Section 1.1, Appendix A
<input checked="" type="checkbox"/>	58 1(b)	Person responsible for managing pests in relation to land described above	Section 1.2
<input checked="" type="checkbox"/>	58 1(c)	Principal contact for information	Section 1.2
<input checked="" type="checkbox"/>	58 2(a)	Description of the program to prevent organisms from becoming pests	Section 2.1
<input checked="" type="checkbox"/>	58 2(b)	Description of pest identification or techniques for pest identification	Section 2.2
<input checked="" type="checkbox"/>	58 2(c)i	Description of monitoring methods of environment and target population before and during pesticide use	Section 2.3
<input checked="" type="checkbox"/>	58 2(c)ii	Description of monitoring frequency of above before and during pesticide use	Section 2.3
<input checked="" type="checkbox"/>	58 2(c)iii	Collected data of 2(c)i before and during pesticide use	Section 2.3
<input checked="" type="checkbox"/>	58 2(d)i	Treatment threshold and description of how it was chosen	Section 2.4
<input checked="" type="checkbox"/>	58 2(d)ii	how treatment threshold will be applied	Section 2.4
<input checked="" type="checkbox"/>	58 2(e)i	Description of all possible treatment methods	Sections 2.5.1, 2.5.2,
<input checked="" type="checkbox"/>	58 2(e)ii	Rational for treatment selection	Sections 2.5.1, 2.5.2,
<input checked="" type="checkbox"/>	58 2(e)iii	Benefits and limitations for each possible method under sec 2(e)i	Sections 2.5.1, 2.5.2,
<input checked="" type="checkbox"/>	58 2(e)iv	Description of how treatment method chosen	Section 2.5.3
<input checked="" type="checkbox"/>	58 2(f)i	Description of monitoring methods of pesticide efficacy and environmental effects	Section 2.6
<input checked="" type="checkbox"/>	58 2(f)ii	Description of frequency of monitoring of above	Section 2.6
<input checked="" type="checkbox"/>	58 2(f)iii	Description of data collected for 2(f)i	Section 2.6
<input checked="" type="checkbox"/>	58 3(a)i	Procedures for safely transporting pesticides	Section 3.1
<input checked="" type="checkbox"/>	58 3(a)ii	Procedures for safely storing pesticides	Section 3.2
<input checked="" type="checkbox"/>	58 3(a)iii	Procedures for safely mixing, loading, and applying pesticides	Section 3.3
<input checked="" type="checkbox"/>	58 3(a)iv	Procedures for the safe disposal of empty pesticide containers and unused pesticides	Section 3.4
<input checked="" type="checkbox"/>	58 3(a)v	Procedures for responding to pesticide spills	Section 3.5
<input checked="" type="checkbox"/>	58 3(b)i	Strategies to protect water sources and community watersheds	Section 4.1
<input checked="" type="checkbox"/>	58 3(b)ii	Strategies to protect fish, wildlife, riparian areas & wildlife habitat	Section 4.2

<input checked="" type="checkbox"/>	58 3(b)iii	Strategies to prevent human food contamination	Section 4.3
<input checked="" type="checkbox"/>	58 3(b)iv	Pre-treatment procedures for identifying treatment area boundaries	Section 4.4
<input checked="" type="checkbox"/>	58 3(b)v	Procedures for calibrating application equipment	Section 4.5
<input checked="" type="checkbox"/>	58 3(b)vi	Procedures for monitoring weather conditions	Section 4.6

## Appendix C: Copy of the advertisement published in local newspapers (Table 3) between December 6, 2017 and December 20, 2017



**DEVELOPMENT OF A PEST  
MANAGEMENT PLAN**

**Pest Management Plan Number:  
RDOS~MOS~PMP~2018/2023**

**Applicant:** Regional District of the Okanagan-Similkameen (RDOS).  
101 Martin Street, Penticton, BC V2A 5J9. Tel: (250) 490-4110 Fax: (250) 492-0063 Attention: Ms. Zoe Kirk

**Application Method:** Granular Larval Control: backpack blower, helicopter, & hand application.

**Pesticides:** The active ingredients and trade names of the pesticides proposed for use under this plan include: *Bacillus thuringiensis israelensis* Vectobac 200G, Aquabac 200G, Teknar G. Only if directed by the Province or IHA will the following be used: Teknar HP-D, Vectobac 1200L, Aquabac XT, Aquabac II XT); *Bacillus sphaericus* (VectoLex WSP, VectoLex CG and VectoLex WDG); and methoprene (Altosid XR Briquets and Altosid Pellets).

**Location:** Within the boundaries of the Regional District of the Okanagan-Similkameen including the municipalities of Penticton, Oliver, Osoyoos, Summerland, Keremeos and Princeton, and Electoral Areas A, B, C, D, E, F, G and H under Bylaw # 2658 -2014. Treatments will be conducted on public, private and crown lands within the above listed municipalities and Electoral Areas.

The selection of granular insecticides has been chosen to target mosquito populations in the most environmentally responsible manner.

**The proposed duration of the PMP is from May 18<sup>th</sup> 2018 to May18<sup>th</sup>, 2023.**

A draft copy of the PMP and maps of the proposed treatment areas may be examined in detail at the address listed above. The draft PMP can also be viewed on the RDOS website at [www.RDOS.bc.ca](http://www.RDOS.bc.ca)

A person wishing to contribute information about a proposed treatment site, relevant to the development of the Pest Management Plan, may send copies of the information to the applicant at the address above within 30 days of the publication of this notice.

A public open house will be held at the Regional District office (address above) on February 13<sup>th</sup> 3:00 – 7:00pm.

## Appendix E: Sample Letter sent to First Nation groups requesting input concerning this PMP – Four Bands within RDOS Boundaries .



Dec 1, 2017

File No: 5260.20

Chief Chad Eneas and Council  
Penticton Indian Band  
RR2, Site 80, Comp 19  
Penticton, BC V2A 6J7

Dear Chief Chad Eneas and Council:

**Re: RDOS Pest Management Plan 2018 – 2023**

The Regional District of Okanagan-Similkameen has been treating nuisance mosquitos in the region for twenty-eight years. Every five years, the Province requires the RDOS to provide (renew) a Pest Management Plan for the control of nuisance mosquitoes within the Regional District.

The RDOS Mosquito Control Program takes place annually between April and early September. There are approximately 350 private landowners whose properties experience ephemeral standing bodies of water too large for them to drain, or areas traditionally inundated by ground water long enough to produce nuisance mosquitos.

This letter introduces the consultation process of the Plan, beginning first with our neighbouring Indian Bands, followed by regional public consultation. The Proposed Plan (No. RDOS-MOS-PMP-2018/2023) in draft form is included in this package, as are maps showing the treatment areas in 2016 and 2017 (an unprecedented year for flooding). The maps provided are on the thumb drive – USB stick, enclosed, due to their size. To be able to enlarge and zoom in, the maps of treatment areas can also be viewed on: <https://file.rdos.bc.ca/index.php/s/gfBgjAPfplwG3mc>

*The RDOS welcomes the opportunity to discuss this program with you, in person at your location.* In addition to this, in accordance with the Ministry of the Environment, we are required to ask you the following questions:|

With the depth of your traditional knowledge and longstanding occupancy of the lands covered by this application, do you feel there would be:

- a. any negative affects to your traditional activities?
- b. any negative affects to your traditional programs?

If you would like submit information, comments or concerns pertaining to the plan, please do so in writing by Feb 15<sup>th</sup>, 2018. If you would like to discuss this, or prefer to offer comments in person, please contact Zoe Kirk, Public Works Projects Coordinator, Regional District of Okanagan-Similkameen (250) 490-4110. Zoe will follow up with a second letter and phone call before the 15<sup>th</sup>



REGIONAL DISTRICT OF OKANAGAN-SIMILKAMEEN  
101 Martin Street, Penticton, BC V2A 5J9 | 250-492-0237 | [www.rdos.bc.ca](http://www.rdos.bc.ca) | [info@rdos.bc.ca](mailto:info@rdos.bc.ca)  
Serving the citizens of the Okanagan-Similkameen since 1966.

page 2 of letter

of February. If we have not heard from you by Feb 15<sup>th</sup> 2018, we will proceed under the assumption that your community has no opposition to our Plan.

If you would like to speak to a Ministry representative directly about the proposed pesticide use outlined in this letter, please contact the following Regional Office:

**Integrated Pest Management Program   Andreas Wins Purdy**  
Ministry of Environment  
102 Industrial Place  
Penticton BC V2A 7C8  
Tel. (250) 490-8257

Or, contact:  
RDOS Mosquito Control Program Supervisor  
Ms. Zoe Kirk  
101 Martin Street,  
Penticton BC V2A 4H4  
Tel. (250) 490-4110  
[zkirk@rdos.bc.ca](mailto:zkirk@rdos.bc.ca)

Yours Truly,

Janine Dougall,  
Public Works Manager

cc: Ministry of Environment, Penticton BC Office



## 7.0 Appendix F - Sample Letter sent to First Nation groups requesting input concerning this PMP – from CAD identified Bands, First Nations and Tribal Councils (14)



March 12, 2018

File No: 5260.20

Individual Addressee

Dear Chief and Council:

### **Re: Regional District Okanagan Similkameen Pest Management Plan 2018 – 2023**

The Regional District of Okanagan-Similkameen (RDOS) has been treating nuisance mosquitos in the region for twenty-eight years. Every five years, the Province requires the RDOS to provide (renew) a Pest Management Plan for the control of nuisance mosquitoes within the Regional District. This is the same process as the successful renewal plans undertaken by the Thompson Nicola Regional District (and the added expansion areas) in 2016 using BWP Consulting, Ms. Cheryl Phippen.

The RDOS Mosquito Control Program takes place annually between April and early September. There are approximately 350 private landowners whose properties experience ephemeral standing bodies of water too large for them to drain, or areas traditionally inundated by ground water long enough to produce nuisance mosquitos. These lands are already disturbed and altered lands such as farms or residential holdings. As far back as records allow, (late 90's) the RDOS has been using the granular larvicide BTi, a biological control under the names Vectobac or Aquabac.

This letter introduces the consultation process of the RDOS Pest Management Plan with our neighbouring Indian Bands (fully underway), Bands or Tribes featured on the Provincial Consultative Areas Data Base, as well as regional public consultation (underway).

The Proposed Plan (No. RDOS-MOS-PMP-2018/2023) in draft form is included in this package. The maps provided identifying treatment areas are included as a link, due to their size. To be able to enlarge and zoom in, the maps of treatment areas can also be viewed on:

[ftp://rdosftp:Transfer1@ftp.rdos.bc.ca/Outgoing/temp/Mosquito\\_Maps.zip](ftp://rdosftp:Transfer1@ftp.rdos.bc.ca/Outgoing/temp/Mosquito_Maps.zip)

Included is a map of the Regional District of Okanagan-Similkameen.

Page 2

***The RDOS welcomes the opportunity to discuss this program with you.*** In addition to this, in accordance with the Provincial protocols, we are required to ask you the following questions:

With the depth of traditional knowledge and longstanding occupancy of the lands covered by this application, do you feel there would be:

- a. any negative affects to your traditional activities?
- b. any negative affects to your traditional programs?

If you would like to submit information, comments or concerns pertaining to the plan, please do so in writing by April 25<sup>th</sup>, 2018. If you would like to discuss this, **please contact Zoe Kirk, RDOS Public Works Projects Coordinator**, (250) 490-4110. Zoe will follow up with a second letter and phone call before the 25<sup>th</sup> of April. If we have not heard from you by April 25<sup>th</sup> 2018, we will proceed under the assumption that your community has no opposition to our Plan.

Throughout the term of the PMP, we continue to welcome the opportunity to meet with a representative from your community to engage in an information sharing exchange. We are available to participate in any dialogue through meetings, teleconference, or in writing. Please feel free to contact Zoe Kirk at the contact options above.

If you would like to speak to a Ministry representative directly about the proposed pesticide use outlined in this letter, please contact the following Regional Office:

**Integrated Pest Management Program Andreas Wins Purdy**  
**Ministry of Environment**  
**102 Industrial Place**  
**Penticton BC V2A 7C8**  
**Tel. (250) 490-8257**

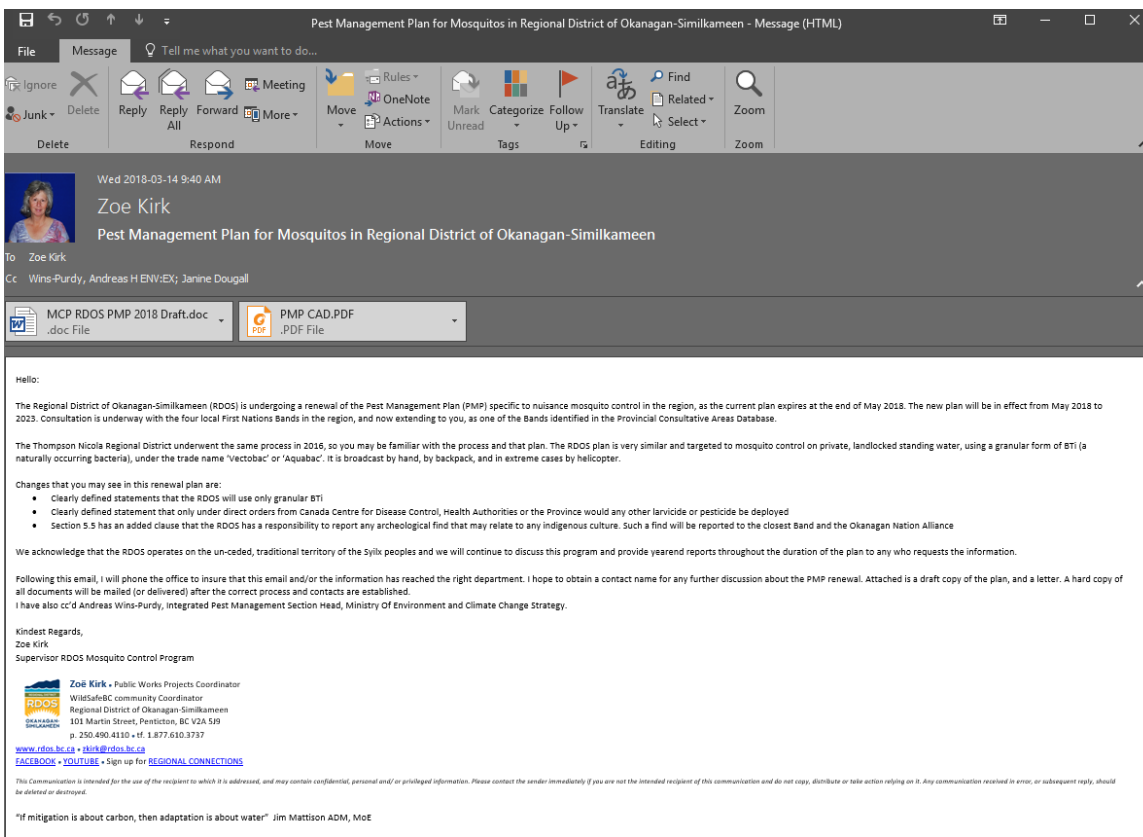
Or, contact:  
**RDOS Mosquito Control Program Supervisor**  
**Ms. Zoe Kirk**  
**101 Martin Street,**  
**Penticton BC V2A 4H4**  
**Tel. (250) 490-4110**  
[zkirk@rdos.bc.ca](mailto:zkirk@rdos.bc.ca)

Yours Truly,

Per Janine Dougall,  
Public Works Manager

cc: Ministry of Environment, Penticton BC Office

# RDOS Nuisance Mosquito Control Pest Management Plan 2018-2023



Email that was sent to introduce the application and obtain the correct contact person for future correspondence with CAD identified Bands/First Nations and Tribal Councils