



Delimiting survey guidelines

This document is to be read in conjunction with the Section 5 of the Environmental Health Protection Manual.

There are a series of events that can trigger the execution of a delimiting survey, such as:

- A live mosquito has been confirmed as exotic by NZBEL
- An exotic mosquito is found in a routine surveillance sample
- An exotic dead mosquito is found simultaneously with other live insects
- A suspected exotic mosquito has been spotted and escaped

These events can occur in a Seaport, Airport, Transitional facility or private property. There may be many different circumstances around the finding that will inform the risk level and the series of further actions. Once communications have been made with the Environmental and Border Health team - MoH and the NZ BioSecure Laboratory (NZBEL) the course of action following the suspected interception can trigger the immediate execution of a delimiting survey. Under some circumstances, such as torrential rain, the delimiting survey can be postponed until the weather has settled.

The Environmental Health Protection Manual defines a delimiting survey as a survey to establish the boundary of the infestation of a pest species. In the case of a delimiting survey following a suspected exotic mosquito interception, a delimiting survey also includes the following activities: checking all traps in place if any; inspecting, treating, mitigating, or eliminating potential breeding habitats with larvicides (i.e., *Bti* or *S-methoprene*); and selecting suitable places to set up traps for enhanced surveillance. It also includes sampling habitats to determine what mosquito species already occur in the area.

The information related to each sample must be recorded on a paper form or in the Kobo app, including GPS coordinates, weather conditions and treatments carried out. All samples collected, positive and negative, must be entered into the online database. Photographs of the breeding site can be uploaded to database. [Delimiting Survey Form example](#).

The exact area covered and habitats to look out for (e.g., ponds, saltmarshes, natural containers, etc.) will be determined by which mosquito species has been intercepted. However, as there are over 3000 mosquito species, each with different behaviours and ecology, advice on delimiting survey area and preferred breeding habitat for the intercepted species will be given by the NZBEL staff following the identification of the mosquito. Some general guidance can be found under the [A Brief Overview of Mosquito Habitats](#) section in this document.

Habitually, the area that will be covered from the initial detection site varies from 400 meters for container breeder mosquitoes and 1 kilometre for ground water breeder mosquitoes. Although, a different size area may be recommended depending on the species flight range and circumstances around the interception.

The best way to visualise this zone is to use a program such as Google Earth Pro that has a measurement tool and make a circle with the desired radius from the initial detection site point (Figure 1).

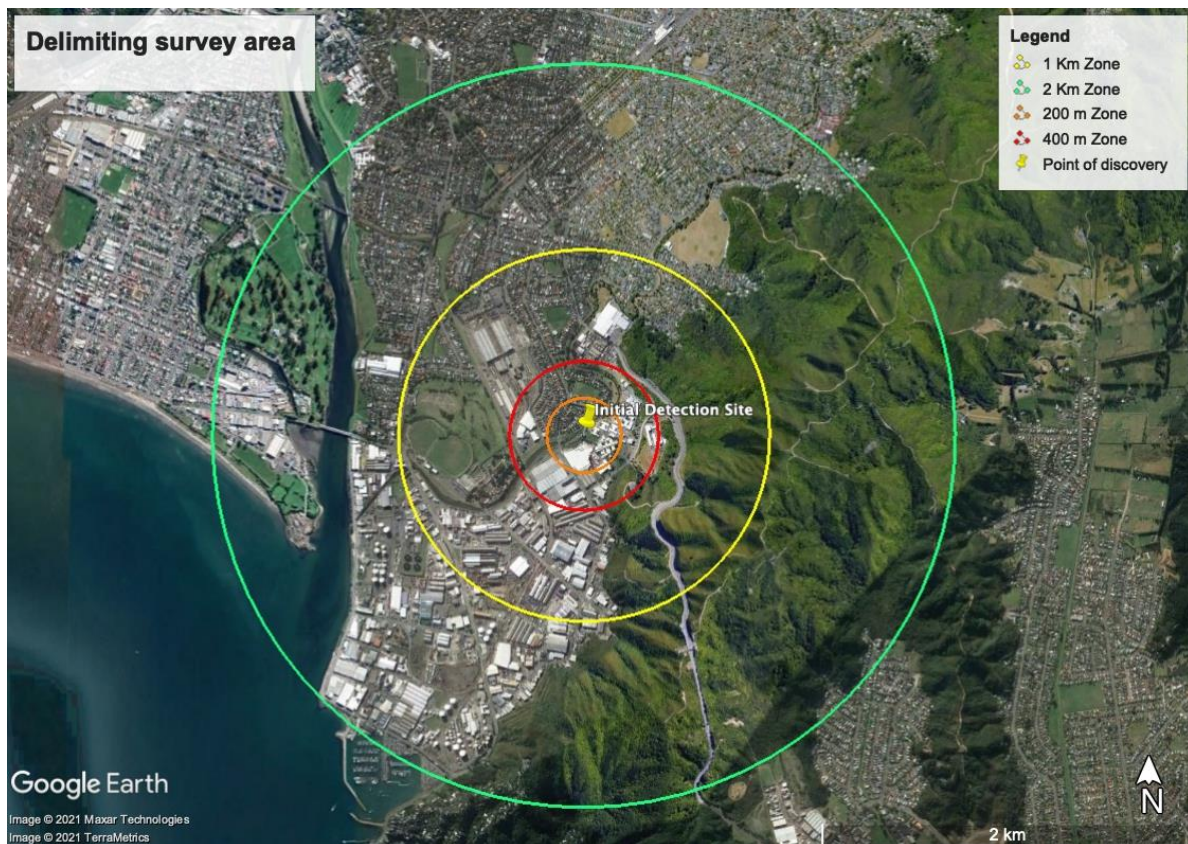


Figure 1: An example of a 200m, 400m, 1Km & 2Km zone drawn using Google Earth

The area to be covered can be of considerable size and the approach to the delimiting survey must be systematic and thorough. This means that there may need to be several people involved. You will need to contact your PHU for additional resources including staff, materials and equipment.

It is useful to break the zone into multiple areas and work in teams of 2-3 people (Figure 2). This makes it easier to carry gear, collect samples, record data, check for hazards and ensure that a thorough job is done. When defining the various areas that teams are covering in the 400m zone, be aware of the terrain, what businesses and buildings are in the area and any other obstacles which may be encountered. All these factors influence the size of the area covered, as an area covering many properties or businesses to check may take longer than an area where most of the zone is located in one property.

Other relevant factors to take into account when deciding the shape and area to be sampled is the wind direction and the landscape heterogeneity. Pay attention to the buildings, walls and streets directly facing the initial detection site. Check the weather conditions on the site and record wind speed and direction (Figure 3).

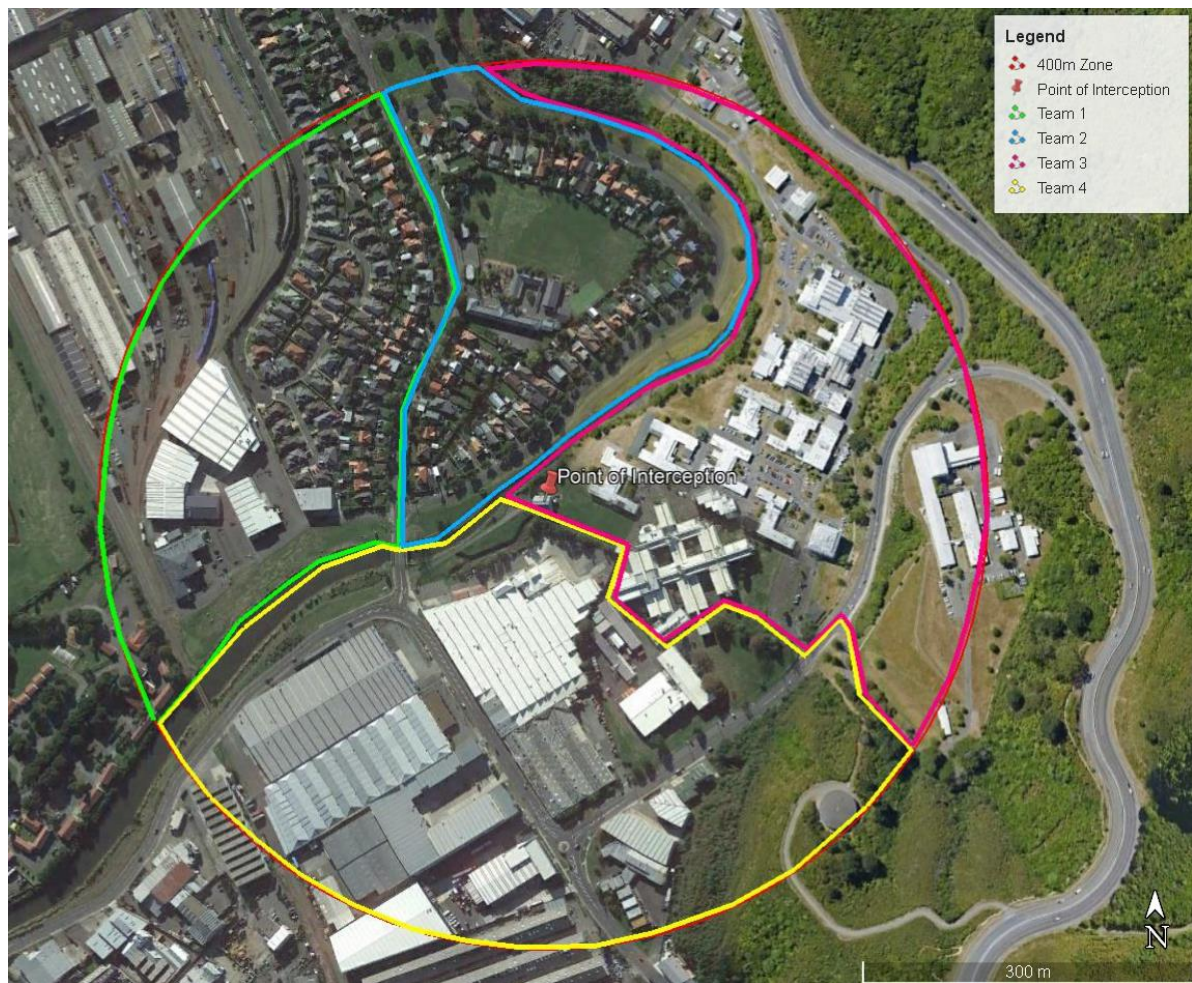


Figure 2: An example of how a 400m zone could be split into teams for a delimiting survey

Depending on the area covered, several stakeholders, businesses and members of the public may be involved. If the interception has happened in a Port Of Entry (POE), ensure all appropriate authorities are contacted and informed of the situation. If the interception has occurred in a transitional facility, the surrounding businesses may also need to be contacted to treat and remove habitat on their property. Depending on the site, residential properties may also fall into the 400m zone.

The kind of habitats that need to be checked for will depend on what the intercepted species is. For a container breeding species, the habitats to look for will be artificial containers such as discarded buckets, drums, guttering, tarpaulins/plastic sheeting, tyres, plant pots, flower vases, and general rubbish that is holding water and natural containers such as the axis of plants or tree holes (see [overview of habitats](#) below for examples of these).

If the species intercepted is a groundwater breeder, then habitats that need to be looked at are ponds, marshes, drainage ditches and other bodies of water. If the species breeds in brackish or saline water, then saltwater habitats will need to be sampled if they fall within the zone. Groundwater and saltwater breeders mosquitoes usually have wider flight ranges than container breeders, and the survey zone will be larger (see [overview of habitats](#) below for examples of these). If there are no ponds (or saltwater in the case of a saltmarsh species) nearby, drainage sumps and larger artificial containers should be sampled.

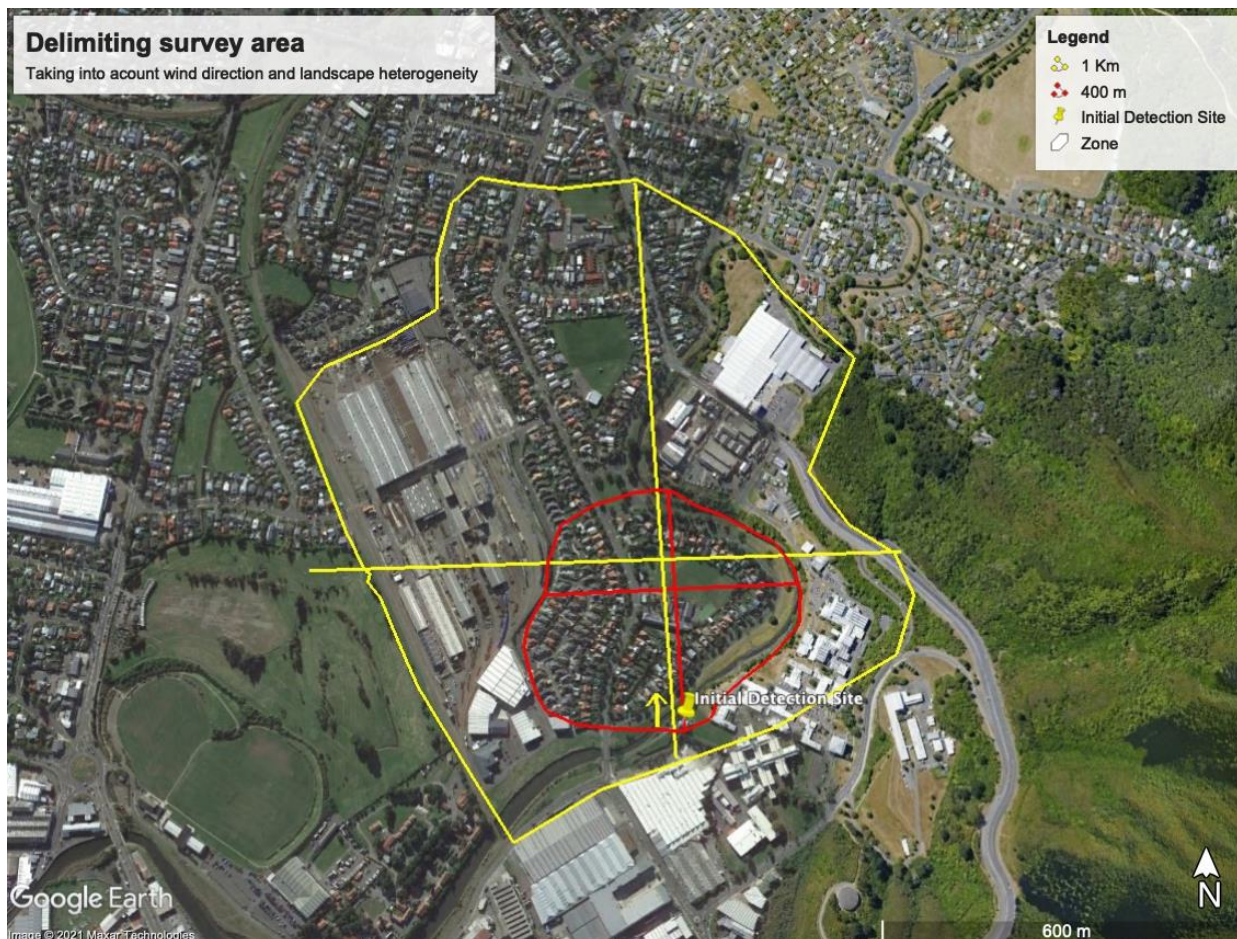


Figure 3. An example on how the wind direction and landscape heterogeneity reshapes the 400m and 1 Km zone. The yellow arrow represents wind direction.

When potential habitat is found it needs to be sampled, have GPS coordinates recorded, and removed where possible. Any container habitats that cannot be removed should be treated and sampled as part of any enhanced surveillance. Generally, groundwater habitats are unable to be removed. These will also need to be sampled, and if possible treated, as part of any enhanced surveillance that is carried out.

When treating groundwater sites, whether the treatment is going to be effective will also need to be considered. In some cases, the area may be too large for treatment to be feasible, for example a large pond that would require a high number of *Bti* dunks. Alternatively, the site may have too much organic matter to make *Bti* effective, for example a drainage sump which has a high organic load. In these cases, the site will need to be sampled as part of any enhanced surveillance, and NZBEL can provide advice on treatment options.

Suitable trap locations for enhanced surveillance should also be noted. The focus for this should be sheltered spots immediately around where the interception occurred, and within the 100m zone, as this is the highest risk area, though depending on the circumstances sites further out may need to be considered. The exact traps required will be confirmed by the lab once the species has been determined. For how to choose an appropriate location and how to set up traps, refer to the sections on larval and adult trapping and the "Where to set up traps" document, or contact the lab.

A Brief Overview of Mosquito Habitats

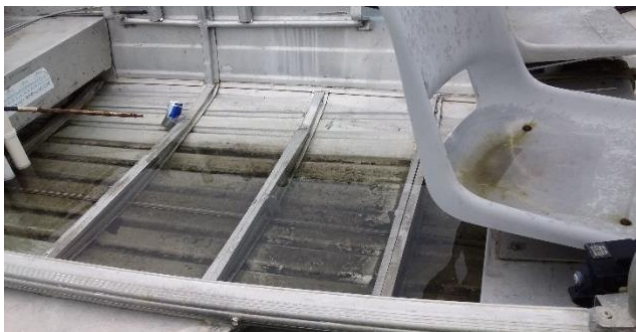
The range of habitats utilised by mosquitoes is extremely diverse. With over 3000 species worldwide, mosquitoes have evolved to utilise almost any aquatic system in most parts of the world.

Most mosquito species can be classified as either Container breeders or Groundwater breeders, though some species may be found in both.

- Container breeders utilize artificial containers and/or natural containers. Artificial container breeders are commonly associated with populated areas as these generally provide more habitats and therefore more opportunity for breeding.
- Groundwater breeders utilise more expansive habitats such as swamps, marshes, lake edges, field drains and mangroves.

Mosquito Classification		
	Container Breeders	Groundwater Breeders
Habitats	<u>Natural containers</u> <ul style="list-style-type: none"> • Tree holes • Leaf axils • Coconut shells • Rock pools <u>Artificial containers</u> <ul style="list-style-type: none"> • Discarded rubbish • Tyres • Tin cans • Plastic sheeting • Oil drums • Buckets and • Guttering • Permanent habitat such as drain sumps 	<ul style="list-style-type: none"> • Swamps • Marshes • Lake edges • Field drains • Mangroves • Temporary ponds • Rock pools
Local species	<i>Aedes notoscriptus</i> <i>Culex pervigilans</i> <i>Culex quinquefasciatus</i> Rock pool: <i>Opifex fuscus</i>	<i>Culex pervigilans</i> <i>Culex quinquefasciatus</i> <i>Aedes antipodeus</i> Rock pool: <i>Opifex fuscus</i>
Exotic species	<i>Aedes aegypti</i> <i>Aedes albopictus</i> <i>Aedes japonicus</i>	<i>Anopheles</i> spp Saltmarsh species: <i>Aedes vigilax</i> <i>Culex annulirostris</i> <i>Aedes camptorhynchus</i>

Artificial container breeding sites:



Natural container breeding sites:



Groundwater Breeding sites:



Delimiting Survey Form

Date: / / Location:

Sampling Officers:

Weather Conditions

- Wind: Km/h Direction: Temp: °C
- Heavy rain/Moderate rain/Light rain/No rain/Snow
- Overcast/Moderate cloud/Light cloud/Clear

Start Time:

End Time:

[illegible]