APPENDIX 5

Papers relating to the Queensland response to the Asian honey bee incursion

- 'National biosecurity event response plan for an incursion of Asian honey bees into Queensland';
- 'Surveillance plan for AHB from Oct 2008 to June 2009' (two versions); 'Revised estimates of costs for 2008-2009 as at March 2009';
- 'Emergency animal disease response plan for an incursion of Asian honeybees into Queensland'; and
- 'Response plan for Apis Cerana in North Queensland 2010'.

ANNEX A

NATIONAL BIOSECURITY EVENT RESPONSE PLAN FOR AN INCURSION OF ASIAN HONEY BEES INTO QUEENSLAND

On initial detection of Asian honeybees (*Apis cerana*) in Cairns Queensland, it was determined that an emergency animal disease / pest (EAD) existed in the State of Queensland because Asian honeybees are known hosts of Varroa mites. The high suspicion of Varroa is consistent with an EAD as defined in the Government and Livestock Industry Cost Sharing Deed in Respect of Emergency Animal Disease Responses (the Deed), and the incursion was handled as for an EAD Incident.

Further investigation with detection and testing of Asian honey bee nests has not led to any evidence of Varroa mites, Tropilaelaps mites or tracheal mites (*Acarapis woodi*), all of which are listed under the Deed. By definition, the incursion of Asian honey bees does not fit under the Deed.

There are convincing reasons to eradicate the Asian honey bees, which are a pest species in their own right. Many insect pests are covered under the Emergency Plant Pest Response Deed (EPPD) but not *Apis cerana*. The honey bee industry represented by the Australian Honey Bee Industry Council (AHBIC) has previously tried to negotiate inclusion of pest bee species in both the animal and plant cost sharing deeds but without success due to procedural and definition issues.

Queensland considers the current incursion of Asian honey bees eradicable and the honey bee industry strongly supports eradication.

A national technical advisory group (equivalent to a Consultative Committee for Emergency Animal Disease (CCEAD)) has met on three occasions to consider the issues related to the pest bee species incursion in Cairns. At the 19 March 2009 teleconference, a response plan was tabled which followed the format of an Emergency Animal Disease Response Plan (EADRP) to assist information sharing and decision making by the commitee.

The Consultative Committee for Asian Honey Bees, provided additional advice to the content of the response plan submitted, including that the plan be amended to follow the structure and content outlined under the Intergovernmental Agreement on Enhancing the Australian Biosecurity System for Primary Production and the Environment (AusBIOSEC).

This document has been prepared for the consideration of the Consultative Committee for Asian Honey bees and incorporates additional comments received at the 21 May 2009 meeting of the Committee.

The document is intended to in provide advice for a higher level national group of Chief Executive Officers (National Management Group equivalent) for final advice to Queensland on ongoing activity and cost sharing for eradication of the *Apis cerana* pest bee incursion.

1.0 STATUS REPORT ON SUSPECT DISEASE

1.1 Overview

Biosecurity Queensland, a business group within the Queensland Department of Employment, Economic Development & Innovation (DEEDI) has confirmed the detection of 29 nests and swarms* of Asian honey bees in the Cairns area of North Queensland *(refer Appendix B).* ** as of 11 June 2009*

Asian honey bees were originally detected in Portsmith in Cairns in May 2007. Five nests were located and destroyed by the end of May 2007 and the response was scaled back to on-going surveillance. Surveillance detected more foraging Asian honey bees in August 2007 and bee lining and grid pattern searching led to location of two additional nests in dense mangroves on Admiralty Island in Trinity Inlet. Final location and destruction of the nests was completed in November 2007. With no further evidence of unusual bees, surveillance for proof of freedom was implemented.

On 29 July 2008, a nest of Asian honey bees was detected at Green Hill, a suburb seven kilometres south of the previous findings. An associated swarm of Asian honey bees was located and destroyed in the vicinity. A further two nests were detected and destroyed at Aloomba, another eight kilometres south of Green Hill. By early November 2008, a further six Asian honey bee nests had been detected and destroyed in inner city Cairns not far from the initial incursion site at Portsmith.

Ongoing surveillance detected a nest north-east of Aloomba on 22 December 2008. No *A. cerana* were sighted between 22 January and 3 March 2009 with wet weather and flooding hampering surveillance efforts. Beelining of foraging *A. cerana* then led to a nest in a tree on 9 March 2009. Foraging *A. cerana* between Green Hill and Trinity Inlet led to a nest in the roof of a farmhouse on 20 March 2009. A small swarm of *A. cerana* were destroyed at a school at Bentley Park on the outskirts of Cairns on 23 March 2009 and a nest was found through beelining on 8 May 2009. A nest was found in a rainforest tree near a creek at the back of houses in Goldsborough on 22 April 2009, and foragers are still being found intermittently. A nest was found at Gordonvale on 27 May which is probably the swarm reported on 30 April that absconded before it could be captured. A swarm and two nests have been found at Mooroobool in June 2009. Active surveillance continues.

Initial samples of the bees were identified as *Apis cerana* by two Northern Australian Quarantine Strategy (NAQS) entomologists and one DPI&F entomologist. Samples of bees and nest material were sent to Dr Denis Anderson, (CSIRO Canberra) who confirmed the identification. Thorough examination of bees and comb at the Biosecurity Queensland Biosecurity Sciences Laboratory at Yeerongpilly indicated that there were no Varroa mites, Tropilaelaps mites or Tracheal mites (*Acarapis woodii*) present. These findings were confirmed by CSIRO in Canberra. CSIRO further confirmed the strain of Asian honey bee as the Java strain.

This indicates they most likely came from Papua (either Indonesian Papua or Papua New Guinea) as this is the closest source of Java strain *A. cerana* and shipping moves regularly between Papua and Cairns.

Samples of bees and comb from 29 detected nests have been confirmed as *A. cerana* and 24 have completed testing and been found negative for exotic bee mites. Tests of the further detected nests and swarms are underway.

A Restricted Area under the *Exotic Diseases in Animals Act 1981* was proclaimed in May 2007 in accordance with AUSVETPLAN as Asian honey bees are known carriers of exotic bee mites. This restricted the movements of bees and bee products and equipment into, within and out of the Restricted Area. When surveillance led to the discovery of nests south of the Cairns port area, the Restricted Area was extended (in November 2008) to provide a greater margin for control of managed bees.

Delimiting surveillance was undertaken concentrating on a 10 kilometre radius around the initial detection. Delimiting surveillance has been conducted around each successive detection site. Surveillance was also conducted at the extremities of the RA and at Mourilyan Harbour to see if the bees had spread long distances or been introduced at another high risk port site.

Beekeepers in the Cairns area were informed of the findings and movement restrictions imposed. Surveillance of managed hives in the Cairns area has been conducted on several occasions for the presence of mites using Bayvarol strips and sticky mats as per a special permit provided by the APVMA. All results have been negative.

At least 12 feral *Apis mellifera* hives have been destroyed during the course of the investigation to date. They have not shown any signs to indicate unusual disease or pest infestation i.e. healthy bees, good brood patterns, no unusual deaths of long established feral nests. Most were destroyed to reduce the numbers of *A. mellifera* using feeding stations and interfering with beelining. About 20 swarms of feral *A.mellifera* have been examined and destroyed.

1.2 Location of AHB nests

The maps at Attachment A show the locations of the nests or swarms of Asian honeybees detected to date. All are within the original restricted area around Cairns. The first map shows an overview of all 22 nest and swarm locations. These are referred to as Infected Premises (IPs) in line with emergency animal disease response terminology. The second map shows the nests in the Cairns City and Portsmith areas in closer detail.

NB: A separate map with the new detections has been forwarded separately on 28 May 2009)

1.3 Description of nests

The locations and descriptions of the sites where the nests were detected are in Attachment B. The age of the nests as estimated by the experienced beekeeper acting as Surveillance Manager and an indication of the number of swarms that might have been produced is also included in the table.

1.4 Clinical situation in nests

Of the nests and swarms detected and destroyed to date, 29 have been sampled for testing purposes.

Wherever possible, nests have been extracted from trees or buildings and all bees and comb submitted to the Biosecurity Sciences Laboratory. From there, samples have been sent to other laboratories as required e.g. CSIRO for confirmation of bee type and strain and University of Sydney for microsatellite DNA testing.

No exotic mites have been detected through examination of bees, washing of bees and examination of every brood cell in submitted comb (for Varroa mites). Microsatellite testing (a type of DNA sequence testing) by Dr Ben Oldroyd (a bee geneticist) at the University of Sydney indicates that the bees in the detected nests are all closely related and it is highly likely the bees are all derived from a single incursion.

Nests have ranged from active healthy nests to queenless nests on the verge of dying out.

2.0 RESULTS OF RISK ASSESSMENT OF THE OUTBREAK OF ASIAN HONEY BEES

The risks associated with the incursion of Asian honey bees into Cairns and their likelihood and consequences are detailed in the spreadsheet attached (Attachment C). The strategy that addresses all the risks identified is eradication of the Asian honey bees. Other strategies were really support activities for the eradication program.

Risk controls already in place include AQIS monitoring of incoming vessels from SE Asia. This incursion clearly shows that border security can be breached. Monitoring activities were not upgraded after the initial detection, but were upgraded a year later after *Varroa jacobsoni* pathogenic to *Apis mellifera* (managed European honey bees) were detected in Papua New Guinea. The Port Sentinel Hive program involves a sentinel managed hive close to the port area which is tested regularly for the presence of exotic mites. This is intended as an early warning surveillance system for bee mites, but does not detect incursions of exotic pest bee species. These prevention and detection strategies have a place but they do not assist to control pest bee species once they have arrived on the Australian mainland.

The risk of another incursion of Asian honey bees remains high as shipping vessels carrying freight and machinery regularly ply between Cairns and Papua New Guinea and Indonesian Papua where Asian honey bees are endemic. These Asian honey bees carry *Varroa jacobsoni* and it is now known that this species of bee mite can be as pathogenic to European honey bees as *Varroa destructor* which is carried by Asian honey bees living in mainland Asia including the Philippines, China, Japan and Korea. *Varroa destructor* is considered the biggest single threat to the Australian

honey bee industry. Australia is the sole remaining continent free of this bee pest mite after infestation was detected in New Zealand in 2000.

Every Asian honey bee incursion is also a risk of Varroa incursion. Dr. Denis Anderson, CSIRO entomologist, has commented that Queensland has been extremely lucky to have an incursion of Asian honey bees that were not affected by Varroa mites as this is a rare occurrence. It remains important to quickly detect new incursions of Asian honey bees so that if they carry Varroa, eradication efforts can commence quickly and maximise the chances of success. If Asian honey bees were endemic in Australia detection of new incursions would be seriously hampered as they would not be distinguishable from the endemic *A. cerana*. This means that Varroa introduced in these future incursions would be unlikely to be detected before significant spread had already occurred. This is one of the most important reasons to eradicate the current Asian honey bees in Cairns even though testing to date has indicated they are not infested with any of the serious mite pests of bees.

2.1 Notes on Economic Risk 1

- Asian honeybees have adapted to survive with Varroa mites. European honeybees are not similarly adapted. Varroa mite infestations of European honeybees in other parts of the world have led to bee deaths, deformed bees and hive deaths, loss of honey production, impacts on pollination ability of apiaries and added production costs to apiarists for chemical and other control measures.

- In this Cairns incursion, it is likely that the *A. cerana* came from Papua New Guinea on one of the freight vessels regularly sailing in and out of Cairns. In Dr. Denis Anderson's opinion, it has been an extremely lucky circumstance that these *A. cerana* were not infested with any of these mites. AQIS monitor incoming vessels, but the current incursion shows that it is possible for pest bee swarms to evade detection.

2.2 Notes on Economic Risk 2

- *A. cerana* compete with *A. mellifera* as they feed on the same floral resources and have similar requirements for pollen and nectar. *A. cerana* are also well known to rob honey from other bee colonies. In the Solomon Islands, A. cerana were first identified in 2003 and by 2004 they had multiplied and spread throughout the islands and were assessed by experts from CSIRO to be the cause of major losses to European honeybee colonies and of reduced honey yields for local consumption. Basically the Asian honeybees starved out the less aggressive European honeybees through competition and robbing. A system of remote poisoning of Asian honeybees had to be introduced to keep the numbers at a level that allowed European honeybees to survive and supply domestic honey needs.

- Large numbers of *A.cerana* may result in reduced honey production and increased hive deaths due to starvation. These impacts would first be noticed in the Cairns area, but since this area does not have a high concentration of apiarists, the effect on the total honey production for Queensland might not ring alarm bells for a number of years until the Asian honeybees have spread further south. By this time there would be no opportunity to eradicate Asian honeybees.

2.3 Notes on Economic Risk 3

- The presence of *A. cerana* in Queensland has already adversely impacted on the trade in Queen bees and packaged bees to the United States of America. This affected all States and territories in Australia. Trade was halted for some time while new import restrictions were negotiated with the US Department of Agriculture. The new restrictions are based on the absence of *A. cerana* within 160 kilometres of the source apiary. If *A. cerana* were to become endemic, this criterion would become almost impossible to prove. Export markets to other countries might also be affected if eradication activities cease. Eventually the market in export of package bees and queens would be lost as *A. cerana* spread further and further.

2.4 Notes on Economic Risk 4

- If eradication is not pursued in Queensland, numbers of *A cerana* are anticipated to gradually increase and spread to the north and south along the coastline. Modelling using the Climex model indicates that climatic conditions suitable for *A. cerana* survival exist in coastal areas in all Australian States and Territories. Initially spread is most likely to occur down the Queensland coast and hinterlands into northern NSW and across Cape York and around the Gulf of Carpentaria, across the top third of the Northern Territory into the Kimberley region of WA. *A. cerana* are known to be able to adapt to colder regions (they are present in northern China and Japan) so eventually it is not inconceivable that they would spread further down the NSW coast and hinterland into Victoria and eastern coastal areas of SA. The SW coast of WA from Exmouth to the Great Australian Bight also has a suitable climate but dry expanses of country between this and other possible infested areas could prevent colonisation of this area. See Attachment D for the Climex model map. Seasonal conditions and abundance of suitable nutrition would affect the rate of spread. This spread of *A. cerana* would lead to losses within the commercial honey and pollination industries throughout these areas. Crops dependent upon commercial pollination services may no longer be produced in these areas. Significant horticulture areas such as the Ord River Irrigation Area, the Northern coast of NSW and the Sydney Basin would be adversely affected. The use of irrigation and the presence of small towns would assist the spread of Asian honeybees west from the coast by providing a suitable microclimate. If cold adaption occurs, the waterways of the Murray-Darling system may provide a corridor for spread leading to infestation in the major almond producing areas of NSW, Victoria and South Australia with the probable loss of this industry.

2.5 Notes on Economic Risk 5

- Currently, the presence of unusual bees is a trigger for investigation as incursions of Asian honeybees are likely to equate to incursions of Varroa mites (*Varroa destructor* and pathogenic *Varroa jacobsoni*), Tropilaelaps mites and Tracheal mites (*Acarapis woodii*). These mites are all serious pests of managed European honeybees that are not currently present in Australia. If Asian honeybees were allowed to become endemic, it would be extremely difficult to detect a new incursion and test them in a timely manner to prevent establishment of these bee parasites.

- If Varroa mites or other exotic bee mites entered Australia, Asian honeybees would act as a reservoir for these pests, facilitate their spread and seriously hamper eradication efforts.

2.6 Notes on Environmental Risk 1

- Where Asian honeybees have established in natural vegetation, they have chosen crevices in trees. While there is no documentation of the environmental effects or impacts of an Asian honeybee invasion, it can be presumed that it must have some effect on other insects that nest in similar places. Thus the presence of *A.cerana* may have an impact on tropical insect biodiversity and with progressive spread impact on sub-tropical and temperate insect biodiversity. *A. cerana* is more likely to be successful in establishing significant populations in tropical areas of Australia than *A. mellifera*. This will mean that native bee species and other pollinators will be subject to increased competition for food resources and thus may be adversely affected and decline in numbers. *A. cerana* may also pollinate tropical weed species more effectively than existing pollinators. It should be noted that *A. cerana* have often been found in the Cairns area feeding on weeds at the forest – sugar cane - urban interface.

2.7 Notes on Social Amenity Risk 1

- Asian honeybees are known to adapt readily to live in urban areas in south-east Asia. Experience in Cairns supports this perception with 10 of the 19 nests being found in man-made environments (houses, cable reels, boats). *A. cerana* are a stinging bee as are European honeybees, but their temperament has not been conducive to domestication. They are more aggressive and more easily disturbed than the European honeybee. When they are located in urban and peri-urban areas these characteristics are likely to impact on people living and working nearby. Calls for governments to deal with nuisance bees are likely to increase. This is likely to put a strain on limited government resources of trained Apiary Officers.

2.8 Notes on Social Amenity Risk 2

- The prevalence of anaphylaxis due to bee stings in Australia is high at 2.7%, with an attributed mortality of about two persons each year, although these figures may be underestimated due to unexplained deaths.1 The introduction of the more aggressive Asian honeybee may lead to substantial increases in human morbidity and mortality due to an increase in the number of stings.

2.9 Notes on Social Amenity Risk 3

- The aggressiveness of Asian honeybees and their ability to adapt to live in urban areas make them a threat to iconic outdoor Australian lifestyle activities. The public are likely to demand that governments act to remove these pests if their outdoor activities are restricted by the presence of pest bees and fear of bee stings and associated health risks.

2.10 Notes on the affected honeybee and pollination industries

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1. Stuckey M, Cobain T, Sears M, et al. Bee venom hypersensitivity in Busselton [letter]. *Lancet* 1982; 2: 41.
2. Harvey P, Sperber S, Kette F, et al. Bee-sting mortality in Australia. *Med J Aust* 1984; 140: 209-211

- The value of the Australian honeybee and pollination industries to Australian agriculture and the Australian economy is significant. The gross value of production of the honeybee industry is about $80 million per annum (in 2007). Three-quarters of this value is in honey production and the rest is from products such as wax, live bees (packaged bees and queen bees), pollen and royal jelly and pollination services. The value of pollination services to Australian horticulture and agriculture has been estimated at $3.8 billion per annum (in 2007) for the 35 most important honeybee dependant crops. This does not include the value to other crops such as pasture seeds like lucerne and clover. So the impact on the honeybee industry due to a bee pest incursion could have wide ranging repercussions.

- Recognition of the importance of the honey bee and pollination industries led to the conduct of a Parliamentary Inquiry into the future development of the Australian honey bee industry. The Report was released in May 2008 and made 25 recommendations. One recommendation was that the Australian Government commit $50 million per annum to promote biosecurity measures in support of the Australian honey bee industry and pollination dependent industries.

- The Australian Honeybee Industry recognises that Asian honeybees present a significant biosecurity threat to their industry and supports eradication. The Queensland Beekeepers Association has been highly supportive of the efforts to date and strongly support maintaining an eradication effort.

3.0 RESULTS OF ASSESSMENT AGAINST NATIONAL SIGNIFICANCE CRITERIA

The assessment for the incursion of Asian honey bee (*Apis cerana*) indicates that this pest bee species meets the national significance criteria related to all three designated areas (natural environment and ecosystems, people including social amenity and business activity). See Attachment E.

4.0 RESULTS OF TECHNICAL FEASIBILITY ANALYSIS

The technical feasibility analysis (Attachment F) indicates that Biosecurity Queensland has the expertise to identify the pest and undertake surveillance activities, to effectively destroy nests and to test bees and comb for exotic bee mites and the legislative capacity to ensure no inadvertent spread of Asian honeybees or bee pests through movements of managed bees. At this stage, Biosecurity Queensland is confident of being able to eradicate this pest. Interim control measures have successfully located 22 Asian honeybee nests and none have been outside of the Restricted Area.

5.0 RESULTS OF COST-BENEFIT ANALYSIS

A cost-benefit analysis has not been conducted to date. However given the documented risks posed by AHB, such an analysis is likely to be highly favourable of eradication given the relatively low cost of the program as indicated in the budget. A Cost - Benefit analysis will be organised if required by a National Management Group equivalent. It is understood there is in principle agreement at National Biosecurity Committee that the analysis should be a Commonwealth responsibility.

6.0 DETAIL OF RESPONSE ACTIONS

6.1 LPCC and SPCHQ

A Local Pest Control Centre was promptly established based at the Redden Street Department of Primary Industries and Fisheries Office in Cairns which is close to the Cairns port area. This was staffed with over 10 DPI&F staff and between 1 and 4 industry personnel assisting with surveillance and technical advice. The Emergency Animal Disease response structure was used with a Controller, and Operations, Planning and Logistic sections. Initially Biosecurity Queensland staff were rotated through the LPCC, but in the past year the number has stabilised and LPCC functions undertaken by dedicated staff.

A small State Pest Control Headquarters was established in Brisbane with between two and five staff.

Management of the Asian Honeybee Response including staff and operations was passed from the LPCC to the Biosecurity Queensland Control Centre in February 2009. This was to gain efficiencies with ongoing projects for eradication of tramp ant species in north Queensland and is a successful business model previously used by Queensland DPI&F to manage national cost shared responses e.g. Red Imported Fire Ants, Mexican Feather Grass.

There are currently 12 staff working full time on the Asian Honey bee eradication Program.

Regular Sitreps have been produced throughout the response. Their frequency has depended on the stage in the response and the amount of activity and new events. Currently Sitreps are being produced weekly.

6.2 Movement controls

A Restricted Area (RA) was declared under the provisions of the Exotic Diseases in Animals Act, 1981 in May 2007. The Restricted Area is consistent with Section 2.2.1. of the AUSVETPLAN Strategy for Bee diseases and pests and covers an area approximately 25 km from the detection site for IP1. The RA was extended to the south in November 2008. See Attachment J.

Movements of bees, bee equipment and products are not allowed out of the RA. It is permitted within the RA under permit based on a risk assessment. Currently permits have not been requested to move managed hives into the RA.

Beekeepers with addresses in north Queensland were advised of the RA and movement restrictions by letter and again after the RA were extended. The Queensland Beekeepers Association has been kept informed of all response activities.

The RA is posted on the web at http://www.dpi.qld.gov.au/documents/AnimalIndustries_OtherAnimals/AHB-Restricted-Area-Map.pdf.

Quarantines under the Exotic Diseases in Animals Act 1981 have been used to secure privately owned sites to contain the bee until destruction was able to be carried out.

6.3 Surveillance

Delimiting surveillance was conducted in a 10 kilometre radius around the initial incursion finding and has been conducted around each subsequent finding. This has involved field staff inspecting flora (flowering shrubs, palm trees, flowering weeds) and collecting insect samples in sweep nets for identification by entomologists. Between May 2007 and December 2007 55 days were spent undertaking active surveillance and sweepnetting. After IPs 6 and 7 had been located and destroyed on Admiralty Island in November 2007, active surveillance was reduced in 2008 and from January to July 31 days were spent sweepnetting. When more *A. cerana* were detected in late July 2008, active sweepnetting increased and 99 days were undertaken between August and December 2008. So far in 2009, 44 days have been spent sweepnetting. Each day of sweepnetting involved sweeping at between 10 and 40 sites. A grid pattern was overlayed on a map and surveillance teams assigned a section to survey. See Attachment K for a map showing sweepnetting activity in August 2008 and 5 and 10 kilometre radius circumferences around IPs 8 and 9.

The numbers of field staff has varied from two teams of two to five teams of two. Following detection of further Asian honeybee nests in March 2009, the number of full time temporary staff has been increased again from two teams of two to four teams of two as per Option B of the Surveillance Plan presented to CCEAD in November 2008. Active surveillance with sweepnetting to collect samples has been effective in detecting *A. cerana* and is conducted at least 4 days per week weather permitting.

Active surveillance of flowing shrubs and flowers using sweepnets to sample bees was also conducted in the northern extremity of the RA and to the south of Cairns including close to Mourilyan Harbour with negative results.

Delta traps with sticky insides were also used. *A. cerana* specific pheromone manufactured by CSIRO chemist, Dr Michael Lacey, was used as an attractant in the trap together with a range of floral scents including coconut and lavender. Over 70 traps were in use around buildings in the port area and around Admiralty Island and the controlled release pheromone strips were replaced monthly to ensure it was still active. The traps were examined every day or every two days or twice a week by boat around Admiralty Island. Despite this no bees were ever detected by this method. Hence traps are no longer used.

Lewin log bait hives constructed of coconut logs were considered more naturally attractive to *A. cerana*. Two traps were located in the port area and baited with A. cerana pheromone. Further Lewin logs were constructed and there are now 16 Lewin log bait hives in the port area and around Trinity Inlet.

Initially sugar feeding stations were only established after A. cerana foraging bees were detected. There were difficulties getting *A. cerana* foraging high up in palm trees to come down to the sugar stations and various techniques were investigated including gradually lowering palm inflorescences down and spraying them with sugar solution then providing sugar stations, scaffolding to raise the sugar stations closer to the flowers and use of high powered binoculars. Techniques such as the Mega garden were developed and have been documented and submitted for inclusion in the revision of the AusVETPLAN Bee Strategy document. The sugar feeding stations have been modified to prevent too many bees drowning and to maintain the supply of sugar solution for several days so the food supply is continuous and

topping up not required so frequently. Plastic covers have been developed to cover the feeding stations to prevent them being washed out by rain while still allowing bees easy access. It has been noted that where natural pollen and nectar resources are limited, both *A. mellifera* and *A. cerana* will actively seek the sugar feeding stations. There are currently some 60 sugar feeding stations in place. These are around Trinity Inlet, and at regular intervals along the eastern and western boundaries of the farming corridor south of Cairns neighbouring forested country and in East Trinity. Additional sugar feeding stations have been established along the Skyrail route up to Kuranda and along Lake Morris Road that goes up into mountainous country west of Cairns. These are monitored regularly, some daily and some less frequently, for bee activity. See the three maps at Attachment G.

Once bees have been trained to the sugar stations, beelining begins. Asian honey bees are more difficult to train to the sugar than *A. mellifera* and more easily disturbed and put off if the sugar station is moved. Details of beelining techniques used for Asian honey bees have been documented. They have been submitted to Animal Health Australia and are included in the revised AusVETPLAN Bee Strategy. Beelining has successfully located a nest on 7 occasions including 2 in mangrove swamps and 5 in areas of dense trees. This shows that if Asian honey bees forage in urban areas they can be successfully tracked to locate nests in nearby uncleared forest or creek areas.

Pollen analysis was conducted on pollen from some of the early nests to identify what flora was most attractive for Asian honey bees and should be targeted by surveillance teams. Dr Michael MacPhail, a consultant providing Palynological Services based at the Australian National University, examined the pollen and provided a report in Attachment I. Information was also provided by Denis Anderson (CSIRO, Canberra) and Barbara Waterhouse (AQIS/NAQS Botanist) which provided some insights into flora likely to attract *A. cerana*.

Microsatellite testing has been conducted on 12 nests and 2 groups of foraging A. cerana. This technology looks as DNA to assess the relatedness of the nests detected. It was conducted by bee geneticist Dr Ben Oldroyd of the University of Sydney. Results indicate that all bee groups tested were genetically very closely related and that only a single incursion has occurred. This is encouraging news as hopefully the lack of genetic diversity and small number of drones available for mating with new queens will reduce the viability of new nests. This microsatellite testing technology has now been transferred to the Biosecurity Sciences Laboratory and testing of samples from the last 7 detections should be completed soon.

A technique to use Bee-eater birds to monitor for the presence of *A. cerana* was developed by Glenn Bellis of AQIS following an incursion of *A. cerana* in Darwin in 1998. Rainbow Bee-eaters (Merops ornatus) are migratory birds which feed principally on bees. They gather nightly in large groups on the same trees (roosts) and disgorge pellets of indigestible insect parts during the night. The indigestible bee parts include wings which can be examined under the microscope and identified to species on their venation pattern. Dr Bellis trained Biosecurity Queensland entomologists in the technique. The vein patterns of *A. cerana* versus *A. mellifera* are documented in "The Asian Honey Bee A guide to identification" (Attachment H). Eight bee-eater roost sites have been identified. Biosecurity ornithologist, Scott Templeton, located a number of roosts and trained surveillance staff to track bee-eaters returning to their roosts in the evening to locate the roost site. There are currently eight known roost sites in the Restricted Area. Sheets are laid under the roost tree to collect the pellets. The pellets are teased apart and placed in water so the wings float to the surface where they can be transferred to the microscope and

examined. In 2007, nearly 100 samples (each consisting of between 10 and 100 pellets) were examined with 4 positive for *A. cerana*. In 2008 11 samples were processed with 1 positive and 7 samples have been examined so far in 2009 with no positives but roosting activity has only just begun again in earnest in April. The earlier positives could be related to IPs detected soon after the samples were collected.

It appears that the pellets contain about 50 bee wings i.e. each bird eats at least 25 bees. The bee-eater birds range over several kilometres from their roost and provide a range of coverage for *A. cerana*. Calculations have been made to determine the probability of finding *A. cerana* wings in bee-eater pellets and this has been documented by Dr. Jack Shield in The Asian Honey Bee – Report of an incursion in Cairns 2007. If the concentration of *A. cerana* in the population of bees was 0.001, then about 600 pellets would need to be tested to be 95% confident of detecting 20 wings or 10 Asian honey bees. As the proportion of *A. cerana* bees is very small, this method is not highly sensitive but it is another source of information on the presence of remaining *A. cerana* nests. A PCR test has been developed at the Tropical Aquatic Animal Health laboratory in Townsville to test for *A. cerana* DNA in the pellets with the aim of increasing the speed and capacity of analysis. Research is underway to improve the sensitivity of this method.

A field day was held for all beekeepers in North Queensland to show them the Asian honey bee, obtain their assistance with looking out for this pest species, explain movement restrictions and the risks of varroa mite incursion. Beekeepers have continued to be informed through industry channels and have been asked to inform Biosecurity Queensland of any swarms they are requested to remove close to Cairns so they can be checked and destroyed.

A strong publicity campaign has been conducted and the public in Cairns have been highly supportive of the eradication response. There have been over 600 calls from the public in the Cairns area and over 100 from people from other parts of the state. These calls have resulted in samples being sent in or visits made and have led to 9 Asian honey bee nests being detected (all within the Restricted Area).

Public awareness has been through media releases that have all been published by the Cairns Post and other newspapers (including state newspapers), radio and television interviews with response staff, and distribution of posters and flyers especially in businesses in the Cairns port area and houses close to the locations of each Asian honey bee nest detection. A total of 32 media releases have been made (13 in 2007, 17 in 2008 and 2 in 2009).

In Cairns City, surveillance teams have visited every house close to the cluster of nests found there and examined every backyard. This led to finding another nest. Public awareness has also been conducted at shopping centres and it was noted that most people were aware of the Asian honey bee incursion. Samples of *A. cerana* and *A. mellifera* have been mounted in resin blocks to demonstrate the difference to the public and as a training tool.

Special awareness sessions have been held with AQIS and EPA staff in Cairns so they can assist with surveillance. Because the bees have been seen foraging on weeds on roadsides, Road Tech have been approached and now include Asian honey bee awareness in their induction training. Use has also been made of other outdoor events such as Tilapia Extermination Days to advise people about Asian honey bees and promote reporting. Pest exterminators have been requested to

inform Biosecurity Queensland of any bee nests they are asked to remove so they can be checked for Asian honey bees.

Surveillance for exotic bee mites has also been conducted in managed hives and the sentinel hives in the Cairns Restricted Area. There are 16 beekeepers in the RA and the apiaries of all have been sampled at least twice and some more frequently. Initially it was feared that varroa mites might have been introduced and a permit was obtained from the APVMA to conduct frequent testing of managed hives in the Cairns area. However, as each Asian honey bee nest was tested and found free of exotic mites, the frequency of testing of managed hives was reduced.

Feral *A. mellifera* nests are located in the RA but there is no indication that these are an issue as all *A. cerana* nests have been negative for varroa mites and other exotic parasites of bees. Over 20 feral *A. mellifera* hives and swarms have been destroyed during the course of the investigation to date and none have not shown any signs to indicate unusual disease or pest infestation.

The Surveillance Plan is in the first worksheet in the attached spreadsheet (Attachment L).

6.3 Destruction

All 28 nests and swarms have been successfully destroyed to date*. 7 nests were destroyed by a Pest Control professional and the rest by Biosecurity Queensland staff. Where the nests were in privately owned houses or were difficult to access e.g. out of sight between large concrete blocks, a contractor was used. Most nests were in trees and the opening could be plugged and insecticide powder (Coopex permethrin dust) puffed in to kill the bees. Household 'knockdown' aerosols were used to kill escaping bees and late returning foragers even though these would not survive long after the nest was destroyed. Swarms were knocked into boxes and killed. Details are in the Technical feasibility study (Attachment F).

** as of 1 June 2009*

6.4 Industry and community liaison

The Honeybee Industry has been informed of developments throughout the response with regular situation reports and teleconferences. Currently, teleconferences are held at fortnightly intervals where two representatives of QBA attend. More immediate and direct contact with industry is made in the event of new findings.

Industry provides regular updates to the national industry through advisory bulletins after each teleconference or new find. These have proved to be very effective.

An operational debrief and a technical debrief were conducted after the first 7 nests were detected in 2007 and industry was involved in both.

7.0 RECOMMENDED APPROACHES FOR DETERMINING PROOF OF FREEDOM

It is expected that more nests will be found before winter 2009, and that additional nests will be detected between August and December 2009.

It is expected that Proof of Freedom surveillance will commence from January 2010 at the latest.

Biosecurity Queensland epidemiologists indicate that, based on information to date, proof of freedom will require at least 18 months of surveillance to be confident that all Asian honeybee nests have been eradicated. These estimations will be updated as further nests are detected and destroyed.

A range of surveillance activities will continue to be used to give the best possible chance of locating any remaining Asian honeybee nests. The Surveillance Plan for April to June 2009, and the proposed activities for 2009/2010 and 2010/2011 are included in Attachment L.

8.0 PROJECTED BUDGETS

The projected budget for 2008/09 is in Attachment L. The proposed budgets for 2009/10 and 2010/11 are also in Attachment L.

As the numbers of Asian honeybees declines and they are harder to find, the surveillance effort will appear less productive. This is a common issue at the end of eradication programs for insect pests in particular. The issue should be that we cannot afford to become complacent and reduce eradication efforts too soon or the benefits of final eradication will be lost. In this case the benefits are principally the allaying of the consequences of not eradicating this pest bee species. The most significant consequence to governments and industries with an interest in honeybee health is that the presence of *A. cerana* would almost certainly prevent the possible success of any attempt to eradicate Varroa mites by providing a widespread wild host that is adapted to carry these mites and facilitate their spread. The impact on the Honeybee industry and the many horticulture industries reliant on pollination from honeybees is well recognised as significant with impacts extending to the general population through increased food production costs.

The Queensland Government is currently funding the entire response. Queensland has requested the need for cost sharing arrangements to be organised for the eradication program to continue after June 2009. This issue was raised with CCEAD in November 2008, but no clear solution has been produced as yet.

9.0 REVIEW POINTS

Criteria that would trigger reassessment of the future of the eradication program would include:

- **Detection of Asian honeybees outside of the RA.** The RA is quite large and provides a buffer of more than 10 kilometres around any known IP. While Queensland is confident that the bees have not spread that far based on surveillance results and learnings about the behaviour of *A. cerana* in the Cairns environment, this is always a possible, if remote, scenario.

- **Detection of Asian honeybees at other Queensland ports.** Other Queensland ports do not have the same number of shipping vessels travelling routinely between the Queensland mainland and south-east Asia as occurs in Cairns, hence the risk of incursion is lower. Travel times from Asia to the southern Queensland ports are longer and a bee swarm is more likely to be noticed and destroyed during transit. Even if undetected, the viability of the swarm would be reduced after a long sea voyage with restricted access to suitable nutrient and water sources. There are ports in Cape York where an Asian honeybee swarm could be introduced. This is unlikely to occur via a small boat plying the Torres Strait as the bees sting and would be destroyed for safety reasons. However, this is a possible scenario and the resources required to mount an eradication response in two locations would necessitate careful consideration.

- **Detection of several nests of *A. cerana* in rainforest areas.** At present there is no indication that *A. cerana* have moved into timbered country or rainforest areas. Nests have been detected in timbered country but close to cleared areas where the bees were foraging on weeds between cane fields and garden shrubs and palm trees around houses. If it becomes apparent during beelining activities that nests are located in forest areas that are difficult to access, consideration will need to be given to remote poisoning and the numbers of likely nests in the forest.

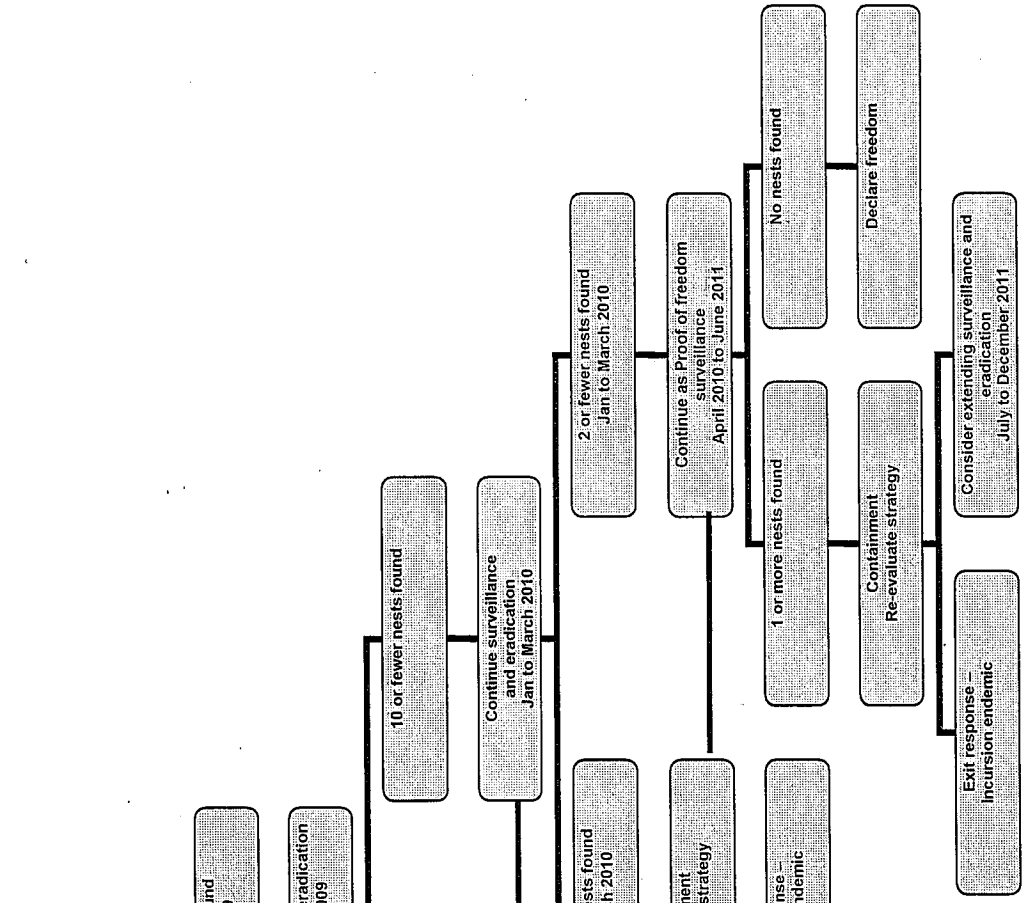
- **A second incursion through the port of Cairns**. Thus far, DNA microsatellite testing of the bees from the different IPS in Cairns has shown remarkable uniformity of the alleles measured. This indicates that the nests are all closely related. It is possible in the bee world for drones and Queen bees produced in the same nest to mate and produce fertile offspring. In the opinion of Ben Oldroyd, a Professor in the School of Biological Sciences at the University of Sydney and a world leader in the behavioural genetics of bees, the genetic pattern is consistent with matings of brother drones with sister Queens and the lack of genetic diversity indicates that there has only been a single incursion. Detection of genetic diversity in new IPs would indicate another incursion has occurred and the improved reproductive capacity of the Asian honeybees could increase the rate of spread and viability of nests.

- **Detection of more than 10 nests before 30 June 2009.** In the period March to June 2009, the number of *A cerana* nests detected is more likely to be a factor of surveillance pressure and expertise of field surveillance staff combined with continued public assistance with call ins. Age estimations of the nests will be useful to support the belief that rapid multiplication of the Asian honeybee population is not occurring. Detection of more than 10 nests before 30 June 2009 should trigger reassessment of epidemiological information and review of the eradication program. Detection of more than an additional 10 nests between July and December 2009 should also trigger review of the current eradication program.

- **Rediscovery of *A. cerana* 12 to 18 months into Proof of Freedom surveillance.** When the numbers of an insect pest are small, it is very difficult to detect the last one. During the proof of freedom surveillance period anticipated to commence by January 2010, it is reasonable to expect to find a few nests initially (2 or less) without affecting the proof of freedom. Thereafter a nest during the next 15 months of surveillance is possible, but consideration

would have to be given to the viability of any nests (it might be dying out), the location of the nest and the chances of other nests persisting.

ANNEX A



NATIONAL BIOSECURITY EVENT RESPONSE PLAN
FOR AN INCURSION OF ASIAN HONEY BEES INTO QUEENSLAND (V7)

Surveillance Plan for AHB from Oct 2008 to June 2009

Methods		Next 12 months (1 Jan to 30 June 2008)	Notes	Oct to December 2008	Wet Season - decreased bee activity January 2009 to March 2009	April 2009 to June 2009
Pheromone traps	Location and numbers: Checking frequency:	Maintain strategic traps in high risk areas. Estimate: 14 traps Every month	Useless - Discontinued			
Lewin logs	Location and numbers Checking frequency	Maintain two logs in high risk areas Every month	More logs are to be produced (aim is for 16-18)	16 logs around Cairns port and Trinity Bay	16 logs around Cairns port and Trinity Bay Weekly	16 logs around Cairns port and Trinity Bay Weekly
Field surveillance Sweepnetting	Frequency:		Bee samples to be identified inCairns (Jane Royer, Paul Zabroski or AQIS entomologist) then sent to BSL for confirmation	Sweepnet where flora likely to attract bees. Complete grids around Ips and repeat strategic grids. 6 teams of 2 Weekly	Sweepnet where flora likely to attract bees. Weekly Around known IPs (Green Hill, Admiralty Island, Aloomba, Cairns City, Cairns Port, Hussey Rd) Monthly at 25 km from IPs (Greater Cairns outer suburbs, North of Green Hill, Aloomba south, Aloomba - Hussey Rd, Aloomba - Green Hill) 2 teams of 2 Weekly	Sweepnet where flora likely to attract bees. Complete grids around Ips and repeat strategic grids. 6 teams of 2 Weekly
Sugar stations	Frequency:			20 at Hussey Rd Establish 30 more feeding stations on E side of corridor (Near Yarrabah forested area) Possibly move some from Hussey Rd and add another 10? on W side of corridor adjacent to national park. Harbour.Currently 1 near each log (16) Weekly	c.60 feeding stations Weekly	c.60 feeding stations
Sugar stations around Admiralty Island	Frequency:		Boat Patrol Takes 1 team of 2 a whole day	18 Weekly	18 Replace sugar syrup after rain as necessary. Consider feeding station design to prevent wash out with rain. Reduced frequency dependant on weather	18 Weekly
Building examination	Frequency:	Concentrate on Port of Cairns area and 1 Km around known IPs and along lines connecting IPs		Concentrate on Port of Cairns area and 1 Km around known IPs When weather not good for sweeping or Fortnightly	Concentrate on Port of Cairns area and 1 Km around known IPs When weather not good for sweeping or Fortnightly	Concentrate on Port of Cairns area and 1 Km around known IPs When weather not good for sweeping or Fortnightly
Beelining		Yes if bees found	May need to call on industry help to beeline	May need to call on industry help to beeline	Team has beelining capacity	Team has beelining capacity
Bee-eater surveillance	Early warning Supporting proof of freedom Frequency:	Bee-eater surveillance every 8 weeks	Pellets to be analysed at TAAHI. PCR testing likely soon Number of roosts	Locate more roosts. Bee-eaters in breeding mode and not roosting until Jan. Monitor roosts for use every fortnight for activity. Collect 10-20 pellets per roost if plenty of birds there. Test strategic roosts. Opportunistically	Locate more roosts. Bee-eaters in breeding mode and not roosting until Jan. Monitor roosts for use every fortnight for activity. Collect 1- - 20 pellets per roost if plenty of birds there. Test strategic roosts. Prob unlikely to be catching bees due to weather. Fortnightly after roosts back in use	Collect 10 - 20 pellets per roost. Test strategic roosts. Fortnightly if required
Public information	Follow up suspicious bee sightings within 2 days	Continue to follow up suspicious reports	Through call centre to surveillance coordinator in Cairns or direct to Redden St	Follow up suspicious bee sightings within 2 days Likely numbers?	Follow up suspicious bee sightings within 2 days	Follow up suspicious bee sightings within 2 days
Sentinel hive	Supporting proof of freedom from mites	Miticide strips every 8 weeks	Increased frequency to become part of current Sentinel Hive Program	Ev 2 months	Ev 2 months	Ev 2 months
Registered beekeepers	Supporting proof of freedom from mites	Miticide strips in selected apiaries only every 8 weeks (1 Jan, 1 Mar, 1May)	To be coordinated as part of state wide enhanced mite surveillance – managed from SE region. 10 beekeepers with 22 apiary sites	Ev 3 months (Stagger sampling of north Cairns and south Cairns regions)	Ev 3 months (Stagger sampling of north Cairns and south Cairns regions)	Ev 3 months (Stagger sampling of north Cairns and south Cairns regions)
Staff				6 teams of 2 for surveillance 1 surveillance team supervisor 1 Surveillance Manager (Wim) Mapping .5d every day DAFF mapper Full time 1 mth Data entry 2d/wk Technical Specialist (Charlotte) Controller (Pat) Controller (Ian)	2 teams of 2 for surveillance Extra person to do mthly work 1 surveillance team supervisor 1 Apiary Officer (from March) 1 Surveillance Manager (Wim) Mapping 1d/wk (Jan/Feb) Data entry 2d/wk (Jan/Feb) Technical Specialist (Charlotte) Controller (Ian)	6 teams of 2 for surveillance 1 surveillance team supervisor 1 Apiary Officer 1 Surveillance Manager (Wim) Mapping .5d/wk Data entry 1d/wk Technical Specialist Controller

Surveillance Plan for AHB from Oct 2008 to June 2009

Methods		Next 12 months (1 Jan to 30 June 2008)	Notes	Oct to December 2008	Wet Season - decreased bee activity January 2009 to March 2009	April 2009 to June 2009	July 2009 to June 2010
Pheromone traps	Location and numbers: Checking frequency:	Maintain strategic traps in high risk areas. Estimate: 14 traps Every month	Useless - Discontinued				
Lewin logs	Location and numbers Checking frequency	Maintain two logs in high risk areas Every month	More logs are to be produced (aim is for 16-18)	16 logs around Cairns port and Trinity Bay	16 logs around Cairns port and Trinity Bay Weekly	16 logs around Cairns port and Trinity Bay Weekly	16 logs around Cairns port and Trinity Bay Weekly
Field surveillance Sweepnetting	Frequency:		Bee samples to be identified inCairns (Jane Royer, Paul Zabroski or AQIS entomologist) then sent to BSL for confirmation	Sweepnet where flora likely to attract bees. Complete grids around Ips and repeat strategic grids. 6 teams of 2 Weekly	Sweepnet where flora likely to attract bees. Weekly Around known IPs (Green Hill, Admiralty Island, Aloomba, Cairns City, Cairns Port, Hussey Rd) Monthly at 25 km from IPs (Greater Cairns outer suburbs, North of Green Hill, Aloomba south, Aloomba - Hussey Rd, Aloomba - Green Hill) 2 teams of 2 Weekly	Sweepnet where flora likely to attract bees. Complete grids around Ips and repeat strategic grids. 6 teams of 2 Weekly	Sweepnet where flora likely to attract bees. Complete grids around Ips and repeat strategic grids. 6 teams of 2 Weekly
Sugar stations	Frequency:			20 at Hussey Rd Establish 30 more feeding stations on E side of corridor (Near Yarrabah forested area) Possibly move some from Hussey Rd and add another 10? on W side of corridor adjacent to national park. Harbour.Currently 1 near each log (16) Weekly	c.60 feeding stations Weekly	c.60 feeding stations	c.60 feeding stations
Sugar stations around Admiralty Island	Frequency:		Boat Patrol Takes 1 team of 2 a whole day	18 Weekly	18 Replace sugar syrup after rain as necessary. Consider feeding station design to prevent wash out with rain. Reduced frequency dependant on weather	18 Weekly	18 Weekly
Building examination	Frequency:	Concentrate on Port of Cairns area and 1 Km around known IPs and along lines connecting IPs		Concentrate on Port of Cairns area and 1 Km around known IPs When weather not good for sweeping or Fortnightly	Concentrate on Port of Cairns area and 1 Km around known IPs When weather not good for sweeping or Fortnightly	Concentrate on Port of Cairns area and 1 Km around known IPs When weather not good for sweeping or Fortnightly	Concentrate on Port of Cairns area and 1 Km around known IPs When weather not good for sweeping or Fortnightly
Beelining		Yes if bees found	May need to call on industry help to beeline	May need to call on industry help to beeline	Team has beelining capacity	Team has beelining capacity	Team has beelining capacity
Bee-eater surveillance	Early warning Supporting proof of freedom Frequency:	Bee-eater surveillance every 8 weeks	Pellets to be analysed at TAAHL PCR testing likely soon Number of roosts	Locate more roosts. Bee-eaters in breeding mode and not roosting until Jan. Monitor roosts for use every fortnight for activity. Collect 10-20 pellets per roost if plenty of birds there. Test strategic roosts. Opportunistically	Locate more roosts. Bee-eaters in breeding mode and not roosting until Jan. Monitor roosts for use every fortnight for activity. Collect 1- - 20 pellets per roost if plenty of birds there. Test strategic roosts. Prob unlikely to be catching bees due to weather. Fortnightly after roosts back in use	Collect 10 - 20 pellets per roost. Test strategic roosts. Fortnightly if required	Collect 10 - 20 pellets per roost. Test strategic roosts. Monthly if required
Public information	Follow up suspicious bee sightings within 2 days	Continue to follow up suspicious reports	Through call centre to surveillance coordinator in Cairns or direct to Redden St	Follow up suspicious bee sightings within 2 days Likely numbers?	Follow up suspicious bee sightings within 2 days	Follow up suspicious bee sightings within 2 days	Follow up suspicious bee sightings within 2 days
Sentinel hive	Supporting proof of freedom from mites	Miticide strips every 8 weeks	Increased frequency to become part of current Sentinel Hive Program	Ev 2 months	Ev 2 months	Ev 2 months	Ev 2 months
Registered beekeepers	Supporting proof of freedom from mites	Miticide strips in selected apiaries only every 8 weeks (1 Jan, 1 Mar, 1May)	To be coordinated as part of state wide enhanced mite surveillance – managed from SE region. 10 beekeepers with 22 apiary sites	Ev 3 months (Stagger sampling of north Cairns and south Cairns regions)	Ev 3 months (Stagger sampling of north Cairns and south Cairns regions)	Ev 3 months (Stagger sampling of north Cairns and south Cairns regions)	Ev 3 months (Stagger sampling of north Cairns and south Cairns regions)
Staff				6 teams of 2 for surveillance 1 surveillance team supervisor 1 Surveillance Manager (Wim) Mapping .5d every day DAFF mapper Full time 1 mth Data entry 2d/wk Technical Specialist (Charlotte) Controller (Pat) Controller (Ian)	2 teams of 2 for surveillance Extra person to do mthly work 1 surveillance team supervisor 1 Apiary Officer (from March) 1 Surveillance Manager (Wim) Mapping 1d/wk (Jan/Feb) Data entry 2d/wk (Jan/Feb) Technical Specialist (Charlotte) Controller (Ian)	6 teams of 2 for surveillance 1 surveillance team supervisor 1 Apiary Officer 1 Surveillance Manager (Wim) Mapping .5d/wk Data entry 1d/wk Technical Specialist Controller	6 teams of 2 for surveillance 1 surveillance team supervisor 1 Apiary Officer 1 Surveillance Manager (Wim) Mapping .5d/wk Data entry 1d/wk Technical Specialist Controller

Revised estimates of costs for 2008-2009 as at March 2009
Option B: Bee detections in Febuary requiring increased surveillance in April and May

Description	Level	Number	FTE	No. months	Annual wage	Sal (Hired staff)	
Nov - Dec 2008							
6 teams of 2 for surveillance	OO2/1	12	1	2	35,956	71,913	
1 surveillance team supervisor	OO3/1	1	1	2	39,632	6,605	
1 Surveillance Manager (Wim)	OO5/1	1	1	2	49,570	8,262	
Mapping .5d every day	OO5/1	1	0.5	2	54,534		
DAFF mapper Full time 1 mth		1	1	1		0	
Data entry 2d/wk	AO3/4	1	0.4	2	51,432		
Technical Specialist (Charlotte)	PO4/1	1	0.8	2	72,017		
Controller (Ian)	AO6/4	1	0.2	2	77,584		
							86779.48
Jan 2009 to March 2009							
2 teams of 2 for surveillance	OO2/1	4	1	3	35,956	35,956	
1 extra surveillance person	OO2/1	1	1	2	35,956	5,993	
1 surveillance team supervisor	OO3/1	1	1	3	39,632	9,908	
1 Surveillance Manager (Wim)	OO5/1	1	1	3	49,570	12,392	
Mapping 1d/wk	OO5/1	1	0.2	2	54,534	1,818	
Data entry 2d/wk	AO3/4	1	0.4	2	51,432		
Apiary Officer (Start March 09)	TO3/1	1	1	1	54,534		
Technical Specialist (Charlotte)	PO4/1	1	0.3	3	72,017		
Controller (Ian)	AO6/4	1	0.2	3	77,584		
							66067.24
April 2009 to June 2009							
4 teams of 2 for surveillance	OO2/1	8	1	3	35,956	71,913	
1 surveillance team supervisor	OO3/1	1	1	3	39,632	9,908	
1 Surveillance Manager (Wim)	OO5/1	1	1	3	49,570	12,392	
Apiary Officer (Start March 09)	TO3/1	1	1	1	54,534		
Technical Specialist (Charlotte)	PO4/1	1	0.8	3	72,017		
Controller (Ian)	AO6/4	1	0.2	3	77,584		
							94212.97
Lab staff?	No Cost						
Jane Royer	Bio Science						
Paul Zboroski	Casual PO3/4	1	0.1	3	67,647	1,691	
Bill Doherty	Bio Science						
Jane Oakey and Brad	Bio Science						
				Salaries		248,751	
				Plus oncosts (23%)		57,884	
Locality allowance						2,600	
TOTAL Labour						309,235	

Operational costs	Vehicle	3 hire vehicles $85/day for 8 months		61,710
	Public Awareness			15,000
	Microsatellite testing Uni of Sydney	6 more nests @$250 each		1,500
	Scaffold hire		1	2,000
	Tree loppers	1 or 2 @ $300		600
	Pest exterminators	1 or 2 @ $200		400
	Travel			15,000
	Phones			1,500
	Office supplies/copying			1,000
	Safety supplies			600
	Network access			800
	Other costs			10,000
		Operations total		110,110
		Est Nov 2008 - June 2009		**419,345**
		Actual to 30 October 08		200,708
		Est Total for 2008-09		**620,053**
	Revised estimates	Actual to 28 February 2009		432,443
		Actuals consists of salaries etc of $286,535 and Operational costs of $145,908		
		Op costs increased due to nests found requiring specialised tree loppers		
		Increased staff from April to June to 6 teams of 2 rather than 4 teams of 2		
		This is to cover the surveillance area effectively in a erasonable time frame.		
		Est Total for 2008-09		**641,000**

EMERGENCY ANIMAL DISEASE RESPONSE PLAN FOR AN INCURSION OF ASIAN HONEYBEES INTO QUEENSLAND

It has been determined that an emergency animal disease (EAD)* has been confirmed, as defined in the Government and Livestock Industry Cost Sharing Deed in Respect of Emergency Animal Disease Responses (Deed), and that an EAD Incident exists in the State of Queensland.

Requirements of the Deed have been met in that the EAD Incident has been previously reported and defined, as required by Sections 5 and 6 of the Deed.

This Emergency Animal Disease Response Plan (EADRP) has been prepared in accordance with Sections 6 and 7 of the Deed.

The structure and content of the EADRP have been prepared in accordance with Part A of Schedule 4 of the Deed.

**while it is recognised that the Asian honey bee is not covered by the EADRA (or the EPPRD), the EADRP template has been used to convey the necessary information for CCEAD consideration.*

1. STATUS REPORT ON SUSPECT DISEASE*

1.1 Overview

The Queensland Department of Primary Industries and Fisheries has confirmed the detection of 19 nests of Asian honeybees in the Cairns area of North Queensland.

Asian honey bees were originally detected in Portsmith in Cairns in May 2007. Five nests were located and destroyed by the end of May 2007 and the response was scaled back to on-going surveillance. Surveillance detected more foraging Asian honey bees in August 2007 and bee lining and grid pattern searching led to location of two additional nests in dense mangroves on Admiralty Island in Trinity Inlet. Final location and destruction of the nests was completed by November 2007. With no further evidence of unusual bees, surveillance for proof of freedom was implemented.

On 29 July 2008, a nest of Asian honey bees was detected at Green Hill, a suburb seven kilometres south of the previous findings. An associated swarm of Asian honey bees was located and destroyed in the vicinity. A further two nests were detected and destroyed at Aloomba, another eight kilometres south of Green Hill. A further six Asian honey bee nests have since been detected and destroyed in inner city Cairns not far from the initial incursion site at Portsmith.

Ongoing surveillance detected two more nests north-east of Aloomba on 22 December 2008 and 9 March 2009. No *A. cerana* were sighted between 22 January and 3 March with wet weather and flooding hampering surveillance efforts. Foraging *A. cerana* have recently been confirmed about three kilometres north of Green Hill and sugar stations and honey frames are being established in the area to enable beelining.

Initial samples of the bees were identified as *Apis cerana* by two Northern Australian Quarantine Strategy (NAQS) entomologists and one DPI&F entomologist. Samples of bees and nest material were sent to Dr Denis Anderson, (CSIRO Canberra) who confirmed the identification. Testing at the Biosecurity Queensland Biosecurity Sciences Laboratory at Yeerongpilly indicated that there were no Varroa mites, Tropilaelaps mites or Tracheal mites (*Acarapis woodi*) present through thorough examination of bees and comb. These findings were confirmed by CSIRO in Canberra. CSIRO further confirmed the strain of Asian honeybee as the Java strain.

Samples of bees and comb from 18 detected nests been confirmed as *A cerana* and have been tested and found negative for exotic bee mites.

A Restricted Area under the *Exotic Diseases in Animals Act 1981* was proclaimed in May 2007 in accordance with AUSVETPLAN as Asian honeybees are known carriers of exotic bee mites. This restricted the movements of bees and bee products and equipment into, within and out of the Restricted Area. When surveillance led to the discovery of further nests south of the Cairns port area, the Restricted Area was extended (in November 2008) to provide a greater margin for control of managed bees.

A surveillance plan was established concentrating on the 10 kilometre radius around the initial detection. Surveillance was also conducted at the extremities of the RA and at Mourilyn Harbour to see if the bees had spread long distances.

Beekeepers in the Cairns area were informed of the findings and the movement restrictions imposed. Surveillance of managed hives in the Cairns area has been conducted on several occasions for the presence of mites using Bayvarol strips and sticky mats as per a special permit provided by the APVMA. All results have been negative.

1.2 Location of AHB nests

The Maps at Attachment A show the locations of the nests of Asian honeybees detected to date. All are within the original RA. The first map shows the nest location in the Cairns City and Portsmith areas. The second map shows the nests south of Cairns in the Green Hill, and Aloomba areas. The third map shows the most recent two nests located east of Aloomba.

1.3 Description of nests

The locations and descriptions of the sites where the nests were detected are in Attachment B.

At least 12 feral *Apis mellifera* hives have been destroyed during the course of the investigation to date. They have not shown any signs to indicate unusual disease or pest infestation i.e. healthy bees, good brood patterns, no unusual deaths of long established feral nests. Most were destroyed to reduce the numbers of *A. mellifera* using feeding stations and interfering with beelining.

1.4 Clinical situation in nests

18 of the 19 nests detected and destroyed to date have been sampled and tested.

Wherever possible, nests have been extracted from trees or buildings and all bees and comb submitted to the Biosecurity Sciences Laboratory. From there, samples have been sent to other laboratories as required e.g. CSIRO for confirmation of bee type and strain and University of Sydney for microsatellite DNA testing.

The bees have been confirmed as *A. cerana* Java strain. No exotic mites have been detected through examination of bees, washing of bees and examination of every brood cell in submitted comb (for Varroa mites). Microsatellite testing indicates that the bees in the detected nests are all closely related and it is likely the bees are from a single incursion.

Nests have ranged from active healthy nests to queenless nests with only drone comb on the verge of dying out.

1.5 Results of initial tracing/surveillance

Delimiting surveillance was initially conducted in a 10 kilometre radius of the first detection concentrating first in the 1, 2 and 5 kilometre boundaries. Five nests were quickly detected within 2 kilometres of the first nest. Active surveillance of flowing shrubs and flowers using sweepnets to sample bees was also conducted in the northern extremity of the RA and to the south of Cairns including close to Mourilyan Harbour with negative results.

An extensive public awareness campaign has been conducted and all public calls are investigated. Information from the public has led to the detection of 7 of the 19 nests.

1.6 Estimated numbers of premises/susceptible species in vicinity

Epidemiological information has been collected on each of the nests detected and is now being used to try to estimate the number of likely nests still undetected.

There is little documentation or research available on the frequency and distance of swarming and viability of *A. cerana* in a new environment. Most information has been obtained from Denis Anderson of CSIRO. *A. cerana* was first identified in Papua New Guinea in 1986 and is now found throughout the island. It has the reputation of being highly invasive and rapidly taking over new environments. In the Solomon Islands, the numbers of *A. cerana* nests multiplied rapidly after introduction in 2003 and within a year had caused major losses to the European honeybee colonies and their honey yields through direct competition for floral resources and through robbing of managed hives. A planned remote poisoning program was established to reduce the numbers of *A. cerana* to allow for domestic honey production to occur.

As at November 2008, DPI&F estimated that there were between 3 and 7 nests undetected. Two further nests have been found since then and some recently identified foraging *A. cerana* are anticipated to lead to a third nest in the near future.

It is well recognised that when the numbers of insects are low, detection is very difficult.

The benefits of establishing full time surveillance personnel is being realised as the skills honed as part of a dedicated team have led to all recent detections even though wet weather conditions have limited surveillance opportunities.

Feral *A. mellifera* nests are located in the RA but there is no indication that these are an issue as all *A. cerana* nests have been negative for varroa mites and other exotic parasites of bees. As outlined previously, at least 12 feral *Apis mellifera* hives have been destroyed during the course of the investigation to date. They have not shown any signs to indicate unusual disease or pest infestation.

Managed hives in the RA have been tested for mites and been negative on several occasions. There are 16 registered beekeepers with hives in the RA.

1.7 Actions Taken to Date

- A Restricted Area (RA) was been established in accordance with AUSVETPLAN Section 2.2.1 in May 2007 and covers an area approximately 25 km from the detection site for IP1. The RA was extended to the south in November 2008.

- Movement controls have been imposed and permits are required for movements of managed hives into and within the RA. Managed hives are not allowed to move out of the RA.

- Complete epidemiological assessment has been difficult due to limited knowledge on the behaviour of *A. cerana* where a single swarm has moved into a new environment. Work is continuing as more nests are detected and as more information in relation to each nest is recorded.

- Remote poisoning has been considered and a permit obtained from APVMA for this purpose in the event that bee lining indicates a nest is located in forested or mountainous areas or mangrove swamp where it is difficult for the surveillance teams to follow the bee line. For remote poisoning to be effective, a large number of bees must be using the feeding station so that when the poison is added to the sugar a significant amount gets back to the nest and results in the nest being killed. To date, there have only been small numbers of *A. cerana* on the feeding stations (5 to 10 from a nest of 3,000 to 6,000) and remote poisoning has not been possible. In addition, remote poisoning does not allow for gathering of any epidemiological information such as the estimated age of the hive or number of swarms it may have produced. This destruction method is only of value as a last resort in difficult locations.

- Media releases have been released on the finding of each Asian honeybee nest. A total of 32 media releases have been made (13 in 2007, 17 in 2008 and 2 in 2009). Feature articles have been supplied to three Beekeeping and Honeybee industry journals and to the Cairns Post. Interviews have been held on television and radio. Local newspapers have run most articles as well as state newspapers. The high rate of awareness evident in the community supports the success of media and community engagement activities to date.

- Extensive surveillance in the Restricted Area has indicated that the incursion is restricted to that area. A Control Area was not considered necessary and has not been declared. Beekeepers in north Queensland have been targeted for awareness of the Asian honeybee incursion as they are the most likely people to be called to deal with nuisance bee swarms and to recognise unusual bees.

They have also been informed and updated about the movement restrictions of the RA.

- Intensive surveillance has been conducted in the RA. This has included sweep netting of flowering shrubs and trees for unusual bees, establishment of sugar feeding stations to attract foraging bees (special covers have had to be designed to protect the feeding stations from being washed out by rain) and beelingin to locate nests. Traps with pheromones to attract *A. cerana* were used extensively initially with some 60 traps in use around Portsmith and Trinity Inlet. These proved not to be effective and are no longer used. Lewin Log traps were considered more effective and these are still in use around Trinity Inlet and near the forestry SW of Cairns city.

- Research is being conducted as the response progresses to look into the use of honey frames and pollen mixed with sugar to improve the attractiveness of feeding stations for bees. Research has been conducted to support the Bee-eater surveillance technique which aims to identify *A. cerana* in regurgitated pellets of Bee-eater birds that prey mostly on bees. This surveillance technique supplies a snapshot to indicate if *A. cerana* are still in an area and is most suitable for indicating if ongoing surveillance is necessary in an area and for proof of freedom surveillance.

1.8 Feasibility of Eradication

There are many reasons to support eradication of *A. cerana* from Australia, including:

- Asian honey bees can carry *Varroa destructor*, an external parasite of bees, which would decimate European honey bee populations managed for honey production and pollination of crops in Australia. Native bees would similarly be affected. Australia is the last remaining continent to be free of this bee pest since New Zealand was infested in 2000.

- Although no Varroa mites have been found on the Asian honey bees detected to date, eradication is a key strategy to enable any new incursions (possibly carrying Varroa) to be detected. Shipping traffic is constant between Cairns and ports in Papua New Guinea and Indonesia where Asian honey bees reside, so the risk of new incursions remains constant and high.

- Asian honey bees are a threat to the honey bee industry through competition for resources. These highly invasive bees will rob honey from managed hives and reduce production. In the Solomon Islands, the effect of the newly introduced Asian honey bees is so severe that a baiting program is being conducted to keep their numbers down to a level where the managed European honey bee hives can survive to produce some honey for the local market. Such baiting programs also raise issues of chemical contamination of honey.

- Asian honey bees also present a human health threat as they sting and adapt well to urban areas. Nests in the inner city suburbs of Cairns have been found in floor cavities and under eaves of private residences.

- The capacity of the Asian honey bees to occupy small nesting sites means they also pose an environmental threat to native bees and other native animals that may use similar spaces.

- Exports of queen bees and live bees (including packet bees) from Queensland and Australia has been impacted by the continued presence of Asian honey bees in Cairns. The United States of America have altered their import requirements to allow Australian bees from other areas to be imported, but issues will arise if Asian honeybees are detected at any other Australian port.

Factors that indicate that eradication is feasible include:

- Microsatellite testing of all nests indicate they are related and it appears that there has been a single incursion. As a result, the ability of the bees to adapt and flourish may be restricted.

- Experience with the incursion to date indicates that the bees do not swarm as frequently as previously thought, perhaps only two swarms per year.

- Spread has not been as extensive as anticipated, most likely due to the limited breeding opportunities. Surveillance has been conducted at the edges of the RA and south of the RA in a 5 kilometre zone around Mourilyan Harbour with no detections. All nests remain in the RA and appear to form clusters with a number of nests within a kilometre or two of each other. Experience has shown that once the first nest is detected, other nests in the cluster are detected quite quickly.

- There continues to be good public awareness of the response and reporting of unusual bee activity. This supports the chances of detecting new clusters.

- Surveillance team members are employed as long term casuals. This has allowed for expertise to be developed and team members can identify *A. cerana* by their different flight patterns and behaviours as well as visually. The number of samples of wasps and flies submitted for identification has declined considerably. Bee lining expertise has also been honed. This has made active surveillance more efficient and effective.

- Feeding stations situated around Trinity Inlet have never attracted a lot of bee activity. In addition, bees from IP6 and IP7 on Admiralty Island had to fly to the mainland to forage and were detected there. It appears that the mangroves cannot totally support a bee nest even though there are a large number of varieties of mangrove and they flower at different times of the year. This suggests that if there are other nests on Admiralty Island some evidence of foraging bee activity should have been detected. This has not occurred since IP6 and IP7 were destroyed.

- Bee lining techniques have been improved as well as skills in timing bee visits to feeding stations and obtaining a flight direction. New nests have been identified when there are only a few *A cerana* (usually under 10) using a feeding station.

- AQIS have provided assurance that monitoring of shipping from Papua New Guinea is continuing and there is heightened awareness of the risks of introduction of *A. cerana* since pathogenic *V. jacobsoni* was confirmed in PNG in 2008.

It has been estimated that there are likely to be less than 7 nests still to be found. As the numbers of *A. cerana* bees is very low, surveillance is a difficult process. With the recorded successes in detecting nests, it is prudent to commit to eradication.

If eradication is not pursued, numbers of *A cerana* are anticipated to gradually increase until there are issues with loss of productivity of managed hives (through competition for nectar and pollen and robbing of managed hives), impacts on lifestyle from stinging Asian honeybees establishing in urban areas and impacts on tropical insect biodiversity.

By the time this occurs, most likely in about 5 years, eradication will certainly not be a feasible option.

If Varroa mites entered Australia, Asian honeybees would act as a reservoir for this pest, facilitate its spread and hamper eradication efforts.

The Australian Honeybee Industry recognises that Asian honeybees present a significant biosecurity threat to their industry and supports eradication. The Queensland Beekeepers Association has been highly supportive of the efforts to date and strongly support maintaining an eradication effort.

DPI&F epidemiologists indicate that proof of freedom will require up to 18 months of surveillance.

2. PROPOSED RESPONSE ACTIVITIES*

RATIONALE

It has been determined that an emergency animal disease (EAD)* has been confirmed, as defined in the Government and Livestock Industry Cost Sharing Deed in Respect of the Emergency Animal Disease Responses (Deed), and that an EAD Incident exists in the State of Queensland.

> **while it is recognised that the Asian honey bee are not covered by the EADRA (or the EPPRD), the EADRP template has been used to convey the necessary information for CCEAD consideration.*

These proposed response activities are based on the firm conviction of the Queensland Department of Primary Industries (Lead Agency) and endorsed by CCEAD, that:

- the incident represents a recent incursion of Asian honeybees (*Apis cerana*) ;
- there is evidence, based on surveillance and testing, that the Asian honeybees have not spread outside of the Restricted Area. ;
- eradication of the Asian honeybee incursion is both achievable and feasible; and
- failure to implement surveillance and eradication procedures would place the honey bee and pollination industries at an unacceptable risk, as the incursion is unlikely to be contained with the risk of spread through Queendland and into other environments suitable to the bee (refer Climex model).
- failure to implement surveillance and eradication procedures will reduce the capacity of biosecurity authorities working in Queensland to detect early incursions of pathogenic Varroa mites and other exotic pests of bees known to be carried by *A. cerana.*
- failure to implement surveillance and eradication procedures will reduce the capacity of biosecurity authorities working in Queensland to respond effectively to incursions of pathogenic Varroa mites and other exotic pests of bees known to be carried by *A. cerana* because of the reservoir they provide for maintenance and spread of these pests.

OBJECTIVE

The objective of these proposed response activities are to eradicate Asian honeybees in accordance with AUSVETPLAN strategies and procedures.

2.1 Quarantine and Movement Controls on animals, products and things

Quarantines under the *Exotic Diseases in Animals Act 1981* have been used to secure privately owned sites to contain the bee until destruction was able to be carried out.

2.1.1 Infected Premises (IP)

Nests have been located on private property, nature reserves and crown land. Where necessary, permission has been sought to fell trees to allow destruction of the nests.

2.1.2 Restricted Area (RA)

A Restricted Area has been declared under the provisions of the *Exotic Diseases in Animals Act, 1981* and will continue to be enforced. It is consistent with Section 2.2.1. of the AUSVETPLAN Strategy for Bee diseases and pests.

2.2 Eradication

All detected nests of *A. cerana* are to be destroyed as quickly as possible and samples taken for testing for exotic pests of bees.

Once the nest is destroyed, any remaining foraging bees that did not return before the nest was treated with insecticide would die within a few days and are not capable of establishing another nest.

2.4 Diagnosis, Tracing and Surveillance

2.4.1 Liaison between State, Private Laboratories and AAHL

Initially samples of comb were sent to CSIRO Canberra for examination for varroa mite as required under AUSVETPLAN. This technology has since been transferred to the Biosecurity Sciences Laboratory (BSL) in Yeerongpilly and all mite testing is now conducted there.

The technology for microsatellite testing is in the process of being transferred to BSL also as the University of Sydney laboratory is a research facility without the capacity to provide an ongoing analytical service.

Confirmaton of *A. cerana* identification is being conducted by entomologists at the DPI&F Meiers Road facility at Indooroopilly after initial identification by a DPI&F entomologist in Cairns. NAQS entomologists supply this service if the DPI&F entomologist is not available.

DPI&F entomologists at the Tropical and Aquatic Animal Health Laboratory in Townsville are assisting with examination of bee-eater pellets for *A. cerana* wings.

2.4.2 (Resources for) Surveillance and Laboratory Testing

DPI&F considers arrangements are in place to allow most of the testing resources required for ongoing surveillance activities to be accessed.

A surveillance plan is attached. It involves active surveillance of flora and sweepnetting, follow up of information supplied by the public, surveillance of managed hives for exotic mites and maintenance and monitoring of sugar feeding stations and Lewin Log traps.

2.5 Zoning

Zoning as part of the response has not been established.

2.6 Vaccination Strategy

Not applicable

2.6.1 Vaccination protocols

Not applicable

2.6.2 Priorities

Not applicable

2.6.3 Processing of vaccinated stock, their by-products and waste

Not applicable

2.6.4 End-use of vaccinated stock

Not applicable

2.7 Situation Reports

Regular situation reports will be provided to CCEAD on an agreed basis once the EADRP is initiated.

The office of the Queensland CVO will prepare regular situation reports for Industry (refer 4.2).

2.8 International notification

It is understood that the Commonwealth, will be responsible for all international notifications about this EAD Incident.

Liaisons with Biosecurity Australia on trade issues associated with the response have already occurred.

3. INDICATIVE BUDGET*

3.1 Staffing

After the initial nest was detected, a Local Pest Control Centre (LPCC) was established in Cairns with Operations, RAMS, Surveillance and Tracing, Community Awareness and Logistics sections led by a Controller. A small SPCHQ was established in Brisbane. These arrangements were in line with the AUSVETPLAN Management Centre Manuals

Initially, Biosecurity Queensland officers were rotated through the various sections and supported by beekeepers from the Queensland Beekeeper's Association (QBA) who supplied additional technical and surveillance expertise. Beekeepers assisting with the response were reimbursed living expenses and airfares but no wages.

Later in the response, an experienced beekeeper was employed to undertake management of the surveillance activities and casual field surveillance staff were employed to provide a more consistent surveillance effort. Currently, 3 teams of 2 surveillance teams are active during the current wet season. There is scope to increase this to 6 teams of 2, as was in place during the period before Christmas 2008.

The intention was to reemploy more field surveillance staff in April 2009 if further nests were discovered during the wet season. This has occurred and needs to be considered.

Currently field surveillance staff concentrate on areas where *A. cerana* bees have been sighted and surveillance of other high priority areas has to be put on hold for some time.

Presently DPI&F is covering all staff related costs for the response.

3.2 Operating

Management of the Asian Honeybee Response including staff and operations was passed from the LPCC to the Biosecurity Queensland Control Centre in February 2009. This was to gain efficiencies with ongoing projects for eradication of tramp ant species in north Queensland.

4 PUBLIC RELATIONS

4.1 Lead responsibility for liaison with media

Queensland DPI&F is the lead agency for liaison with media. To date, a total of 32 press releases have been made and feature articles have been supplied to three Beekeeping and Honeybee Industry journals and to the Cairns Post.

Information is available on the DPI&F website.

The DPI&F Business Information Centre has been provided with scripts to ensure information pertinent to the response is conveyed to the LPCC in Cairns for follow up.

The Controller and Technical Manager and Surveillance Manager have all acted as spokespersons for media events. A Media strategy has been developed to maintain public awareness and reporting of bee related information.

Relevant information has been supplied to Biosecurity Australia for use in negotiating market access for export of live bees where it was affected by the incursion.

4.2 Industry and community liaison

The Honeybee Industry has been informed of developments throughout the response with regular situation reports and teleconferences. Currently, teleconferences are held at fortnightly intervals where two representatives of QBA attend. More immediate and direct contact with industry is made in the event of new findings.

Industry provide regular updates to the national industry through advisory bulletins after each teleconference or new find. These have proved to be very effective.

An operational debrief and a technical debrief were conducted after the first 7 nests were detected in 2007 and industry was involved in both.

Response Plan for *Apis cerana* in North Queensland

2010

REVISION REGISTER

Issue No.	Date of Issue	Amendment Details
1.0	30/10/09	
2.0	4/12/09	Reformatted, major changes
3.0 & 3.1	6/12/09	2 new sections
3.2	7/12/09	Minor updates
4.0	18/12/09	Expanded to an Eradication Plan
4.1	12/01/2010	Minor updates
4.2	15/03/2010	Updates to Sections 3, 8, 9.4

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Prepared by: Karen Skelton

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Acronym	Meaning
APVMA	Australian Pesticides and Veterinary Medicines Authority
BQ	Biosecurity Queensland
BQCC	Biosecurity Queensland Control Centre
Cairns CBD	Cairns central business district
CCAHB	Consultative Committee for Asian honey bees
CSIRO	Commonwealth Scientific and Industrial Research Organisation
IP	Infected Premise (In this document, IP refers to detection site)
RA	Restricted area

1 Introduction

An established nest of Asian honeybees (*Apis cerana*) was first detected in North Queensland in 2007. A response was immediately implemented to establish the extent of the incursion with a view to eradicating this exotic bee species and any exotic parasites they might carry. In 2008 a response plan was submitted to the Consultative Committee for Asian honeybees. The response to date has been funded by the Queensland Government and has been based upon the principles of the AUSVETPLAN disease strategy.

There is a growing understanding within Government and Industry that agricultural and horticultural industries that are reliant on honeybees for pollination will suffer substantial impacts from pests and disease issues affecting managed honey bee colonies (European honeybee, *Apis mellifera*). This is particularly the case with Varroa mites. The long term impacts on pollination services should *A. cerana* become established in Australia are less clear. *A. cerana* have almost crippled the managed honeybee industry in the Solomon Islands and it is possible that the Australian Honeybee industry could suffer a similar fate as the numbers of *A. cerana* multiply. Reduced numbers of and weakened managed *A. mellifera* hives could result in a serious impact on crops requiring pollination services i.e. where feral bee pollination is insufficient for optimal production outcomes.

Plans to transfer the over sighting of management and funding of responses relating to emergency bee and bee-borne pests and diseases from the Emergency Animal Disease Response Agreement (EADRA) to the Emergency Plant Pest Response Deed of Agreement (EPPRD) are being developed.

Under the current AUSVETPLAN, no provision for cost sharing between Government and Industry exists for pest bee species. It is anticipated that a cost sharing agreement with other Australian Governments and with industry will be secured.

This document was prepared by Biosecurity Queensland at the request of the Scientific Advisory Panel to the Consultative Committee for Asian Honey Bees (CCAHB). Originally it concentrated on surveillance activities, but at the request of the CCAHB, it has been expanded into an eradication response plan from 2010 onwards. It builds on eradication activities conducted between May 2007 and December 2009.

2 Scope

This eradication plan provides detailed information on the outcomes of previous surveillance and eradication activities and outlines proposed future surveillance activities and other activities intended to eradicate *Apis cerana* (*A. cerana*) from Australia. Cost estimates for eradication and proof of freedom are included.

3 Background

The AUSVETPLAN contains information on exotic pests of honeybees and on a number of exotic pest bee species (http://www.aahc.com.au/ausvetplan/index.htm).

3.1 Previous incursions of Asian honeybees

The Asian honeybee (*A. cerana*) is found throughout Asia and as far north as Siberia. In 1986, it spread to Papua New Guinea (PNG) and in 1993, it was detected in the three outer islands of the Torres Strait adjacent to the southern coast of PNG (Sabai, Dauan and Boigu).

Since the mid 1990's there have been approximately 14 incursions of exotic bee species into northern Australia including the current incursion (Attachment 1). Most reports were of single bees or of single swarms or nests which were either dead when detected, destroyed on board the vessel or destroyed at the port of entry to Australia soon after detection.

Active surveillance for *A. cerana* has been previously undertaken in Queensland. This occurred at the Port of Brisbane in 2003/2004 following detection of a single *A. cerana* bee on a ship from PNG. No further bees were detected and there has been no indication that the species established in Queensland.

AQIS continue to monitor incoming vessels at all international ports in Queensland. Biosecurity Queensland and AQIS have collaborated to establish a series of bait hives and log traps close to the wharves to provide suitable nesting sites for exotic bee swarms arriving in a port that can be monitored weekly. The attractiveness of these nest sites has been enhanced by the addition of pheromones designed to lure *A. cerana* scout bees looking for nest sites.

The bees responsible for the current incursion have been strain typed as *Apis cerana javana*, a strain of Asian honeybees found in Indonesia and PNG. It is believed that a swarm or nest was introduced to North Queensland via on one of the cargo ships that regularly move between Cairns and PNG.

3.2 Adverse impacts of Asian honeybees

There are two risks associated with Asian honeybees. The first is from the honeybee itself which competes with the European honeybee (*A. mellifera*) which is used for honey production and for managed pollination services in Australia. The second risk stems from the parasites and diseases that the Asian honey bee may carry, particularly varroa mites.

A. cerana is a highly invasive bee species which adversely impacts on populations of *A. mellifera* by competing for floral resources, by robbing managed hives and by transmitting diseases. It becomes a pest in urban area through establishing nests in houses and by its aggressive stinging behaviour. It will also disturb native fauna such as native bees, small marsupials and birds that nest in similar places. The Java strain of *A. cerana* does not adapt to domestication and is not suitable for commercial honey production or commercial pollination services.

Varroa mites are generally regarded as the greatest threat to the Australian Honeybee industry. Two forms of varroa mites, *Varroa destructor* and the form of *Varroa jacobsoni* pathogenic to *A. mellifera* (discovered in PNG in 2008) are known killers of managed and feral European honeybee colonies. Infestation of *A. mellifera* colonies results in weak and deformed bees and the slow death of the colony. The effect of varroa mites on managed *A. mellifera* hives will also adversely impact on the agricultural and horticultural industries that rely on European honeybees to pollinate crops, including fruits and nuts. The seed-production industry would also be affected.

A. cerana may act as a mechanical carrier for tropilaelaps mites (*Tropilaelaps clareae*) and may be infested with tracheal mites (*Acarapis woodi*). Both species of mites are known to adversely affect managed European honeybee colonies.

A. cerana are also a threat to the environment through possible pollination of unwanted weed species and competition with native bees and other pollinators leading to loss of species that are specifically adapted to fertilise particular native plants. They will also compete for pollen and nectar with native birds and mammals and also for nesting sites in crevices in trees.

A. cerana are a stinging bee and their adaptability to the urban environment makes them a public nuisance and threat to people allergic to bee stings.

A risk assessment in relation to Asian honeybees and an assessment of their potential impact against national significance criteria have been undertaken and support the need for eradication of this pest bee species. (Attachments 11 and 12).

Modelling has been conducted to look at the potential spread of *A. cerana*. The outcome of the Climex model is in Attachment 13. This is based on climatic parameters matching all strains of *A. cerana*. As a species, *A. cerana* has shown itself to be highly adaptable establishing across a wide range of different geographies from Iran through India, China, Japan and SE Asia. While only the tropical Java strain of *A. cerana* has been detected in north Queensland, this is known to survive in cold mountain areas in Papua New Guinea as well as hotter coastal areas. Thus temperature is not expected to impede spread of this species for long. The model identifies that lack of water in many areas of Australia will restrict where *A. cerana* can establish, but the presence of artificial water sources such as dams, swimming pools and irrigation systems are expected to permit survival of *A. cerana* outside the wet tropics. The model shows that *A. cerana* are capable of reaching the large agricultural areas in other states besides Queensland and could survive in coastal areas in all states except Tasmania.

3.3 Biology and ecology of *A. cerana*

A. cerana are similar in appearance to *A. mellifera* but are smaller in size. The worker bees are distinguished by distinct black and yellow bands on their abdomen. See Attachment 2 for a comparative photograph. *A. cerana* have smaller swarms, but swarm more often than *A. mellifera*. Its natural nesting sites are hollow trees, caves and small enclosed areas around buildings. Nests have also been detected in shipping containers, industrial and farm machinery and ships. They are very likely to abandon a nest if disturbed. *A. cerana* are attracted to similar flora as *A. mellifera*, but unlike *A. mellifera*, do not store large amounts of honey or pollen in their nests.

Experimental mixing of *A. cerana* and *A. mellifera* colonies has not been successful (Ruttner, 1987). Introduced larvae and bees to a colony of the other species were rejected and expelled from the nest. Young bees, less than a day old, were more readily accepted, but some were rejected later or were attacked by guard bees when returning from foraging. The two species do not appear to interbreed.

Generally *A. cerana* colonies are smaller than those of *A. mellifera*. Colonies of *A. cerana* vary in size which partly depends on the size of the available nest cavity. Nest sizes vary from small (1400-2000 bees in coconut plantations in Malaysia and 2800 in Sulawesi) to large (10-

20,000 bees in Japan) (Ruttner, 1987; Bakker, 1999). The accessible colonies in the Cairns area had an average of 4700 bees (range 590 to 9080; n = 12).

In Sulawesi, Indonesia *A. cerana* nests are almost exclusively found in highly disturbed agricultural areas and villages and not in the forests (Bakker, 1999; Hadisoesilo, 1997). The *A. cerana* present in Cairns seem to occupy a similar habitat to *A. cerana* found in Sulawesi.

Known foraging distances for *A. cerana* vary. In India, the maximum reported distance was 900 metres but the uphill foraging distance was much shorter (300m) (Ruttner 1987). The reported average foraging distance for *A. cerana* in Sulawesi was 580 metres (Bakker, 1999). Foraging distances of 3.75 km have been recorded in Kashmir (Ruttner, 1987). Wet and windy conditions reduce *A. cerana* foraging activity. In the Cairns area, *A. cerana* appear to begin foraging later in the morning than *A. mellifera* and return to the nest earlier in the afternoon.

The queen bee is the reproductive hub of a bee colony. Fertilised eggs produce worker bees that care for the brood (nurse bees) and collect food (foraging bees). Unfertilised eggs produce drones that mate with queen bees. Worker bees usually live only about 3 weeks but queen bees live for several years. A queen undertakes a mating flight and once completed, she does not leave the nest until it reaches a critical size. Once this size has been reached, the worker bees produce a new queen. A swarm with about half the worker bees and some drones and (usually) the old queen leave the nest to establish a new nest. This is the natural method of dispersal of bee colonies. Swarming generally occurs once a nest is well established with sufficient bees, pollen and honey stores. A swarm may stay quite close to the original nest for several days until scout bees locate a suitable new nest site. If a nest including the queen bee is destroyed, any worker bees that are not killed soon die.

In Pakistan, swarming of *A. cerana* occurs when bee numbers in the colony reach 20,000 and in a single year, approximately 8 swarms are produced (Ruttner, 1987). In Japan, only 1-3 swarms are produced per year. Based on experiences in PNG and the Solomon Islands, Denis Anderson (CSIRO, *pers comm*) estimated that *A. cerana* could swarm over a distance up to 10 kilometres when the swarm is in an “invasive mode”.

Inadvertent human spread of *A. cerana* nests or swarms is possible by a number of mechanisms e.g. on shipping containers and industrial equipment (likely route of introduction into Queensland) and by bee-keepers boxing and shifting swarms.

4 Surveillance methods used to detect *A. cerana*

Surveillance methods used to detect the presence of *A. cerana* are directed at finding the location of nests or swarms and destroying them. The death of the queen bee is an important outcome. Surveillance methods include

- active surveillance
    - direct and deliberative searching for swarms and nests; and
    - indirect surveillance through examination of bee-eater pellets for evidence of *A. cerana.*
- passive surveillance which generally relies on notification by the public of suspicious bees or bee behaviour (swarms or aggressive bees).

Surveillance is also conducted for the presence of exotic bee mites through laboratory examination of detected *A. cerana* nests and bees and also by monitoring managed bee hives using pesticide strips and sticky mats to kill and trap the mites.

4.1 Active Surveillance methods

Active surveillance methods to detect the presence of *A. cerana* include the use of pheromone traps and associated strategies to attract swarming bees; detection of foraging bees through their capture using nets (sweep netting); and visual inspections of premises for bee swarms and nests.

Once a foraging *A. cerana* is found and identified, methods to trace the bees back to the nest commence. This is known as bee-lining. Other active surveillance approaches are to analyse the regurgitated crop contents of bee-eater birds and the use of odour detecting dogs. All methods except the use of odour detection dogs are currently in use in North Queensland and Standard Operating Procedures are available describing their practical application. An overview is given below. Additional information is available in AUSVETPLAN.

4.1.1 Pheromone traps

Pheromone traps are designed to attract swarms that are searching for a new nest site through the use of an odour that is attractive to *A. cerana*. Effective traps offer space, location, insulation and shelter for an *A. cerana* swarm. Pheromone traps for *A. cerana* are placed in areas that can be conveniently monitored.

The pheromone is targeted at *A. cerana* scout bees looking for a suitable nesting site. Only one pheromone is available in Australia through Dr Mike Lacy from CSIRO, Canberra. The actual chemical constituent of the pheromone has not been disclosed and is referred to hereafter as “the pheromone”. It is considered effective in the attraction of the Java strain of *A. cerana*, the strain of *A. cerana* responsible for the current incursion.

The effectiveness of pheromone traps are improved by:

- Utilising hollow coconut logs (log traps), a natural nesting choice for *A. cerana*, to place the pheromones in. A coating of melted cerana wax coat can be applied to the inside of the log to further increase its attractiveness;
- Utilising bait hives which consist of old hive boxes formerly used for *A. mellifera*. These contain the aroma of bees, honey and beeswax without the *A. mellifera* colony and provide a suitable nesting site; and by
- Refreshing the pheromones every six weeks.

4.1.2 Sweep netting

Sweep netting involves using a butterfly net to capture suspicious bees after insect activity is observed around flowering plants. The locations of the observations and the collections of samples are recorded by GPS which is downloaded into a database. The collected bees are identified and positive sites revisited to begin the process of tracing bees to find their nest. Sweep netting is resource intensive and is adversely affected by unfavourable environmental factors.

Sweep netting of an area involves an assessment of the flora in the designated area on the first day. Identified flowering plants are targeted for observation at different times of day over the next one or two days. If weather conditions are not suitable for foraging bees, the area is marked for revisiting later. If there is a strong suspicion that *A. cerana* has been found, the field surveillance team member immediately calls the Surveillance Manager so prompt action can be considered. Rapid reporting allows bee-lining to start quickly which minimises the time taken to detect a nest.

General sweep netting is conducted throughout the declared Restricted Area for the Asian honeybee response (Section 5.1) on a suburb by suburb basis. Overlaid on this is a system for intensive sweep netting where priority is given to areas surrounding previous detections and to areas where further Asian honey bee activity is suspected. Intensive sweep netting around detections of *A. cerana* nests is called delimiting surveillance and is undertaken in a grid pattern in one and two kilometre radius areas around the nest site. If the nest is in a new area, delimiting surveillance is also performed in the five and 10 kilometre radius areas around the detection site. Intensive sweep netting also involves more frequent revisiting of areas of interest.

The effectiveness of this method depends on the number of surveillance officers simultaneously undertaking sweeping in the field and their level of experience. An area can be surveyed more quickly and suspect areas can be targeted continuously when sufficient, experienced surveillance teams are available. The more often floral resources are revisited the more likely that this will correspond to a time when a foraging *A. cerana* is present.

4.1.3 Other techniques to enhance detection by sweep netting

A number of techniques have been utilised to increase the probability of detection of *A. cerana* by sweep netting.

- Targeted floral surveillance: Targeting of flowering plants known to be attractive to *A. cerana* increases the effectiveness of sweep netting. A dossier of plants attractive to *A. cerana* has been developed (Attachment 3);
- Sugar feeding stations and bait hives: Sugar feeding stations are places where a repository of a sugar solution is made available to bees. Bait hives are old managed honeybee hives which still have residues of bees wax and honey present. These sources of sugar/honey are places strategically to complement available food sources and provide some alternative food in monoculture areas such as the mangroves. The sugar solution may also be attractive to bees as a source of moisture in areas where little fresh water exists. The aim is to attract bees out of difficult terrain (e.g. mangroves, scrub country) to an accessible area that can be targeted for sweep netting. These attractants are also used to augment targeted floral surveillance by placing them near flora attractive to *A. cerana*; and
- Scenting: Scenting involves heating up bees wax on a small spirit stove and allowing the smoke to drift in the breeze. Bees are atttracted to the scent and follow the smoke plume towards the source of the odour where they can be caught by sweep netting. In our experience scenting has not been effective. This technique is no longer used routinely but will be reconsidered in difficult terrain when suspect bees are thought to be nearby.

4.1.4 Actions following detections of bees by sweep netting

Once foraging *A. cerana* have been identified, the nest needs to be found and destroyed. The process of tracing bees back to their nest is called bee-lining. If the bee-lining leads to an area which is inaccessible, another technique is to destroy the nest by remote poisoning.

Bee-lining involves training foraging bees to feed on sugar syrup so that observations can be made of the direction of their flight back to the nest. Timing of the flights will give an estimate of the distance to the nest. The sugar solution is gradually moved closer to the nest and observations continue until the nest can be located. The nest is immediately destroyed.

Remote poisoning is conducted by adding an insecticide to the sugar syrup solution so that bees transport the poisoned sugar syrup back to the nest where it kills off the brood and queen bee. It is most useful when bee-lining indicates the nest site is inaccessible. The method requires significant numbers of bees feeding on the sugar solution to ensure adequate poison is transported to the nest to kill it. The method has been effective in the Solomon Islands where some 300 bees were feeding on the sugar solution. A permit has been obtained from the APVMA for the emergency use of fipronil for remote poisoning of bees as a contingency. It has never been used in the Cairns region because the numbers of feeding *A. cerana* were considered inadequate (less than 10 bees in most cases).

4.1.5 Property inspection

This active surveillance method involves surveillance teams knocking on doors and obtaining permission to enter business and private premises and examine them for the presence of bees. It allows access to flora in back yards that might otherwise be inaccessible. Inspections are usually conducted in the vicinity of the known detections of *A. cerana* and where further nests are suspected. This surveillance has been combined with a public awareness program on exotic bees and on how to report suspicious bees and their activity.

4.1.6 Bee-eater surveillance

Bee-eater bird surveillance is an indirect means of determining if *A. cerana* are present in an area. It is not a means to identify the exact location of a nest site. The technique was developed by AQIS in Darwin to investigate the extent of an incursion of *A. cerana* that occurred there in 1998.

The bee-eater bird (rainbow bee-eater, rainbow bird, *Merops ornatus*) is a migratory bird widespread in Australia. Beekeepers are fully aware that this bird is a predator of bees. A number of behaviours make the bird useful for detecting the presence of bees such as *A. cerana*. These include a preferential bee diet and the disgorgement of pellets of indigestible insect parts such as bee wings that can be identified to bee species level. Bee-eaters congregate in flocks in 'roost trees' and return to the same trees nightly between March and September. In the other months they migrate or are breeding and only a few juvenile birds collect to roost at the roost site. Whilst roosting, the birds disgorge their pellets onto the ground below. The pellets consist of remains of bees foraged by the bee-eater in an area about 2 kilometres around the roost site. The method was established in Cairns and training has been conducted on how to dissect the pellets for evidence of bee wings and to differentiate bee wing venation patterns of *A. cerana* from those of *A. mellifera*.

Bee-eater birds returning to their roost trees at dusk were followed on foot and by bicycle to locate the roost sites. Up to 100 pellets are collected from under each roost tree between March and September and fewer pellets in other months. This method is an important, indirect means of indicating absence of *A. cerana* in an area and will assist with Proof of Freedom testing when *A. cerana* numbers are expected to be very low.

4.1.7 Odour Detection Dogs

Odour detection dogs are being successfully used by Biosecurity Queensland to detect insects in the current responses to fire ants and electric ants. They have also been used by AQIS to detect bees and honey at international airports.

The use of odour detection dogs is proposed as a means to increase the speed and accuracy of *A. cerana* nest detection in this response. Consultation with specialist dog trainers experienced with training sniffer dogs suggests the approach would be feasible and worth pursuing. Special training would be necessary because the dogs would be required to locate *A. cerana* nests which are often located high up in trees. This is very different from established applications where the target is usually at ground level, although detritus (dead bees, old wax etc) from a target nest may accumulate at the base of the tree and assist a dog with the detection of a nest.

Training of an odour detection dog would take approximately six months. The expertise is available within Biosecurity Queensland. This is discussed in more detail in Section 9.3.6.

4.1.8 Surveillance methods to detect exotic bee mites

Any detected *A. cerana* are tested for the presence of external bee mites (varroa and tropilaelaps) and internal tracheal mites. Managed *A. mellifera* hives are also regularly tested to ensure that the hives have not become infested with exotic bee mites. Bayvarol^{R} pest strips are hung in the brood chamber for 24 hours every three months. Any mites are killed by the insecticide and fall from the bees onto sticky mats inserted in the bottom of the brood chamber. The sticky mats are then sent to the Biosecurity Sciences Laboratory in Yeerongpilly, Brisbane for examination. A permit has been obtained from the Australian Pesticides and Veterinary Medicines Authority (APVMA) to use Bayvarol^{R} in managed bee hives during this response.

4.2 Passive surveillance

The public are a good source of information on the presence of *A. cerana* as these bees establish nests in urban areas and create problems for residents through stinging when disturbed and by nesting in inappropriate places. Information has been supplied to the public via newspaper reports, radio and television interviews and attendance at local events. Posters and flyers encourage the public and businesses in the restricted area to report unusual bee sightings. These posters and flyers are displayed and distributed at markets, field days, community stands and during surveillance work. The public are encouraged to contact the Queensland Primary Industries and Fisheries Business Information Centre if they see suspicious bees or swarms.

Particular effort was also made to involve the Queensland Honeybee industry by providing information individually by letter to registered beekeepers in north Queensland and through the industry association and beekeeper volunteers assisting in response activities. Local beekeepers are often called to assist home owners with swarms and their vigilance and ability to recognise unusual bees has led to detection of *A. cerana* swarms and nests.

5 Destruction of *A. cerana* nests

A. cerana nests are destroyed using permethrin dust after sealing off all entrances and exits to the nest area. Queensland holds a current permit from the Australian Pesticides and Veterinary Medicines Authority to use permethrin for destruction of feral honey bee nests. Where the nest is high up in a tree, an arborist may be required to access the nest and destroy it and also to lop the tree limb or open the trunk to obtain samples of bees and comb for evaluation.

6 Outcomes from the current response to *A. cerana* in North Queensland

6.1 Declaration of the Restricted Area

Following the initial detection of *A. cerana* in 2007, a restricted area (RA) was established on the basis of the reasonable probability that *A. cerana* had introduced exotic bee mites. The imposition of an RA allowed the movements of managed hives to be controlled until the extent of the incursion was known and the risk of the presence of exotic mites was assessed. The initial RA covered an area approximately 25 kilometres in radius around the index case as recommended in AUSVETPLAN. Its perimeter was the edge of the mountains to the west of Cairns and the coastline. Boundaries of local council areas were used as a convenient and easily conveyed description of the RA. The RA was extended in November 2008 to provide a larger buffer area when it became apparent that *A. cerana* were spreading southwards along the agricultural/urban corridor south of Cairns. In October 2009, it was again extended to include an area about 25 kilometres in radius around a detection of *A. cerana* at Mareeba on the Atherton Tableland, west of Cairns. A map showing the current RA is attached (Attachment 4).

Although no exotic mites have been detected, the RA remains in place as a safeguard and to expedite control of possible human-assisted spread of *A. cerana*. It also allows control over movements of managed bees to reduce interference with surveillance activities, particularly bee-lining.

Work has commenced to include *A. cerana* as an exotic disease in its own right under the *Exotic Diseases in Animals Act 1981*. The RA will then be effective due to the presence of *A. cerana* whether they carry exotic mites or not.

6.2 Nests, swarms of *A. cerana* identified

A map showing the geographical location of the 57 detections of *A. cerana* made in North Queensland between May 4 2007 and December 31 2009 is in Attachment 5. The maps in Attachments 6 and 7 show the location of nests and swarms in the Cairns area and south of Cairns in more detail. The index case was a nest of *A. cerana* bees in the mast of a yacht in dry dock in Portsmith, Cairns. It was reported on 4 May 2007 by a local beekeeper. Swarms and nests have been found in the Cairns CBD, as far north as Whitfield, in the agricultural corridor south of Cairns as far as Aloomba and as far east as Yarrabah township. A swarm and associated nest was found in Mareeba in August 2009 (Attachment 5).

During 2009, no detections occurred until 9 March 2009 (Detection 19 or IP19) which corresponded with the end of the wet season in Cairns when rain interfered with surveillance activities. From March to November 2009, detections averaged four per month (range 2 to 9). The nine detections in August included 3 swarms. There have been a total of 39 detections during 2009.

The total number of detections to date comprised 41 nests and 16 swarms. Of the 14 nests where bee numbers could be counted, the average nest size was 4386 bees (range 590 to 9080). Of 12 swarms that have been counted, the average size was 2192 bees. However, 6

swarms had less than 1000 bees (including IPs 42, 45, 47 and 48) while the other 5 consisted of 3,000-5,000 bees (IPs 9, 16, 26, 38 and 40).

The frequency of swarming is not known. In the current incursion, most swarms have been found within one kilometer of a nest with a recently hatched queen cell. For example, the IP16 swarm was detected in a house in Cairns and a nest was identified 50m from the swarm site three days later. The swarm and nest in Mareeba (IP40 and IP43) were less than 500 m apart.

Of the 57 swarms and nests identified in North Queensland, 83% were associated with fixed objects i.e. 26 were attached to trees and 21 were attached to man-made constructions (houses, schools, small sheds, pile of concrete blocks, a fence and a letterbox). Fourteen percent (eight swarms) were on transportable objects e.g. a wooden pallet, empty shipping containers (3), boats in dry dock (2), a cable reel and a tractor. *A. cerana* has established nests in large machinery and containers stored in industrial sites at the Port of Cairns as well as in crevices the walls and roofs of houses in the port area and the suburbs. Swarms or nests in mobile equipment may be transported to another destination. For example, IP20 was moved from the paddock to machinery shed by a tractor.

The movement of heavy equipment (probably a container) is also believed to account for the appearance of IP 43 at Mareeba, more than 20 kilometres from the closest known nest. AQIS often finds bee nests under containers and machinery on ships on the water. Of the nests and swarms on transportable objects in North Queensland, three (approximately 6% of total nests/swarms detected) were not obvious and could have been moved and inadvertently spread the bees. Because *A. cerana* are easily disturbed and become highly visible and sometimes aggressive, it is expected that presence of bees would become obvious when an object with attached bees is moved. The bees would be expected to be killed or reported.

6.3 Laboratory identification of suspected bees, bee nests and mites

6.3.1 Bee identification

Samples of suspect bees collected through surveillance are identified by a QPIF entomologist in Cairns. The identification of bees in suspected nests and swarms of *A. cerana* is made initially in Cairns and confirmed at the Biosecurity Sciences Laboratory in Brisbane.

Between 2007 and 2009, active sweep netting resulted in as many as 30 bee samples per day being collected. Of these, about 3% were positively identified as *A. cerana*. Strain typing was conducted by Dr Denis Andersen (CSIRO) on the first 9 detections and on IPs 11, 16 and 17 which confirmed the Java strain of Asian honeybee (*A. cerana javana*). This strain is found throughout Indonesia and Papua New Guinea. Strain typing was not continued after microsatellite testing indicated that all detected nests and swarms tested were genetically very similar.

6.3.2 Microsatellite testing

Microsatellite testing to date has used genetic markers at eight specific loci on the DNA of bees and these are used to assess relationships between bee colonies. Microsatellite testing was conducted by Dr Ben Oldroyd (University of Sydney) on the first 15 detections. The results indicated that similar genetic profiles existed for the bees collected from separate nest/swarm sites. This supports the hypothesis that only a single incursion initially occurred.

Microsatellite testing capability for honey bees has now been established at the Biosecurity Sciences Laboratory in Brisbane. Microsatellites from detections 1 to 40 have been tested at this location. The results also show similar genetic profiles among all tested detections.

6.3.3 Examination of nests and swarms

Examination of honeycomb may provide information on a nest's age, the viability of the nest and whether previous swarming has occurred. Counts of bees in the detected nests and swarms have also been conducted to provide other background information on *A. cerana.* Analysis did not confirm a significant change in the size of detected nests over time, however the trend indicates some reduction in size. It is speculated that this may reflect a lack of genetic diversity which is limiting the reproductive performance of the bees. Some swarms have had less than 300 bees. If they were *A. mellifera*, these swarms would not be expected to survive. It is not known if *A. cerana* can manage to build up a viable colony from such low numbers. The trend line showing the change in detected nest and swarm size over time is shown in Figure 1.

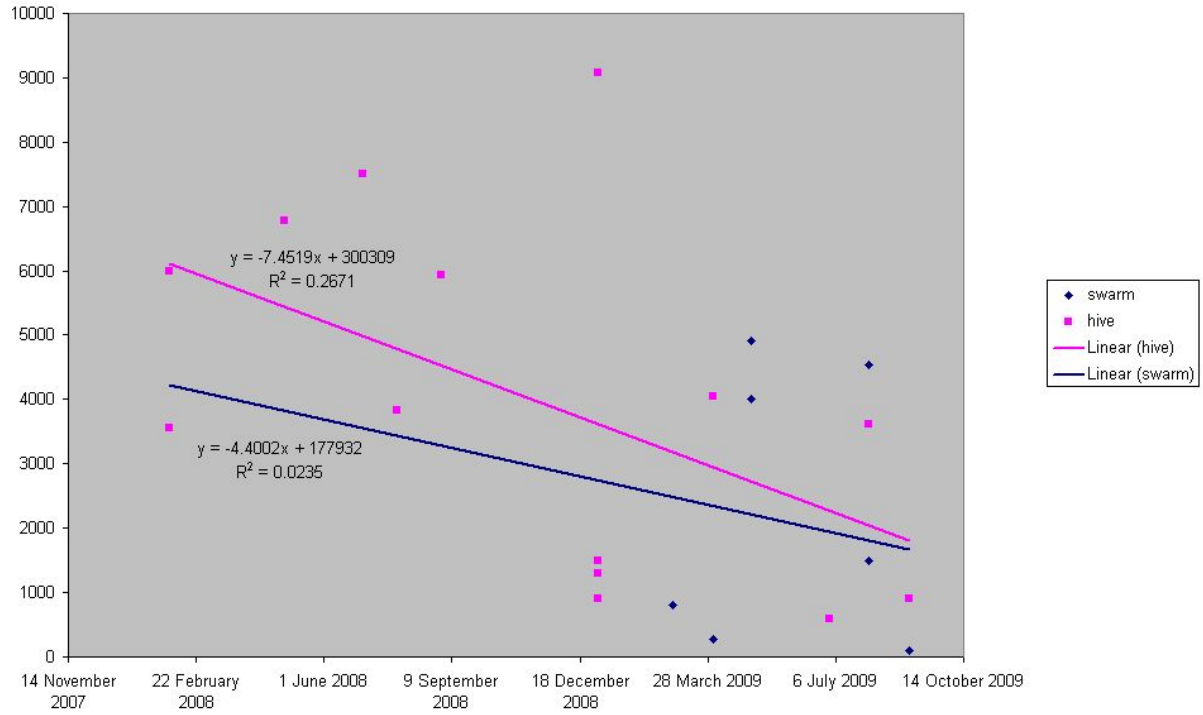

Figure 1. Regression analysis of the sizes of *A. cerana* nests and swarms from February 2008 until October 2009.

6.3.4 Monitoring bees and honeycomb for exotic mites

Bees and comb from all detected nests to date have been examined for exotic mites including varroa, tropilaelaps and tracheal mites at the Biosecurity Sciences Laboratory in Brisbane. All test results have been negative.

Managed honeybee hives in the RA have also been monitored for the presence of exotic mites using pesticide strips and sticky mats. No exotic mites have been detected.

7.0 Current surveillance activity and results

7.1 Pheromone traps (log traps and bait hives)

Ten log traps and 5 bait hives are currently in place as follows (Attachment 8):

- Admiralty Island which is an difficult area to access and the traps provide the best chance of attracting any *A. cerana* in the area;
- Cairns city near Spence Street where there has been a lot of *A. cerana* activity in the past; and
- The Port of Cairns which is considered at a higher risk of a new incursion through a swarm from a ship or cargo boat from overseas.

These traps and hives were previously checked weekly, but since early 2009 they have been checked fortnightly. No *A. cerana* have been detected to date.

7.2 Sweep netting

The RA has been divided into manageable areas or zones based on suburbs because the perimeter of the RA has been defined by local council area boundaries. In addition, field surveillance teams are local residents who are familiar with suburban boundaries. Sweeping has been conducted in each of the 46 Cairn's suburban areas in the RA, but only in six of the 46 suburbs on the Atherton Tableland.

The number of sweeps (incorporating targeted floral surveillance and the use of other techniques to attract bees) performed each month from September 2008 to the end of January 2010 is shown in Table 1. Approximately 3% of collected samples were positive. During this time, 29 nests of *A. cerana* were detected through sweep netting followed by bee-lining. All detections were within the RA.

Table 1: Sweeps conducted between September 2008 and November 2009

Month	Total sweeps performed	Number with no samples collected	Number of samples collected	Number of positive samples	Positive rate per 100 samples collected	Positive rate per 1000 sweeps performed
Sep-08	1152	1124	28	8	29	6.94
Oct-08	5883	5424	459	5	1	0.85
Nov-08	1429	1148	281	3	1	2.10
Dec-08	970	834	136	0	0	0
Jan-09	538	421	21	1	5	1.86
Feb-09	1332	1123	209	0	0	0
Mar-09	1352	951	401	8	2	5.92
Apr-09	949	668	281	7	2	7.38
May-09	1593	1405	188	7	4	4.39
Jun-09	2282	2217	65	10	15	4.38
Jul-09	1129	1011	118	11	9	9.74
Aug-09	1446	1183	263	13	5	8.99
Sep-09	1899	1652	247	8	3	4.21
Oct-09	1491	1473	18	5	28	3.35
Nov-09	1145	1027	118	6	5	5.24
Dec-09	832	601	231	0	0	0
Jan-10	736	590	146	8	5	10.87
Total	26158	22431	3727	100	2.68	3.82

7.3 Bee-lining

Twenty-six bee-lines have been performed after foraging bees were captured by sweeping. Bee-lining has taken from one day to several months to obtain a result. The time to locate a nest depends on the distance to the nest as measured by the flight time, the weather conditions and the number of foragers using the feeding station. More bees allow better estimations of flight time to and from the nest and make it easier to deduce the direction the bees are flying towards the nest. The terrain and experience of the surveillance team also affect the speed of nest location. So far, bee-lining has had a 100% success rate in locating the nest.

7.4 Remote poisoning

This activity has not been used because insufficient numbers of bees were using the feeding stations.

7.5 Property inspections

Intensive inspection of business premises in the Portsmith area was conducted in May 2007. House by house inspections of residential properties in the Cairns CBD area occurred from September 2008 to November 2008. Four nests have been detected through inspections of premises. Property inspection has occurred in other areas on an *ad hoc* basis where targeted flora can be seen from the footpath and access was needed for closer observation.

7.6 Bee-eater surveillance

Pellet samples from bee-eater birds were collected between May 1 2007 and November 30 2009. Ten roost sites were found in the Cairns area. Attachment 9 shows their location. (Note that there are two roosts very close together in Parramatta Park in Cairns CBD that appear on the map to be one location rather than two.) After formal sample collection began, 18 of 149 samples have tested positive for *A. cerana* wings. On each occasion, a viable nest of *A. cerana* was found nearby.

Regular testing of bee-eater pellets has not been undertaken because resources have been directed at bee-lining and the destruction and testing of detected nests. Results confirm that bee-eater surveillance does provides an indication that *A. cerana* are present in the area, although it does not directly lead to detection of a nest.

7.7 Monitoring of managed apiaries for bee mites

Surveillance of registered apiaries in the RA occurs on a quarterly basis. Hives are tested for evidence of external exotic bee mites (varroa and tropilaelaps mites). Surveillance of registered apiaries is considered essential because varroa is known to be very difficult to detect in small numbers. For example, in New Zealand, an estimated three years elapsed before an infested hive became apparent. All results to date have been negative.

7.8 Passive surveillance

Almost half of the detected nests/swarms have been reported to Biosecurity Queensland by the public. This level of responsiveness has been attributed to awareness by the public of quarantine issues and their exposure to other eradication programs for exotic insects i.e. yellow crazy ants and electric ants.

A dedicated community engagement officer has recently been appointed to focus on a coordinated campaign to maintain public awareness of the eradication program and to encourage reporting of unusual bees. The campaign will emphasise the risk of inadvertent human assisted spread of bees. Previous activities were successful with more than 900 calls being received by QPIF. Approximately 10 calls per week regarding nests and swarms in the Cairns and Mareeba restricted area are currently received. These are followed up within 2 days. Backup arrangements exist for weekend calls so that those reporting swarms can be attended to promptly.

7.9 Efficiency and effectiveness of surveillance methods used

The perceived efficiency and effectiveness of surveillance methods used to date are shown in Table 2 and Table 3.

Table 2: Estimated efficiency and effectiveness of active surveillance methods used to date

Method	Efficiency	Effectiveness	Application
Log Traps (pheromone trap)	A surveillance team of two field staff can inspect and refresh the pheromone in 5 log traps per day. Refreshed every 6 weeks & inspected fortnightly. There are currently 10 traps.	No detections.	Around the port where an incursion by a new swarm from overseas is possible and around Trinity Inlet where the terrain is too difficult for sweeping.
Bait Hives (pheromone trap)	A surveillance team of two field staff can inspect and refresh the pheromone in 5 bait hives per day. Refreshed every 6 weeks & inspected fortnightly. There are currently 5 bait hives.	No detections.	Around the port, around Admiralty Island and Cairns city where a cluster of nests is suspected.
Sweep Netting	Three days for a team of two field staff to cover approximately 1 square km. One day to check for attractive flowering plants and two days to intensively observe and sweep net at different times of the day.	26 of 55 nests found following initial identification of foragers.	General surveillance throughout the restricted area. Delimiting surveillance around new detections. Targeted surveillance where bee activity is suspected.
Targeted floral surveillance with sugar feeding stations and bait hives without pheromones	Takes one team of two field staff one day per week to refresh sugar syrup in sugar feeding stations and sweep net in the area around sugar feeding stations and bait hives.	No detections.	Along East and West boundaries of the agricultural corridor south of Cairns adjacent to forested areas. For enticing foraging bees from difficult terrain to areas where observation is easier.
Scenting	No reliable data. Labour and time intensive.	No detections.	Used on Admiralty Island where limited access is available for sweeping.
Bee-lining	Variable effort required. May take hours, or months depending on weather conditions, terrain and distance from the nest, number of bees and expertise of team.	Once foragers detected, 100% effective in detecting a nest. Identified 26 of 57 detections.	Whenever foragers are found and the nest isn't immediately obvious.

Method	Efficiency	Effectiveness	Application
Property inspections	One team of two field staff can cover about 30-40 houses/business premises per day.	Led to 4 of 57 detections.	In industrial areas and Cairns CBD where there is a need to access flora in people's backyards for sweeping. Combined with community engagement and awareness programs.
Bee-eater surveillance	10 sites, takes 1 team half a day and one diagnostician up to one day to identify the wings.	18 positive of 149 pellet samples formally tested.	Used to indicate Asian Honey bees presence within a 2 km radius. Potential to assist with Proof of Freedom studies.
Monitoring managed hives	One team of 2 field staff 2 days to monitor 8 apiaries. (Have to revisit on day 2 to collect sticky mat)	Quoted 94 % sensitivity of detection of external mites (best of the mite detection techniques in hives). No mites detected.	Used as early warning of exotic external bee mites especially varroa.

Table 3: Estimated efficiency and effectiveness of passive surveillance methods used to date

Method	Efficiency	Effectiveness	Application
Public reports	Until Oct 2009, surveillance staff and program leaders undertook public awareness activities. Higher level expertise is required. A community engagement officer has been engaged to coordinate actions. The surveillance manager is required to visit suspect premises, review and evaluate situations.	Led to 28 of 57 detections (16 swarms, 12 nests).	Every report is investigated. Average of ten calls per week.

8 Assessment of current position in the eradication effort and justification to continue surveillance

The monthly proportion of positive samples per 1000 sweeps and the number of positive samples per 100 suspicious insects collected are highly variable, but increased to the highest level so far in the month of January 2010 (Table 1). The possible explanations include:

- an improvement in the expertise of field surveillance teams which has definitely occurred since dedicated surveillance staff have been employed;
- a seasonal variation in bee foraging behaviour which is supported by the sweeping results and the known biology; or
- an increase in the number of *A. cerana* actually foraging.

Based on this, it is not possible to make reliable projections about the probable numbers of *A. cerana* swarms or nests.

However, it is possible to calculate a projected number of *A. cerana* nests over a number of years based on a number of assumptions. The theoretical number of *A. cerana* nests possible after the introduction of a single nest and assuming the nest swarms one to three per year and that there are no losses over a period of 5 years is shown in Table 4.

Table 4: Theoretical number of *A. cerana* nests possible in one to five years after the introduction of a single nest and assuming the nest swarms one to three per year and there are no losses.

Possible swarming rate	Years after initial nest becomes established				
	1	2	3	4	5
Once per year	2	4	8	16	32
Twice per year	4	16	64	256	1024
Three times per year	8	64	512	4096	32768

The calculations in Table 4 together with the number of detections made to the end of December 2009 (57 detections) indicate that:

- if the swarming rate is low (once per year), then the initial incursion must have occurred more than five years ago;

- if the swarming rate occurs twice per year, then the incursions would be at least 3 years old. This fits with the suspected year of initial incursion (2006) estimated from the age of nests detected to date.

- if the swarming rate is three times per year, the incursion is more than 2 years old. If this scenario or the one above is true, the number of nests would be expected to expand rapidly in the next surveillance period.

The assumption of no losses is probably not valid. The age of the oldest nest detected during the response was estimated at about 13 months. Hence it is unlikely that nests survive for 5 years. In addition, 5 of the 36 nests detected where the comb could be examined were assessed as dying (no queen or no worker brood or drone comb only). This equates to losses of 7% per annum. The size of recent swarms (three with less than 600 bees) may also be too small for survival. Expert beekeepers unanimously advise that *A. mellifera* swarms this small would not survive.

The relevance of these scenarios is that, even after taking into account an average loss of 7% of hives each year, they indicate that the likely success of efforts to eradicate *A. cerana* will become evident within the next year.

Continued surveillance with regular review and evaluation is the only way to establish whether the population of *A. cerana* in the North Queensland is declining or expanding.

Continued surveillance is also supported by other considerations. Judged by the public response in reporting suspicious bees and the level of cooperation given to surveillance teams, it is apparent that there is substantial community support for the eradication program. In addition, there has been effective cooperation from registered bee keepers in the restricted area who have reported suspicious bees and complied with movement restrictions in the restricted area.

It can be expected that the numbers of detections will increase in the short term with an increase in field surveillance staff (especially the planned quadrupling of numbers). If continued surveillance involving experienced operators over the full seasonal cycle shows a decline in rate of detection of *A. cerana*, then eradication is occurring. Should the numbers of *A. cerana* nests and swarms show a substantial and maintained increase over the seasonal cycle, then the feasibility of eradication should be reviewed. More specific criteria for evaluation of the surveillance activities are given in Section 8.4.1.

9 Proposed containment and surveillance activities for eradication and proof of freedom

The containment and surveillance strategies have been refined and amended with the experience of the previous two years.

9.1 Containment activities

The containment activities are:

- Maintenance of the RA;

- Monitoring the movement of managed bee hives and bee equipment through the use of permits; and
- Implementation of a system which will require businesses in the Cairn's Port vicinity to inspect port infrastructure, transport equipment and cargo loads for bee nests or swarms and report any suspicious observations.

Previous containment activities have focused on reducing potential interference with surveillance activities by bees originating from managed hives and by preventing the inadvertent movement of *A. cerana* when managed hives and boxed swarms are moved by beekeepers.

New approaches were considered to prevent human assisted spread of *A. cerana* following the unexpected detection of *A. cerana* in Mareeba (Table 5). Only approach 2 below was considered feasible and this approach has been included in the 2010 action plan.

Table 5: Suggested additional approaches to prevent human assisted spread of A cerana in the Cairns port region.

Approach	**Comments**
1. Inspection of business and business process associated with the Cairns port	Resource intensive. Current resources not adequate to implement. Possible small benefit as the mode of spread of *A. cerana* is not expected to be high.
2. Self regulation by business associated with the Cairns port	To involve business with most potential to transport *A. cerana* nests and swarms. E.g. business located in the port area where *A. cerana* nests have been previously identified and business involved with the importation of heavy machinery from Asia. Significant goodwill would be required and the diligence of the company to undertake inspection would need to be monitored. Significant training costs and operational cost to business. May have wider political implications. Higher approval necessary. A RAMS officer would be appointed to liaise with businesses and provide training in inspection for bees (in conjunction with the Community Engagement Officer). The RAMS officer would work with businesses to establish an inspection system including recording of inspections and reporting suspicious findings. The RAMS officer would set up an audit schedule to ensure that monitoring of cargo is conducted and recorded to the required standard.
3. Road blocks and vehicle inspection at the Cairns port and the perimeter of	Resource intensive and multi agency cooperation needed to be effective. Adverse public response expected. Not recommended at this stage.

the Restricted area	

9.2 Passive Surveillance

Future passive surveillance activities will involve a more coordinated and comprehensive approach to increasing public awareness and responsiveness regarding *A. cerana*. The Cairns public is already well educated about quarantine issues and has a culture of speaking up if they see anything unusual. The Community Engagement Plan aims to build upon this receptive community attitude which has successfully led to nearly half of all detected swarms and nests.

Some examples of planned activities to further increase public awareness include:

- Engagement with far North Queensland Beekeeping industry especially on Atherton Tableland;
- Engagement with businesses in the Cairns port area and other targeted areas where movement of heavy machinery, containers and equipment might result in inadvertent spread of bees;
- Increase public knowledge of Asian honey bees and encourage reporting (promotional materials, Neighbourhood Watch, shopping centres);
- Train QPIF staff and other relevant agencies (EPA, Railways, Main Roads) about Asian honey bees;
- Increase awareness at local government level (weeds officers, environmental health officers, parks and gardens officers);
- Radio and TV interviews/broadcasts;
- Presentations at Landcare and Bushcare meetings, attend local field days, agricultural shows and other events;
- Assistance to train new general surveillance staff to increase awareness of *A cerana*; and
- QPIF website updates.

9.3 Active Surveillance

Future active surveillance will include:

- Sweep netting;
- Property inspections;
- Bee-eater surveillance;
- Log traps and bait hives with pheromones;
- Monitoring of detected *A. cerana* bees and nests; and
- Odour detection dogs.

9.3.1 Sweep netting

An increase in surveillance staff is required for sweep netting so that all zones in the RA can be effectively surveyed at least twice annually and suspicious zones targeted for intensive surveillance at least four times per year. It will also allow delimiting surveillance to be conducted around all detection sites. Sweep netting takes a team of two people 2-3 days to effectively cover a designated area before moving on to the next area. Experience has shown that flowering plants need to be visited at a number of different times of day and on different days to maximise the chances of detecting bees foraging on them. Techniques to attract bees

to locations where they can be sampled by sweep netting will continue to be used to improve the likelihood of detecting *A. cerana*.

9.3.2 Property inspections

Property inspections will focus on businesses and residences in the port area, in the Cairns CBD and in residences and farm houses area where clusters of *A. cerana* nests or swarms have been found previously. Bee samples will be collected using sweep nets.

9.3.3 Bee-eater surveillance

Bee-eater bird roost sites need to be identified on the Atherton Tableland and more investigation of potential roost sites conducted in Cairns (currently 10 identified). Pellet samples will be collected on a regular weekly basis during the roosting season (March to September) and whenever possible at other times. Results of testing will be analysed to enable the effectiveness of this surveillance method to be measured quantitatively. It is anticipated that Bee-eater surveillance will become an important tool in the Proof of Freedom phase of the response.

9.3.4 Log traps and bait hives

This method has had no success in the past but as little cost, staff time and effort are required, this method of surveillance will continue. Use will be restricted to the port area and around Admiralty Island where the risk of incursion of a new swarm is highest and where the terrain makes monitoring by sweep netting difficult.

9.3.5 Monitoring for exotic mites

All detected *A. cerana* bees and nests will continue to be tested for the presence of exotic mites. Testing to date indicates that no exotic mites have been introduced. There is an ongoing risk that another incursion of *A. cerana* might occur through the port of Cairns and mite testing may be the first indicator of this.

Managed apiaries in the Cairns area have been monitored every 3 months and monitoring on the Atherton Tableland has commenced starting with apiaries closest to Mareeba. This activity will cease as part of this eradication program as it does not impact directly on eradication efforts. However, some monitoring of managed honeybee hives for the presence of exotic mites will continue as part of another program to support trade in live bees.

9.3.6 New initiatives

- **Utilising an odour detection dog**

It is proposed that a trial be conducted using an odour detection dog to evaluate their effectiveness in detecting Asian honeybee nests.

The estimated costs of procuring, training and kenneling a suitable dog to be ready to work by June 2010 in time for the spring peak bee season is $88,500. Subsequent maintenance costs are estimated to be $15,000 (dog) and $85,000 (trainer and handler) or $100,000 per annum. Minimal ongoing refresher training is necessary. The above costs would be those incurred using a Biosecurity Queensland dog trainer.

The cost of outsourcing this training is much greater as is the purchase of a dog that is already trained.

In anticipation, fresh *A. cerana* bees and some nest material have been retained to use for dog training purposes.

- **Establishing new technology for analysis of bee-eater pellets**

Polymerase chain reaction (PCR) technology for identification of *A. cerana* specific genetic material is available at CSIRO in Canberra. The Biosecurity Science Laboratory at Yeerongpilly has the general capability to undertake PCR testing. It is proposed to apply PCR technology to Bee-eater surveillance. Current testing of bee-eater pellets is labour intensive and focuses on identification of *A. cerana* bee wings by venation pattern. Since there are other sources of *A. cerana* genetic material in the pellets besides wings, PCR technology has the potential to improve the sensitivity of testing as well as its' efficiency and cost effectiveness. The development and evaluation of PCR for bee-eater pellet testing will cost an estimated $13,000. The primers purchased for this work would then be available for ongoing testing.

9.3.7 Laboratory testing of suspect bees, *A. cerana* nests and swarms and managed apiaries

The laboratory tests in routine use, the service provider and some comment regarding current activities are shown in Table 6.

Table 6: Laboratory tests required, test provider and some additional information on the test.

Test type	Service provider	Comment
Bee identification	QPIF Cairns, Biosecurity Queensland Townsville and Brisbane	Delays have occurred due to large numbers of samples. A part time technician to assist is required. This includes bee wing identification at Townsville. Development of a PCR test may improve bee-eater pellet test efficiency but will cost c. $13,000.
Bee counts	Biosecurity Queensland Brisbane	Provides an indication of nest/swarm viability. Delays have occurred due to large numbers of samples. A part time technician to assist is required.
Nest examination	QPIF Cairns	Provides estimate of a nest's age, if the nest has swarmed and colony viability. In-house specialist skills exist.
Exotic mites	Biosecurity Queensland Brisbane	Conducted on bees and on comb of *A. cerana* detections. In house specialist skills exist.
Microsatellite	Biosecurity Queensland Brisbane	Intensive microsatellite testing, using 24 loci rather than just 8, has the potential to improve the identification of genetic links between different colonies of Asian honey bees and provide more reliable test results. Since testing of the first 40 *A. cerana* nests or swarms using 8 loci indicated similar genetic makeup, further microsatellite testing is considered unnecessary unless there is a reason to suspect a new incursion such as an *A. cerana* nest of unusual size in the port area. The cost of testing an expanded number of loci (approximately $18,000) was considered too high. If further testing is required, reagents for testing at 8 loci would cost about $3,000.

The flow chart of surveillance monitoring is shown in Figure 2. Tables 7a, 7b and 7c show the surveillance action plan for 2010.

9.3.8 Destruction of nests and swarms

Nest of *A. cerana* will be destroyed in the evening following detection when most foraging bees have returned to the nest. All bees and comb will be collected whenever possible and submitted to the laboratory for testing and evaluation. If all bees and comb cannot be accessed, samples are collected. Access to a nest may require contracting of an arborist if the nest is elevated in a tree. Swarms of *A. cerana* will be destroyed immediately after detection before they move to a new nest site. Permethrin dust is the preferred destruction method with backup from household knock down insect spray. Samples of bees and comb from each nest or swarm are retained in the laboratory after testing and the remainder disposed of as pathological waste.

9.3.9 Proof of Freedom surveillance

Proof of Freedom surveillance will consist of the same containment, active and passive surveillance activities as for the eradication phase of this response. Active surveillance will focus on sweep netting and bee-eater surveillance, but property inspections would still be conducted (with the odour detection dog) and pheromone traps would remain in place. The number of nest/swarm detections would be less so laboratory resources could be diverted to Bee-eater pellet analysis.

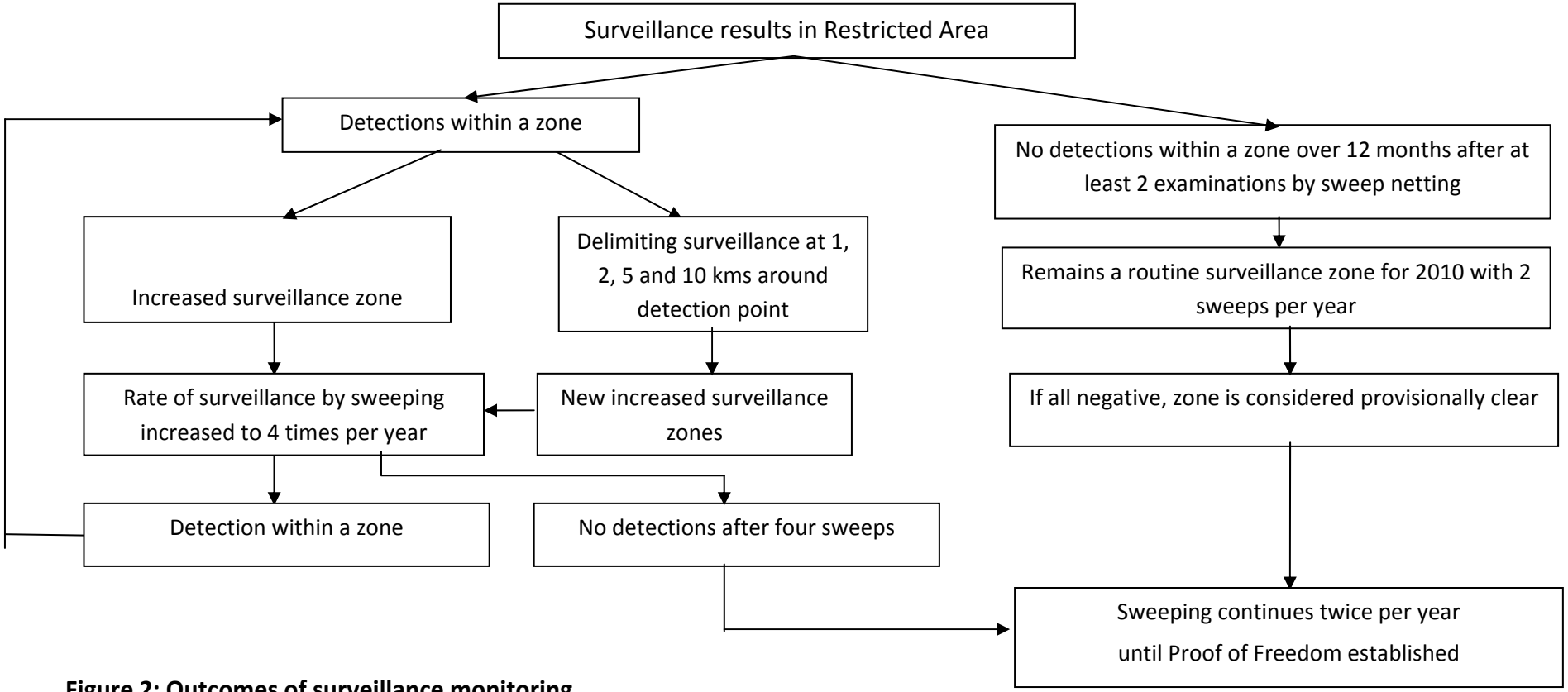

Figure 2: Outcomes of surveillance monitoring

Table 7a: *A. cerana* surveillance action plan for 2010

Strategy	Tasks	Completion date	Location	Justification	Persons responsible
Containment					
1. Maintain restricted area	1. Divide the RA into zones based on suburb 2. Inform bee-keepers of the extent of the RA and the implications for their business	1. Completed 2. Completed	N/A	1. Comprehensive coverage; Proof of freedom 2. Increase awareness and engagement of bee-keepers with identification and reporting of unusual bees	Coordinator, Cairns
2. Monitor movement of managed bee hives and equipment	1. Maintain current operations	Ongoing	Movements in, out and within RA	Control known risks (e.g. movement of swarms and interference with bee-lining)	Coordinator, Cairns
3. Involve business in monitoring at the port	1. Obtain Departmental approval 2. Consult with business 3. Devise agreed monitoring systems 4. Provide training 5. Monitor performance	February 28, 2010	Cairns port area	To reduce the risk of inadvertent spread of *A. cerana*	Coordinator, Cairns & Community Engagement Officer, Cairns

Table 7b: *A. cerana* surveillance action plan for 2010

Strategy	Tasks	Completion date	Location	Justification	Persons responsible
Passive surveillance					
1. Improve community awareness and reporting	1. Develop a Community Engagement Plan 2. Implement plan	1. February 28, 2010 2. Ongoing	RA	Cost effective way of improving detection rates	Community Engagement Officer, Cairns

Table 7c: *A. cerana* surveillance action plan for 2010

Strategy	Tasks	Completion date	Location	Justification	Persons responsible
Active surveillance					
1. Sweep Netting to detect foraging bees including targeted floral surveillance	1. Sweep entire restricted zones twice per year 2. Sweep increased surveillance zones at least four times per year 3. Delimiting surveillance around new detections 4. Record surveillance points and sample collection sites 5. Maintain list of plants attractive to *A. cerana*	Ongoing	RA	Known effective method to detect foraging bees	Surveillance Manager, Cairns
2. Bee lining after foraging bees have been identified	1.Train bees to feed on sugar syrup 2. Undertake bee-line activity	As required	RA	Proven method to locate nests	Surveillance Manager, Cairns
3. Log Traps	1. Check existing 10 log traps fortnightly 2. Refresh the pheromone every 6 weeks	Ongoing	Specific locations in RA	Situated in areas where the terrain is too difficult for sweeping and where there is a higher risk of a new incursion via the port.	Surveillance Manager, Cairns
4. Bait Hives	1. Check existing 5 bait hives fortnightly 2. Refresh the pheromone every 6 weeks	Ongoing	Specific locations in RA	Situated in areas where the terrain is too difficult for sweeping and where a cluster of nests exists and another is suspected.	Surveillance Manager, Cairns

Strategy	Tasks	Completion date	Location	Justification	Persons responsible
5. Property inspections	1. Identify targeted areas 2. Draw up a priority list	Ongoing with increased activity when environmental conditions makes sweeping difficult or ineffective	Predominately in the Cairns CBD, port area and industrial areas	1. Allows access to flora in private property which is otherwise inaccessible 2. Allows closer examination of business premises for suitable nesting sites for bees	Surveillance Manager, Cairns
6. Bee-eater surveillance	1. Identify bee-eater roost sites on Atherton Tableland and organise approvals to collect pellets 2. Collect pallets weekly from the Cairns roost sites (10) and elsewhere when available 3. Further evaluation for effectiveness for Proof of Freedom surveillance 4. Investigate PCR as a method for analysis of pellet samples	Seasonal, predominantly March to September	Roosts in RA	Value adding and independent indicator of possible *A. cerana* presence.	Surveillance Manager, Cairns
7. Odour detection dogs	1. Obtain approval to proceed (Departmental expertise exists) 2. Identify a suitable dog and train it. 3. Train a handler. 4. Conduct and evaluate a trial 5. Integrate into surveillance plan	1. January 31 2010 2. Process expected to take six months after funding approval.	In areas in the RA where the terrain precludes sweep netting and in industrial areas	Proven method of insect detection in current use with QPIF. Potential to improve detection capability.	1. Principal Veterinary Officer 2. QPIF dog trainer 3. Surveillance Manager

9.4 Assessment and review

The Biosecurity Queensland Control Centre at Oxley will oversee the operational aspects of surveillance activities and will provide a report on a quarterly basis. The quarterly report will include maps showing zones with all negative surveillance results, maps showing the location of destroyed nests and swarms and the location of *A. cerana* identifications for which the nest has not been located. It will also include a comparison of the success of each of the surveillance method utilised and expenditure monitoring.

9.4.1 Criteria for assessing surveillance outcomes

Success of the surveillance plan will be assessed on the basis of the numbers of detections of nests and swarms and the geographical extent of these detections. The success criteria and the exit criteria are shown in Table 8.

Criteria based on numbers of *A. cerana* nests and swarms detected

- The success criteria take into account the seasonal variation in the number of detections that occurred in 2009. Accordingly, the success criteria for the first half of 2010 are eight detections or less which represents 60% of the detections made during this period in 2009. The success criteria for the second half of 2010 are 12 detections or less which represents 50% of the detections made during this period in 2009.

- Exit criteria have also been formulated (for the first half of 2010, more than or equal to 150% of detections in the same period in 2009 and for the second half of 2010, more than or equal to the same number of detections in the same period in 2009). If these are reached, the incursion is considered uncontrollable and eradication is not likely with the available resources. CCAHB would be informed of this development and a recommendation would be made that an exit strategy be developed.

  A second exit criterion for nest/swarm detections is based on the number of detections made during 2009. The exit criteria for the number of detections for the first and second halves of 2010 are 150 % and 100 % respectively of the detections made during the first and second halves of 2009.

- The review criteria is defined as when the number of detected *A. cerana* nests/swarms fall between nine and 19 nests/swarms in six months. This will be reported to the CCAHB and a review of surveillance activities will be made.

- It is expected that an increase in trained field surveillance staff will result in an increase in the number of detections. It has been recognised that a lack of funding for surveillance staff has been the most significant factor affecting the effectiveness of surveillance.

Criteria based on geographical spread of *A. cerana*

Success and exit criteria have also been based on measurements of the geographical extent of detections.

An infested area is defined as the area circumscribed by a line that is no more than one kilometer away from any previous detection site.

- Surveillance will be considered to be succeeding when an expansion of the known infested area is less than 10% of the 2009 infested area for both the first and second halves of the year;
- The corresponding exit criterion is defined as a 50% or more increase in the infested area for 2009;
- Review of the surveillance activities will occur when the infested area expands between 11% and 49% of the known infested area for 2009 and if an *A. cerana* nest is detected more than 15 kilometres outside the current RA.
- A swarm of A. cerana was found at Lake Eacham on 24 December 2009. Subsequent surveillance shows this was the result of natural spread from Goldsborough. Discussion of this incident at the Consultative Committee on Asian Honeybees resulted in addition of another exit criteria which is the detection of another nest or swarm of *A. cerana* more than 5 kilometres to the west and south of IP57 i.e. in a direction away from the majority of detections to date.

It is anticipated that *A. cerana* will be eradicated within two years provided that surveillance continues for two spring seasons when bee activity and swarming are expected to be greatest.

If the success criteria are met for 2010, then surveillance would continue into 2011. Provided that *A. cerana* activity is progressively declining, then Proof of Freedom could commence as early as 2012. Proof of Freedom is expected to take two years. If no bees or nests/swarms are detected for a three month period during the dry season in 2011, advancing the onset of Proof of Freedom surveillance should be considered.

Criteria for assessing Proof of Freedom surveillance

These criteria would be developed as the eradication phase of the response concludes. They would likely include similar criteria to the above plus additional criteria related to Bee-eater pellet analysis results.

Table 8. Success, exit and review criteria for *A. cerana* surveillance

Time frame	Nest/swarm detections			Geographical extent of incursion		
	Success criteria	**Review criteria**	**Exit criteria**	**Success criteria**	**Review criteria**	**Exit criteria**
Jan-Jun 2010	<= 8 nests or swarms	9 – 19 nests or swarms	>= 20 nests or swarms	<= 10% increase in extent of known infested area	11 – 49% increase in extent of known infested area or Detection occurs more than 15km outside the current RA	>= 50% increase in extent of known infested area or detection occurs more than 5km to the south or west of IP57
Jul-Dec 2010	<= 12 nests or swarms	13 – 23 nests or swarms	>= 24 nests or swarms	<= 10% increase in extent of known infested area	11 – 49% increase in extent of known infested area or Detection occurs more than 15km outside the current RA	>= 50% increase in extent of known infested area or detection occurs more than 5km to the south or west of IP57

10 Budget

Table 9 shows a summary of the total costs and different component costs for surveillance, destruction and containment activities. The total costs are $1,355,657 for the next 6 months (until the end of the 2009/10 financial year) and $2,702,006 for the 2010/11 financial year.

More detailed analysis of the budget for *A. cerana* for the remainder of 2009/10 and for 2010/11 is shown in separate Excel worksheets (Attachment 10).

Assuming that surveillance criteria continue to indicate success, surveillance for eradication is expected to take two years (involving two spring seasons when bee activity is maximal) followed by Proof of Freedom surveillance for two years. An extrapolated budget for the entire program is shown in Table 10.

Costs of eradication beyond the 2010/11 financial year have been projected by taking into account an enterprise bargaining agreement increase of 3 to 4% and some increases in the costs of supplies and services (by cost price index). Staffing levels are expected to remain similar through both eradication and proof of freedom phases of the program. These projections are also in the spreadsheet (Attachment 10)

Table 9: Summary of staff and operational costs and total costs for an Asian honey bee eradication program for the remainder of the 2009/10 financial year and the 2010/11 financial year.

	Costs January 2010 to June 2010 (6 months) ($)			Costs July 2010 to June 2011($)		
Activity	**Staff**	**Operational**	**Total**	**Staff**	**Operational**	**Total**
Program management	62,797		**62,797**	130,617		**130,617**
Active surveillance	738,775	180,854	**919,629**	1,559,884	337,124	**1,897,008**
Mapping	17,832	1,703	**19,535**	38,268	1,081	**39,349**
Data entry	40,345	3,206	**43,551**	86,033	1,761	**87,794**
Detector dog	60,815	23,832	**84,647**	85,477	29,681	**115,157**
Laboratory analysis	71,327	1,114	**72,441**	179,972	4,513	**184,485**
Bee-eater PCR test optimisation		13,000	**13,000**			
Microsatellite testing **May not be required**		3,000	**3,000**			
Community Engagement	53,495	7,103	**60,598**	114,804	11,881	**126,685**
Containment	31,592	18,869	**50,460**	67,827	31,086	**98,913**
Demountable building & contingency		26,000	**26,000**		22,000	**22,000**
Total	**1,076,977**	**278,681**	**1,355,658**	**2,262,881**	**439,126**	**2,702,007**

Table 10. Projected costs for eradication of *A. cerana* and Proof of Freedom over the expected lifetime of the program.

Program Phase	Year	Costs
Eradication	2009/10 (Jan-Jun 2010)	$1,355,657
	2010/11	2,702,006
	2011/12 (Jul-Dec 2011)	$1,401,079
	Sub-total	**$5,458,743**
Proof of Freedom	2011/12 (Jan-Jun 2012)	$1,401,079
	2012/13	$2,797,017
	2013/14 (Jul-Dec 2013)	$1,394,676
	Sub-total	**$5,592,772**
	Total	**$11,051,515**

Attachment 1. Detections of exotic *Apis* species in northern Australia since 1995

Date	Area	Location	Origin	Ship	Comments 1	Comments 2
?1995	Torres St islands	Top Western Islands	PNG		*A cerana*. Wind assisted swarms	*A cerana* now endemic on these islands
Apr-95	Off Mooloolaba	On vessel at sea	?	?	*A cerana*. Destroyed on vessel	
Jun-98	Darwin	House laundry	?	?	Nest of *A cerana*	
16.9.99	Brisbane	Hamilton dock	Lae?	Cape Jervis	Swarm of *A cerana*	
29.12.99	Brisbane	Fisherman Islands (in grader)	Lae, PNG	?	Nest of *A cerana*. *Varroa* mites found on some bees	A second (abandoned) nest in crane in same consignment
4.3.00	Brisbane	Fisherman Islands (under a container)	Malaysia via Singapore		Swarm of *A dorsata*	
3.8.00	Cairns	Trinity Wharf	Papua, Indonesia	Java Sea	Only dead *A cerana* found	
31.12.02	Brisbane	Between Gateway Bridge and Hamilton Wharves	Lae, PNG	?	One *A cerana* found. It had stung a crew member	Boat travelling under Gateway bridge
Date	**Area**	**Location**	**Origin**	**Ship**	**Comments 1**	**Comments 2**

Feb-03	Off Northern Australia		Singapore	Oil tanker	*A. dorsata*: large swarm. Dead bees found on arrival at port	
Feb-03	Off Northern Australia		Indonesia	?A vessel	*A. dorsata*. Seven dead bees and one dying bee. No evidence of swarm. No mites	Probably same case as the one above
May-04	Cairns	Portsmith	Papua, Indonesia	Java Sea	Swarm of *A. cerana*	
14.11.04	Brisbane	Fisherman Islands (under container)	Lae, PNG		*A. cerana* nest < 1m old *Varroa jacobsoni*	
Apr-05	Brisbane		Lae, PNG	'a boat'	'A single incursion of *A. cerana*'	
?06–07	Cairns	Portsmith	?	?	7 .*A cerana* nests found in 2007	Eradication program commenced May 2007. Still in action in November 2009.
2/07/2009	Townsville	Flatracks on break bulk cargo boat "Nuigini Coast"	Lae, PNG	Nuigini Coast	Dead *Apis cerana* (Asian honeybees) and nest. No live bees.	Negative for Varroa, Tropilaelaps and Tracheal mites, 1080 bees counted but more lost (blown away or not swept up) No queen found. Comb had no honey or pollen reserves, no Q cells or drone brood. Suspect small struggling nest either fumigated in PNG or starved out on trip of 5-7 days from PNG.

Attachment 2

Comparative photograph of *A. cerana* and *A. mellifera*

Attachment 3

List of flowering shrubs and trees known to be attractive to *A. cerana*.

1. Coconut palm (Cocos nucifera)
2. Cuban royal palm (Roystonea regia)
3. Alexandra palm (Archontophoenix alexandrae)
4. Mimosa (Mimosa pudica)
5. Mad hatter (Cuphea mexicana)
6. Singapore daisy (Sphagneticola trilobata)
7. Soft khaki weed (Gomphrena celosioides)
8. Farmer's friend (Bidens pilosa)
9. Bottle brush (Callistemon sp.)
10. Beech almond (Terminalus cattapa)
11. Golden cane palm (Chrysalidocarpus lutescens)
12. Blue nun (Delarbrea michieana)