# Hazard identification and import release assessment:

# The introduction of red imported fire ants into New Zealand via the importation of goods and arrival of craft from Australia, the Caribbean, South America, and the USA.

**Biosecurity Authority**
**Ministry of Agriculture and Forestry**
**Wellington**
**New Zealand**


**5 August 2002**

Ministry of Agriculture and Forestry
Te Manatu Ahuwhenua, Ngaherehere
ASB Bank House
101-103 The Terrace
P O Box 2526
Wellington
New Zealand

Telephone: +64 4 474 4100
Facsimile: +64 4 474 4133
Internet: http://www.maf.govt.nz

Animal Biosecurity
Biosecurity Authority

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Approved for general release

Derek Belton
Director Animal Biosecurity
Biosecurity Authority

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## Contributors to this risk analysis

### 1. Primary Author

| | | |
|---|---|---|
| Toni Tana | National Adviser, Risk Analysis | MAF Biosecurity |

### 2. Project Team

| | | |
|---|---|---|
| Ken Glassey | Programme Co-ordinator | MAF Biosecurity |
| Brendan McDonald | Programme Co-ordinator | MAF Biosecurity |
| Amelia Pascoe | Programme Co-ordinator | MAF Biosecurity |

### 3. External Expert Advisers

| | |
|---|---|
| Sanford D. Porter | USDA/ARS, USA |
| Charles Barr | Fire Ant Project, Texas A&M University, USA |

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# 1 Executive summary

Red imported fire ant (RIFA) (*Solenopsis invicta*) is a native ant species of Argentina, Brazil and Paraguay[1]. It is a significant agricultural and urban pest in the United States of America (USA), where it established after its unintentional introduction sometime between 1930 and 1940[1]. More recently, RIFA has established on a number of islands in the Caribbean[2] and in Queensland, Australia[3]. A single nest was discovered at Auckland International Airport, New Zealand in February 2001[4]. The routes of entry of the Australian and the New Zealand incursions are unknown.

Concerns have been raised that there might be further RIFA incursions into New Zealand as a result of international travel and trade. The establishment of RIFA in this country would have significant negative economic and social impacts, affecting horticulture, agriculture, wildlife and community infrastructures.

The establishment of RIFA would require the importation of a viable queen; either as a newly-mated female or through the inadvertent importation of all, or part, of a RIFA nest. Introduction by air or sea transportation could occur.

A newly-mated queen is essentially a hitchhiker pest and could be transported on a variety of imported items, including traded commodities, containers, packaging, aircraft, vessels, and in passenger baggage. Goods imported from an infested area that contain soil, are contaminated with enough soil to support a small colony or have suitable moist cracks and crevices, have the potential to be carrying a RIFA nest infestation. Goods that have spent periods of time outside, in contact with the ground, have the greatest likelihood of RIFA infestation.

This assessment examines the pathways by which RIFA could enter New Zealand and estimates the likelihood of introduction via each pathway. The assessment will be used to prioritise resources for preventing future incursions.

A qualitative assessment has been performed, with each pathway given a relative ranking of 'negligible', 'low', 'moderate', 'high' or 'very high'. Untreated soil from an infested area, that undergoes no inspection or post-arrival quarantine, is assessed as having a 'very high' likelihood of introducing RIFA. Untreated soil has been used as the point of reference when allocating the relative likelihood of introduction of RIFA by the other pathways examined.

Currently, all infested countries pose some degree of risk of exporting RIFA to New Zealand. As a result of trade patterns and proximity, RIFA are most likely to be introduced from Australia[A]. The introduction of RIFA from the USA is more likely than from South America or the Caribbean.

[A] Australia has implemented an eradication program that may change its RIFA status.

The following table summarises the likelihood of RIFA introduction via each examined pathway. It must be emphasised that any commodity from a RIFA-infested country, that has spent a period of time outdoors and in contact with the ground, should be considered to be a high risk.

| Route | Likelihood of introduction |
|---|---|
| • Commercial importation of untreated soil that undergoes no inspection or post-arrival quarantine.* | Very high |
| • Sea containers – wharf-inspected<br>• Sea containers – transitional facility-inspected<br>• Packaging materials: sea – wharf-inspected<br>• Vehicles<br>• Used car parts<br>• Used machinery<br>• Non-wooden building materials<br>• Untreated and non-manufactured wooden building material<br>• Bark<br>• Hay<br>• Used electrical equipment | High |
| • Sea vessels<br>• Personal effects (unaccompanied baggage)<br>• Animal containers<br>• Packaging materials: air<br>• Packaging materials: sea – transitional facility-inspected<br>• Nursery stock (dormant bulbs)<br>• Manufactured wooden building materials<br>• Treated wooden building materials | Moderate |
| • Aircraft<br>• Accompanied baggage: air<br>• Accompanied baggage: sea<br>• Air containers<br>• Nursery stock (raised from seeds or cuttings)<br>• Soil imported under MAF Soil Import Health Standard<br>• Straw<br>• Air courier cargo<br>• International mail | Low |
| • Transportation on a person<br>• Nursery stock (tissue culture)<br>• Beehives | Negligible |

* Such an importation is prohibited, but is included here as the point of reference for other pathways.

# 2 Introduction

This assessment has been carried out because of concern over the possibility of further incursions of RIFA into New Zealand through international travel and trade.

The recent establishment of RIFA in Brisbane, Australia and the discovery of a nest at Auckland International Airport in February 2001 have highlighted the need to identify the pathways by which RIFA could enter New Zealand, estimate the likelihood of introduction by each of these pathways and examine measures that could be successfully implemented to prevent further incursions.

This assessment examines the pathways by which RIFA could enter this country and estimates the likelihood of introduction via each pathway. A qualitative assessment has been performed, with pathways given a relative ranking of 'negligible', 'low', 'moderate', 'high' or 'very high'. Untreated soil from an infested area, that undergoes no inspection or post-arrival quarantine, is assessed as having a 'very high' likelihood of introducing RIFA. Untreated soil has been used as the point of reference when allocating the relative likelihood of introduction of RIFA by the other pathways examined.

The Ministry of Health (MoH) and the Department of Conservation (DoC) have provided comment on a draft of this document. The footnotes in bold show their comments and MAF's responses.

**NOTE:**
MAF Biosecurity Authority standards and MAF Quarantine Service (MQS) process procedures are subject to periodic review. The information referenced in this analysis is, therefore, subject to change.

# 3 The risk analysis framework

This assessment is based on the import risk analysis framework developed by the Office International des Epizooties (OIE)[5].

## 3.1 Hazard identification

In this assessment, hazard identification involves identifying craft or goods that are capable of harbouring RIFA, which are classified as unwanted organisms under the Biosecurity Act 1993. The relevant ecology of RIFA is assessed to identify the types of craft or goods that could act as vehicles (fomites) for introduction. While the scope of the Biosecurity Act does not encompass people as potential vehicles for the introduction of organisms, this document will assess their role as a potential fomite.

## 3.2 Risk assessment

A risk assessment evaluates the likelihood and the biological, environmental and economic consequences of the entry, establishment or spread of an organism. In this assessment, each craft or good that may act as a potential fomite for the introduction of RIFA is evaluated in the form that it is intended to be used, processed or sold when it arrives in, or is imported into, New Zealand.

A risk assessment consists of four inter-related steps:

1) *Release assessment*: The biological pathway(s) necessary for the craft or goods to become infested with RIFA are described and the likelihood of such infestations when craft arrive or goods are imported, given current MQS practices, is estimated. Thus, this release assessment considers the likelihood of entry via a particular pathway up until the point where biosecurity clearance is given.

2) *Exposure assessment*: A description of the biological pathway(s) necessary for RIFA to spread, or become established and an estimation of the likelihood of these events occurring. MAF Biosecurity used the 'CLIMEX' model to determine the potential geographical distribution of RIFA in New Zealand[6].

3) *Consequence assessment*: The identification of the potential biological, environmental and economic consequences associated with the entry, establishment or spread of RIFA and an estimation of the likelihood of these consequences occurring. MAF Biosecurity has carried out an economic impact assessment[4].

4) *Risk estimation*: The results of the release, exposure and consequence assessments, summarised to produce an estimate of the risks associated with the importation of RIFA.

## 3.3 Risk management

Risk management is the process of deciding upon, and implementing, measures to effectively manage the risks posed by the importation of RIFA.

# 4 Definitions

**Accompanied baggage**
Personal baggage accompanying a travelling individual. For air travel, this includes carry-on and checked baggage.

**Aircraft residual disinsection**
The application of an insecticide to an aircraft cabin and hold areas, including flight decks, toilet and locker areas, etc. The insecticide product has the capability to kill insects that contact the treated surfaces over an extended period of time post-treatment. Treatments are performed every eight weeks unless a live fly bioassay efficacy result requires the aircraft to be re-treated sooner. Surfaces within the aircraft cabin that are routinely cleaned during the eight-week period are required to be re-treated as appropriate.

**Airside**
Airside means that part of a security designated aerodrome declared as a security area under section 84 of the Civil Aviation Act 1990; and aerodrome has the same meaning as in that Act[7].

**Alate**[B]
A winged ant. Refers to queens that have not yet removed their wings prior to egg-laying, and to males[8].

**Biosecurity clearance**
A clearance issued by an inspector under section 26 of the Biosecurity Act 1993. The clearance is given only when all the conditions of the Import Health Standard have been met. The Biosecurity Clearance may be written, oral or tacit depending on circumstances[9].

**Brood**
The immature stages of a colony, including eggs, larvae, and pupae.

**Container**[10]
An article of transport equipment, such as a lift van, movable tank, seafreighter, International Organization for Standardization (ISO) container or similar structure, either rigid or collapsible, which is strong enough to be suitable for repeated use, can carry goods by land, sea or air without immediate re-packing, can be sealed if required, and has an internal volume of more than $1m^3$.

[B] **MoH submission:**
**Definition of 'alate', second sentence would read better, "Refers to queens that have not yet removed their wings prior to egg-laying, and to males."**

**MAF comment:**
**This suggestion has been adopted.**

**Contaminants**
Any imported plant or animal material, including soil, which may introduce unwanted organisms or regulated pests into New Zealand but not including *bonafide* cargo[9].

**Craft**
Includes any aircraft, ship, boat, or other machine or vessel used, or able to be used, for the transportation of people or goods, or both, by air or sea[11].

**Disinsection**
Application of insecticide, recommended by the World Health Organisation, to meet Ministry of Agriculture and Forestry and Ministry of Health requirements[12].

**Door inspection**
Visual inspection of the interior of the container (by opening both doors) and the exterior surfaces, looking for contaminants[10].

**Established nest**
A RIFA nest with a mated queen(s) and adult worker ants.

**Equipment**
Used machinery that, in the course of its intended function, may have come in contact with plant, animal, forestry material or soil, and may include non-moving machinery and/or equipment[13].

**FCL**
Full container load: cargo for one importer[10].

**Fomite**
An inanimate object or material on which agents may be conveyed, e.g. faeces and bedding. Although fomites are usually defined as inanimate objects, for the purpose of this release assessment, fomites include people, plants and animals.

**Goods**
All kinds of moveable personal property[11].

**Gross contamination**
Where the degree of contamination is to the extent that it poses (in the mind of the inspector) an unacceptable biosecurity risk if landed[13].

**Import Health Standard (IHS)**
A document, issued pursuant to section 22 of the Biosecurity Act, permitting entry into New Zealand of a specific risk good under certain conditions.

**Inspector**
A person who is appointed as an inspector under Section 103 of the Biosecurity Act[11].

**LCL**
Limited container load: cargo consolidated for more than one importer[10].

**Line of containers**
All containers listed on one vessel manifest, on any one voyage, per shipping company, and discharged at any one port[10].

**Live fly bioassay**[C]
Live flies in test cages are placed in nominated locations on the treated interior surfaces of the aircraft for a prescribed length of time. After being removed from the aircraft, these are checked at regular intervals to determine whether the treatments have affected them. Each cage is compared with a control test cage that contains healthy flies that have not been exposed to any chemical treatments. The results of these tests determine whether the particular aircraft: a) has failed a residual disinsection audit, b) requires follow up assays, or c) has passed a residual disinsection audit[12].

**Lot of containers**
Containers that have been packed by one exporter or consolidator and loaded aboard the same vessel on the same voyage[10].

---

[C] **Ministry of Health (MoH) submission:**
**There are a number of risk management methods the status of which are uncertain according to the paper, but that are still cited as the reason for estimation of risk of pathways of entry, namely:**
**- live bioassay for effectiveness check of aircraft disinsection – what is the relationship between effectiveness on flies and effectiveness on ants?**
**(Further sections of this submission are answered under the appropriate sections of this document.)**

**MAF comment:**
**Bioassay of residually disinsected planes is performed, not to test whether permethrin kills flies at 8 weeks, but to audit, along with certification, that residual insecticide is being applied by airlines, and is being applied effectively.**

**Permethrin is effective in killing ants, including RIFA[14; 15]. Although testing during the bioassay development did not specifically include ants, evidence supports that the disinsection program will kill ants for 8 weeks. A product registered for use against ants in New Zealand, with a residual claim for up to 8 weeks, has a permethrin concentration of 1%[16], half that used in aircraft disinsection. An expert in aircraft disinsection consulted by MAF is confident that the aircraft residual disinsection program using 2% permethrin, which kills flies for up to 10 weeks, will kill ants for 8 weeks. (Eight weeks is the period of time allowed between aircraft disinsections.)[17] However, the need for a trial to be performed, to confirm that the permethrin insecticide used in the aircraft residual disinsection program maintains its efficacy throughout the 8-week treatment period, has been identified under issues for further consideration.**

**MAF Border Management Group**
The MAF Border Management Group administers standards and requirements pertinent to New Zealand's biosecurity at the border relating to the arrival and inspection of international aircraft and ships, international mail, arriving passengers and crew, and the clearance of imported cargo. Requirements for facilities where uncleared, imported cargo or quarantine refuse is processed are also administered by this group.

**MAF Forestry Biosecurity:**
The MAF Forestry Biosecurity group develops standards to protect New Zealand's forestry resource against new pests and diseases, manages response programmes to exotic pests and negotiates market access for forest products.

**MAF Plants Biosecurity:**
The MAF Plants Biosecurity group develops import health standards, conducts surveillance for exotic pests of agriculture and horticulture crops, responds to incursions of exotic pests and provides export phytosanitary assurances for plants and plant products including fruit, vegetables, seeds, grain, cut flowers and nursery stock.

**Manufactured wood products**[D]
Products formed from wood by a process that would kill, remove or render infertile any associated pests[18]. Examples of manufactured wood products are chipboard, medium density fibre boards, particle board and plywood.

**Maximum pest limit**
The maximum level of infestation/contamination allowed within a consignment[19].

**MQS**
The Ministry of Agriculture and Forestry Quarantine Service (MQS) is a New Zealand government-owned agency delivering independent biosecurity inspection services required by the MAF Biosecurity Authority. The function of MQS is to inspect incoming passengers, baggage, aircraft, vessels, cargo and mail against biosecurity standards set by the MAF Biosecurity Authority. These inspections are carried out at ports, airports, mail centres and transitional facilities.

**Newly-founded nest**
A recently made RIFA nest with a mated queen. Worker ants have not yet developed to adulthood and foraging ants are not present.

[D] **MoH submission:**
**There are two late additions to the definitions list: 'Manufactured wood products' and 'Treated wood', and the formatting differs for these entries.**

**MAF comment:**
**Formatting has been corrected.**

**Newly-mated queen**
A queen that has mated during a nupital flight and has not yet formed a nest or found a suitable nesting site.

**Nursery stock**
Whole plants or parts of plants imported for growing purposes, e.g. cuttings, scions, budwood, marcots, off-shoots, root divisions, bulbs, corms, tubers, rhizomes, and includes tissue cultures[19].

**Personal effects**
Unaccompanied personal or household effects, belonging to a person or company that are imported for personal use, as opposed to goods imported for resale. Does not include motor vehicles and parts thereof[20].

**Phytosanitary Certificate**
A certificate issued by the authority of an exporting country in accordance with the requirements of the International Plant Protection Convention (IPPC), which verifies that the requirements of the relevant Import Health Standard have been met[19].

**Port of lading**
The initial port where the container was loaded aboard a vessel for carriage to New Zealand[21].

**Prohibited packing material**
Soil, peat, bark, raw green or contaminated moss, used sacking, hay, straw, chaff, or any packing contaminated with these materials[10; 22].

**Risk goods (Biosecurity Act 1993)**
Any organism, organic material, or other thing, or substance, that (by reason of its nature, origin, or other relevant factors) it is reasonable to suspect constitutes, harbours, or contains an organism that may—
(a) Cause unwanted harm to natural and physical resources or human health in New Zealand; or
(b) Interfere with the diagnosis, management, or treatment, in New Zealand, of pests or unwanted organisms[11].

**Sea vessels (Vessels)**
Any vessel arriving in New Zealand from an overseas destination with either passengers, crew, cargo, ballast dunnage, food stores or animals. This includes cruise ships, yachts, naval vessels, cargo ships and fishing vessels.

**Transitional facility**
Any facility approved as a transitional facility in accordance with section 39 of the Biosecurity Act for the purpose of inspection, storage, treatment, quarantine, holding, or

destruction of uncleared risk goods; or a part of a port declared to be a transitional facility in accordance with section 39 of the Biosecurity Act[11].

**Treated wood**
Wood that has undergone an officially authorised procedure for the killing, removal or rendering infertile of pests[18]. Examples of authorised procedures include specified heat treatments, chemical treatments and fumigation.

# 5 Hazard identification

## 5.1 Pest identification

**Order:** Insecta
**Family:** Formicidae
**Subfamily:** Myrmicinae
**Name:** *Solenopsis invicta*
**Common name:** Red imported fire ant
**Acronym:** RIFA

## 5.2 Pest importance

RIFA are highly invasive insects because of their high reproductive capacity, large colony size, ability to exploit human disturbances[23], wide food range, aggressiveness, and ability to sting.[E] Where they establish, they can affect agricultural[24] and horticultural systems[25], wildlife[26], natural ecosystems, and people's quality of life[24]; incur medical and pest control costs[27]; and cause damage to roads[28] and electrical equipment[29].

RIFA are aggressive and readily defend their nests, injecting a venom, which consists primarily of alkaloids[26], into any animal that disturbs the colony. Workers are stimulated to attack by vibrations or in response to a chemical released by other workers when using their stings. Worker ants are able to sting multiple times[1].

## 5.3 Pest distribution

RIFA, a native of South America[1], has become established in the USA[30], on a number of islands in the Caribbean[2] (see Appendix 1) and, more recently, in Australia[3].

Since its introduction into the USA, RIFA has established in at least 13 states: Alabama, Arkansas, California (which is attempting eradication), Florida, Georgia, Louisiana, Mississippi, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee and Texas[31]. Estimates are of a total spread of over 290 million acres (see Appendix 2). The movement of RIFA in the USA was facilitated primarily by the movement of sod and nursery stock, by nuptial flights and, to a lesser extent, by the ability of colonies to float down rivers during floods[32], and by accidental transportation by humans[1; 33].

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[E] **DoC submission:**
**RIFA have a well-established history of invasiveness. It is suggested that the first sentence [of s 5.2] be revised to read *"RIFA are highly invasive insects because of their high reproductive capacity, large colony size…".***

**MAF comment:**
**This suggestion has been adopted.**

RIFA was first detected in Brisbane in February 2001, with two main infestations: one at Brisbane's seaport on Fisherman Islands and another in the south-western suburbs, centred on Richlands. Further infestations were discovered at Cooroy (100km north of Brisbane) and at Dandenong, in Victoria. The original infestation at Fisherman Islands covered approximately 800 hectares and, at Richlands, approximately 3000 hectares[34]. The Dandenong and Cooroy infestations have been treated and are being monitored[35].

## 5.4 Pest biology

RIFA have four life stages: eggs, larvae, pupae and adults. Four types of adults are found in a mature nest[1]:

- winged, reproductive males
- winged, unmated queens
- mated queens
- non-winged workers.

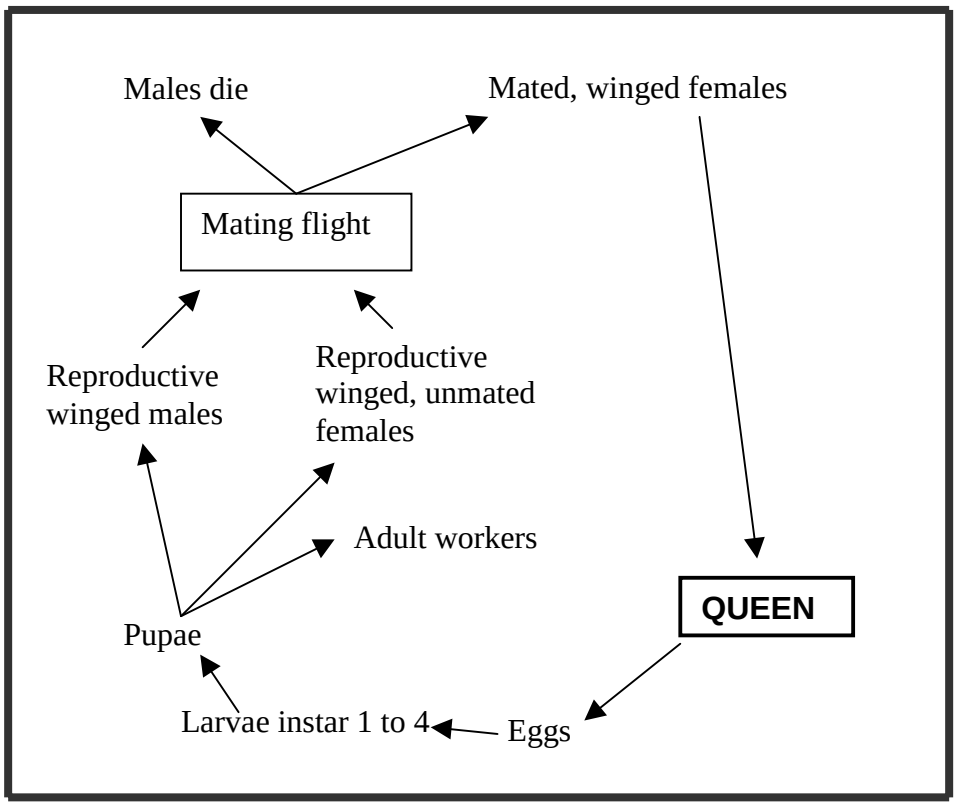


**Figure 1: Life cycle of the red imported fire ant**

RIFA workers are light reddish-brown to strongly dark brown[36] in colour and range from about 2 to 6mm in length[37]. The winged female is also brownish-red and is slightly larger than the worker ants[1].

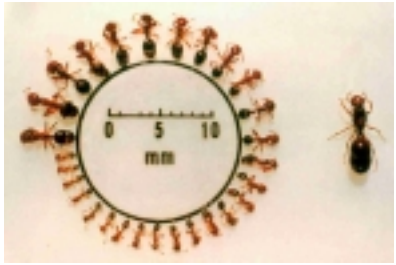


**Figure 2: Red imported fire ant size**
(Photo courtesy of Sanford D. Porter)

Queens establish colonies after a single mating (nuptial) flight. Flights usually occur following rain, if the air temperature is between 20°C and 33°C[38; 39]. Mating between winged reproductive females and males occurs during a nuptial flight, up to 500 to 600 feet in the air[39], with the males dying soon after mating. The mated females start descending to the ground within half an hour of taking flight[39] and, if necessary, are able to fly again within a few minutes of landing[40]. Once they land on a suitable site, queens break off their wings and search for a place to dig their nest, usually a vertical tunnel 3 to12cm deep, in soil (often under a solid object)[36; 41]. Soil does not appear to be essential for nest formation[40]; although uncommon, RIFA queens will nest in moist cracks and crevices of inanimate objects[42].

The queen is unable to sting and is vulnerable to predation during, and immediately after, the mating flight[24]. Ninety percent of queens complete their burrows within 6 to 7 hours of flying[41], although it has been estimated that a newly-mated queen can survive several days at a relative humidity of 40-50% if a suitable nesting site is unavailable[40]. After constructing a nest, the queen seals herself off and, under optimum temperatures, lays up to approximately 70 eggs over the next 5 days[43]. After hatching, the queen rears the larvae, with the first brood of adult workers emerging, on average, 22 days after laying, if held at a constant temperature of 29.5°C[41]. Brood development is temperature dependent and studies indicate that the range of emergence times can be between 13 and 95 days[41]. Brood development in founding colonies has been observed between approximately 21°C and 35°C, with the development time of the first generation workers decreasing with increasing temperature until approximately 32°C[40; 44].

During the period from sealing to the emergence of the first workers, the queen does not feed. Instead, she utilises her body reserves, losing approximately 50% of her bodyweight[41; 45]. The workers open the nest and begin to forage for food, rear more workers and care for the queen, who continues to produce eggs and is now reliant on the workers for food. Worker ants can live for approximately 2 to 17 months, depending on their size and the ambient temperature[46].

Queens can live for up to 6 to 7 years[47] and can lay up to 3000 to 5000 eggs per day[23]. The average three year old colony contains approximately 50,000 worker ants and several thousand winged reproductives[48]. Colonies containing as many as 230,000 to 500,000 workers have been reported[48; 49]. In Australia and the USA, winged reproductives are produced for most of the year, with mating flights occurring year round [35; 50]. However, a higher frequency of mating flights has been observed in Australia in the summer and in the US from April to August[39; 50; 51].

The length of time between colony establishment by a newly-mated queen and the production of the first winged reproductives is approximately 1 year under field conditions. Colonies reach full sexual maturity at 2 to 3 years of age[48].

Two forms of colony exist: monogyne and polygyne [49; 52]. Monogyne colonies have one reproductive female and are founded by mated queens that disperse via flight. The majority of queens fly less than 0.6km, but can travel distances up to 16km or more[39]. Polygyne colonies have more than one reproductive queen and can found new nests via mating flights and by queens travelling on foot to new locations. As monogyne colonies are territorial, their colonies occur at lower mound densities of up to 250 mounds per hectare compared with reports of up to 1000 to 2000 mounds per hectare for polygyne colonies[27; 53; 54]. Monogyne populations also contain lower worker numbers per square unit of area than polygyne populations[55]. Both types of colonies occur in the USA[52], South America[40] and Australia[35].

RIFA typically build subterranean nests and form mounds that vary in size, depending on soil type, soil moisture and vegetation. Mounds in sandy areas tend to be flat and rather broad, while mounds in clay soils may be up to 0.5 to 1 metre high and 1 metre in width[36].

RIFA can build nests in almost any type of soil, but prefer open areas such as pastures, parks, lawns, meadows and cultivated fields[23; 36]. They are often associated with disturbed habitats such as roadsides[23; 56], and will infest close to, and inside, logs and buildings[24; 57]. RIFA will frequently infest electrical equipment, as the worker ants are attracted to heat, and utility housing provides extra warmth and dryness for colonies during winter months[24; 58].

Although RIFA defend their mounds from intruders, the mound is often not permanent; colonies frequently migrate. RIFA can develop a new mound 1 to 30 metres or more away from their previous location[36]. Nest disturbance is often cited as a cause of migration but colonies will not consistently relocate if disturbed[59]. One reference suggests that a queen needs only six workers[60] to start a new colony, although it has been suggested that several dozen are more likely to be required for a successful nest[40].

While the mound is important, it is not essential. As long as there is a small space, which is dark and damp, and a source of food and water, the ants may not form a mound, but nest instead in walls of buildings, cracks, crevices in stone walls or in logs[1].

The minimal mean supercooling temperature (lowest body temperature reached before spontaneous freezing) for field colonies has been recorded at slightly higher than -6°C, with minimal individual supercooling temperature recorded at -7.6°C[61]. It has been suggested that colonies and individuals would survive only minutes at these temperatures[40]. Soil temperature is an important limiting factor in the spread of RIFA, as soil acts as an insulator. Colonies have been observed to survive air temperatures of -14.5°C to -17.8°C and soil surface temperatures of 0°C to -1.9°C[62]. Established colonies are able to move up and down the temperature gradient that develops within the nest, protecting themselves from extreme soil surface and air temperatures[63].

RIFA are susceptible to dry and hot conditions; exposure for 1 hour at 48°C (0% relative humidity) killed RIFA that had been acclimatised for weeks to a temperature of 32°C or less[64]. Queens held at 40°C died within 24 hours, before laying eggs[64]. Adequate soil moisture is required prior to mating flights and also appears to be necessary for the successful establishment of a nest. In one study, females that were unable to excavate more than a shallow trench in hard-packed soil died[39].

RIFA are omnivorous, opportunistic feeders and will feed on almost any type of animal or plant material and will cannibalise one another if food is short[65]. However, their primary diet has been shown to consist of insects, other small invertebrates, and plant saps (phloem)[33; 66]. RIFA have been reported to feed on a variety of crops, including soya beans[25], citrus trees[67], corn (germinating seeds and seedlings) [25; 68], potatoes[69] (young plants and tubers), okra[25], eggplant, cabbage, peanuts, and watermelon[26]. They are also associated with cotton and sugar cane, as they feed on insects that feed on these products[26]. RIFA are attracted to sugar, certain amino acids and some plant oils containing polyunsaturated fatty acids[24; 33].

## 5.5 Pest introduction

There are three stages of a queen's life cycle relevant to this assessment:
1) a newly-mated queen that has not yet formed a nest
2) a queen in a newly-founded nest with brood (first generation of workers not yet developed)
3) a queen in an established nest with workers present.

New Zealand trades by sea and air with RIFA-infested countries. The establishment of RIFA here would require the importation of a viable queen; either newly-mated or with all, or part, of a nest.

An individual, newly-mated queen could be transported on a variety of fomites, while a nest could be transported in, or on, any object containing soil, contaminated with enough soil to support a small colony, or containing suitable moist cracks and crevices. Objects that have had spent periods of time outside, in contact with the ground, have the greatest likelihood of infestation[40].

1) Introduction by a newly-mated queen[F]

It appears that 90% of newly-mated queens will start forming their nests within 6 to 7 hours of mating, if conditions allow[41], although it is reported that a newly-mated queen can survive several days at a relative humidity of 40-50% (possibly longer at higher humidity) if a suitable nesting site is unavailable[40]. However, a delay in finding a suitable nesting site decreases the queen's chances of survival. The successful establishment of a nest is dependent, amongst other factors, on the ability of the queen to survive on her own body reserves until sufficient numbers of workers have developed. Queens that cannot find a suitable nesting site are susceptible to predation and dessication[39; 50] and are likely to deplete

[F] **DoC submission:**
**S 5.5. The Department suggests removing the final sentence *"It is not known if this is possible at typical NZ temperatures, even in summer".* The identification of a mature nest at Auckland airport suggests that it is possible for a successful colony to develop after a queen's arrival. While we are not sure whether RIFA were introduced as a single newly mated queen, or a newly founded nest, clearly the development of a successful colony is possible. The sentence referred to above understates this possibility.**

**MAF comment:**
**This sentence has been removed. This submission indicates that there is some confusion between the introduction of a queen by sea and by air as the sentence referred to introduction by sea and the supporting reasoning referred to introduction by air. This section has been separated into air transport and sea transport to show the distinction.**

their energy reserves while searching for a suitable site. This depletion of reserves decreases the number of eggs a queen will initially be able to lay[40 G].

The length of time from mating to egg production is temperature dependent. The development of founding colonies has been observed between temperatures of 21°C to 35°C (with optimal development occurring around 32°C)[40; 44]. Experimental studies have shown that queens held at 21°C to 35°C produce eggs, on average, within 2 to 3.4 days[41; 43]. Queens held at temperatures outside the range 21°C to 35°C had longer average brood development times and failed to produce workers and viable nests [41; 43; 44]. Although the maximal period between mating and egg-laying, where a queen went on to establish a viable nest was not stated, and the effect of temperature on the queen's energy reserves may act as a confounding variable, queens that did not lay eggs within an average of 6 to 8 days, did not produce viable nests, and died [41].

a) Air transport

Given that the longest flight transit time from an infested country to New Zealand is less than a day (see Appendix 3), it is possible for a newly-mated queen to enter from any infested country via air-transported fomites and establish a successful nest on arrival. This possibility is confirmed by two interceptions of single, live, non-RIFA queen ants from Australia[70] without accompanying nests, in the first six months of 2001.

b) Sea transport

Given that queens will preferentially start nest-building within hours of a nuptial flight, that queens have been observed to lay eggs within an average 2 to 3 days of a nuptial flight, and assuming that nesting sites will usually be available on ships, it follows that queens in newly-founded nests, rather than newly-mated queens, would arrive by sea transport.

The shortest sea journey from an infested country is 4 days (from Australia) to 28 days (from the Caribbean). It is probable that from all infested countries except Australia, a newly-mated queen would form a nest during transport and a queen that did not form a nest would not survive the sea transit times to New Zealand. There is a low probability that a newly-mated queen could survive transport by sea from Australia and establish a successful nest on arrival.

2) Introduction by a nest

A RIFA queen could be introduced in a newly-founded nest, before workers are developed and foraging, or in an established nest with adult workers present.

Once sealed in a newly-founded nest, a queen is able to survive 13 to 95 days on her own body reserves[41; 44]. There is evidence that established nests can survive for at least 42 days at 30°C without food[71].

[G] This section has been refined from the consultation draft document to clarify that queens can not delay egg-laying. This change has not affected any likelihood rankings.

The longest air and direct sea transit times from RIFA-infested countries to New Zealand are 13 hours and 28 days respectively. It is, therefore, likely that a newly-founded or an established nest could survive transit to New Zealand by both sea and air transport.

## 5.6 Hazard identification conclusion

A newly-mated queen could survive transport to New Zealand by air from all infested countries and, possibly, by sea from Australia. A newly-founded or established nest could survive transport by air or sea from all infested countries.

An individual, newly-mated queen is essentially a hitchhiker pest and could be transported on a variety of imported fomites. Goods imported from an infested area that contain soil, are contaminated with enough soil to support a small colony, or have suitable moist cracks and crevices, have the potential to carry a RIFA nest. Objects that have spent periods of time outside, in contact with the ground, have the greatest likelihood of infestation.

RIFA are established in both urban and rural environments[26]. Their tendency to move nests; ability to form nests in buildings, vehicles, small moist cracks and crevices, as well as soil; and their variety of food sources and mobile queens, all mean that the following items could act as fomites:

- people and their baggage
- transporting craft, i.e. aircraft and sea vessels
- containers for transporting goods
- packaging used to transport goods
- most commodities from infested areas.

# 6 Release assessment

Five fomite pathways have been identified via which a viable RIFA queen or nest could enter New Zealand by air or sea from an infested area:

- people and their baggage
- the transporting craft, i.e. aircraft and vessels
- containers for transporting goods[H]
- packaging material used to transport goods
- commodities (goods) transported, e.g. fruits, machinery, mail and animals, etc.

In order for RIFA to be introduced, the following events are necessary (see also Appendix 4):

1) the fomite originates from, or passes through, an infested site
2) a newly-mated queen or nest is present in, or on, the fomite
3) any treatment applied prior to importation is ineffective or no treatment is applied
4) the queen or the nest survives transportation
5) on arrival in New Zealand, the fomite is either not inspected or inspection fails to detect an infestation
6) any treatment applied on arrival or before release is ineffective.

These events and the factors affecting the risk of introduction can be divided into two components: those associated with the country of origin and those associated with the fomite.

1) Likelihood of introduction by country

The density/severity of the infestation, control measures in the country of origin, the volume of trade from an infested country, and the time taken to travel to New Zealand, all affect the likelihood of a viable queen or nest being introduced.

2) Likelihood of introduction by fomite class

Each fomite has a different likelihood of becoming infested. Each fomite has different transport conditions, and inspection and treatment procedures. The conditions and procedures affect the likelihood that the queen or nest would survive transportation and the likelihood of detecting RIFA at the border.

As each fomite can be transported by air or sea, and the two means of transport pose different risks, this release assessment will address each fomite/transport pathway separately where it is appropriate.

[H] In this assessment containers and packaging are assessed as pathways for the introduction of RIFA independent of the commodities they contain or are associated with.

## 6.1 Likelihood of introduction by country

A native to Brazil, Argentina and Paraguay, RIFA has been introduced and established in 13 states of the USA, on a number of islands in the Caribbean[2; 72] and in Queensland, Australia. Because of its close proximity to the southern states of the USA, the northern part of Mexico should also be considered at risk of being infested, although there is no information to indicate Mexico's status.

The United States Department of Agriculture (USDA) has domestic quarantine regulations in place to prevent the interstate and, for some areas, intrastate movement of soil, hay, baled straw, plants, soil-moving equipment and any other article that could spread RIFA[73]. Australia also has movement controls in place around infested properties[74]. Management plans are in place for each business with goods that have the potential to transport RIFA[35]. No information was found regarding whether the Caribbean islands, Argentina, Brazil, or Paraguay apply movement restrictions.

The higher the density of RIFA nests at an infested site, the greater the likelihood of a fomite from that site becoming infested. Studies indicate that RIFA in the USA attain colony sizes and densities greater than those that occur in their native habitat in South America[75]. Personal communications suggest that infestations in Australia can reach densities similar to those in the USA[40]. This suggests that parts of the USA and Australia pose a greater risk of fomite infestation than South America.

The likelihood of introduction of a viable queen or nest will decrease with transit time. As previously discussed, a RIFA queen could survive transportation by air from any infested country. However, due to her vulnerability to predation and reliance on her body reserves until she has founded a nest and workers are produced, the ability of a queen to survive air travel and form a viable nest on arrival will decrease with time. Similarly, although a nest could survive the longest sea transit times to New Zealand of 28 days, it is likely that survival would decrease with increasing transit times.

Direct transportation probably increases the likelihood of introduction of RIFA, as indirect transportation increases the transit time and includes stopovers, which provides opportunities for a nest to be discovered or a queen to disperse. New Zealand receives sea vessels direct from Australia, the Caribbean and the USA. Transhipping is necessary for passengers and cargo from Argentina and Brazil[76]. Flights are received direct from Australia, Argentina and the USA. Connecting flights are needed for passengers and cargo from Brazil, Paraguay and the Caribbean[77;I].

New Zealand imports approximately 7 million tonnes of goods each year (see Appendix 5). Although not all goods are a high risk of infestation, approximately 74% of importations come from RIFA-infested countries. The likelihood of RIFA being transported on

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[I] **MoH submission:**
**We are not convinced of the blanket statement that direct transportation by air and sea was a higher risk than indirect transportation by air or sea (p20) as plane routing may not mean hugely longer transit times.**

**MAF comment:**
**It is not MAF's intention to suggest such a blanket statement. Any increase in time and opportunity for dispersal or discovery will decrease the risk of introduction of RIFA. MAF acknowledges insufficient information is available to determine the significance of indirect transportation in terms of discovery or dispersal of RIFA during stopover, suggesting that the time in transit should be the main consideration.**

importations from an infested area is proportional to the volume of trade. The volume of imports from Australia is approximately 23 times greater than that from Brazil, Argentina and the Caribbean, and the volume from the USA is approximately 3-4 times greater. This indicates that there is a higher likelihood of RIFA being imported from the USA and Australia than from South America and the Caribbean.

The port facility, Fisherman Islands, is a centre of the Brisbane infestation (see Appendix 6). Nests at the port have been treated and are being monitored. The extent to which the infestation of the seaport increases the likelihood of RIFA introduction to New Zealand has not been assessed. Further investigation, taking into consideration the proximity of the containers to nest sites during loading and storage, and the frequency with which queens have been detected in containers is required[J]. The Australian authorities have initiated an attempt to eradicate RIFA, which may change Australia's pest status.

## Conclusion

The relatively short transit times and volume of trade suggest a greater likelihood of RIFA introduction from Australia than from the Caribbean, South America or the USA.

The density of infestation and size of colonies in South America is lower than those of the USA, suggesting that the USA would be a higher risk for introduction through the movement of commodities and people.

The higher volume of trade, shorter sea transit times and the availability of direct flights from South America suggest a greater likelihood of RIFA introduction from South America than from the Caribbean.

All infested countries pose some degree of risk. As a result of trade patterns and proximity, RIFA are most likely to be introduced from Australia. The introduction from the USA is more likely than from South America and the Caribbean[K].

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**[J] DoC submission:**
**The document recommends further investigation to aid in an assessment of the extent to which the infestation of the Fisherman Islands seaport in Brisbane increases the likelihood of RIFA introduction to NZ. The Department supports this recommendation.**

**[K] DoC submission:**
**The assertion that there is a higher likelihood of RIFA being imported from the USA and Australia based on the relative densities of RIFA present in each country is logical. However, both Australia and the USA also have in place quarantine measures to help reduce the spread of RIFA. Do the Caribbean Islands have similar controls in place, and what are the characteristics of the goods exported to New Zealand? The Department recommends revising this analysis to include consideration of the effect that different quarantine measures, and exported goods characteristics (i.e. are more goods at high risk of RIFA contamination exported from Australia than the Caribbean?) may have on the likelihood of introduction.**

**MAF comment:**
**All RIFA-infested countries pose some degree of risk of exporting RIFA-infested commodities to New Zealand. The analysis proposed would be a large use of resources, and the outcomes subjective. Given that RIFA is a hitchhiker pest and <u>all</u> goods from a RIFA-infested area that have spent a period of time outside, in contact with the ground, pose a risk of infestation, the risk of an importation of an infested good is proportional to the volume of trade, and in view of the fact that the volume of trade from the Caribbean is 0.1% of that from the USA and 0.02% of Australia, MAF believes that such an exercise is not appropriate.**

## 6.2 Likelihood of introduction by fomite class

The following factors increase the likelihood of a fomite being infested.

- Soil
  Objects contaminated with soil pose a high risk because soil is the natural nesting site of RIFA queens and most nests are found in soil. Queens normally burrow approximately 3 to 12cm down into soil[36], forming a nest with an area[40] of approximately 1cm$^2$. Newly-founded nests will not be apparent until the first workers are produced.

- Objects in ground contact
  Objects that have contact with the ground[40] are more likely to become contaminated with organic material and soil, and more likely to become infested from walking infestations.

- Objects with moist cracks and crevices
  Queens are susceptible to desiccation[40; 50] and will seek objects with moist cracks and crevices if soil is not available.

- Outside objects
  Queens are more likely to nest outdoors. Objects normally used outdoors are more likely to become contaminated with organic material and soil, and have an increased potential of infestation after mating flights.

- Used objects
  Used objects are more likely to have become contaminated with soil or organic material.

- Commodities that produce an electric field
  Used electrical equipment has frequently been cited as containing RIFA infestations[24; 29]. The majority of risk associated with this category is from equipment that has been used outdoors and has been in contact with the ground. Worker ants are attracted to heat or pheromones released when other workers are electrocuted[40], which may be important for walking introductions. The housing of electrical equipment also provides warmth and shelter for colonies, thus attracting infestation[58]. Examples of infested equipment are air conditioning units, power company transformers, traffic signal control cabinets[29], electrical pumps, and car electrical systems[24].

- Shiny objects
  Queens prefer to land on shiny or reflective surfaces[24; 33]. There is probably an increased likelihood of a nuptial queen landing on such objects and nesting if a suitable site is available.

- Objects that are packed over a period of time
  Objects that are manufactured, packed and transported immediately have less opportunity for infestation. Objects that are gradually packed over an extended period of time, e.g. used car tyres and car batteries, present an increased opportunity for infestation.

#### 6.2.1.1 People

RIFA are present in urban areas in both the USA and Brisbane. Transportation via people is a possibility given that ants will inhabit areas close to, and sometimes within, houses[60].

#### 6.2.1.2 Transportation on a person

Transportation on a person includes on their body and on clothing they are wearing. It does not include carry-on baggage.

Only RIFA that arrive as newly-mated queens or queens that are part of an established nest would be able to go on to form or maintain a nest. A mature queen from an established nest that has been separated from her workers could not go on to create another nest[78].

Transportation of a queen

While it is theoretically possible for a newly-mated queen to land on a person's clothing, it is likely that a 6mm queen would be seen and removed. In addition, queens are susceptible to trauma and would probably be crushed during transportation.

Aircraft cabins are disinsected before, or on, arrival in New Zealand (see section 6.2.2).

The likelihood of a newly-mated queen being transported on a person is negligible.

Transportation of a queen in an established nest

Given that:

- queens usually stay in the nest while non-reproductive worker ants forage and protect the nest, queens are unlikely to come in contact with people
- it is unlikely that a person would inadvertently harbour nest material in clothing without contacting the worker ants
- RIFA are aggressive and a person inadvertently carrying worker ants would be stung and would remove the infestation,

it is concluded that the likelihood of a RIFA nest being transported on a person is negligible.

**Conclusion**

The likelihood of a RIFA queen or nest being carried on a person is negligible.

#### 6.2.1.3 Transportation in accompanied baggage

**a) Air transport**

Approximately 3.5 million passengers and crew arrived in New Zealand by air between July 2000 and June 2001[79]. Undeclared risk goods were detected in association with 1.8% of passengers[L79]. In the year ending June 2001, approximately 37% of seizures of risk goods at airports were from categories containing risk goods assessed as presenting a high risk of transporting RIFA. Of these seizures, 17% were undeclared (see Appendix 7).

Although RIFA typically nests in the ground and prefers sunny areas, it will occasionally nest indoors and has been found in wall voids and in boxes[24].

The ability of ants to survive transportation in accompanied baggage is illustrated by a nest of a *Solenopsis spp.* of ant being intercepted in a sports bag and *Solenopsis invicta* workers twice being intercepted associated with tents on flights from the USA[80]. It may be possible for a nest or a queen to be transported in a person's baggage, either accidentally or through carrying risk goods that are potential fomites for RIFA. However, because worker ants are stimulated to attack by vibration and the presence of material from an established nest would probably become obvious during packing, it is unlikely to be included in a person's baggage. On the other hand, because of the small size of RIFA, lack of workers in newly-founded nests and the predilection of queens for small moist cracks and crevices, a small or newly-founded nest might not be detected, and could inadvertently be included in baggage.

Passengers landing in New Zealand are required to fill out a MAF declaration card (see Appendix 8) that includes their point of embarkation and a declaration that they are not carrying risk goods. Passengers are required to declare camping gear and other possessions that might carry soil[81]. Instant fines are now in place to deter travellers from making false declarations. Given that most nests are associated with soil, the only high-risk items for harbouring an infestation not listed on the declaration card are used electrical equipment, although these are likely to be uncommon in passenger baggage. Electrical parts that have been used outside and in contact with the ground pose the greatest risk of infestation due to the attraction of worker ants to warmth and the increased likelihood of soil contamination. Items that have been used solely indoors have a low likelihood of harbouring RIFA.

Approximately 80-85% of cabin baggage and passengers is checked by Biosecurity Detector Dogs for fruit and other organic material at Auckland, Christchurch and Wellington airports. The dogs used in baggage searching are not trained to detect soil and, although have, in the past, indicated the presence of soil in passenger baggage, this may have been in response to other odours they are trained to detect[82;M].

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[L] Undeclared risk goods detected by MQS are inspected and are released or seized for treatment, reshippment or destruction.

[M] **MoH submission:**
**Do sniffer dogs detect soil or not? The paper says they 'would be likely' to (p24). Does that mean they should (but sometimes may not) or that they may (even though that isn't what they are trained to do)?**

**MAF comment:**
**Dogs that deal with passenger baggage are not trained to detect soil, and this has been clarified in the assessment. In comparison, dogs that deal with mail are trained to detect soil (see s 6.2.5.2).**

Passengers are profiled in accordance with MQS Risk Passenger Profile for their likelihood of carrying risk goods. A quarantine officer inspects the bags and effects of passengers fitting the profile.

All baggage that is not searched is X-rayed[77]. Nests might be detected on X-ray, but a small number of ants would not.

Most of the items highly likely to be contaminated with soil and plant material would be detected by the combination of passenger declaration, passenger profiling, detector dog inspection, bag inspection and baggage X-ray[N].

All declared and suspect risk goods identified by X-ray or detector dogs are inspected by a quarantine officer. Given that the development of RIFA eggs to adults can take between 13 and 95 days, newly-founded nests may not have produced workers before arrival. This, combined with the small size of the RIFA, small size of initial nests and predilection for small crevices, means that not all infestations would be detectable on inspection. However, the importation of soil contamination is prohibited and most of the commodities at high risk through their association with soil, are already being targeted for inspection and treatment.

All goods contaminated with soil are washed, or surrendered and destroyed[83]. Items with insect contamination present would be fumigated with methyl bromide or treated with an insecticide[84;O;P].

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**[N] MoH submissions:**
**The paper says 'most of the high-risk items for contamination with soil and plant material would be detected' on x-ray (p24) – does this mean that an undeclared tent (in all of its possible shapes) would be picked up for inspection.**

**Given the insecurity about some of the treatment options we weren't sure why the risk assessment of entry via undeclared camping gear in accompanied baggage was put at 'low' – should this be high?**

**MAF comments:**
**MAF agrees that it is unrealistic to believe that X-ray examination of personal baggage would detect 100% of tents. However, the X-ray process does detect undeclared tents at the border. Figures provided by Auckland Airport MQS for the period of November 2001 to April 2002 suggest that 81% of undeclared tents detected by MQS are detected by X-ray. More importantly, the X-ray inspection process does not stand alone, but works in conjunction with the other inspection procedures to increase the ability of MQS to intercept undeclared risk goods at the border.**

**MAF does not believe that uncertainty in treatment options warrants increasing the rating of undeclared camping gear. The greater part of the risk associated with undeclared camping equipment is from potential soil contamination. Undeclared camping gear intercepted by MQS is thoroughly inspected. No information is available to determine the frequency with which soil contamination is found associated with intercepted camping gear, and whether the amounts of soil found are likely to harbour a RIFA nest. (Soil distributed as a clod is more likely to sustain a RIFA infestation than a dry or thin dirt layer.) If live ants were detected on an inspected item, the item would be fumigated or insecticide sprayed and the effectiveness of the treatment verified before biosecurity clearance of the commodity was given. Soil contamination would be removed by washing. MAF Border Management reports that soil contamination is usually disposed of into the effluent system, however, soil can sometimes be disposed of into the stormwater drain or equivalent. As discussed in Appendix 9, MAF believes there is a low, but non-negligible likelihood that a queen washed into a stormwater drain would go on to form a viable nest. Disposal into an effluent system has not been examined, but may further decrease this likelihood. However, MAF acknowledges that this is an area of uncertainty and further research would be needed to evaluate the requirement to, and the management methods available to, decrease the risk of soil contamination removed from intercepted products introducing RIFA to a negligible level. Such an evaluation is beyond the scope of this assessment.**

Fumigation with methyl bromide is likely to be effective in exterminating RIFA intercepted at the border if appropriate concentrations and treatment times are used[Q].

Washing soiled items would be undertaken only where no live insects were apparent and would be performed in the presence of an adequate water supply, with the contaminants being disposed of into a stormwater drain or equivalent[83;R]. It is believed that RIFA submerged in detergent water would survive 8 to 10 hours and ants in submerged soil would survive several days[40]. Given that items are inspected prior to washing, there is a low likelihood that a queen disposed of into a stormwater drain would be able to go on to establish a viable nest (see Appendix 9).

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[O] MQS uses methyl bromide fumigation, formalin treatment, hydrogen cyanide (HCN) fumigation and heat as methods of treating risk goods to remove unwanted organisms. Fumigation is widely used to eliminate pests from a variety of commodities. A chemical with a high vapour pressure is introduced into a closed space and maintained at a certain level for a minimum period of time to kill unwanted organisms[85].

Methyl bromide is most commonly used by MQS at temperatures greater than 10°C[85]. It appears to exert its toxic effects on the nervous system. It has no residual effect, therefore, does not prevent re-infestation of a commodity by insects[86]. Methyl bromide has been used to kill a wide array of potential insect pests[87; 88]. Methyl bromide is registered for use against ants in the USA[89]. Expert opinion is that methyl bromide will kill RIFA, but the concentrations and treatment times required would need to be determined. In an unpublished experimental trial, methyl bromide, used at 32g/$m^3$ for a treatment period of 24 hours, killed 100% of exposed worker ants[90].

HCN is one of the most toxic insect fumigants[88] and is used by MAF to kill unwanted organisms associated with bananas and pineapples[85]. HCN is effective against some species of ants[88]. Although no information confirming the efficacy against RIFA was found, and not all ant species have the same susceptibility to insecticides, expert opinion is that HCN would probably kill RIFA[91].

[P] A range of insecticides, including dichlorvos, malathion, and pyrethrum, are avaliable to be used depending on the commodity, pest and the pest's lifestage. An aerosol insecticide containing the dichlorvos is most likely to be used against ants present on items not at risk of being tainted by treatment[84]. These active ingredients are reportedly effective against RIFA[92]. Treated goods are inspected to confirm the effectiveness of the treatment before biosecurity clearance is given.

**[Q] MoH submission:**
**Is methyl bromide effective against ants or not? The paper says it ' is likely to be effective' and that 'expert opinion' suggests [it] would kill RIFA (p25). This sounds inconclusive, yet, as the 'preferred fumigant' (p45), its use is one of the reasons for the 'negligible' estimation of risk from shipments treated on arrival (p53).**

**MAF comment:**
**Methyl bromide is used to kill a wide range of insects. Unpublished experimental data show that methyl bromide is effective against RIFA worker ants[90], and expert opinion is that methyl bromide would be effective against RIFA queens, but an appropriate treatment rate needs to be determined[91]. In an unpublished field trial, fumigation of RIFA *mounds* with methyl bromide resulted in 63% of nests being killed within the first week of treatment[93]. Although 100% of nests were not killed (it is probable that inadequate contact of the fumigant with the nest decreased the chemical's efficacy), the experiment shows that methyl bromide can be used to kill ant nests and, therefore, queens. However, the experiment is inadequate to confirm the effective treatment rates of methyl bromide against RIFA queens. In view of this uncertainty and the MoH comments, the ratings of bark and treated wooden products have been adjusted until confirmation of effective methyl bromide fumigation rates against queen ants is obtained.**

[R] MAF Border Management reports that, although the process procedure *Clearance of soil, sand, clay, water and other miscellaneous items* indicates that soil can be disposed of into the stormwater drain, soil contamination is usually disposed of into the effluent system. The risk of disposal of soil into a stormwater drain has been examined as the 'worst case scenario'.

The luggage holds of all arriving aircraft have been residually treated with 2% permethrin or are sprayed with a World Health Organisation-recommended insecticide containing the active ingredient(s) 2% permethrin and 2% d-phenothrin[12] either before leaving the last port or on arrival in New Zealand. However, these insecticides do not penetrate baggage[84] and holds residually treated would not contain baggage at the time of disinsection.

Permethrin is registered for use against ants in New Zealand[94]. Studies have demonstrated that it is effective against RIFA[14; 15].

No studies on the effectiveness of d-phenothrin could be found, but d-phenothrin is registered for use against RIFA in the USA[95].

**Conclusion**

Given that:

- MQS organic X-ray machines have a limit of detection
- not all bags are examined by detector dogs
- detector dogs are not trained to detect soil odour
- used electrical equipment is not routinely inspected,

and taking into account that:

- the packing of baggage by the owner decreases the risk of transportation by this pathway
- soil-contaminated items are already being actively intercepted at the border
- the types of used electrical equipment cited as sometimes harbouring RIFA infestations are unlikely to be in accompanied passenger baggage
- passenger declarations and instant fines are used to deter transport of undeclared risk goods
- there is 100% screening of passenger baggage with an effective baggage search, X-ray and detector dog scheme,

it is concluded that the likelihood of air-transported, accompanied baggage introducing a RIFA queen or nest is low.

**b) Sea transport**

Approximately 19,500 passengers[S] and crew arrived by sea and filled in MAF declaration cards between July 2000 and June 2001[79]. Undeclared risk goods were detected in association with 0.7% of passengers[79].

It might be possible for a RIFA nest to be transported in baggage, either by contamination or through inclusion of risk goods. However, the presence of established nest material would probably be obvious during packing because of the aggressive nature of the ants, and would be unlikely to be included in baggage. Although very small or newly-established nests might not be initially detected, given the lengths of time at sea, some baggage would be opened during transit. Therefore, there is less potential for a nest to remain undiscovered in personal baggage for the length of time in transit on a vessel compared with an aircraft.

There is no requirement for routine disinsection of vessels arriving in New Zealand.

With the exception of cruise ship passengers entering on day trips, passengers (including crew) landing in New Zealand are required to fill out a declaration card (see Appendix 8). Passengers are also questioned by MQS Officers prior to disembarking from their vessel, providing an additional opportunity for items to be declared. Passengers are required to declare camping gear and other possessions that may carry soil[96].

Given that most nests are associated with soil, the only high-risk items for RIFA not listed on the declaration card are used electrical parts, which are likely to be uncommon in passenger baggage. Electrical equipment that has been used outdoors and that is likely to have been in contact with the ground present a high risk. Items that have been used solely indoors have a low likelihood of harbouring RIFA.

A proportion of passenger baggage (including day trip passengers) is hand-searched and checked by Biosecurity Detector Dogs. Bags are not routinely X-rayed. Landing passengers are profiled in accordance with the MQS Risk Passenger Profile[96]. A quarantine officer inspects the bags and effects of passengers fitting the profile. A MQS survey of passengers disembarking from cruise vessels found that approximately 1.2% of passengers not searched as part of normal inspection procedures had hand-carried baggage (baggage carried down the gangway) containing undeclared risk goods seized by MQS. Approximately 1.4% of passengers had luggage off-loaded through the ship's luggage handling agents containing undeclared risk goods that were seized by MQS[97].

All declared goods and suspect goods detected by bag searches or detector dogs are inspected by a MAF quarantine officer. A newly-founded or small nest might not be detected on visual inspection, but soil and most of the commodities at high risk of harbouring RIFA are already being targeted for inspection. All goods contaminated with soil are washed, fumigated or surrendered and destroyed. Items discovered with live insect contamination are fumigated, treated with an insecticide or destroyed[84].

[S] This statistic includes only passengers and crew who filled out a MAF declaration card. Passengers and crew disembarking in New Zealand on day excursions from cruise ships are not required to fill out declaration cards[76].

## Conclusion

Given that:

- RIFA can be transported in undeclared risk goods
- not all passenger baggage may be repacked while on board
- not all baggage is examined by MQS on arrival,

and taking into account that:

- a relatively small proportion of people arrive by sea
- the packing of baggage by the owner decreases the risk of transportation by this pathway
- soil-contaminated items, are already being actively intercepted at the border
- passengers and crew packing and unpacking their bags while in transit decreases the risk of transport by this pathway,

it is concluded that the likelihood of accompanied baggage transported by sea introducing a RIFA queen or a nest is low.

If a person's sea- or air-accompanied baggage were infested with RIFA, and both transit times were of similar duration, because of the higher intensity of inspection procedures in place for air baggage, sea baggage has the greater likelihood of the two of introducing RIFA. However, given that the initial likelihood of a RIFA infestation being present in a person's baggage is considered to be low, the overall rating for accompanied sea baggage as a pathway for the introduction of RIFA is also low.[T]

[T] **MoH submission:**
**We were not sure if we followed the logic of the appraisal in the last paragraph of page 28, e.g. that sea baggage has a greater likelihood of introduction because of the lower intensity of inspection of air baggage. Also the duration of the trip should be included in this sort of comparison.**

**MAF comment:**
**The error in this section has been corrected; 'lower intensity' should have been 'higher intensity'. Consideration of the duration of the trip has been included.**

#### 6.2.1.4 Unaccompanied personal effects

Personal effects are unaccompanied personal or household goods shipped as sea or air cargo. Examples are books, clothes, gardening equipment, furniture, golf clubs, lawn mowers, sporting equipment, and vacuum cleaners.

Approximately 30,000 consignments of personal effects are cleared into New Zealand each year. Between July 2000 and June 2001, 30% of consignments were inspected, with 1,263 declared and 117 undeclared seizures made, including 8 declared seizures of nursery stock, and 407 declared and 41 undeclared seizures of plant material (excluding seeds)[79]. These figures suggest that approximately 1 in 100 consignments contain undeclared risk goods. However, this is likely to be an over-estimation, as one consignment may contain more than one seizure and the effectiveness of the profiling program has not been evaluated. Nevertheless, the figures do indicate that declaration alone will not prevent undeclared risk goods, some of which may have the potential to carry RIFA, from entering New Zealand.

Because of the greater variety of types and sizes of goods that can be transported as personal effects, it is more likely for a RIFA infestation to be transported in such goods, either by contamination or through inclusion of an infested item, than in a person's accompanied baggage. Because of the small size of RIFA, lack of workers in newly-founded nests and the predilection of queens for small moist cracks and crevices, a small or newly-founded nest might not be detected and could be inadvertently included in personal effects.

The importer and owner of transported personal effects must complete and sign a declaration form describing the contents of their unaccompanied effects. This declaration includes the country of origin of the effects, point of embarkation, and a declaration that they do not contain any listed risk goods. Possessions that may carry soil must be declared (see Appendix 10). Most high-risk commodities, including motor vehicles, are included in this declaration. The only high-risk items for RIFA not included on the declaration form are used electrical parts that have been used outdoors.

The declaration is profiled by a MAF quarantine officer for occupation, country of origin, nationality, and contents listed, and the person collecting the goods is profiled for their familiarity with English and behavioural responses to questions. Where there are declared risk goods, or if the inspector considers it likely that there are risk goods or contaminants present, the items are inspected. Inspectors are directed to pay particular attention to outdoor furniture and equipment from North America, Europe, Australia and Asian Gypsy moth (*Lymantria dispar)* areas, and to consignments containing wooden packaging[20].

Most of the commodities at high risk for RIFA are targeted for inspection. However, a newly-founded or small nest would be relatively unlikely to be detected on visual inspection.

Any risk goods that do not comply with an Import Health Standard are seized. Such goods can be reshipped, treated or destroyed. All risk goods identified as requiring treatment are packaged to prevent contaminants dispersing or, if appropriate, can be treated on site by washing, provided there is an adequate water supply[20]. Treatments include washing the risk good, insecticide treatment or fumigating it with methyl bromide or formalin.

**Conclusion**

Given that:

- a wide variety of items can be transported as personal effects
- RIFA can be transported via undeclared risk goods
- reliance is placed on the descriptions and declarations of the owners being accurate and correct
- no X-ray or detector dog inspection of unaccompanied personal effects is performed,

and taking into account that:

- the packing of items by the owner decreases the risk of transportation by personal effects
- the majority of the high-risk goods for transporting RIFA are already targeted by MQS
- a relatively high percentage of importations are inspected,

it is concluded that the likelihood of unaccompanied baggage introducing a RIFA nest is moderate.

### 6.2.2 Transportation vehicles (craft)

#### a) Aircraft

New Zealand has ten international airports: Auckland, Wellington and Christchurch, which receive air passengers and freight; Ohakea and Whenuapai, which receive military passengers and freight; Queenstown, Palmerston North, Hamilton and Dunedin, which receive passengers; and Invercargill, which currently does not receive international flights[77].

Auckland receives passenger and cargo flights direct from Argentina and the USA. All airports that receive international flights receive flights from Brisbane[77].

It is possible for aircraft transiting infested areas to become contaminated with RIFA through transporting infested commodities or through queens landing after mating flights.

Exposure to high velocity airflow and temperatures below -7°C mean it is highly unlikely that RIFA would survive importation on the outside of an aircraft travelling internationally[98]. However, a 1987 study indicates that it is possible for insects located in cages to survive international flights within the wheel bays of aircraft. The minimal temperatures measured in the wheel bays varied between 8°C and 25°C, temperatures well above the minimum temperature for survival of RIFA[99]. Although the results suggest that RIFA could survive temperatures within wheel bays during international flights, the effect of air turbulence on the ability of insects to remain in the wheel bays was not examined and the likelihood of insects being transported in this way is uncertain. Moreover, it is unlikely a queen would fly or climb up into a wheel bay of an aircraft, as a newly-mated queen will generally move down, not up, when seeking to found a nest[40].

An established nest present within an aircraft interior is likely to be discovered by passengers and crew because of the number of workers present, aggressive nature of the ants, high density of passengers (except in dedicated cargo planes) and the enclosed nature of the aircraft. Only immature or newly-founded nests might remain undiscovered.

Aircraft interiors (cabins and holds) are disinsected before, or on, arrival in New Zealand with a World Health Organisation-recommended insecticide containing the active ingredients 2% d-phenothrin and/or 2% permethrin, to meet the MAF and Ministry of Health requirements[12; 100; 101U].

Any infestation present inside a plane, and not in close association with a person or person's baggage, would be likely to be exposed to the insecticide.

Disinsection prior to arrival in New Zealand occurs either pre-embarkation, at top of descent, or by residual disinsection[12]. At least 70% of planes landing in New Zealand are residually treated with insecticide[77].

[U] The MAF process procedure *Requirements for Aircraft Inspection, Authorisation and Direction* is unclear in that it sets out the requirements for hold disinsection in an appendix that is not clearly referred to in the body of the document. However, MAF Border Management does consider Appendix 4 to be part of the minimum requirements that must be fulfilled before biosecurity clearance can be given to an aircraft at its first port of arrival in New Zealand.

Airline operators can obtain approval from the MQS to disinsect their own aircraft prior to arrival. They are required to demonstrate their ability to meet stated specifications[12] . The airline's disinsection program is regularly audited by MQS[12].

The disinsection status of all aircraft is checked by MQS on arrival to ensure that disinfection of the cabins and holds has been performed[100]. If treatment has been omitted, or a failure has occurred, disinsection is carried out by, or under the supervision of, MQS[100V].

After passengers have disembarked and if time permits, the passenger cabin, flight deck, galleys and baggage areas are examined for risk goods. If live insects are detected on board, the aircraft is required to be immediately closed and disinsected again[100].

Mandatory inspection of holds is required for certain aircraft types arriving from giant African snail (*Achatina fulica*) and Asian Gypsy moth areas, Guam and some Pacific Islands. If live insects (other than mosquitoes) are found during inspection, there is no specific requirement in the process procedure *Clearance of Aircraft on Arrival* for the holds to be redisinsected[100W]. However, retreatment of the holds is required under the *Requirements for Aircraft Inspection, Authorisation and Direction,* which indicates that, when routine inspection reveals that the effectiveness of an aircraft disinsection may be deficient, the aircraft is required to be sprayed on arrival[101]. Current practice is not reflected in the process procedure for *Clearance of Aircraft on Arrival*[X].

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[V] When disinsection of aircraft holds is required in the event of missing certification, the process procedure for the *Clearance of Aircraft on Arrival* refers to Appendix 1, Section 7 and Appendix 1, Section 7.1.4.3. These numbers should read Appendix 1, Section 8 and Appendix 1, Section 8.1.4.3.

[W] The process procedure *Approval and Monitoring of Aircraft Disinsection* requires holds (and cabins) to be retreated when live flying insects are found on inspection and requires the group leader to be informed when live risk goods are located.

[X] **MoH submission:**
**It is of concern when 'current practices' do not match written process procedure (p32).**

**MAF comment:**
**The process procedure referred to is currently under review. An Import Health Standard is the document that states the sanitary and phyosanitary requirements a risk good must comply with for biosecurity clearance to be given.**

**Import Health Standards and MAF documents called "Requirements for Suppliers of Inspection Services at the Border" specify the services MQS are required to provide at the border when inspecting commodities and granting biosecurity clearance. The process procedures give further direction to MQS staff as to the process to follow to comply with the Import Health Standard and the requirements of inspection services. These documents are used together by MQS to ensure that all disease and pest mitigation measures are complied with. The process procedure does not negate the Import Health Standard or requirements of inspection services. The *Requirements for Aircraft Inspection, Authorisation and Direction* indicate that when routine inspection reveals that the effectiveness of an aircraft disinsection may be deficient, the aircraft is required to be sprayed on arrival[101]. This would include redisinsection of aircraft holds if live insects were found on inspection.**

**DoC submission:**
**The Department suggests that for the purposes of transparency, the process procedure for *Clearance of Aircraft on Arrival* in relation to the retreatment of holds if insects are found on routine inspection, be updated to reflect current practice.**

**MAF comment:**
**The process procedure referred to is currently under review.**

Visual inspection of holds and cabins is unlikely to detect small or newly-founded nests if a treatment failure has occurred.

Commercial aircraft are reported to have short turn-around times, minimal ground contact, and are secured overnight[77], decreasing the opportunity for initial exposure to RIFA and, if an infestation did occur, for it to be released from the aircraft.

Mature nests are likely to be discovered because of their size. Studies indicate that RIFA nests are not usually producing ants capable of reproduction until approximately one year of age, at which time the nest has an average of 11,000 workers[48]. Therefore, mating flights are unlikely to be the route via which RIFA are introduced from aircraft. Introduction by walking is more likely.

**Conclusion**

Given that:

- not all RIFA infestations are likely to be detected on visual inspection,

and taking into account that:

- it is unlikely that RIFA would survive importation on the outside of aircraft travelling internationally
- there is mandatory insecticide treatment of all arriving aircraft
- there is a high likelihood that established nests on board an aircraft would be discovered by passengers or crew if the ants were not killed by the insecticides
- all aircraft are inspected for effective disinsection or are disinsected on arrival,

it is concluded that the likelihood of aircraft introducing a RIFA queen or nest into New Zealand is low.

**b) Sea vessels**

New Zealand has 21 international seaports: Auckland, Bluff, Dunedin, Gisborne, Greymouth, Lyttelton, Milford Sound, Napier, Nelson, New Plymouth, Onehunga, Opua, Picton, Port Chalmers, Taharoa, Tauranga, Timaru, Wanganui, Wellington, Westport, and Whangarei[76]. Approximately 3,100 sea vessels landed at New Zealand ports from international waters during the year ending June 2001[79].

Areas around overseas seaports have infestations[72; 91]. The frequency with which of queens may nest on vessels is not known. It is possible for a mated queen to alight on ships docked in, or transiting, infested areas. This point is illustrated by a nuptial RIFA queen being captured 9-10km out to sea on a charter fishing boat in the USA[39], and by RIFA being observed on vessels[91]. However, as soil is the queen's normal nesting site, nesting on vessels is likely to be an unusual event. If a vessel were not docked, it would require prevailing winds out to sea during a queen's nuptial flight or introduction to the vessel via infested commodities. The effect of the marine environment on the ability to successfully establish a nest is unknown.

Cargo holds containing frozen goods at temperatures -18°C to -23°C[76] are highly unlikely to contain live ants. A minimal supercooling temperature for an individual RIFA ant has been recorded as -7.6°C[61], and ant colonies have survived subzero air temperatures through the insulating effect of soil[62]. Therefore, it is conceivable that RIFA could survive chilled cargo areas at temperatures of -0.5°C to 5°C.

There is no routine disinsection of vessels landing in New Zealand.

The master of a vessel arriving from overseas is required, under the Biosecurity Act, to give notice of the anticipated time and port of arrival[11; 102].

Vessels are met, on arrival at their first port, by a MAF inspector. If the vessel anchors offshore, this period can be extended to no longer than 48 hours[102]. A limited inspection occurs; the master declares all meat on board, and meat lockers and refuse facilities are inspected. Passengers, crew, animals and any goods to be landed are processed. There is a requirement for the shipmaster to inform MQS of animals on board a vessel, however, insect infestations (primarily nests) are not specifically mentioned on the master's declaration[102] and may not be thought of by a lay person as animals that require declaration.

A more thorough inspection is carried out for vessels that have been in Asian Gypsy moth-infested areas in the previous two years. This includes inspection of the light fittings, portholes and doorways, the edges of holds, vents and ventilation shafts, and interiors and exteriors of lifeboats[102]. Approximately 0.6% of vessels that dock at New Zealand ports are considered high-risk for Asian Gypsy moth infestation[76].

Because of the preference of queens for crevices when founding nests and because of the small size of the ants and initial nests, small and newly-founded nests would be unlikely to be detected on inspection.

An established nest is likely to be discovered and treated by passengers or crew on a cruise ship, naval ship or yacht and in the living and working areas of cargo ships and fishing vessels, because of the high human population density of such vessels and the enclosed

environment. However, it might be possible for unmanned areas and cargo holds to contain undetected infestations.

Because of the duration of transit[Y], it is likely that any RIFA introduced by sea would arrive in nests rather than as newly-mated queens. Queens from nests could be transported to land on unloaded commodities, or mating flights from mature nests could occur, which would allow dispersal of nupital queens. However, the time taken for a nest to mature increases the time available for discovery before alates are produced and suggests that there is a low likelihood that the introduction of infestations would occur by mating flights from vessels.

## Conclusion

Given that:

- areas around seaports have infestations
- it is possible for queens to be carried onto vessels with transported goods or to reach a sea vessel on mating flights
- nests have been observed on vessels
- an inspection sufficient to detect ants does not occur on all vessels
- not all nests would be detected on visual inspection
- there is no routine disinsection of vessels[Z]
- small nests might not be found in areas of sea vessels rarely visited,

and taking into account that:

- if sea vessels are not docked, queens would be reliant on prevailing winds and infested commodities for transportation onto vessels
- the high human densities and enclosed environment on most ships makes detection of established infestations by passengers or crew likely,

it is concluded that vessels pose a moderate likelihood of introducing a RIFA infestation[AA].

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[Y] See Section 5.5 'Introduction of a newly-mated queen'.

**[Z] DoC submission:**
**The Department suggests adding "*there is not routine disinsection of vessels*" to the first group of bullet points.**

**MAF comment:**
**This point has been added.**

**[AA] DoC submission:**
**We question the conclusion that vessels pose a low likelihood of introducing a RIFA infestation and suggest that this be increased to a moderate rating. In addition to the bullets provided, this is based on the absence of a requirement for routine disinsection of vessels, the characteristics of cargo being transported (e.g. animal crates), the structural complexity of vessels and the resultant difficulties of inspecting such structures for RIFA.**

**MoH submission:**
**We are not sure why sea vessels are estimated to pose a 'low likelihood' of introduction, is this due to unlikely transfer of any ants to shore?**

**MAF comment:**
**A level of risk of a release pathway can be no greater than the lowest component or step of that pathway. After the presence of RIFA in the country of origin of a commodity (or the presence of RIFA in a country**

Vessels with more people, such as naval ships, cruise ships and yachts, pose a lower risk than less highly populated cargo ships and fishing vessels with holds at ambient temperatures.

**of transit), the likelihood of infestation in sea vessels is the next step in considering the release assessment pathway of RIFA introduction by sea vessels. The following factors decrease the risk of an infestation: soil is the normal RIFA nesting site, vessels are likely to spend the majority of their time in water without soil contact decreasing the risk of introduction by migrating infestations, and the introduction of a newly-mated queen to a sea vessel by a nuptial flight would require a prevailing wind out to sea. For these reasons, MAF considers that the likelihood of an infestation of a vessel is low relative to an importation of untreated soil. Therefore, the release pathway assessment was considered to be low. However, MAF acknowledges that there is uncertainty in regard to the frequency of sea vessel infestations in RIFA-infested areas. Therefore, in response to the submissions from MoH and DoC, this risk pathway has been rated as moderate.**

### 6.2.3 Containers

Containers are used to facilitate transport of commodities by air or sea.

**a) Air containers**

Containers transported by air, also known as unit loading devices (ULDs), can be divided into three categories:

- flat base containers (known as 'pigs')
- aluminium air containers (referred to as 'air containers' for the remainder of this document)
- animal containers (see section c for further discussion).

Flat base containers have a basic design of a flat aluminium sheet and are unlikely to harbour a RIFA infestation.

Air containers may be landed only at Auckland, Wellington and Christchurch airports[77]. They could harbour an infestation, as illustrated by an interception of *Camponotus* spp. in the channelling along the base of a container[BB] at Auckland airport in 2001.

The frequency with which RIFA might infest air containers is not known. A 1999 survey[104] indicated that approximately 24% of imported air containers carried contaminants and that 5.4% of contaminants were insects. The survey also indicated that approximately 96% of all contamination and 82.8% of insect contamination was found inside the container. All insects found on the outside were on top of containers. Of 991 randomly surveyed containers, one was contaminated with ants.

Air containers, because of their short transit times to New Zealand, could transport RIFA queens and nests; sea containers, which have longer transit times are likely to transport only nests. Given that a queen would have to stay in, or on, an air container after a nuptial flight, avoid exposure to insecticide, escape from the container on arrival and avoid predation, the additional risk posed by air containers through their potential to transport queens is likely to be small.

In the 1999 survey[104], 5% of containers were contaminated with soil – a high-risk contaminant for transporting RIFA – with 99.5% of soil contamination on the inside of the containers. The survey gives no information about amounts and distribution of soil found in containers that could be used to determine the likelihood that the soil associated with air containers could harbour a RIFA nest. (Soil distributed as clods would be more likely to sustain an infestation than a dry or thin dirt layer.) The survey does, however, demonstrate that air containers, especially their interiors, are a vehicle by which insects and soil may be imported.

All aircraft, except those residually treated with insecticide, are required to have their holds disinsected, either on arrival in New Zealand or in the previous port[12]. Insects present on the external surface of air containers may be killed by insecticide treatment of holds.

With the exception of those carrying passenger baggage, air containers removed from aircraft are transported to an approved transitional facilities airside (within the security fencing of the

[BB] The container was thought to have come from Thailand via Sydney[103].

airport). No action is required unless contamination is observed and reported to an MQS inspector, or if MQS has reason to suspect the integrity of the container or its contents[105; 106].

Containers may be unpacked or stored airside or be conveyed from the airside facilities to MAF-approved transitional facilities outside the security fencing for unpacking or storage. At all approved transitional facilities, once air containers are unloaded, they are inspected by transitional facility staff and cleaned of any contamination[107CC]. Transitional facilities are audited by MQS[107].

There is an allowance in the Air Container Import Health Standard for air containers containing cargo for one consignee to be transported from transitional facilities and returned directly after unloading. However, transitional facilities are required to inspect the container for contaminants before they can be transported off-site, and air containers do not normally leave transitional facilities or the airport area, as specialised equipment is necessary to handle them[77]. The empty containers are required to be inspected by transitional facility staff[106].

Any insect contamination is required to be reported to MQS. Non-insect and non-animal contamination is collected and placed into a quarantine bin. MQS is not required to be notified of non-insect or non-animal contamination unless there is difficulty in removing the contaminant[77]. Insecticides are not included in quarantine bins, but the contents are collected and incinerated or heat-treated to a core temperature of 100° C for 30 minutes[77].

Air containers conveying passenger baggage are transported to a point airside for unpacking and repacking by airline baggage personal. Currently there are two baggage company's in New Zealand, Air New Zealand and Menzies Aviation. Menzies Aviation handles baggage only in Auckland and Air New Zealand handles baggage throughout New Zealand[108]. Baggage personal are required, as are all airport employees or contractors, to immediately notify a MQS inspector or telephone the biosecurity hotline if they suspect or locate any risk goods, including soiled containers and insects[7]. For Air New Zealand staff, there is also a requirement in the Air New Zealand Standard Operating Procedure for Aircraft Arrivals that personal inform MQS of any insects (as well as animal, fruit or seed contamination) detected during the unpacking of an aircraft. The procedure also requires that any other contaminants

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[CC] **MoH submission:**
**The paper suggests 100% of air containers are inspected (p35&36), is that right? (p36 also states that even with 100% inspection, newly-founded nests would be unlikely to be detected.)**

**MAF comment:**
**Not all containers are inspected. All air containers transported to transitional facilities are required to be inspected for contaminants after unloading or before transportation to a single consignee by transitional facility staff. MAF adds for clarification, that transitional facility staff are not MAF quarantine officers. Baggage handlers are required, as are any airport employees or contractors, to immediately notify a MQS inspector or telephone the biosecurity hotline if they suspect or locate any risk goods, including soiled containers and insects. Air containers are inspected by MQS inspectors if contamination is observed and reported, or if MQS has reason to suspect the integrity of the container or its contents.**

**The paragraph referred to, regarding newly-founded nests, states: "The 1999 survey suggests that most contaminants are found inside air containers. Unpacking and inspection of containers means that it is likely that most contamination would be found. However, small or newly-founded nests are unlikely to be detected."**

**Given the small size of the queen and an initial nest, a queen or a newly-founded nest not associated with soil would be difficult to detect with a visual inspection. However, in considering the entire release pathway, MAF considers the likelihood of an introduction of RIFA associated with an air container is low relative to an importation of untreated soil.**

found be placed in quarantine bins. Menzies currently has an equivalent verbal agreement with Auckland MQS[108].

The 1999 survey[104] suggests that most contaminants are found inside air containers. Unpacking and inspection of containers by transitional facility staff, and unpacking of baggage containers by baggage handlers means that it is likely that most contamination would be found. However, small or newly-founded nests are unlikely to be detected.

**Conclusion**

Given that:

- approximately 5% of imported air containers may be contaminated with soil
- soil is the normal nesting site for RIFA queens
- a small nest or a newly-founded nest would be unlikely to be detected,

and taking into account that:

- most contaminants are likely to be present inside the containers
- containers processed through a transitional facility are required to be internally inspected after unpacking or before transportation to a single consignee
- airport employees or contractors are required to immediately notify a MQS inspector or telephone the biosecurity hotline if they suspect or locate any risk goods, including soiled containers and insects,

it is concluded that the likelihood of an air container introducing RIFA queens or a nest is low.

**b) Sea containers**

Approximately 350,000 sea containers land in New Zealand each year[79].

Sea containers may be landed only at ports with approved decontamination facilities. Currently, Auckland (which receives approximately 59% of containers), Bluff, Dunedin, Lyttelton, Napier, Nelson, New Plymouth, Tauranga, Timaru, Wellington, and Whangarei are approved to receive sea containers[76].

There are four categories of sea containers:

- full load containers (FCLs)
- less than container load (LCLs)/freight of all kinds (FAKs)
- empty containers
- animal containers (see section c) for further discussion).

The FCL, LCL, FAK and empty container categories all comprise similar container models, but each category is generally processed differently. FCLs are processed, and may be inspected, at the wharf before release. They usually consist of one type of cargo intended for one importer. Empty containers may be inspected at the wharf or may be moved directly to a transitional facility for cleaning. LCLs and FAKs are usually forwarded to transitional facilities for inspection and often contain mixed cargo for a number of importers. The effect of the different processing on the likelihood of RIFA introduction is examined below. The effects of different container models on the initial likelihood of infestation are not examined in this release assessment.

The likelihood of infestation of sea containers is not known. They have more uneven surfaces and reportedly longer 'down times' between shipments than air containers, increasing the potential for infestation to occur[76]. Container surveys found that 31% of the external surfaces of sea containers carried soil contamination[109] compared with 5% of air containers (internal and external surfaces)[104]. These figures suggest that sea containers are more likely to become contaminated with soil and, therefore, pose a greater risk of carrying RIFA infestations.

As sea containers are usually stored outside, they can become soiled, and have the potential to become infested via nuptial flights or walking introductions. Although soil is the preferred nesting site, RIFA queens have been shown to nest in inanimate objects. Containers have crevices that may provide a suitable environment for infestation. A small nest could establish on a container or in soil contamination if moist conditions were present.

Although the electrical motors on the external surfaces of refrigeration containers could harbour RIFA infestations, containers operating at temperatures -18°C to -23°C are not likely to contain live ants. However, it is possible that RIFA could survive in containers of chilled commodities at temperatures of 5°C to -0.5°C.

Routine disinsection of vessels landing in New Zealand is not mandatory. It is the responsibility of the shipping company to supply valid cleaning and packing certificates to MQS for all containers imported on a particular vessel[21]. However, some containers do arrive without appropriate certification.

The certification states that the containers on the vessel for discharge in New Zealand are free from contaminants and that prohibited packing materials have not been used. The certification identifies the vessel, voyage route, ports at which containers were loaded and

ports where the containers are to be discharged[10]. Currently, no reliable information is available to determine the efficacy of certification in managing contamination[DD].

Contamination of sea containers found post-arrival

Between July 2000 and June 2001, approximately 27% and 12%[EE] of sea containers imported were inspected internally and externally respectively[110].

A 1998 MAF survey[109], looking at forestry contaminants on the external surfaces of 3,681 shipping containers, indicated that 31% were contaminated with soil; 42% of the soil contamination was present on the sides and top of the containers and 58% on the underside.

The survey gives no information about the distribution of the soil found, so could not be used to determine the likelihood that soil contamination present on containers could harbour a RIFA nest. (Soil distributed as a clod is more likely to sustain an infestation than a dry or thin dirt layer.) However, the survey shows that the external surfaces of containers do become contaminated with soil. This increases the likelihood that sea containers might transport a RIFA infestation.

Insect contamination was also surveyed in the study and, although the percentage of containers infested is not clear, 82% of insect contamination was found on the underside of the container. In contrast to the air containers, no insects were found on the top surface. The underside of the containers carried 61.5% of all contaminants found.

Approximately 23% of FCL containers landed in New Zealand between July 2000 and June 2001 were inspected internally, with 4% of these requiring quarantine for insects, insect-related damage, bark or fungi[110]. A MAF study at the port of Auckland in 1999[111] found that approximately 0.1% of FCL containers contained insects or materials with insect damage, and 1.6% contained plant material, fungi, bark and insect quarantinable material. The study is unclear as to whether the contaminants detected were found associated with goods or packing materials inside the containers or with the containers themselves. Nevertheless, the study does illustrate that insect contamination can occur within sea containers. No information could be found on the amounts of internal soil contamination in sea containers.

[DD] A MAF survey is currently being undertaken to examine this issue.
[EE] This figure does not include LCLs and empty containers.

1) Wharf-inspected containers

a) Full container loads (FCLs)

If no valid cleaning or packing certification accompanies the container, or if the description in the vessel manifest suggests that the container contains risk goods[FF], FCLs are given an external inspection and are door-inspected at the wharf, as required by the relevant Import Health Standards and process procedures[10; 21]. At least 10% of certified containers are door-inspected to audit for compliance with standards (referred to as random door inspections)[10]. Depending on which is greater, either 10% of a line of containers or 1 container per port of loading is inspected[10].

Door inspections consist of a visual inspection of the interior of the container by opening both doors and looking for contaminants[10]. Inspection of the entire container is restricted if cargo is present. A 1998 study suggested that only 66% of live insects in containers containing cargo and 60% of contaminated containers are likely to be detected on door inspections[112], illustrating the limitations of this method of inspection.

The only containers routinely lifted for an underside examination are containers from the Russian Far East and giant African snail endemic areas[76]. However, where the external examination of a container suggests the possibility of a contaminant on the underside of the container, the inspector may direct the port company to lift the container for an underside examination[10].

When contaminants are found, and if MQS considers that these are likely to be present throughout the shipment, the remaining containers are also inspected at the port. Those already released are traced for inspection and quarantine staff at all other ports receiving containers from the same lot are advised[10].

FCLs are released if no treatment is required. Containers requiring decontamination or further investigation may be directed to a transitional facility[10]. Contaminated containers may be swept or washed, depending on the severity of the contamination. Those that contain live insects are treated with an insecticide or are fumigated. Contaminants are placed in quarantine bins[107]. No insecticide is present in quarantine bins, but the contents are collected and heat-treated or incinerated[77]. Small nests, if not associated with soil contamination, or newly-founded nests, are not likely to be detected on visual inspection.

b) Empty containers

Between July 2000 and June 2001, approximately 35% of imported containers were empty, returning after carrying exports. Of these, approximately 23% were inspected[110]. No information could be obtained on the internal contamination rate of empty containers. Some companies send all their containers for cleaning as a standard procedure. These containers are directed to a cleaning yard for washing without inspection[76]. The cleaning yards are audited

[FF] **DoC submission:**
**What is meant here by "agricultural and forestry risk" and how are these defined?**

**MAF comment:**
**The statement referred to: "If no valid cleaning or packing certification accompanies the container or if the description in the manifest suggests it is an agricultural or forestry risk…" appeared in the draft consultation document. It has been altered to take into account that 'risk goods' are what must be identified.**

regularly by MQS[76]. Inspection is required on the wharf for any containers without accompanying cleaning certificates, and at least 10% of containers with the appropriate certification that are not sent directly for cleaning are inspected to ensure that cleaning has been performed[76]. Twenty four percent of imported empty containers are cleaned[79].

2) Transitional facility-inspected containers

a) Freight of all kinds (FAKs)

Containers transported direct to transitional facilities are reportedly not inspected externally before transport and are not routinely transported under contained conditions[76]. This allows possible dissemination of contaminants during transport, before inspection occurs at the transitional facility.

Containers carrying freight of all kinds (FAKs) are transported directly to a transitional facility, without inspection at the wharf, and are unpacked at the facility. Immediately after unpacking, the containers are swept and inspected by transitional facility staff. The transitional facility is required to inform MQS if insect contaminants are discovered[76; 107]. Notification is not required for soil contamination[76].

The majority of contaminants are likely to be found during unpacking and inspection of containers. However, small and newly-founded nests are unlikely to be detected by visual inspection. The effectiveness of interception of risk material is dependent on the thoroughness of transitional facility staff in performing inspection. Transitional facilities are audited by MQS[107].

Contaminated containers may be swept or washed, depending on the severity of the contamination. Those that contain live insects are treated. Treatment usually consists of application of an insecticide or fumigation[84]. Contaminants are placed in quarantine bins. No insecticide is present in quarantine bins, but the contents are collected and incinerated[77].

b) Less than container loads (LCLs)

LCL containers are usually unpacked at the wharf, but may be transported to a transitional facility. Although wharf staff are currently under no formal obligation, it is common practice for them to notify MQS if any pests discovered[76].

**Conclusion**

Containers have been found to transport live insects and to be contaminated with soil, suggesting that RIFA infestations of containers could occur. Because soil is a high-risk medium for transporting RIFA, and surveys have indicated that a large proportion of containers can be contaminated with soil, the likelihood of containers carrying an infestation has been assessed as high.

Because comparative figures are not available for soil and/or insect contamination, it is not clear whether the internal or external surfaces of sea containers are likely to present the greater hazard.

Most external contamination has been found to be on the underside of containers. Inspection of the underside of containers is not mandatory, except for containers from the Russian Far East and giant African snail endemic areas[76].

Approximately 23% of wharf-inspected containers are internally inspected by quarantine officers, compared with 100% of containers forwarded to transitional facilities, where they are inspected by transitional facility staff[107]. If inspection is performed to standard, containers forwarded to transitional facilities should be a lower risk pathway for RIFA introduction via internal contamination, than wharf-inspected containers. However, the external surfaces of containers directed to transitional facilities may not be inspected before transportation, which could allow dispersion of contaminants before inspection.

1) Wharf-inspected containers

Given that:

- soil and insects have been transported in, or on, sea containers
- soil is the normal nesting site for RIFA queens
- not all containers are internally and/or externally inspected
- not all infestations will be detected on visual inspection
- detection by door inspection is limited,

it is concluded that the likelihood of wharf-inspected containers introducing a RIFA nest is high.

2) Transitional facility-inspected containers

Given that:

- soil and insects have been transported in, or on, sea containers
- soil is the normal nesting site for RIFA queens
- containers are not externally inspected prior to transportation to the transitional facility
- not all infestations will be detected on visual inspection,

and taking into account that:

- all containers processed through a transitional facility are required to be internally inspected
- all contamination material detected is removed and incinerated,

it is concluded that the likelihood of sea containers processed at transitional facilities introducing a RIFA nest is high[GG].

[GG] **MoH submission:**
**The biggest concern with sea containers would seem to be the underside soil contamination, which is not routinely inspected for (p39) and, for FAKs at least, poses a risk of coming free from the container during transit from the wharf to the transitional facilities (p40). Given this (and the possibility, therefore, that the statement the "importation of untreated soil, which is not directed to a transitional facility for analysis and destruction, does not occur in New Zealand" (p75) is doubtful) we would categorise the risk from transitional facility-inspected sea containers to be high (not moderate).**

### c) Animal containers (by sea and air)

Animal importations are usually received at Auckland, Christchurch, and Wellington airports; Auckland and Christchurch seaports; and, infrequently, at Wellington and Tauranga seaports. Empty animal containers are received at Port Chalmers, Dunedin[113]. Approximately 0.1% of live animal importations in the year 2001 were by sea transport[114]. Containers types include wooden crates (often with a plastic lining), aluminium containers or modified shipping containers[77].

The frequency of RIFA infestation of animal crates/containers is not known, and no information could be obtained on the frequency of soil and insect contamination. However, soil is likely to be a common contaminant on crates and containers used to transport animals. Although not associated with an animal importation, the interception of a nest of a *Solenopsis spp.* of ants on wooden crates from the USA illustrates the point that RIFA infestations could occur[80]. Wooden crates are probably more likely to be infested than aluminium containers or modified shipping containers, as they are likely to provide more moist cracks and crevices suitable for an infestation[HH].

Although containers could act as fomites in the introduction of RIFA, container movement and the movement of contained animals is likely to stimulate worker ants to become active and leave the nest, increasing the number of ants visible for detection. Humans handling the container and the transported animals may be stung, further increasing the likelihood that an established nest would be detected during pre-export inspection in the country of origin or during inspection on arrival in New Zealand. Newly-founded nests are unlikely to be detected on visual inspection.

All imported animals are considered to be risk goods and are required to meet an appropriate Import Health Standard. There is a negligible likelihood that an infestation with worker ants would be present on a live animal. There are requirements in animal Import Health Standards to prevent the introduction of insect hitchhikers on animals. For example, the requirement for

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**MAF comment:**
**Given that all containers transported to transitional facilities are inspected for contamination, transitional facility-inspected containers are likely to be a lower risk than wharf-inspected containers. However, MAF acknowledges the potential for contamination from containers transported to transitional facilities is uncertain. Consequently, MAF has modified the specified rating to high.**

**[HH] MoH submission:**
**Should the fact that queens prefer to land on shiny or reflective surfaces (p22) be mentioned in regards to the statement that 'wooden crates are probably more likely to be infested than aluminium container' (p42)?**

**MAF comment:**
**Nest introductions may be by walking migration of ants from established nests or by newly-mated queens landing on the containers at the end of a mating flight. Although a newly-mated queen may preferentially land on a shiny surface, the article landed on must provide a suitable environment to form a nest and for the nest survival. Aluminium containers are less likely to provide such an environment. There is no indication in the literature that walking migrations are attracted to shiny surfaces, and it is likely that a wooden crate would provide more of a suitable environment for an infestation than an aluminium crate.**

**There is no information about the percentage of introductions to animal containers that are likely to be by mating flights or walking introductions, or the increase in percentage of queens likely to land on an object because it has a reflective surface. MAF acknowledges that the attribution of a greater likelihood to wooden containers over aluminium containers is based on the fact that the former provides a more appropriate environment for RIFA survival.**

ectoparasite treatment of dogs before importation[115]. No reports can be found of RIFA nesting on, or in, living animals. As an animal would show signs of an infestation, it is unlikely that it would escape detection.

There are no requirements in the majority of animal Import Health Standards to clean animals before transport. It is considered extremely unlikely that soil containing a newly-founded nest might be carried on an animal.

The Import Health Standards for the importation of horses (except from Australia[116]), pigs, and ruminants state that crates or pens must be new or satisfactorily cleaned[117]. Although a number of animal Import Health Standards (such as those for companion animals) do not directly require containers to be cleaned before use, they do require that animals transported by air are carried in containers that met the International Air Transport Association (IATA) Live Animal Regulations[115]. The IATA Regulations have a general requirement for containers to be clean, and if being reused, disinfected and sterilised[118]. Further, the generic Import Health Standard *Forestry and Agricultural Equipment from any Country*[119]requires all animal containers to be cleaned free from contaminants before importation.

The use of hay and straw as bedding is not permitted. Only sterilised peat, soft board or other inert approved product may be used[120]. However, hay – one of the materials cited as transporting RIFA into California[121] – is permitted as a food source for imported animals (see section 6.2.5.1.10). Infestations in hay could relocate onto animal containers during transit, increasing the risk of animal containers introducing RIFA. Hay, straw and other contaminants are identified during inspection, and are collected and disposed of.

Pig and horse Import Health Standards from countries currently infested with RIFA require insecticide spraying of the animal compartment either immediately prior to, or during, transportation to New Zealand[120]. Ruminant Import Health Standards from countries currently infested with RIFA require insecticide spraying of the animal compartment immediately prior to air transportation to New Zealand[120]. The holds of all aircraft arriving in New Zealand have been residually treated with insecticide or are sprayed before, or on, arrival[12; 101]. There is no mandatory requirement for spraying of arriving sea vessels.

Animals are inspected at the port of arrival or at a transitional facility unless a permit to import specifically states otherwise[22]. Animals are required to go into quarantine, if specified on the Import Health Standard, or are released after they have passed inspection if quarantine is not required.

Any crates and containers accompanying the animals are inspected for contaminants, including soil and hay, at the port of arrival or, less frequently, at the transitional facility specified to receive the animal[22]. A newly-mated queen or newly-founded nest is unlikely to be detected on visual inspection.

Where any contaminants are found, the crates/cages are washed at an approved decontamination facility or by the quarantine inspector, where this is deemed effective and appropriate, as outlined in the *Clearance of Animals and Animal Products* process procedure[22]. The Import Health Standard for *Forestry and Agricultural Equipment from any Country*, which includes equipment used for housing livestock, requires that steps should be taken to address contamination if there is a risk of dispersal before decontamination would normally occur[119].

Quarantine contaminants are placed in quarantine bins and are steam-sterilised or incinerated[77; 107]. Although most ports receiving animal importations report that the disposal of contaminants occurs promptly, and cleaning of containers occurs within 24 hours of arrival, there are no references in the process procedure or the Import Health Standard to the time period after arrival within which the collection and destruction of contaminants is required[22; 119]. If hay or soil is not considered to be at risk of dispersal, this allows the possibility that disposal could be delayed. Given that RIFA will readily move nest sites, relocations and mating flights could occur if there are delays in collection and destruction of contaminants[II].

Crates/containers may be left at the inspection facilities or may leave with the animals after inspection and biosecurity clearance is given[122]. Mandatory cleaning of all containers left at the transitional facility is not required in the relevant process procedure[22] or Import Health Standard[119]. However, crates/containers would be required to be cleaned if contaminated[22]. Auckland Airport does currently have a policy of mandatory cleaning of all animal containers left at the livestock-compound transitional facility[122].

When animals are transported to a transitional facility prior to inspection and decontamination of the accompanying container, requirements for approved transportation of animals are present in the transitional facilities and containment standards[123]. For most animals, except cats and dogs[JJ], the requirements include specifying the use of a crate that is sealed at the bottom and whose solid sides are high enough to prevent the discharge of faeces and urine from the container. The presence of a sealed effluent system, the cleaning and disinfection of the vehicle after unloading, the cleaning and disinfection of the container as soon as possible after arrival at the transitional facility and the incineration of hay, soil and animal waste is also required[123]. For avian transport, and high-risk animal transport, an approved biocontainment vehicle must be used[123]. Supplementary transport requirements can also be included on the permit to import issued for the animal importation[124].

**Conclusion**

Given that:

- there are no requirements to clean animals in the majority of Import Health Standards
- soil is likely to be a contaminant on crates and containers used to transport animals
- untreated hay may be imported in animal containers (see section 6.2.5.1.10)
- not all Import Health Standards require insecticide spraying of animal compartments immediately prior to air or sea transportation to New Zealand
- visual inspection of containers has a limited level of detection
- there is the potential for delayed disposal of contaminants,

and taking into account that:

- animals are extremely unlikely to carry an infestation without detection

[II] Appropriate action would be taken if live insect contamination were detected during inspection.

[JJ] Cats and dogs are required to be moved in approved, escape-proof compartments made of materials that can be cleaned and disinfected. Containers in which animals have been delivered must not be stored outside the transitional facility or handed over to any person until the containers have been thoroughly cleaned and disinfected to the satisfaction of the supervisor[123].

- all containers are inspected on arrival
- animal containers with hay and soil contamination are already targeted by MQS,

it is concluded that the likelihood of animal containers introducing RIFA is moderate.

### 6.2.4 Packaging

Goods are usually imported in secondary packaging to prevent damage and to facilitate handling. A variety of packaging materials (wooden, plastic, metal and paper) and types (cartons, crates, rolls, drums, pallets and frames) are used. Soil, peat, bark, raw green or contaminated moss, used sacking, hay, straw, chaff, or any packaging contaminated with these materials is prohibited[10; 18]. Goods and packaging are transported in bulk form or packed into containers before loading onto vessels and aircraft. During transport, goods may be protected, braced or supported by dunnage, which is usually made of wood.

Packaging and dunnage have been identified as potential fomites for the introduction of insects[86] and are likely to provide an environment that would support an infestation, particularly if they are contaminated with soil or organic material, or have moist cracks and crevices. Contamination rates are likely to be higher when packaging is reused or stored outside. It appears that consignments packed in crates have a higher level of fungi, insect and bark contamination than those packed in cartons, and that packing types made from wood are more contaminated than those made from non-wooden materials[125]. It is likely that packaging and dunnage associated with a RIFA food source would provide a greater likelihood of infestation.

Approximately 40-50% of sea consignments and 10% of air consignments entering New Zealand use wooden packaging[18]. Wooden packaging/dunnage is often made from non-manufactured, low grade, inexpensive raw wood[86], with cracks and holes suitable for RIFA. Interceptions of *Solenopsis spp.* on dunnage, and nests on wooden crates, illustrate that ant infestations can occur[80].

MQS concentrates on wooden packaging during inspection for insect infestation. However, queens are versatile in their nesting sites, and non-wooden packaging materials would also provide suitable nesting sites[42; 58]. It has not been possible to determine whether any difference in likelihood of infestation is balanced by the different inspection level for wooden and non-wooden products.

Packaging found with insect contamination is either fumigated, heat-treated, reshipped or incinerated[18] and all contaminants are placed in quarantine bins. The contents of quarantine bins are collected and heat-treated or incinerated[77].

Methyl bromide[KK] is the preferred fumigant, although sulphuryl fluoride[LL] may also be used for pre-import fumigation[126]. Heat treatment is required to be performed at 70°C for a minimum of 4 hours[126]. RIFA acclimatised to 32°C are killed at 48°C for 1 hour[64]. It is highly unlikely that wood subjected to a heat treatment of 70°C for 4 hours could contain viable RIFA.

[KK] Imported wood products that require treatment are required to be fumigated with methyl bromide or sulphuryl fluoride for a minimum of 24 hours[126].

[LL] Sulfuryl fluoride is effective against all insect stages except eggs[87; 88], but its efficacy decreases below 21°C. Although sulphuryl fluoride is generally toxic to all post-embryonic stages of insects[88], no information confirming the efficacy of sulphuryl fluoride against RIFA was found.

**a) Air transport**

A 1999 survey[104] of air cargo containers found that 3.3% of all contaminants identified were associated with packaging. Air cargo usually contains more expensive or perishable items than sea cargo and better quality, more processed packaging is likely to be used[18], reducing the likelihood of contamination and crevices that could provide a suitable environment for a RIFA infestation.

Although all aircraft are treated with a residual insecticide or have their holds sprayed before, or on, arrival[12; 100; 101], it is unlikely that infestations in, or on, packaging materials within an air container will be exposed to sufficient insecticide to kill an infestation.

Air cargo is taken directly to transitional facilities for unpacking. Although targeted inspection of wooden packaging occurs, inspection of all wooden packaging is not mandatory, and packaging materials are not normally listed on the airway bill manifest. There is no requirement for transitional facility staff to report wooden packaging found during unpacking[106; 127].

If insect contamination is discovered, MQS must be notified[77; 106; 107]. Transitional facilities are routinely audited by MQS[128; 129].

The majority of contaminants are likely to be found during the unpacking process. However, because of their size and the queen's preference for small moist cracks and crevices, it is unlikely that queens or newly-established nests would be detected on inspection.

There is an allowance in the Air Container Import Health Standard for air containers containing cargo for one consignee to be transported from transitional facilities to that consignee and returned directly after unloading[106]. However, transitional facility staff are required to inspect the air containers for contaminants before they can be transported off-site[106] and air containers do not normally leave transitional facilities or the airport area, as specialised equipment is necessary to handle them[77].

**Conclusion**

The likelihood of RIFA introduction is dependent on the likelihood that a particular commodity could become infested in the first place. It is difficult to estimate the likelihood of infestation for packaging materials, but survival would be likely if such an infestation were to occur.

Therefore, assuming that contamination had occurred, given that:

- packaging materials are likely to provide suitable conditions for infestation
- approximately 3% of contaminants are likely to be associated with packaging material
- wood comprises 10% of packaging materials used
- individual queens, small or newly-established nests in, or on, packaging materials may not be exposed to sufficient insecticide in the aircraft hold
- inspection of wooden packaging and other materials is not mandatory
- small or newly-established nests are unlikely to be detected on inspection,

and taking into account that:

- quality, processed packaging material is likely to be used
- air cargo is usually unpacked by transitional facility staff[MM]
- transitional facilities are required to inform MQS of any insect contamination found during unpacking,

it is concluded that the likelihood of packaging material used for goods transported by air introducing RIFA queens or nest is moderate[NN].

[MM] Although unusual, air containers could go directly to a consignee, be unpacked and returned immediately to transitional facilities.

[NN] **MoH submission:**
**We were not sure why the risk from packaging in air transport was seen as less of a risk than that from packaging in sea transport (p46, 48) – is it because of the higher percentage of wood packaging used in sea transport?**

**MAF comment:**
**MAF interprets this question as "why the risk from air-transported packaging was seen as less than that from sea-transported packaging inspected at a wharf". MAF considers the risk of both air-transported packaging and sea-transported packaging that is inspected at a transitional facility to be moderate and sea-transported packaging inspected at a wharf to be high.**

**Highly processed materials that are less likely to provide an appropriate environment for a RIFA infestation are more frequently used as air packaging compared with sea packaging. Air packaging materials are usually unloaded in transitional facilities, resulting in goods and their packaging being observed by transitional facility staff. Transitional facilities are required to inform MQS of any insect contamination detected before biosecurity clearance of the goods can be given. In comparision, either 10% or all of packaging from consignments identified as containing wooden packaging are inspected by MQS at wharf and non-wooden packaging materials (which are generally not targeted for inspection) are inspected only as part of random door inspections. MAF acknowledges there is uncertainty and that objective judgement is difficult. However, MAF maintains that air-transported packaging material is a lower risk than sea-transport packaging material inspected at a wharf.**

**b) Sea transport**

Ships carrying cargo arriving at their first port of entry are required to supply a manifest that identifies the cargo type being imported, port of lading and the port of origin[76].

It is the responsibility of the shipping company to supply valid cleaning and packing certificates for all container cargo. The certification states if any prohibited packing materials have been used[21]. The vessel's manifest lists all the cargo consignments on board and (inconsistently) the types of packaging materials[76].

Cargo and its packaging may be inspected at the wharf or at a transitional facility.

1) Wharf inspection (dunnage and FCLs)

All cargo listed as packaged in wooden packaging, or commodity types likely to be packaged in wood, are inspected irrespective of whether they are accompanied by certification of treatment[18]. All dunnage that leaves vessels is inspected[18; 76].

Ten percent of large consignments and all packaging for small consignments of identified untreated and non-manufactured wood are given a close-up inspection: all surfaces are inspected for holes, insects, plant material, soil and bark. Contaminated packaging is reshipped, treated or destroyed by incineration[18]. Manufactured or treated wood packaging is given a superficial examination.

Some non-wooden packaging materials may be inspected as part of the random door inspections of containers. As stated previously, this method of inspection is limited in its ability to detect insects and other contaminants, as visualisation of all of the container and its contents is limited.

RIFA are stimulated to attack by vibration[1]. Thus, a well-established nest is likely to be found during inspection. In addition, close inspection for insect damage and small crevices that could harbour termites and other insects, increases the chances of both detecting a RIFA nest and treatment of the wooden material. However, not all infestations are likely to be found on visual inspection.

**Conclusion**

The likelihood of RIFA introduction is dependent on the likelihood that a particular commodity could become infested in the first place. It is difficult to estimate the likelihood of infestation for packaging materials, but survival would be likely if such an infestation were to occur.

Therefore, assuming that contamination had occurred, given that:

- packaging materials are likely to provide suitable conditions for infestation
- wooden packaging often consists of low quality, unprocessed material
- approximately 40-50% of consignments use wooden packaging
- all, or 10% of, the wooden packaging associated with a consignment is thoroughly inspected

- some non-wooden packaging materials may be inspected during random door inspections
- visual inspection is unlikely to detect all small or newly-founded nests
- the level of detection of contamination and ability to see packaging during door inspections is limited,

it is concluded that the likelihood of importation of RIFA by wharf-inspected packaging materials is high.

2) Transitional facility inspection (LCLs and FAKs)

Most FAK and LCL containers are transported directly to a transitional facility. The cargo is unpacked and a MAF quarantine officer inspects goods identified on the vessel manifest as potential risk goods. Identified risk goods can not be released until biosecurity clearance is given by a MAF Quarantine Officer.

Staff at sea container transitional facilities are required to inform MQS if any insect contaminants are discovered during unpacking or in association with containers[76; 107]. Transitional facilities are routinely audited by MQS staff[128; 129].

Wooden packaging is usually inspected irrespective of whether or not it is accompanied by certification of treatment[18]. All identified untreated or non-manufactured wood packaging is given a close-up inspection, with 10% of large, and all of small, consignments inspected. As with wharf-inspected consignments, all surfaces are inspected for holes, bark, plant material, soil and insects. Wooden packaging stated as having been treated is inspected to confirm this[18]. Non-wooden packaging may be given a superficial inspection as part of a general inspection of the transitional facility storeroom.

Unpacking of containers removes the detection limitation of door checking. However, newly-founded or small nests, not associated with soil, would be unlikely to be detected on inspection.

**Conclusion**

The likelihood of RIFA introduction is dependent on the likelihood that a particular commodity could become infested in the first place. It is difficult to estimate the likelihood of infestation for packaging materials, but survival would be likely if such an infestation were to occur.

Therefore, assuming that contamination had occurred, given that:

- packaging materials are likely to provide suitable conditions for infestation
- wooden packaging often consists of low quality, unprocessed material
- approximately 40-50% of consignments use wooden packaging
- all, or 10% of, consignments of wooden packaging are thoroughly inspected by a quarantine officer
- some non-wooden packaging materials may be given a superficial inspection by a quarantine officer
- visual inspection is unlikely to detect all small or newly-founded nests,

and taking into account that:

- cargo is unpacked by transitional facility staff
- transitional facilities are required to inform MQS of any insect contamination found during unpacking of sea containers,

it is concluded that the likelihood of importation of RIFA by transitional facility-inspected sea packaging materials is moderate.

### 6.2.5 Commodities

Any commodities originating, packaged in, transiting or exported from an infested region have the potential to transport a RIFA queen. Any commodities containing soil, contaminated with enough soil to support a small nest or containing moist cracks and crevices, have the potential to harbour a nest. Objects that have spent periods of time outside, in contact with the ground, have the greatest likelihood of infestation.

The release pathways for all commodities from an infested region could be examined, but because of the time constraints, only commodities considered to be a high risk have been included here.

The likelihood of a commodity being infested with RIFA is affected by the presence of soil being on or in a commodity[36; 40], the attraction of queens to shiny objects[24; 33], an association with an electric field[58], whether the commodity has been used outdoors[40], and if the commodity was packed gradually. Overseas interceptions and reports of infestations in goods have also been used to identify high-risk commodities[121].

High-risk commodities considered in this release assessment are:
- motor vehicles
- used car parts
- soil
- used machinery
- nursery stock
- non-wooden building and landscaping materials
- wooden building materials
- bark/mulch
- beehives
- hay and straw
- used electrical equipment

Non-reproductive workers are the colony foragers. Commodities that are common food sources for RIFA are more likely to be associated with worker ants than reproductive queens. No references could be found to nests being discovered in live plants or animals, so these commodities have not been considered. However, fresh fruit and vegetables, especially root crops, could present a pathway because of soil contamination and, therefore, require a release assessment to be performed.

Commodities can enter New Zealand as one of four categories:
- cargo containers (sea and air)
- bulk cargo (sea and air)
- international mail (sea and air)
- air courier cargo (air)

Aircraft and vessels carrying cargo to New Zealand are required to supply an airway bill or ship's manifest to MQS. The ship's manifest identifies the cargo type being imported, place of loading and the place of origin. The airway bill identifies the cargo type being imported and its place of loading.

#### 6.2.5.1 Bulk and container cargo

RIFA are thought to have been introduced into the USA between 1930 and 1940 via shipping cargo or, possibly, dirt used as ship's ballast[1].

Goods or cargo can be transported in bulk form or packed into containers before loading onto vessels and aircraft.

**a) Air transportation**

Inspection of commodities is performed based on the airway bill. Quarantine officers examine the airway bills for commodities considered to be risk goods and inform the transitional facilities of those goods that require inspection before release[OO].
The transitional facilities are required to inform MQS if any insect contaminants are found associated with the cargo[77; 106; 107]. The facilities are audited by MQS to ensure compliance with standards[128; 129].

**b) Sea transportation**

Goods arriving by sea may either be inspected at the wharf or be forwarded to a transitional facility for inspection[9;10].

Wharf inspection

Importations considered to be risk goods are identified by their description in the ship's cargo manifest and are stopped for inspection as dictated by the relevant Import Health Standards and process procedures[76].

*Container cargo*
Containers identified as holding risk goods or with no, or invalid, container cleaning certification are door-inspected and the cargo is inspected as dictated by the relevant process procedures. Some of the remaining cargo may be inspected as part of random door inspections of containers.

*Bulk cargo*
Bulk cargo is inspected as dictated by the relevant Import Health Standards and process procedures[9].

Transitional facility inspection

[OO] **DoC submission:**
**Quarantine officers should be examining airway bills for all risk goods – not only those that pose an agricultural or forestry risk. Is this what currently happens? The choice of text in this paragraph is a little confusing.**

**MAF comment:**
**The paragraph referred to appeared in the draft consultation document and contained statements limiting goods identified to those "…considered to be an agricultural or forestry risk (risk goods)…". This section has been altered to take into account that 'risk goods' are what must be identified.**

Risk goods can not be given biosecurity clearance until they are inspected by a MAF quarantine officer. The remaining goods may be given a general visual examination by a quarantine officer as part of the inspection of the storeroom. Transitional facility staff are required to inform MQS if live insect contamination is found associated with containers, packaging or goods[76; 107]. Transitional facilities are regularly inspected and audited by MQS.

#### 6.2.5.1.1 Motor vehicles

'Motor vehicles' include cars, trucks, utes, vans, buses, motorcycles and trailers. The term may cover the entire chassis, or parts that could be readily re-assembled into an entire vehicle[13]. Approximately 160,000 vehicles were imported between January and September 2001, 7.6% of which were from the USA or Australia[76].

Motor vehicles have been cited in a number of references as harbouring RIFA infestations[24; 42]. Motor vehicles are often contaminated with organic material and conceal moist areas that can sustain an infestation. RIFA may be attracted by their reflective surfaces[24; 33]. The interception of ants and ant nests in motor vehicles (trucks and cars) from Japan illustrates the point that imported vehicles can harbour infestations[130]. Used and older vehicles are usually more heavily contaminated with organic material and, therefore, pose the majority of risk for transporting RIFA infestations.

Pre-importation inspection of vehicles from Australia, the USA and South America is not required[84], but may be performed as part of a MAF-approved pre-shipping inspection program. On arrival of a consignment of vehicles in New Zealand, documentation associated with the vehicles is reconciled with the consignment and an audit is performed on 10% of vehicles to ensure they have been inspected pre-shipment[131].

Vehicles can be landed only at ports that have approved transitional facilities for decontamination[13]. All used vehicles arriving into New Zealand that are not part of an approved pre-shipment inspection program are inspected on the wharf and are not permitted to move from the wharf without authorisation from MQS. New vehicles are exempt from mandatory inspection unless there is evidence of cross-contamination from other cargo or if field testing has taken place prior to loading[13].

During inspection, the exterior and interior of the vehicles are examined[131]. Any vehicle found to have contaminants that can not easily be removed at the time of inspection is sent to a decontamination facility and re-inspected prior to final clearance [13]. Between July 2000 and June 2001, 37% of imported used vehicles required treatment on arrival[79].

Contaminants are removed by vacuuming, washing, fumigation, or removal and destruction of severely contaminated parts[13]. In most cases, the inside is vacuumed and the outside waterblasted[76]. All wastewater from washing of vehicles is passed through a 2mm sieve[107]. Displaced organic material is collected and incinerated[107]. A 2mm sieve would not be fine enough to prevent RIFA worker ants from passing into the effluent system[132PP]. No information was obtained on the smallest mesh size needed to contain queen ants. Vehicles are fumigated with methyl bromide when observed or suspected contamination warrants[13; 76].

A well-established nest is likely to be found by inspection but, because of the initial lack of workers in founding nests, the small size of immature nests, and the preference for small, moist cracks and crevices, not all infestations are likely to be found on visual inspection. Case studies report the walls of a 2-year old motor home and a cylindrical air pollution control canister in a motor vehicle being infested, demonstrating the variety of sites RIFA are able to infest[42].

[PP] The Border Management group states that washings from car parts, heavy machinery and vehicles are usually disposed of into the effluent system. If washings are to be disposed of into a fresh water system, they are chlorinated before release. (The effect of chlorination on RIFA survival in waterways has not been examined in this assessment.)

Cleaning, consisting of vacuuming and washing, is unlikely to access all RIFA nesting sites.

**Conclusion**

Given that:

- vehicles can be infested by RIFA
- nesting sites are likely to be well concealed
- small or newly-established nests are unlikely to be detected on visual inspection
- routine treatment methods are not likely to remove all infestations,

and taking into account that:

- all vehicles are inspected pre-shipment or on arrival,

it is concluded that the likelihood of importation of RIFA with used motor vehicles is high.

#### 6.2.5.1.2 Used car parts

Although they have been detected in vehicles overseas, there are no reports of RIFA being intercepted in car parts. The likelihood of car parts introducing RIFA has been examined because of concern expressed that this could be a pathway for introduction. The frequency with which RIFA might infest car parts is not known. New car parts are not considered to be risk goods and, unlike motor vehicles, are unlikely to have a high risk of outdoor exposure or contamination with organic material. However, used car parts are reportedly often contaminated with organic material, have moist areas that could contain a RIFA infestation and are often packed outdoors into containers over a period of time[76]. Although used car parts are often packed individually into containers, increasing the likelihood of an established infestation being detected, smaller and newly-founded nests might be missed. Any extended period of packing increases the possibility of a subsequent infestation in parts already packed.

All used car parts are inspected on arrival for contaminants, including soil, plant material, animal material, and insects. Consignments are not permitted to move from the transitional facility without MQS authorisation[13].

On arrival, it is mandatory for all used car parts from Japan, and junk batteries and used tyres from all countries, to be fumigated with methyl bromide. If fumigation can not occur within 48 hours, an external inspection is carried out and all holes are sealed until fumigation is performed[13; 76]. Although Australian fumigation certification for junk battery consignments, certifying that fumigation has occurred up to 21 days prior to shipment, would be accepted in lieu of fumigation in New Zealand, currently all are fumigated on arrival[13; 76].

When contaminants are identified on inspection, the contaminated consignment can be refused entry and reshipped or destroyed[9], or can be sent to an approved transitional facility for decontamination. This is usually by washing, vacuuming or fumigation, depending on the nature of contamination[13]. The car parts are required to be reinspected post-treatment[9].

A well-established nest is likely to be found by inspection but, as previously discussed, not all infestations are likely to be found on visual inspection.

Transitional facilities carrying out treatments on used car parts are required to inform an MQS inspector of any insect contamination found in association with a consignment of car parts[76; 107]. All waste water from washing of car parts is passed through a 2mm sieve[107]. Displaced organic material is collected and heat-treated or incinerated[77; 107].

Methyl bromide is registered against ants in the USA[89]. Unpublished experimental data show that methyl bromide will kill RIFA worker ants when used at a dose rate of $32 g/m^3$ for a period of 24 hours[90]. Expert opinion is that methyl bromide would be effective against queens, but an effective treatment rate needs to be determined[91].

**Conclusion**

The likelihood of RIFA introduction is dependent on the likelihood that a particular commodity could become infested in the first place. It is difficult to estimate the likelihood of infestation for used car parts.

Therefore, assuming that contamination had occurred, given that:

- used car parts could provide suitable conditions to support a RIFA infestation
- nesting sites are likely to be well concealed
- small or newly-established nests are unlikely to be detected on inspection
- an efficacious treatment rate of methyl bromide fumigation against RIFA queens requires determination,

and taking into account that:

- all used car part consignments are inspected on arrival,

it is concluded that the likelihood of importation of RIFA by used car parts is high.

#### 6.2.5.1.3 Soil

Soil is defined in the MAF Soil Import Health Standard[133] as the upper layer of earth, containing a mixture of organic material, sand, gravel, clay and silt. It includes potting mix and peat[18; 134].

Soil is the normal nesting site for RIFA queens, making it a high-risk commodity. Queens nest in a variety of soils, including sand and clay-based soils[36]. Therefore, all imported soil from infested areas must be considered to be a high-risk.

Entry of soil into New Zealand is prohibited unless it falls into one of the following categories[133]:

- *Small quantities (up to 10kg)*
  The soil shall be treated by raising the internal temperature of the soil to 95°C for at least 25 minutes (soil must be moist) before release.
- *Soil samples not known to contain pests or pathogens causing plant or animal disease, imported by a commercial company or education facility, may be directed for analysis and destruction at a facility approved as a transitional facility.* The soil must not leave the transitional facility. It is analysed, destroyed by incineration, or autoclaved[134].
- *Soil in excess of 10kg, not known to harbour pests or pathogens or where heat treatment is not desired*
  The importer shall (prior to shipment) apply to the National Manager, Import Management, MAF with the details of the consignment's origin, composition, destination and intended use.
- *Soil that is known or suspected to harbour pests or pathogens*
  Requires a permit from the MAF Import Management Section prior to shipment.
- *Soil that is a contaminant on a consignment*
  This soil must be removed, treated and destroyed. Commercial consignments are decontaminated at an approved facility. Private cargoes can be washed provided there is an adequate water supply and the contaminants are disposed of into the stormwater drain or equivalent[83]. Where decontamination is not possible, the cargo is reshipped or destroyed.

Clay and sand, if free of organic material, commercially packed and intended for manufacturing, or as absorbents, are not risk goods[133]. Small quantities (up to 10kg) of clean sand and clay for analysis/testing, personal use or display are permitted entry provided the sand or clay is inspected and found to be free from organic material. Sand and clay containing organic material is treated as soil[133].

As stated, contaminated items are washed and contaminants are disposed of into a stormwater drain or equivalent[83;QQ]. It is believed that RIFA submerged in detergent-mixed water would survive approximately 8 to 10 hours, and several days within soil submerged in water[40]. However, there is a low likelihood that a queen washed into stormwater drain would survive and go on to establish a nest (see Appendix 9).

Studies have shown that RIFA acclimatised to 32°C are killed when exposed to 48°C for one hour[64]. The USDA RIFA quarantine regulations require soil to be heated to 65.5°C (no time

[QQ] MAF Border Management report that, although the process procedure *Clearance of soil, sand, clay, water and other Miscellaneous Items* indicates that soil can be disposed of into the stormwater drain, soil contamination is usually disposed of into the effluent system. The risk of disposal of soil into a stormwater drain has been examined as the 'worst case scenario'.

period is stipulated)[73] before it is eligible for movement. Although some insects show high temperature tolerance, RIFA exposed to 95°C for at least 25 minutes would be killed[40;RR].

There are a small number of peat products currently imported under the MAF Plant Products standard 152.09[19]. No quarantine or inspection of these products is required[134]. These products and other peat importations are currently under review by MAF Plants Biosecurity[134]. Given that soil presents a high risk for transportation of RIFA, release assessments need to be performed on these products to evaluate the likelihood of transportation of RIFA from an infested area.[SS]

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**[RR] MoH submission:**
**What is effective heat treatment for RIFA? 95C for at least 25 minutes (p55), or 48C for at least one hour (p55&68)? The answer is crucial to the 'low likelihood' or introduction via soil that has been heat-treated to 65.5C.**

**MAF comment:**
**The maximum temperature tolerance of RIFA is influenced by the ambient temperature the ants are acclimatised to before being subjected to heat treatment. In experimental studies, all RIFA acclimatised to 32°C (the optimum temperature for brood development) died when exposed to 48°C[64] for one hour and 99% of RIFA acclimatised to 29.1-29.8°C died at 47.7°C[135]. Both the US Federal Code of Regulations[73] and the Fire Ant Control Centre, Brisbane[51] use 65.5°C as the lower limit of heat treatment against RIFA. An expert consulted by MAF was confident that any RIFA exposed to 95°C for 25 minutes would be killed[40].**

***Cataglyphis bicolor, Cataglyphis bombycina, Ocymyrmex barbiger* and *Melophorus bagoti* are desert-dwelling scavenger ants[136] reportedly among the most thermophilic insects identified[137]. These ant species use physiological and behavioural adaptation to forage at surface temperatures greater than 56°C[136; 138]. It is considered that they are foraging near the limit of animal potential and their own thermal maximum. These species forage until their body temperature reaches critical thermal maximum, at which time the ants seek refuge from the heat[137]. Without the opportunity for access to thermal refuges the ants become disorentiated, incapable of coordination, and die[136; 138; 139].**

***Cataglyphis bombycina* has foraging activity over a temperature range of 7°C (46.5°C to 53.6°C)[139]. They spend 30%, and sometimes up to 75%, of their foraging time in thermal refuges, often pausing on the tops of stalks of dry vegetation where they encounter much lower temperatures, and can 'off load' excess body heat[139]. *Ocymyrmex barbiger* have been observed foraging at surface temperatures of 26°C -67°C. At surface temperatures above 51°C, *Ocymyrmex barbiger* periodically pause in relatively cooler thermal locations, such as shade, or by climbing above the desert floor[138]. An *Ocymyrmex barbiger* ant deprived of a thermal refuge at 62°C became paralyzed within 60 seconds[138].**

**Similarly, RIFA worker ants can forage at surface temperatures potentially lethal to them (i.e. temperatures above 42°C-48°C[140]). It is believed that the extensive use of the tunnel system allows this to occur, as the tunnel system decreases the time workers are exposed to surface temperatures. When RIFA workers forage, 90% of their journey is subterranean, at soil temperatures from approximately 15°C to 43°C, with maximal foraging rates between 22°C and 36°C. Ten percent of a foraging journey is above ground, at surface temperatures of 12°C to 51°C[141].**

**The critical thermal maximum (the temperature at which the animal is no longer capable of proper locomotion and, therefore, escaping thermal death) for *Cataglyphis bicolor*, a Sahara Desert ant, is reported as 55.1 +/- 1.1°C[142]. *Cataglyphis* spp. appear to be the most heat-tolerant desert ant genera, with five species taking 10-25 minutes to enter a heat coma when exposed to 55°C. Under similar conditions, *Ocymyrmex barbiger* workers entered a heat coma after 25 seconds[138].**

**Given that RIFA are adapted to forage at lower temperatures than desert-dwelling ants, and that *Cataglyphis bombycina, Ocymyrmex barbiger,* and *Melophorus bagoti*s succumb to temperatures of 55.2 +/- 1.1 °C (standard deviation)[139], 51°C for 30 minutes[138] and 54°C after one hour[136] respectively, it is considered improbable that RIFA would survive quarantine treatment temperatures of 95°C for 25 minutes, 90°C for 15 hours, or 70°C for 4 hours.**

**[SS] DoC submission:**

## Conclusion

Heat-treated soil, clay and sand would not contain viable RIFA. As soil is a high-risk material for transporting a nest, it must be emphasised that soil, clay and sand (not free of organic material) should not be imported from infested areas without heat treatment unless an effective alternative treatment is used or the soil is going to a transitional facility for analysis and subsequent destruction. Currently, under the soil Import Health Standard, there is a possibility that soil, sand and clay could be imported without heat treatment. However, it is highly unlikely that the National Manager, Import Management would approve importation of non-heat-treated soil that was not directed to a transitional facility for analysis and subsequent destruction[TT].

With the exception of the peat products (which require further assessment), given that:

- soil is prohibited entry unless it is heat-treated or directed to a transitional facility, where it is analysed or destroyed
- clay and sand containing organic material are required to be treated as soil
- heat treatment is likely to be effective in eliminating any RIFA infestation present,
- although there is an allowance for non-heat-treated soil to be imported on individual import health permits, the National Manager, Import Management is unlikely to approve importation of non-heat-treated soil that was not directed to a transitional facility for analysis and subsequent destruction,

it is concluded that the likelihood of introduction of RIFA by soil is low.

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**The Department concurs with this analysis. Does MAF intend to undertake a release assessment in terms of RIFA for the peat products currently imported under the MAF plant products standard 152.09 for RIFA as recommended in this document?**

**MAF comment:**
**A proposal to carry out a risk assessment for peat products is currently under development.**

[TT] **DoC submission:**
**Given the statement it is unlikely the National Manager, Import Management will provide approval for the importation of non-heat treated soil that is not directed to a transitional facility for analysis and subsequent destruction, the Department recommends this provision be removed from the Soil Import Health Standard.**

**MAF comment:**
**The consideration of management measures is outside the scope of this release assessment. However, DoC's submission has been added to the section 'issues identified for further consideration'.**

#### 6.2.5.1.4 Used machinery

Used machinery, especially outdoor machinery such as bulldozers, excavators, agricultural and forestry machinery, is likely to be contaminated with plant material and soil and can contain moist crevices that could support a RIFA infestation. Heavy equipment has been intercepted in USA carrying infestations[121].

Used machinery is imported under the Import Health Standard for *Forestry and Agricultural Equipment from any Country*[119]. Equipment includes used machinery that, in the course of its intended function, may have come in contact with plant, animal, or forestry material or soil[13]. All used machinery encompassed by this definition is required to be inspected.

The Import Health Standard for forestry and agricultural equipment requires all used equipment to be dismantled and cleaned of all contamination prior to shipping and the equipment to be stored and carried in a manner that prevents recontamination[119].

Used machinery can be landed only at ports that have approved transitional facilities for decontamination[119]. If possible, machinery is inspected prior to leaving the vessel on which it arrived[13]. Machinery found to be grossly contaminated may be refused entry and reshipped in the vessel on its departure or be sufficiently cleaned on board the vessel before being taken to an approved decontamination area[76].

All accessible areas of the equipment are inspected for the presence of contaminants. Quarantine officers may partially or totally disassemble parts of used machinery to ensure that no contaminants are present[119]. Any found to have contaminants that can not easily be removed at the time of inspection are sent for decontamination and subsequently re-inspected prior to final clearance being given[13].

As previously discussed, not all infestations are likely to be found on visual inspection. However, used machinery visually contaminated with soil and other contaminants that are likely to harbour a RIFA infestation would not pass inspection and would be required to be treated. Between July 2000 and June 2001, on average, 37% of used machinery and vehicle imports were treated on arrival[79].

Decontamination methods include vacuuming, washing, fumigation, and removal and destruction of severely contaminated parts[13]. In most cases, the inside is vacuumed and the outside waterblasted. Fumigation with methyl bromide may be performed when observed or suspected contamination warrants.

High pressure hosing and vacuuming will remove contamination, but is unlikely to access all possible RIFA nesting sites.

All waste water from washing is passed through a 2mm sieve. Displaced organic material is collected and destroyed by incineration[107].

**Conclusion**

Given that:

- used machinery has a high risk of soil contamination
- some nesting sites are likely to be well concealed
- it is unlikely that all infestations would be detected on visual examination
- routine treatment is not mandatory
- routine treatments are unlikely to remove all infestations,

and taking into account that:

- all machinery is inspected on arrival
- soil-contaminated machinery is being targeted for interception at the border,

it is concluded that the likelihood of importation of RIFA with used machinery is high.

#### 6.2.5.1.5 Nursery stock

There are numerous references to trade in nursery stock spreading RIFA within and between countries[143]. Nursery stock may have been the route of initial importation of RIFA into the USA, and has been identified as the route of spread in outlying infestations in Australia[34].

The soil associated with the nursery stock is much more likely to harbour RIFA than the plant material itself. No references could be found to infestations in living plants and animals.

With the exception of consignments of tissue cultures and dormant bulbs imported as part of an approved propagation scheme from Victoria, Australia, all importations of nursery stock into New Zealand require import permits issued by MAF Plants Biosecurity[134]. Consignments of nursery stock must also be accompanied by a phytosanitary certificate stating that the nursery stock has been inspected by the National Plant Protection Organisation (NPPO) in the country of origin according to appropriate procedures and conforms to New Zealand's current entry conditions[144]. The NPPO of the exporting country ascertains New Zealand's current entry conditions from the consignment's nursery stock import permit and from the *Import Health Standard for Nursery Stock*. Both the import permit and the Import Health Standard states that: " Only inert/synthetic material may be used for the protection, packaging and shipping materials of the nursery stock. Lots contaminated with soil shall be treated, reshipped or destroyed"[134; 144]. This implies that consignments must be free of soil to meet New Zealand's entry requirements.

On arrival, all documentation associated with the nursery stock is reconciled with the consignment and the plant material is sampled and inspected. A randomly selected minimum of 600 units from each line/lot is inspected and any packaging associated with the sample is inspected for pests and contaminants[UU], including soil. Where regulated contaminants are found, the packages are treated (where possible), reshipped or destroyed[9; 19; 144]. There are no quantity restrictions on consignments of nursery stock.

If the number of nursery stock units infested with regulated quarantine pests exceeds the maximum pest limit, the nursery stock is treated (where possible), reshipped or destroyed, as directed by an MAF inspector[144].

RIFA is classified as regulated pest, which is defined by MAF Plants Biosecurity as "a pest of potential economic importance to New Zealand and not yet present there, or present but either not widely distributed and being officially controlled, or a regulated non-quarantine pest, or having the potential to vector another regulated pest into New Zealand"[145]. As RIFA are listed as an unwanted organism under the Biosecurity Act, their detection on inspection would result in the consignment being treated, reshipped or destroyed.

There are three categories of nursery stock imported into New Zealand:
- nursery stock raised from seeds or cuttings
- nursery stock propagated as bulbs
- nursery stock imported as tissue culture.

1) <u>Nursery stock raised from seeds or cuttings</u>

[UU] To achieve 95% confidence that the maximum pest limit will not be exceeded, no infested units are permitted in a randomly drawn sample of 600 units from each line. For lines of less than 600 units, 100% inspection is required[19].

The phytosanitary certificate must have the following additional declarations:

a) The nursery stock must have been dipped in/sprayed with an approved insecticide within 7 days. The approved insecticides available as treatment options are acephate, diazinon, dichlorvos, permethrin/pirimiphos methyl and taufluvalinite.

b) Whole plants must have been raised from seed/cuttings in soil-less rooting media in containers maintained out of contact with the soil. Or the roots of the plants must have been dipped in fenamiphos for 30 minutes[144].

Acephate, diazinion, dichlorvos, and permethrin are likely to be effective at killing RIFA[15; 92; 146]. No information was found on the efficacy of pirimiphos methyl or taufluvalinite against RIFA.

No reports on the efficacy of fenamiphos against RIFA could be found. It has been suggested that, given fenamiphos is efficacious against nematodes and aphids[147], it is likely to be effective against RIFA. However, not all species of insect have the same susceptibility to insecticides. Given that soil is a high-risk material for transporting RIFA infestations, the efficacy of fenamiphos should be confirmed[VV].

Following inspection, all plants raised from seeds or cuttings must undergo a period of post-arrival quarantine in order to check for the presence of regulated pests and diseases[144]. The minimum period of post-arrival quarantine is 3 months in a MAF Biosecurity Authority-registered transitional facility in accordance with the specifications listed in the *PBC-NZ-TRA-PQCON Specification for the Registration of a Plant Quarantine or Containment Facility, and Operator*[144]. Plants in post-arrival quarantine are re-potted into essentially sterile soil[134], and a minimum of two inspections, conducted by MAF, occur over the minimal 3-month post-arrival quarantine period for nursery stock[134].

Although it is possible that newly-founded nests may not have produced workers before the completion of the minimum 3-month post-arrival quarantine, the majority of nests would be producing workers and are likely to be detected if present. In addition, given that the plant material must be free of soil on importation and is replanted in transitional facilities (providing a further opportunity for insect or soil contamination to be observed) there is a low likelihood of RIFA being undetected.

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**[VV] DoC submission:**
**We concur with this analysis. Does MAF intend to test the efficacy of fenamiphos against RIFA and other pest species?**

**MAF comment:**
**This consideration is outside the scope of this release assessment. However, the need to test the efficacy of this product has been recognised under 'issues for further consideration'.**

2) Nursery stock propagated as bulbs

Dormant bulbs may be imported from the following areas[WW]:

- Australia, Canada, European Union countries, Israel, South Africa, or the USA, with a declaration that the consignment has been inspected for plant diseases during the growing season. These importations do not require post-arrival quarantine[144].
- all countries with the exception of those listed above under the following conditions:
  - consignments that have had a growing season inspection and are either fumigated with methyl bromide or treated with an approved insecticide require a post-arrival, level 1 (open ground), quarantine for a minimum of 3 months and a minimum of 2 inspections by MAF during this period.
  - consignments that have not had a growing season inspection require a post-arrival, level 2 (greenhouse), quarantine for a minimum of 3 months and a minimum of 2 inspections by MAF during this period.
- as an importation from the approved propagation scheme of Victoria, Australia. Post-arrival quarantine is not required.

For no consignments is there a requirement for soil-less media to be used during bulb production, but, as stated previously, bulbs must be inspected prior to shipment by the National Plant Protection Organisation in the exporting country and the bulbs must meet New Zealand's current entry conditions. Phytosanitary certification stating that these requirements have been fulfilled must accompany consignments[144]. The general conditions for the importation of bulbs, part of the import permit issued by MAF Plants Biosecurity and accompanying the phytosanitary certificate, states that "lots contaminated with soil shall be treated, reshipped and destroyed". This implies that one of New Zealand's import requirements is that consignments must be free of soil. However, there is no requirement on the phytosanitary certificate or accompanying permit directing the bulbs to be cleaned, to prevent soil contamination, before export and reliance is placed on the exporting countries inspection to detect consignments that may not have been cleaned before export. On arrival in New Zealand, to ensure freedom from contaminants, a random sample of 600 units is inspected, 100% inspection is required for lines less than 600 units. There is no quantity restriction on consignments and no information was obtained on the average size of bulb consignments. Random sampling assumes that the contamination is evenly distributed through the consignment and in large consignments a relatively small sample may be inspected.

3) Nursery stock imported as tissue culture

Plants derived using tissue culture techniques are propagated by growing plant material (such as a stem tip, node, meristem, embryo) in sterile (usually gel-based) nutrient media.

Tissue culture plants must have been grown in the vessel in which they are imported[144]. The container must be rigid and either clear plastic or glass[144]. Tissue culture plantlets removed from the original culture containers in which they were grown, must be accompanied by a declaration on the phytosanitary certificate stating that removal occurred not more than 48 hours prior to export, and that they have not been in contact with any other growing media[144].

[WW] Dormant bulb importation requirements are currently under review by MAF Plants Biosecurity. These processes have changed since the draft consultation document was published.

Given that no reports could be found of RIFA nesting in live plant material, that a small amount of plant tissue is used to produce tissue-cultured plants, and that the plants are intensively managed and observed, it is improbable that tissue culture would be infested at the outset of propagation. In addition, because of the controlled growing environment (usually laboratories), tissue cultures are unlikely to become infested with RIFA during propagation and it is unlikely that an infested unit would not be discovered and be discarded prior to export.

Consignments of tissue culture plants, as for other plants and bulbs, are required to be inspected prior to export in the country of origin and be accompanied by phytosanitary certification that states that inspection has occurred and that the material conforms to New Zealand's entry conditions[144]. Tissue culture consignments are inspected on arrival and, if required, may undergo a period of post-arrival quarantine. Post-arrival quarantine is not mandatory, as it is for nursery stock raised from seeds or cuttings[144].

**Conclusion**

1) Nursery stock raised from seeds or cuttings

Given that:

- nursery stock is a high-risk item for transporting RIFA
- there is no quantity restriction on consignments and not all of a consignment may be inspected on arrival
- no reports on the efficacy of fenamiphos in killing RIFA could be found, but assuming it has no effect on RIFA,

and taking into account that,

- whole plants must have been raised in soil-less medium or roots dipped in fenamiphos for 30 minutes
- insecticide treatment of nursery stock must be performed before importation
- nursery stock imported into New Zealand must be free of soil
- consignments of nursery stock are required to be inspected prior to export, and phytosanitary certification stating that this requirement has been fulfilled and that New Zealand's entry requirements have been fulfilled must accompany consignments
- a minimum random sample of 600 units is inspected (100% inspection is required for lines less than 600 units) for contamination on arrival in New Zealand
- consignments identified with soil contamination are treated, reshipped or destroyed
- post-arrival quarantine for a minimum of 3 months is mandatory,

it is concluded that the likelihood of introduction of RIFA by nursery stock raised from seeds or cuttings is low.

2) Nursery stock propagated as bulbs

Given that:

- nursery stock is a high-risk item for transporting RIFA

- there is no requirement for soil-less media to be used for propagation
- there is no requirement for bulbs to be cleaned before export
- there is no quantity restriction on consignments and not all of a consignment may be inspected on arrival
- there is no requirement for quarantine on arrival for bulbs in the approved Victoria, Australia scheme
- there is no requirement for quarantine on arrival for bulbs from the USA or Australia if accompanied by a declaration that the consignment has been inspected in the growing season
- RIFA is established in the USA and Queensland, Australia
- there has been an incursion of RIFA into Victoria, Australia,

and taking into account that:

- nursery stock imported into New Zealand must be free of soil
- consignments of dormant bulbs are required to be inspected prior to export, and phytosanitary certification stating that this requirement has been fulfilled and that New Zealand's entry requirements have been fulfilled must accompany consignments
- a minimum random sample of 600 units is inspected (100% inspection is required for lines less than 600 units) for contamination on arrival in New Zealand
- consignments identified with soil contamination are treated, reshipped or destroyed
- RIFA is not reported to be established in Victoria, Australia,

it is concluded that the likelihood of introduction of RIFA by dormant bulbs is moderate.

3) Nursery stock imported as tissue culture

Given that:

- nursery stock is high-risk item for transporting RIFA
- there is no quantity restriction on consignments and not all of a consignment may be inspected on arrival,

and taking into account that:

- tissue cultures are unlikely to be infested at the initiation of propagation
- there are no reports of RIFA nesting in living plant material
- tissue cultures are raised in intensively managed environments
- nursery stock imported into New Zealand must be free of soil
- consignments of tissue cultures are required to be inspected prior to export, and phytosanitary certification stating that this requirement has been fulfilled and that New Zealand's entry requirements have been fulfilled must accompany consignments
- a minimum random sample of 600 units is inspected (100% inspection is required for lines less than 600 units) for contamination on arrival in New Zealand
- consignments identified with soil contamination are treated, reshipped or destroyed,

it is concluded that the likelihood of introduction of RIFA by nursery stock raised from tissue cultures is negligible.

#### 6.2.5.1.6 Non-wooden building and landscape materials

Used building materials such as bricks, stones, etc. have a high risk of being contaminated with organic material and soil, and concealing moist inlets that can contain a RIFA infestation. Even unused materials that have been packed for a period of time and have had periods of time outside, in contact with the ground, could provide a suitable environment for the establishment of a nest. Roofing materials have been intercepted in the USA carrying RIFA infestations[121].

Currently there is no Import Health Standard for these products and they are not considered to be risk goods. However, as for all importations into New Zealand, these products are required to be free of soil[133].

Wharf inspection

Bulk loaded, non-wooden building and landscape materials are generally not considered to be risk goods, do not have Import Health Standards and are not targeted for inspection.

A portion of building materials will be inspected as part of random door inspections, consisting of visual inspection of the interior of the container by opening both doors and looking for contaminants[10]. As discussed previously, the detection of contaminants by door inspections is limited and commodities at the back of the containers can be difficult to see. A 1998 study suggests that only 66% of live insects in containers are likely to be detected by door inspections[112].

Transitional facility inspection

Building materials in containers taken directly to transitional facilities and are unpacked by transitional facility staff[76]. Transitional facilities are required to inform MQS if insect contamination is detected[76; 107].

**Conclusion**

Given that:

- used building materials has been identified overseas as facilitating the transportation of RIFA
- used building materials are likely to be associated with soil contamination
- no treatment or inspection is required for non-wooden building and landscape materials,

it is concluded that the likelihood of non-wooden building and landscape materials introducing RIFA is high.

#### 6.2.5.1.7 Wooden building materials

Wooden products, such as saw timber and logs, have a high risk of being contaminated with organic material and soil, and concealing moist inlets that could contain a RIFA infestation. Interceptions of *Solenopsis spp.* ants on dunnage and a nest on wooden crates from the USA illustrate that infestations can occur on wooden material[80; 148].

Wooden products are identified from the airway bills or the vessel's cargo manifest for inspection. All wooden products (bulk and container importations) are inspected on arrival[18]. Any consignments found with contaminants are treated with methyl bromide, heat-treated at 70°C for a minimum of 4 hours, or incinerated[18; 126].

Since RIFA are stimulated to attack by vibration[1], well-established nests are likely to be found during inspection. In addition, close inspection for insect damage and for the presence of small crevices that could harbour termites and other insects increases the chances of detecting a nest. However, not all infestations are likely to be found on visual inspection.

For the purpose of this release assessment, wooden materials will be considered in three groups:

- untreated and non-manufactured wood
- manufactured wood
- treated wood.

1) Untreated and non-manufactured wood

Untreated and non-manufactured wood is recognised as a pathway for the introduction of pests and disease[86] and is targeted for inspection on arrival in New Zealand.

All used railway sleeper, poles and transmission pile importations require mandatory fumigation with methyl bromide[76; 126]. Certification of fumigation within 21 days of export is accepted[76].

Untreated or used wooden products are given a close-up inspection, consisting of examining all surfaces for insect damage, holes, insects, soil, plant material and bark. For large shipments, 10% of the consignment is inspected; for small shipments, the whole consignment is inspected for contaminants[18].

2) Manufactured wood

MAF considers all manufactured wooden products, such as chipboard, particle board and plywood, to be sufficiently processed as to have removed or killed any pests associated with the raw wood and these are considered to be a lower biosecurity risk than non-manufactured wooden products[18]. In addition, such products are less likely to contain moist crevices and soil contamination that could sustain a RIFA infestation. There is no time limit after processing for which an unused product is recognised as 'manufactured'[18]. However, manufactured wood that has been used since the manufacturing process, is considered as non-manufactured for inspection purposes[18].

Manufactured wooden products are given a general inspection to ensure that they are free of contaminants[18].

3) Treated wood

Treated wooden products are those that have undergone an officially authorised procedure for the killing, removal or rendering infertile of pests[18]. Treated wooden products must have undergone an approved treatment process less than 21 days before export, to eliminate any insects or other pests[126]. Fumigation with methyl bromide or sulphuryl fluoride at a minimum dosage of 80g/$m^3$ for 24 hours, heat treatment to a minimal temperature of 70°C for 4 hours, or approved chemical treatments[XX] may be used[126].

It is considered that heat treatment or chemical treatment with permethrin is likely to be effective in killing any RIFA infestation present[14; 15; 64; 92]. Methyl bromide has been shown to be effective against RIFA worker ants at a dosage of 32g/$m^3$ for 24 hours[90], but an efficacious treatment rate against queen ants needs to be determined. Although there is no specific information on the efficacy of sulphuryl fluoride and the remaining chemical treatments, MAF Forestry Biosecurity considers that RIFA will be killed by these treatments[18].

Treated wooden products are given a general inspection to ensure that they have been treated and are free of contaminants. Consignments found to be untreated are given a close-up inspection[18].

The period between treatment and/or manufacture and shipment may allow a RIFA infestation to occur, particularly if the product is stored outside in contact with the ground. Therefore, given that products must be exported within 21 days post-treatment to be accepted as treated, manufactured products (i.e. those untreated and those treated more than 21 days prior to export) are more likely to become infested.

**Conclusion**

Wooden building materials, especially those made of used, non-manufactured or untreated wood, are likely to provide an appropriate environment for a RIFA infestation.

1) Untreated and non-manufactured wooden building material

Given that:

- untreated and non-manufactured wood is likely to provide an appropriate environment for a RIFA infestation
- untreated and non-manufactured wood products are likely to be contaminated with soil and organic matter
- all of small consignments and ten percent of large consignments of untreated or non-manufactured wood are closely inspected on arrival
- all infestations may not be detected on inspection
- an efficacious dose rate of methyl bromide against queens needs to be determined,

and taking into account that:

[XX] Boron compounds, copper + didecyldimethyl ammonium chloride, copper azole, copper chrome arsenic, arsenic or permethrin can be used by importers for chemical treatment of wood products.

- untreated and non-manufactured wood is considered to be a risk good and is inspected on arrival
- all consignments are inspected
- some used wooden materials are required to be fumigated on arrival,

it is concluded that the likelihood of untreated or non-manufactured wooden building materials introducing RIFA is high.

2) Manufactured wooden building material

Given that:

- importation can occur an extended period of time after manufacture, thus organic contamination and infestation of the product could occur after the manufacturing process
- inspection for gross contamination and to verify that the wood is manufactured is superficial
- all infestations may not be detected on inspection,

and taking into account that:

- manufactured wood is considered to be a risk good and is inspected on arrival
- all consignments are inspected
- manufacturing is performed prior to importation
- manufactured wood products are unlikely to be contaminated with soil and organic matter
- the manufacturing process is likely to be effective in killing any RIFA infestation present,

it is concluded that the likelihood of treated and/or manufactured wooden building materials introducing RIFA is moderate.

3) Treated wooden building material

Given that:

- the efficacy of some chemical treatments and sulphuryl fluoride against RIFA requires confirmation
- an efficacious dose rate of methyl bromide against queens needs to be determined,
- infestation of treated wood could occur post-treatment
- inspection for contaminants and to verify that the wood has been treated is superficial
- all infestations may not be detected on inspection,

and taking into account that:

- treated wood is considered to be a risk good and is inspected on arrival
- all consignments are inspected
- fumigation, heat treatment or chemical treatment is performed prior to importation
- the heat and permethrin treatment processes are likely to be effective in killing any RIFA infestation present

it is concluded that the likelihood of treated wooden building materials introducing RIFA is moderate[YY].

[YY] If the effectiveness of methyl bromide against RIFA queens at treatment rates of 80g/$m^3$ for 24 hours is confirmed, this rating can be amended to low.

#### 6.2.5.1.8 Mulch/Bark[ZZ]

Mulch (finely chopped bark) has the potential to be contaminated with organic material and soil. RIFA have reportedly been found in bagged and unbagged mulch and bark[91; 149]. In Queensland, regulations are in place preventing the movement of untreated mulch to prevent the spread of RIFA[74].

In New Zealand, mulch imported in a very fine-textured form is processed under the MAF Soil Import Health Standard (see section 6.2.5.1.3). Mulch imported in a coarse form is considered as bark[18] for importation requirements and is examined below.

Bark is considered to be a risk good and is a prohibited packing material. It is subject to entry conditions and is required to be free from pests and disease[19].

Private consignments of bark are required to be inspected and are fumigated if considered to be likely to harbour insects[19]. Commercial consignments require mandatory fumigation with methyl bromide and consignments are inspected on arrival to verify contents[18; 19]. Manufacturer fumigation certification is accepted[18]. If the product is not immediately processed into sealed packaging to prevent contamination or infestation after treatment, the period between sterilisation and shipment (up to 21 days) may allow a RIFA infestation to occur before export. There is no requirement for measures to be taken to prevent infestation occurring post-treatment.

**Conclusion**

Given that:

- An efficacious dose rate of methyl bromide fumigation against queens needs to be determined
- a period of up to 21 days may occur between treatment and shipment, allowing a window for recontamination
- there are no requirements in place to prevent infestation post-treatment
- it is unlikely that all infestations would be detected on visual examination,

and taking into account that:

- all commercial bark consignments are required to be fumigated
- all bark is inspected on arrival.

it is concluded that the likelihood of mulch/bark introducing RIFA is high[AAA].

[ZZ] A draft Import Health Standard for 'bark from all countries' is currently out for consultation. Requirements, additional to those currently required and presented in this document, are present in the draft Import Health Standard.
http://www.maf.govt.nz/biosecurity/imports/forests/standards/drafts/bark-draft.pdf.

[AAA] If conformation of the effectiveness of methyl bromide against RIFA queens is obtained, this rating can be amended to low.

#### 6.2.5.1.9 Beehives

RIFA nests have been associated with apiaries and beehives. It is that believed RIFA was introduced into California in association with the movement of beehives[121; 149; 150; 151]. Bees and honey may act as a food source for RIFA[33].

Infestation of a live or dead beehive could be either by a mature RIFA nest or by a founding queen. Although a queen is defenceless from attack from other insects[24], it is not known if bees would attack a RIFA queen that entered an active hive.

Commercial beehives usually rest on pallets or directly on the ground. The presence of residual honey, which could act as a food source, means the likelihood that used hives might become infested by migration of a RIFA nest becomes greater than the likelihood associated with other wooden products.

Although a large RIFA nest is likely to be detected by people working with the hives, small or newly-founded nests could escape visual detection. Some hives are inspected infrequently, and a nest could become established between inspections. Other ant species are common in and around beehives, and RIFA could be mistaken for another species.

Currently, live bees, used beehives and parts of used hives cannot be imported into New Zealand[152].

**Conclusion**

Given that:

- RIFA infestation of beehives has been reported
- small or newly-founded nests may not be detected on visual inspection,

and taking into account that:

- live beehives or parts of used beehives are currently not able to be imported into New Zealand,

it is concluded that the likelihood of bees or used beehives introducing RIFA is negligible.

However, a risk analysis is currently underway considering the risks associated with the importation of used beekeeping equipment. If the definition of ‘used beekeeping equipment’ in the analysis includes used beehives, then the risk of RIFA introduction with the importation of used beehives should be considered in that analysis.

#### 6.2.5.1.10 Hay and straw

Hay and straw have been included in the movement restrictions imposed in the USA to prevent the spread of RIFA[73]. Hay bales have been cited as frequently being infested[26; 121].

1) Hay

Hay is considered to be a risk good and is a prohibited packing material[10]. There is currently no Import Health Standard for hay, so importation would require a permit. It is considered unlikely that an import health permit would be granted by MAF Plants Biosecurity[134].

However, hay may accompany animal importations as a food source[124]. The handling of hay when placing it into a container and the movement of hay by the animal while eating is likely to stimulate workers to become active, increasing the likelihood of detection. In addition, humans and animals in contact with hay are likely to be stung. It is likely that an established nest present in a small volume of hay, being given as a food source for an animal during transportation, would be detected. However, small nests in large volumes of hay, newly-mated queens or newly-founded nests are likely to escape detection. Small volumes of hay are present in some animal containers transported by air[122]. Larger volumes of hay, e.g. bales, are used to feed some animal species imported by sea[153].

There is no requirement for pre-importation treatment of hay, but there is a requirement for hay to be collected, and reshipped[BBB] or destroyed as part of the mandatory inspection of imported animal crates and containers outlined in the *Clearance of Animals and Animal Products Process Procedure*[9; 19; 22; 107]. The Import Health Standard for *Forestry and Agricultural Equipment from any Country,* which includes equipment used for housing livestock, indicates that, if contaminants are present that are at risk of dispersal prior to decontamination, steps must be taken to address this risk[119]. Quarantine contaminants are placed in approved quarantine bins and are steam-sterilised or incinerated[77; 107]. Most ports receiving animal importations indicate that decontamination of animal containers and disposal of hay occurs promptly. However, there are no references in the process procedure[22] and Import Health Standard[119] to the time period within which collection and destruction of contaminants should be performed. If the hay is not considered to be at risk of dispersal, delays in its disposal could occur. Undetected RIFA infestations present in imported hay could relocate or, if a mature nest were to be present, mating flights could occur before the hay is placed into the quarantine bins and subsequently destroyed.

2) Straw

Although straw is a prohibited packing material, straw may be imported[10; 19]. Importations include processed straw products such as hats and brooms[76]. Imported straw and straw products require heat treatment for 15 hours at 90°C to destroy any disease agents that may be present and to destroy the viability of any seeds[19]. As RIFA acclimatised to 32°C will die after one hour at 48°C[64], this treatment would eliminate any infestation present.

If heat treatment has been performed up to 21 days prior to importation, or if sufficient treatment occurs during the manufacturing process of straw products, manufacturer certification is accepted[76]. If the product is not highly processed and not processed into sealed

[BBB] Although it would be unusual, it would be possible for an importer to request that hay, which was used as a food source for animals, be reshipped.

packaging to prevent contamination after treatment, the period between treatment and shipment may allow a RIFA infestation to occur before importation to New Zealand. There is no requirement for measures to be taken to prevent infestation occurring post-treatment[76].

Straw is inspected on arrival to ensure that treatment has been performed[19], but visual inspection is unlikely to detect newly-established nests if infestation has occurred post-treatment.

**Conclusion**

1) Hay

Given that:

- hay is a high-risk good for transporting RIFA
- untreated hay may be imported in animal containers
- queens, small and newly-founded nests may escape visual detection
- there is an opportunity for delayed disposal of contaminants, increasing the risk of transportation of RIFA through the importation of hay,

and taking into account that:

- apart from hay accompanying animal importations, importation of hay without a permit is prohibited
- hay accompanying animal importations is required to be collected, and reshipped or destroyed
- animal containers containing hay are required to be decontaminated on arrival,

it is concluded that the likelihood of hay introducing RIFA is high[CCC].

[CCC] **MoH submission:**
**We would put the risk from hay accompanying animal importations as high rather than moderate (p65) due to the indication that at some ports there is a delay in dealing with possible contaminants (p43).**

**DoC submission:**
**The document states that large volumes of hay are used to feed animals imported by sea. Previously it has been stated that vessels are not regularly disinsected. As hay is a high risk route for introduction, the Department suggests that the likelihood of hay introducing RIFA via vessels is high and that this should be reflected in the conclusion on page 69.**

**MAF comment:**
**In response to the submissions from MoH and DoC and given that there are no references in the relevant process procedure and Import Health Standard to the time period in which hay should be disposed of after arrival, the rating has been increased to high.**

2) Straw

Given that:

- straw is a high-risk commodity for transporting RIFA
- there is no requirement in place to prevent infestation post-treatment
- all infestations will not be detected on visual examination,

and taking into account that:

- all importations of straw are required to be heat-treated
- heat treatment is likely to be effective in killing any RIFA infestation present
- all straw is inspected on arrival,

it is concluded that the likelihood of straw introducing RIFA is low.

#### 6.2.5.1.11 Used electrical equipment

Worker ants are attracted to the warmth provided by electrical equipment, encouraging infestation during the cooler months[58]. Colonies of ants will frequently infest electrical transformers, electrical equipment and utility housing[58]. Worker ants will also accumulate in large numbers, resulting in mechanical interference or short circuits. Among equipment cited as having been infested with RIFA are air conditioning units[26], power company transformers, traffic signal control cabinets[29], electrical pumps, and car electrical systems[24]. The majority of risk associated with this category is from equipment that has been used outdoors and has been in contact with the ground[40]. Items that have been used solely indoors, such as personal radios, have a low likelihood of harbouring RIFA.

The presence of well-established nests in used electrical equipment would probably be detected during dismantling and packing, resulting in the equipment being treated before export. However, small or newly-founded nests may not be detected.

Generally, items of used electrical equipment are not considered to be risk goods, so do not require an Import Health Standard and are not required to be inspected. However, some shipments of used electrical equipment will be inspected as part of the door inspections of containers. In addition, electrical equipment with cargo manifest or airway bill descriptions fitting the definition of 'equipment' under the process procedure for *Clearance of Used Vehicles, Equipment, Car Parts and Tyres* (i.e. used machinery, which in the course of its intended function may have come in contact with plant, animal, forestry material or soil, such as grain-processing machinery, meat plant machinery, etc.) and the Import Health Standard for *Forestry and Agricultural Equipment from any Country*, would be inspected[119]. Air conditioning units, power company transformers, etc. are unlikely to be considered to be used machinery.

As previously discussed, the level of detection by door inspections for contamination is limited. Shipments found to be infested would be treated with an aerosol spray or fumigated with methyl bromide[84].

**Conclusion**

Although used electrical equipment may be inspected as part of random door inspections or if it is considered to be used machinery, given that:

- RIFA may infest electrical equipment
- inspection of consignments of used electrical equipment is not required,

and taking into account that:

- established nests may be detected during dismantling of used equipment and treated appropriately,

it is concluded that the likelihood of used electrical equipment that has been used outdoors and had contact with the ground introducing RIFA is high.

Items that have been used solely indoors, such as personal radios, have a low likelihood of harbouring RIFA.

#### 6.2.5.2 International mail

International mail is received in Auckland by sea and air, and in Christchurch by air. It includes envelopes and small parcels.

Approximately 2000 to 4000 mail items out of 3.5 to 4.4 million mail items arriving in most months, are found to contain risk goods, with approximately 50% of seizures being undeclared goods. Approximately 48% of seizures of undeclared risk goods were from categories containing goods that have a high risk of transporting RIFA (see Appendix 7). Three hundred and ten nursery stock seizures were made between July 2000 and June 2001[79].

It might be possible for a nest or a queen to be transported in mail, either by contamination or through the smuggling of a risk good. However, the presence of an established nest would probably become obvious to the person packing the good and be avoided because of the aggressive nature of the ants. Letters represent 92% of mail items[79] and are unlikely to become accidentally infested or provide sufficient protection to a transiting queen.

To ensure that unauthorised goods are not imported or introduced into New Zealand by mail, all mail entering the country is X-rayed. Nests might be detected on X-ray, but small numbers of ants would not be. Most of the high-risk items for harbouring RIFA infestations, e.g. organic materials such as soil and plant material, would be detected. The only high-risk items not included as part of routine checks are used electrical parts, although these are likely to be uncommon in international mail.

The majority of mail X-rayed is also checked by Biosecurity Detector Dogs. The dogs in the mail centre are trained to detect soil and, although not trained to detect insect odour, have detected and indicated their presence in mail[82].

Declarations and addresses of mail items are examined to determine if the packages contain items that do not readily show up on X-ray, especially if the detector dogs are not present. The last parcel from the end of the mail belts is selected for parcel inspection[154].

All mail deemed to be a quarantine risk as the result of X-ray scanning or detector dog inspection is inspected by a MAF quarantine officer. If risk goods are found, the intended recipient is given the option of treatment, re-shipment or destruction, depending on risk item found[154]. Given the individual examination, and the small size, of intercepted items, soil contamination usually associated with RIFA infestations and small nests are more likely to be found than with other inspection procedures.

**Conclusion**

Given that:

- MQS X-ray machines have a limit of detection
- not all mail is examined by Biosecurity Detector Dogs
- used electrical equipment are not risk goods,

and taking into account that:

- the individual packing of mail decreases the risk of transportation by international mail

- envelope mail makes up 92% of mail and RIFA queens are vulnerable to trauma that is likely to occur due to mail handling practices
- most high-risk commodities for transporting RIFA are already being targeted for inspection in mail system
- it is uncommon for used electrical equipment to be sent by international mail
- there is 100% screening of mail items with an effective X-ray and detector dog system,

it is concluded that the likelihood of introduction of RIFA by international mail is low.

#### 6.2.5.3 Courier mail (courier air cargo)

A variety of goods are transported as courier air cargo to Auckland airport, usually in envelope and parcel form.

Although courier air cargo is more expensive than standard international mail, they are similar transport methods. Between November 2000 and July 2001, approximately 50% of international mail seizures were of undeclared risk goods[79]. It is likely that a percentage of risk goods are also not declared in courier air cargo. It might be possible for a nest or a queen to be transported in courier mail, either by contamination or through the smuggling of a risk good. However, since courier mail is generally individually packed, the presence of an established nest would probably become obvious to the person packing the good and be avoided because of the aggressive nature of the ants. RIFA are more likely to be inadvertently transported in risk goods than other courier items, as most of the high-risk materials for transporting infestations are listed as risk goods.

Containers with air courier cargo go directly to the transitional facilities for unpacking.

The sender of courier mail fills out a customs declaration card, which is attached to the mail. The courier company records the contents of the mail, usually from the sender's oral description or from the description written on the declaration card[127]. MQS is sent a copy of the manifest containing these descriptions before or on arrival. The airway bill manifest is examined by a quarantine officer for risk goods. Where there are declared risk goods, or if the inspector considers that it likely that there are risk goods or contaminants present, the transitional facilities are informed of the items that require inspection. The items are transported to the MAF cargo site for inspection[127].

Commodities possibly contaminated with soil and most of those at high risk of being associated with RIFA, apart from used electrical equipment, are already being targeted for inspection. However, reliance is placed on the descriptions and declarations of the owners being accurate to detect consignments containing risk goods. Declarations alone will not prevent risk goods from entering New Zealand, as indicted by the fact that approximately 50% of seizures of international mail risk goods are undeclared. Some of these risk goods may have the potential to transport RIFA. Air courier mail is not routinely X-rayed or examined by a Biosecurity Detector Dog.

A newly-founded or small nest might not be detected on visual inspection of courier cargo. However, given the individual examination that occurs, soil and small RIFA infestations are more likely to be found than in many other inspection procedures, increasing the likelihood that small or newly-founded nests will be intercepted if a consignment is inspected.

Any risk goods that do not comply with an existing Import Health Standard are seized. Goods can be reshipped, treated or destroyed[9]. Contaminants are collected for disposal[107].

**Conclusion**

Given that:

- not all courier air cargo is inspected
- courier air cargo is not routinely X-rayed or examined by Biosecurity Detector Dogs
- reliance is placed on correct descriptions by the packer to identify items for inspection
- RIFA could be introduced through undeclared goods
- used electrical equipment are not risk goods and are not routinely inspected,

and taking into account that:

- the individual packing of courier mail decreases the likelihood of RIFA transportation
- used electrical equipment is likely to be unusual in air courier cargo,

it is concluded that the likelihood of courier mail introducing RIFA is low.

# 7 Release assessment conclusion

The aim of this release assessment is to rank craft and imported goods according to the likelihood that they may introduce RIFA. Currently Australia, Argentina, Brazil, Paraguay, a number of islands in the Caribbean, and the USA are infested with RIFA. All infested countries pose some degree of risk of exporting goods infested with RIFA to New Zealand. Because of trade patterns and proximity, RIFA are most likely to be introduced from Australia[DDD]. The introduction of RIFA from the USA is more likely than from South America or the Caribbean.

The greatest likelihood of introducing RIFA into New Zealand would be if untreated soil that undergoes no inspection or post-arrival quarantine is imported directly from an infested country. The following table summarises the likelihood of RIFA introduction via examined pathways relative to untreated soil[EEE]. However, it must be emphasised that any good from a RIFA-infested country that has spent a period of time outdoors, in contact with the ground, should be considered a high risk.

| Route | Likelihood of introduction |
|---|---|
| • Commercial importation of untreated soil that undergoes no inspection or post-arrival quarantine.* | Very high |
| • Sea containers – wharf-inspected<br>• Sea containers – transitional facility-inspected<br>• Packaging materials: sea – wharf-inspected<br>• Vehicles<br>• Used car parts<br>• Used machinery<br>• Non-wooden building materials<br>• Untreated and non-manufactured wooden building material<br>• Bark<br>• Hay<br>• Used electrical equipment (that has been used outdoors or is likely to have been in contact with the ground) | High |

[DDD] Australia has implemented an eradication program that may change its RIFA status.

**[EEE] MoH submission:**
**The MoH submission on page 47 of this document mentions the possibility that the statement the "importation of untreated soil, which is not directed to a transitional facility for analysis and destruction, does not occur in New Zealand" is doubtful. This statement appeared in the draft consultation document, referring to the hypothetical importation of untreated soil that is used as the reference point against which other pathways for RIFA introduction are ranked. This hypothetical situation is intended to portray an intentional, commercial importation and does not refer to soil contamination on importations (for which there are measures in place in the MAF Soil Import Health Standard).**

| Route | Likelihood of introduction |
|---|---|
| • Sea vessels<br>• Personal effects (unaccompanied baggage)<br>• Animal containers<br>• Packaging materials: air<br>• Packaging materials: sea – transitional facility-inspected<br>• Nursery stock (Dormant bulbs)<br>• Manufactured wooden building materials<br>• Treated wooden building materials | Moderate |
| • Aircraft<br>• Accompanied baggage: air<br>• Accompanied baggage: sea<br>• Air containers<br>• Nursery stock (raised from seeds or cuttings)<br>• Soil imported under MAF Soil Import Health Standard<br>• Straw<br>• Air courier cargo<br>• International mail | Low |
| • Transportation on a person<br>• Nursery stock (tissue culture)<br>• Beehives | Negligible |

* Such an importation is prohibited into New Zealand, but is included here as the point of reference for other pathways.

# 8 Issues identified for further consideration

Issues for further consideration in the development of risk management measures or that are beyond the scope of this release assessment are listed below.

- Although essentially transported in soil or as a hitchhiker, RIFA have been reported to feed on a variety of plant materials and cause significant crop losses in some instances. The potential association of RIFA with plants and plant products needs to be further investigated to ensure RIFA is recorded on the appropriate MAF Plant Biosecurity pest lists.

- Although imported products such as straw, treated wood and bark have pre-import treatments applied, any post-treatment, unsealed storage outside presents a risk of infestation. Moreover, any post-treatment infestation will be at an early stage at importation and will be unlikely to be detected on visual inspection. Therefore even if effective pre-import treatments are applied, these importations can not be considered to have a negligible risk. Accepting pre-importation treatment certification should be conditional on requirements to prevent infestation post-treatment.

- D-phenothrin is an aircraft insecticide treatment used by MQS. No information was found regarding its efficacy against RIFA. The efficacy of this insecticide needs to be confirmed.

- The successful interception of potential incursions requires detection of an infestation. Visual inspection is unlikely to identify all RIFA infestations. Inspections of a superficial nature, such as container inspection by door inspections, are more likely to fail to detect an infestation than more thorough inspections.

- The undersides of sea containers have been shown to transport soil and insect contamination. The undersides of sea containers are not routinely inspected, lessening the chances of identification and interception of RIFA.

- Many of the high-risk items for RIFA are already targeted for inspection and measures are in place to prevent the importation of soil contamination. However, used electrical equipment that has been used outdoors and in contact with the ground, are relatively high-risk items for transporting RIFA and are not currently considered to be risk goods.

- Untreated soil is a high-risk item for transporting RIFA. A small number of peat products are currently being imported. Although likely to be highly processed, because of the high risk untreated soil poses, these products should be reviewed to ensure that they are not a pathway for the introduction of RIFA.

- The release pathways of nuts, fruits and vegetables from RIFA-infested areas have not been examined in this release assessment. The pathways of root crops and those likely to be contaminated with soil should be examined.

- The risk of RIFA introduction through the disposal of soil into stormwater drain cannot be discounted completely. MAF Border Management state that, although disposal into the stormwater drain could occur, most washings from contaminants are disposed of into the effluent system, not the stormwater drains. The risk of introducing RIFA through the

disposal of soil into the effluent system is likely to be lower than by the disposal of soil into stormwater drains. Further investigation is needed to determine the likelihood of survival of small RIFA colonies discarded into stormwater drains or effluent systems, and to determine alternative disposal or treatment methods for soil from RIFA-infested areas.

- Personal effects and air courier cargo rely heavily on 'personal declarations' and review of cargo manifests to ensure that risk materials are not imported. Between July 2000 and June 2001 approximately 8% of personal effects seizures were undeclared[79], suggesting that declarations may be insufficient to ensure that RIFA is not imported in risk goods.

- Retreatment of aircraft holds if live insects (other than mosquitoes) are found during routine inspection is not specified as being required in the process procedure for the *Clearance of Aircraft on Arrival*. However, it is required under the *Requirements for Aircraft Inspection, Authorisation and Direction*. These requirements state that, when routine inspection reveals that the effectiveness of a disinsection may be deficient, the aircraft is required to be sprayed on arrival. To ensure efficacious treatment of aircraft holds originating from RIFA-infested areas, if live insects are found, current practices should be reflected in the process procedure for *Clearance of Aircraft on Arrival*. This process procedure is currently under review.

- The process procedure *Approval and Monitoring of Aircraft Disinsection*[12] requires cabins or holds of aircraft to be retreatment if live flying insects are found during monitoring of aircraft disinsection or during inspection of the aircraft on arrival. The procedure also requires the MQS group leader to be informed when live risk goods are located during inspection on arrival. An inspection of an aircraft that identifies any live insects (flying and non-flying species) present may suggest a treatment failure and any other insect pests, such as RIFA, present on the aircraft are, therefore, unlikely to have been exterminated. To ensure efficacious treatment of aircraft originating from RIFA-infested areas consideration should be given to the process procedure requiring retreatment if any live insects (flying or non-flying) are found. This process procedure is currently under review.

- Hydrogen cyanide (HCN) is a fumigant used by MQS. Although known to be efficacious in killing some species of ants, no information was found regarding the efficacy of HCN specifically against RIFA. This issue should be investigated.

- Sulphuryl fluoride is approved for use in the pre-importation fumigation treatment of wood products. Although known to be efficacious in killing insects, no information was found regarding the efficacy of sulphuryl fluoride specifically against RIFA. This issue should be investigated.

- Pirimiphos methyl, taufluvalinite, and fenamiphos are insecticides used to treat importations of nursery stock. The efficacy and treatment rates required for effective treatment of these insecticides against RIFA need to be confirmed.

- Permethrin is known to kill RIFA. However, a trial should be performed to ensure 2% permethrin maintains its efficiacy against RIFA throughout the 8-week treatment period of the aircraft residual insecticide program.

- Sea containers transported direct to transitional facilities may not be inspected externally before transport and are not routinely transported in a contained environment. This allows the possibility of dissemination of contaminants that may contain RIFA during transportation, before inspection occurs at the transitional facility.

- The requirement for animal containers to be clean before importation should be clearly stated in animal import health standards.

  Currently the animal import health standards either:
  - specifically state this requirement,
  - require compliance with the IATA Live Animal Regulations,
  - specifically require animal containers to be clean before importation and compliance with IATA Live Animal Regulations
  - gives no requirement.

  Notwithstanding the above, there is a generic requirement under the Import Health Standard for *Forestry and Agricultural Equipment from any Country* for all animal containers to be cleaned free of contaminants before transport. However, no animal import health standard refers to the *Import Health Standard Forestry and Agricultural Equipment from any Country*. Further, it should be noted that while the IATA Regulations require containers to be clean, these regulations are primarily used to promulgate animal welfare and container construction requirements. It is therefore likely that an exporter/importer would be unaware of the requirement for animal containers to be clean before use if it not specifically stated.

- There are no references in the process procedure for the *Clearance of Animals and Animal Products* to the time period within which disposal of contaminants is required. There is the possibility that collection and destruction could be delayed, especially if the crate or container is not taken with the animal and is left at the inspection site. Nest relocations and mating flights could occur during delays. Although correspondence indicates that rapid disposal is occurring, the need for rapid collection and destruction of contaminants should be reinforced in the process procedure or Import Health Standard. In particular, hay contaminants from RIFA-infested areas should be immediately collected, sealed in an appropriate containment and incinerated.

- MAF Border Management reports that transitional facilities are required by the *MAF Regulatory Authority Facility and Operator Standard, Requirements for holding and processing facilities (Class: Transitional facilities) for uncleared risk goods*[107] to inform MQS of any live animal and insect contamination found associated with containers, goods or packaging. The requirements state that " an inspector must be notified immediately if the normal operation of the facility is disrupted (or the operator anticipates a disruption), preventing procedures being carried out in the approved manner". This requirement is non-specific and consideration should be given to the inclusion of a statement to the effect that "any live animal or insect contamination will be immediately reported to MQS". Such a requirement is present in the Air Container Import Health Standard.

- All commodities from an infested area that contain soil or have the potential to be contaminated with soil could harbour a RIFA infestation. Future risk analyses for such commodities should address the likelihood of an infestation being present.

- It is unlikely that the National Manager, Import Management will provide approval for the importation of non-heat-treated soil that is not directed to a transitional facility for analysis and subsequent destruction. A DoC submission recommended the removal of that provision from the Soil Import Health Standard.

- Unpublished field trials indicate that methyl bromide is effective at killing RIFA worker ants at treatment rates of $32g/m^3$ for a treatment time of 24 hours. An efficacious dose rate of methyl bromide against RIFA queens needs to be determined.

# 9 Appendices

**Appendix 1: Caribbean Islands reported to be infested with RIFA**

The Bahamas:

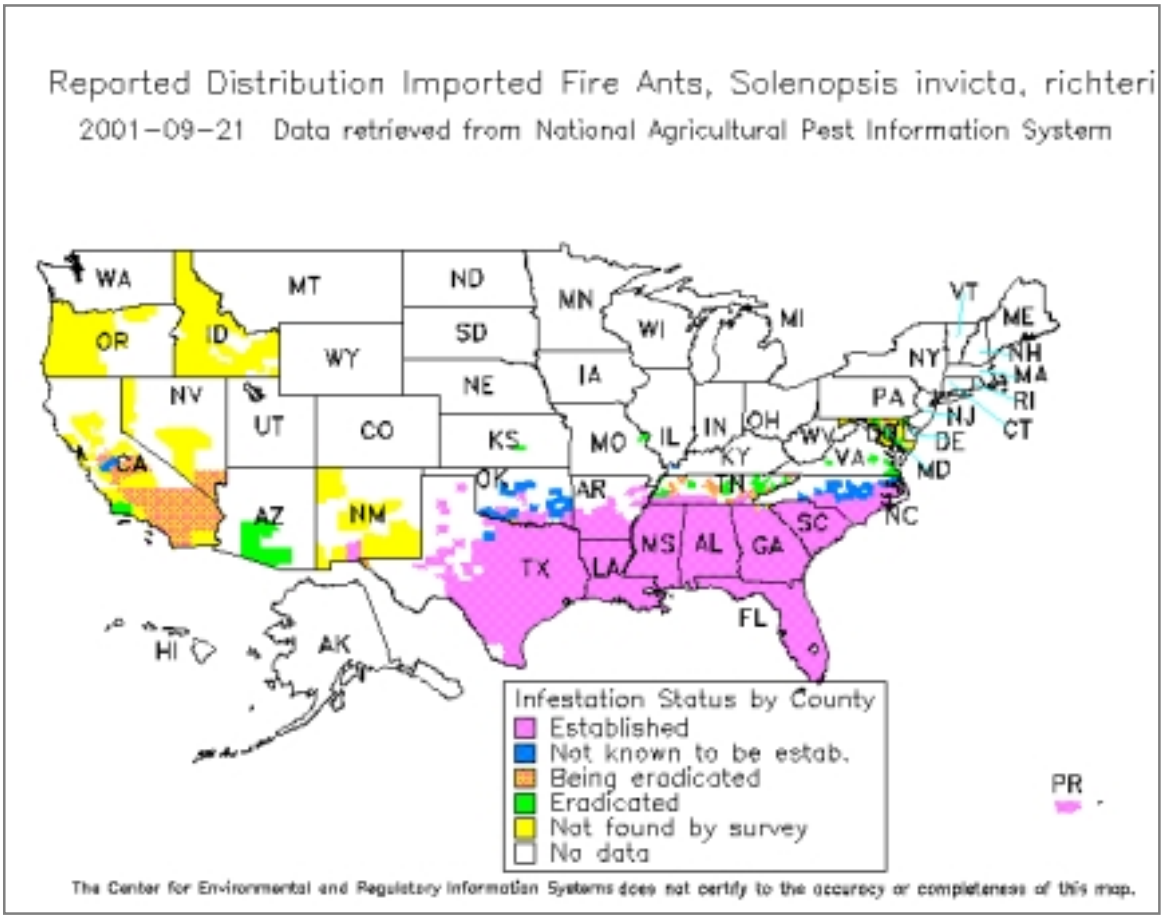
San Salvador
New Providence
North Andros
Abaco
Grand Bahama
Gorda Cay

Other Caribbean locations:

Puerto Rico
British Virgin Islands; Guana Island
U.S. Virgin Islands; St. Croix
Antigua
Trinidad
The Turks and Caicos Islands; Providenciales Island[2]

## Appendix 2: Distribution of RIFA in the United States of America

(Source: Cooperative Agriculture Pest Survey program - http://www.ceris.purdue.edu/napis/pests/ifa/imap/ifaall.html.)



## Appendix 3: Sea and air transit times to New Zealand

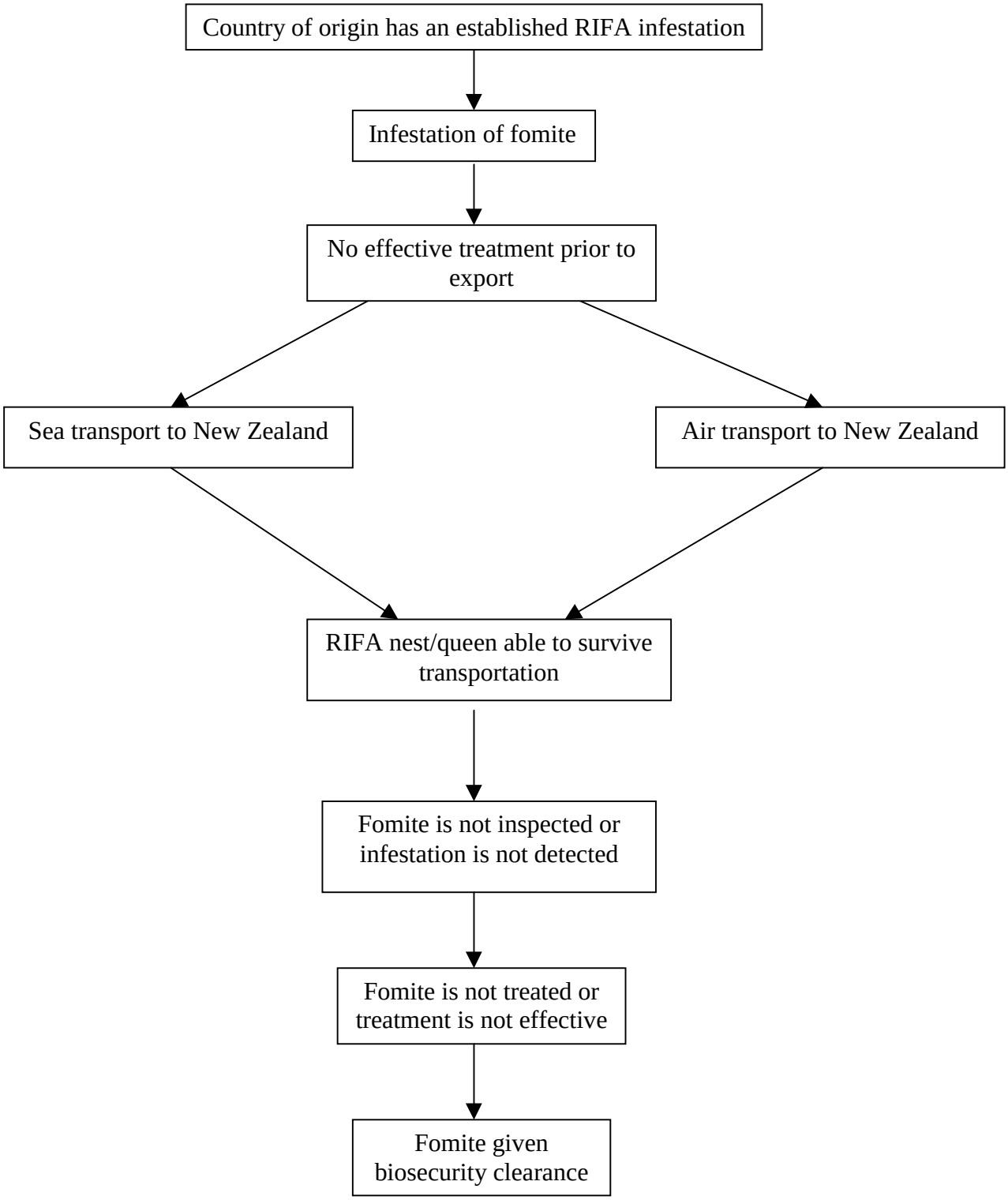
Sea vessel transit times to New Zealand[76]:
(Sources: The Shipping Guides Ltd - The Ships Atlas 1998
The New Zealand Shipping Gazette.)

| | |
|---|---|
| California (United States of America): | 18 days |
| Southern USA: | 18 to 23 days |
| South America (via Mexico): | minimum of 18 days |
| The Caribbean: | 28 days |
| Brisbane: | 4 days |

Aircraft transit times to New Zealand[77].

| | |
|---|---|
| Brisbane: | 3 hours |
| Los Angeles: | 12 hours |
| Argentina: | 13 hours |

**Appendix 4: Overview of entry pathways**



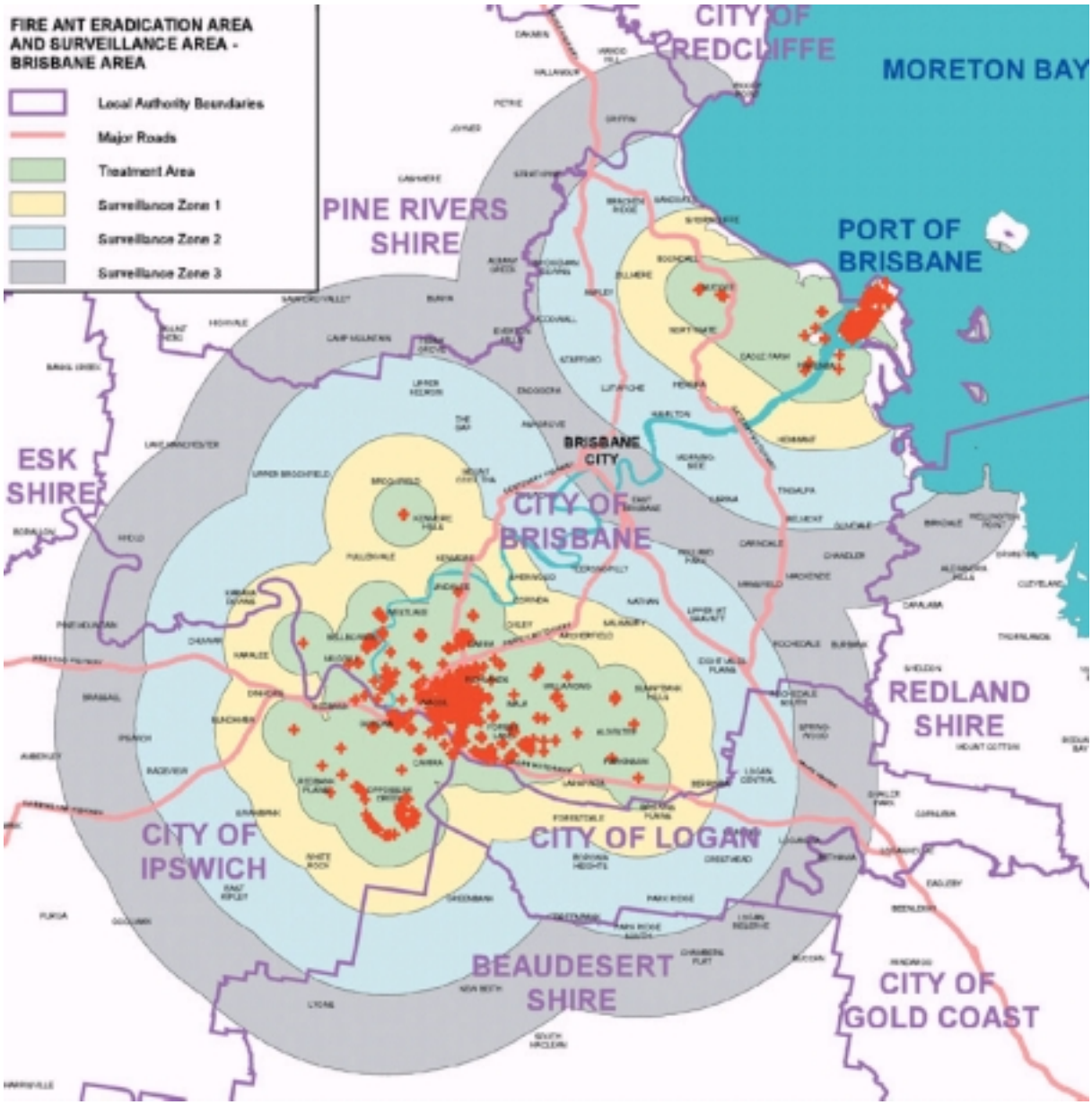
## Appendix 5: Volume of New Zealand importations from RIFA-infested regions for the year ending June 2001

(Source: Statistics New Zealand. www.stats.govt.nz Te Tari Tatau.)

| Region of export | Volume of trade (tonnes) |
|---|---|
| Argentina | 160,037 |
| Brazil | 26,102 |
| Imports from all Caribbean countries | 785 |
| (Imports from RIFA-infested Caribbean countries) | (751) |
| USA | 690,715 |
| Australia | 4,361,709 |
| (Brisbane) | (418,789) |
| TOTAL imports from RIFA-infested countries | 5,239,314 |
| TOTAL New Zealand imports | 7,064,975 |

## Appendix 6: Reported distribution of RIFA in the greater Brisbane area, Australia

(Source: The Department of Primary Industries, Queensland, Australia. http://www.dpi.qld.gov.au/fireants/)




\+ The presence of RIFA identified.

5kms

## Appendix 7: MAF Quarantine Service seizure statistics: July 2000 - June 2001

Most of the high-risk items for transporting RIFA are considered to be risk goods under the Biosecurity Act. Risk goods entering New Zealand are required to be declared by the importer and are usually inspected by MQS on arrival to ensure that the goods meet the requirements of the relevant Import Health Standard. Goods that do not meet the requirements are seized by MQS, who may treat (before releasing), re-ship or destroy the items. Seizures of risk goods by MQS are recorded under the categories listed in the tables below.

The seizure categories that contain goods that have a high risk of transporting RIFA are:

- nursery stock
- other plant products (includes hay, straw and wood)
- other items (includes soiled shoes, tents, sporting equipment)
- animal equipment.

Approximately 38% of seizures are from these categories. (For ease of reference, figures associated with these categories are shown in bold.)

**Table 1: MAF Quarantine Service seizure statistics for all border activities: July 2000 - June 2001**

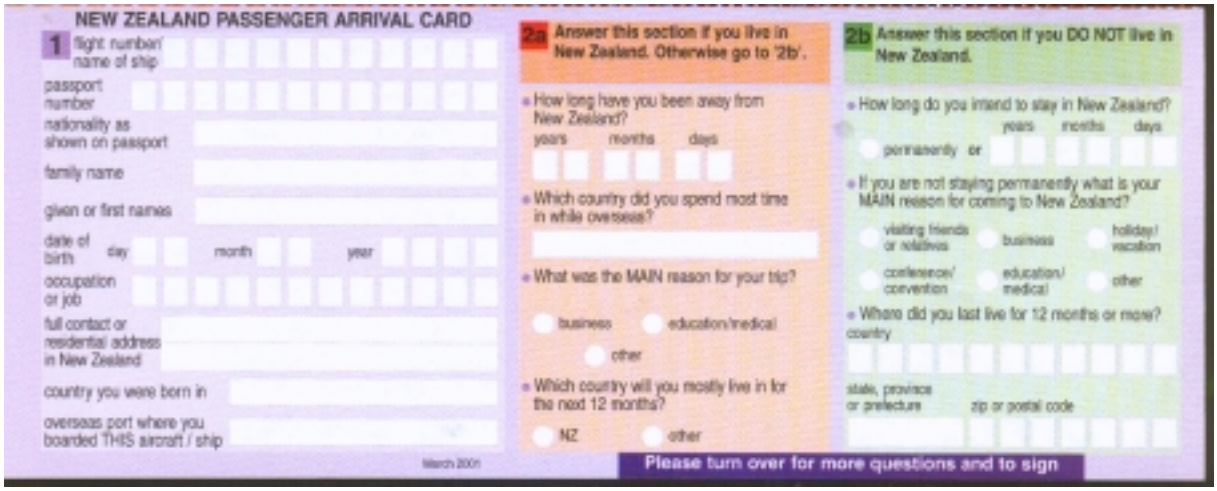
| Seizure categories | Total seizures from all border activities* | | |
|---|---|---|---|
| | **Declared** | **Undeclared** | **Total** |
| Fruit fly host material | 18211 | 12333 | 30544 |
| **Nursery stock** | **596** | **333** | **929** |
| Seeds | 5867 | 3102 | 8969 |
| Non-fruit fly host material | 3620 | 1233 | 4853 |
| **Other plant products** | **9015** | **5152** | **14167** |
| **Other items** | **23896** | **4113** | **28009** |
| Bee products | 4181 | 1615 | 5796 |
| Dairy products | 3802 | 1370 | 5172 |
| Meat and poultry | 8227 | 4538 | 12765 |
| Live animals | 160 | 93 | 253 |
| Fish products | 786 | 389 | 1175 |
| Wool skins and hides | 1782 | 333 | 2115 |
| Trophies, tusks, etc. | 2293 | 468 | 2761 |
| **Animal equipment** | **2652** | **403** | **3055** |
| Animal remedies | 249 | 70 | 319 |
| Total seizures | 85337 | 35545 | 120882 |

*Includes air cargo, aircraft and passenger, personal effects, mail, sea cargo and sea vessel risk good seizures.

**Table 2: MAF Quarantine Service seizure statistics for international mail and aircraft and air passengers: July 2000 - June 2001**

| Product categories | Aircraft and air passengers | | International mail | |
|---|---|---|---|---|
| | **Declared** | **Undeclared** | **Declared** | **Undeclared** |
| Fruit fly host material | 17605 | 12232 | 41 | 97 |
| **Nursery stock** | **420** | **179** | **156** | **154** |
| Seeds | 3299 | 1600 | 2327 | 1496 |
| Non-fruit fly host material | 2843 | 1153 | 41 | 75 |
| **Other plant products** | **5832** | **2020** | **2315** | **2952** |
| **Other items** | **22977** | **3768** | **501** | **316** |
| Bee products | 3791 | 1321 | 190 | 272 |
| Dairy products | 1082 | 3473 | 240 | 287 |
| Meat and poultry | 7231 | 3559 | 546 | 962 |
| Live animals | 124 | 77 | 12 | 14 |
| Fish products | 561 | 215 | 207 | 174 |
| Wool skins and hides | 1439 | 223 | 262 | 103 |
| Trophies, tusks, etc. | 2015 | 270 | 192 | 192 |
| **Animal equipment** | **1855** | **318** | **134** | **46** |
| Animal remedies | 127 | 26 | 113 | 42 |
| Total seizures | 73592 | 28043 | 7277 | 7182 |

## Appendix 8: Passenger declaration card



NEW ZEALAND PASSENGER ARRIVAL CARD

1 flight number/ name of ship

passport number

nationality as shown on passport

family name

given or first names

date of birth day month year

occupation or job

full contact or residential address in New Zealand

country you were born in

overseas port where you boarded THIS aircraft / ship

March 2001

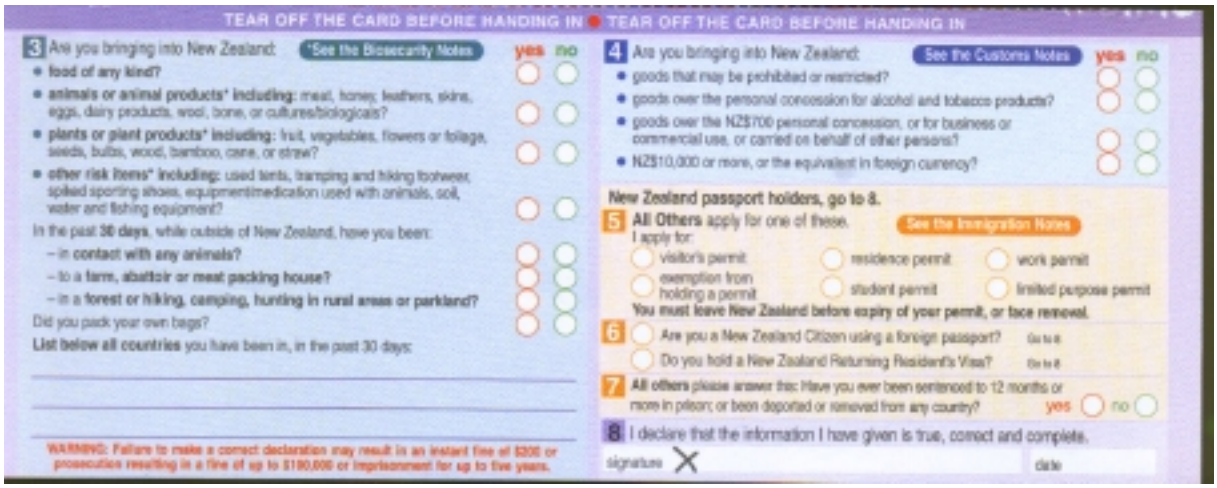
2a Answer this section if you live in New Zealand. Otherwise go to '2b'.

- How long have you been away from New Zealand? years months days
- Which country did you spend most time in while overseas?
- What was the MAIN reason for your trip? business education/medical other
- Which country will you mostly live in for the next 12 months? NZ other

2b Answer this section if you DO NOT live in New Zealand.

- How long do you intend to stay in New Zealand? years months days permanently or
- If you are not staying permanently what is your MAIN reason for coming to New Zealand? visiting friends or relatives business holiday/ vacation conference/ convention education/ medical other
- Where did you last live for 12 months or more? country state, province or prefecture zip or postal code

Please turn over for more questions and to sign



TEAR OFF THE CARD BEFORE HANDING IN

3 Are you bringing into New Zealand: *See the Biosecurity Notes yes no

- **food of any kind?**
- **animals or animal products* including:** meat, honey, feathers, skins, eggs, dairy products, wool, bone, or cultures/biologicals?
- **plants or plant products* including:** fruit, vegetables, flowers or foliage, seeds, bulbs, wood, bamboo, cane, or straw?
- **other risk items* including:** used tents, tramping and hiking footwear, spiked sporting shoes, equipment/medication used with animals, soil, water and fishing equipment?

In the past **30 days**, while outside of New Zealand, have you been:

- in **contact with any animals?**
- to a **farm, abattoir or meat packing house?**
- in a **forest or hiking, camping, hunting in rural areas or parkland?**

Did you pack your own bags?

**List below all countries** you have been in, in the past 30 days:

WARNING: Failure to make a correct declaration may result in an instant fine of $200 or prosecution resulting in a fine of up to $100,000 or imprisonment for up to five years.

TEAR OFF THE CARD BEFORE HANDING IN

4 Are you bringing into New Zealand: See the Customs Notes yes no

- goods that may be prohibited or restricted?
- goods over the personal concession for alcohol and tobacco products?
- goods over the NZ$700 personal concession, or for business or commercial use, or carried on behalf of other persons?
- NZ$10,000 or more, or the equivalent in foreign currency?

**New Zealand passport holders, go to 8.**

5 **All Others** apply for one of these. See the Immigration Notes

I apply for: visitor's permit residence permit work permit exemption from holding a permit student permit limited purpose permit

**You must leave New Zealand before expiry of your permit, or face removal.**

6 Are you a New Zealand Citizen using a foreign passport? Go to 8

Do you hold a New Zealand Returning Resident's Visa? Go to 8

7 **All others** please answer this: Have you ever been sentenced to 12 months or more in prison; or been deported or removed from any country? yes no

8 I declare that the information I have given is true, correct and complete.

signature X date

## Appendix 9: Likelihood of RIFA surviving disposal into a stormwater drain

RIFA's native South American habitat is subject to periodic floods. RIFA appear to have adapted to submergence in water by the formation of 'colony balls' and 'rafts of ants'[23; 32]. These are a buoyant clustering of ants around a queen. Colony balls and individual fire ants are buoyant, preventing any adults from being immersed for excessive periods of time. These floating clusters of ants may go on to establish new nests downstream, allowing transportation of RIFA by waterways. It is reported that when water is used to submerge soil containing a nest, the ants rise rapidly to the surface and cluster[40; 48; 91]. (In water containing detergent, the ants are unable to rise and will remain submerged[40]).

It is believed that RIFA can survive 8 to 10 hours submerged in detergent water and several days in soil[40]. This suggests treatment or filtering of washings from contaminated items may be required from RIFA-infested areas. However, although some Australian investigators are less confident, expert opinion from the USA suggests that there is a low likelihood that a queen or nest displaced into a stormwater drain would go on to establish a viable nest[40].

Because of the number of ants and their aggressive nature, colonies large enough to form a successful ball around a queen would be unlikely to escape detection during inspection of an imported item. Detection would result in the item being fumigated. Where live insects are detected in soil, soil would be fumigated and would not be discarded into waterways.

Newly-founded nests and small colonies pose the greatest risk of being discarded into waterways, as they may not be detected on visual inspection. However, due to their lower numbers, they would be less able to form a successful colony ball or raft around a queen. In addition, because of the agitation of washing and dissolution of soil, it is likely the queen and workers would become separated from the soil and each other and not have sufficient time to form a cluster.

A queen from an established nest is unlikely to be able to form a new, successful nest if separated from her workers[48; 78].

A queen from a newly-founded nest would not have a colony ball to protect her. It is unlikely, except in the first one or two days of founding, that a queen would be able to survive, crawl out of the waterway, and go on to establish a nest, because of her susceptibility to predation and her reliance for survival on limited body reserves[40].

## Conclusion

There is a low likelihood that a queen, displaced into stormwater drains, could go on to establish a viable nest. Nevertheless, it is not possible to say that the risk is negligible. Therefore, the disposal of soil from RIFA-infested areas into stormwater drains remains an issue of importance, and measures should be examined for alternative disposal or treatment of soil from RIFA-infested areas[FFF].

---

**[FFF]MoH submission:**
**Why is there a low likelihood of a mated queen surviving after being washed into a storm-water drain if RIFA survive in detergent-mixed water 9-10 hours and in solid clumps in water for several days (p25&55)?"**

**MAF comment:**

## Appendix 10: Unaccompanied baggage declaration form

**MAF acknowledges that there is uncertainty about the survival of a mated queen after being washed into a stormwater drain. However, the more salient point is whether the queen that survives a period of time in moving water can go on to establish a successful nest. It is the formation of the nest that will determine if RIFA could establish by this route. This is dependent, not only on the queen's initial survival in water, but also on her body reserves at the time of being washed into a waterway and whether she is still with a reasonable number of worker ants at the time of emerging from the water.**

**MAF believes that there is a low likelihood that a queen displaced into a waterway could go on to establish a viable nest.**

# Quarantine Declaration

Information collected on this form is required by Inspectors (appointed pursuant to the Biosecurity Act 1993) for the purposes of ascertaining the presence of risk goods. Collection of this information is justified pursuant to s27, s30(1)(a), s43, s44 of the Biosecurity Act 1993. Failure to provide such information may amount to an offence pursuant to s154 and s156 of the Biosecurity Act 1993.

The information shall not be stored longer than necessary for its lawful purpose. You are entitled to access and correct this information (if stored) by contacting: General Manager, MAF Quarantine Service, PO Box 1254, Auckland.

MAF

Ministry of Agriculture and Forestry
Te Manatu Ahuwhenua, Ngaherehere

MAF 004 00281101 GST No. 64-558-838

Family Name

Given or First Names

Sample Copy

Address in New Zealand

Telephone Work: Home:

Occupation Countries Visited:

Country of Origin

Air Way Bill/Bill of Loading No. or Container No.

Ship/Flight

No. Packages and Type

Agents Name/ Address in NZ

Total Volume: Less than $^1/_2$ m³ (Tick as applicable)

Greater than $^1/_2$ m³

Voyage No.

(Tick as applicable)

| | |
|---|---|
| Have you packed your own baggage | no ○ yes ○ |
| **Do you have** in your baggage food of any kind (raw or processed) | no ○ yes ○ |
| animals (alive or dead), animal products including, medicines, meat, skins, feathers, bone, wool, eggs, cultures, shells, hair or honey | no ○ yes ○ |
| plants, fruit, vegetables, seed, also flowers (fresh or dried), nuts, bulbs, straw, bamboo, wooden artifacts, any other plant products | no ○ yes ○ |
| equipment used with animals or plants (including saddlery, beekeeping equipment); things to treat or prevent pests or disease in animals. Items associated with forests or trees | no ○ yes ○ |
| manufactured items made from animal products (including snake and lizard skins, ivory, crocodile skin and furs) | no ○ yes ○ |
| motor vehicles | no ○ yes ○ |
| used camping equipment; sporting or garden equipment; bicycles or soil | no ○ yes ○ |

I certify that the information given is true and correct.

Signature Date

**WARNING: LEGAL PENALTIES CAN BE IMPOSED IF INCORRECT INFORMATION IS GIVEN ON THIS DECLARATION AND/OR PACKAGES ARE OPENED WITHOUT PERMISSION OF A MAF INSPECTOR.**

**FOR OFFICIAL USE**

INSPECTION REQUIRED/NOT REQUIRED
(Delete as applicable)

Inspector: .....

Location: .....

Date: .....

Inspection at: .....

.....

Items: .....

.....

.....

.....

.....

.....

.....

Clearance Fee $_____

OFFICIAL STAMP

Zone Fee $_____

G.S.T. $_____

| | |
|---|---|
| Account | |
| Cash | |

TOTAL $

Agents Reference:

Ag.Q.23 PP 33/1 (Aug 97)

Do you have a vacuum cleaner; if so what did you do with the bag?

……
……

Have you any garden tools or equipment (including lawnmowers, catchers); if so how have they been cleaned? Did you pack any seeds with your garden equipment?

……
……
……

What type of sporting goods do you have? For example, golf clubs, golf buggies, rugby/golf/soccer/hiking or other sporting shoes, bicycles.

……
……
……

What type of food do you have, e.g., noodles, honey, rice, meat/meat products, popcorn, in your baggage? Please list it below.

……
……
……

Please list any straw, bamboo, cane, rattan and other plant product items you may have.

……
……
……

What type of medicines have you packed? Please elaborate as to whether they contain animal or plant products, and in which form they are (raw/processed). Are they herbal medicines?

……
……

What ornaments do you have? What are they made from?

……
……

Do you have Christmas decorations; if so, what are they made from?

……
……

Have your goods been treated before they were shipped to New Zealand (e.g., fumigation, steam cleaning)? If so, do you have certificates?

……
……

# 10 References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3 **Department of Primary Industries.** Red Imported Fire Ant (RIFA) Greater Brisbane Area. Queensland, Australia. http://www.dpi.qld.gov.au/health/3125.html. Date downloaded, 7 September 2001

4 **Pascoe A.** Programme Co-ordinator, Exotic Animal Response, Animal Biosecurity, Biosecurity Authority, Ministry of Agriculture and Forestry, New Zealand. Personal communication to Tana T. MAF Biosecurity File AR60-280. August 2001-January 2002.

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7 **Ministry of Agriculture and Forestry.** Requirements for Places of First Arrival (Airports)MAF Biosecurity Authority Standard:BMG-STD-AIRPT. http://www.maf.govt.nz/biosecurity/border/transitional-facilities/bmg-std-airpt.htm. December 2001.

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10 **Ministry of Agriculture and Forestry.** Process Procedure 32, Clearance of containers imported by sea. Version 4 October 1999. http://qminder/quarantine/intranet/procedure.htm. Date downloaded, 27 July 2001.

11 **Biosecurity Act 1993, New Zealand.** Public Act 1993, No.95, New Zealand statutes. Status Publishing. Date of assent, 26 August 1993.

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