Australian Government
Department of the Environment and Energy

Ms Penny Holloway
Chief Executive Officer
Lord Howe Island Board
PO Box 5
LORD HOWE ISLAND NSW 2898

Lord Howe Island Eradication Project, NSW (EPBC 2016/7703)

Dear Ms Holloway

Thank you for your email of 13 September 2017, requesting approval of the Terms of Reference for the Technical Advisory Group (TAG) and of suitably qualified experts to establish the TAG, in accordance with condition 3 of EPBC approval 2017/7703.

As delegate of the Minister for the Environment and Energy, I approve, in accordance with condition 3 of EPBC approval 2017/7703, the attached Terms of Reference for the Technical Advisory Group (TAG).

I have noted the qualifications and experience of the experts nominated to be members of the TAG and approve the following in accordance with condition 3 of EPBC approval 2017/7703.

- **Primary members**: Mr Pete McCleland (Rodent Eradication Expert); Dr Penny Fisher (Environmental Toxicologist); Mr Nicholas Carlile (Pelagic Expert); Mr Ian Hutton (Island Expert); Ms Frances Hulst (Captive Management Program); and
- **Alternate members**: Mr Keith Springer (Rodent Eradication Expert); Dr Belinda Goldsworthy (Environmental Toxicologist); Dr Barry Baker (Pelagic Expert); Mr Hank Bower (Island Expert); Mr Michael Shiels (Captive Management Program).

Should any TAG member resign from the TAG, please ensure approval from the Department for any proposed appointment prior to making that appointment.

Should you require any further information please contact Nathan O'Brien on 02 6275 9682 or by email: post.approvals@environment.gov.au.

Yours sincerely

Greg Manning
Assistant Secretary
Assessment (WA, SA, NT) and Post Approvals Branch
Environment Standards Division

18 January 2018

Attachment: Approved Terms of Reference for Technical Advisory Group.

Australian Government
Department of the Environment and Energy

Mr Andrew Walsh
Project Manager – Rodent Eradication Project
Lord Howe Island Board
PO Box 5
LORD HOWE ISLAND NSW 2898

Dear Mr Walsh

EPBC 2016/7703: Lord Howe Island Rodent Eradication Project

Thank you for your correspondence of 30 May 2018 and 8 August 2018 to the Department of the Environment and Energy, seeking approval of the Monitoring and Mitigation Plan and the Biosecurity Plan, in accordance with Conditions 4 and 6 of the approval for the above project under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Officers of the Department have considered the Monitoring and Mitigation Plan and the Biosecurity Plan, and are satisfied they meet the requirements of Conditions 4 and 6 of the approval for this project. On this basis, and as a delegate of the Minister for the Environment, I have decided to approve the Lord Howe Island Rodent Eradication Project Monitoring and Mitigation Plan, Version 2.2, and the Lord Howe Island Rodent Eradication Project Biosecurity Plan, Version 2.2, both dated 2 January 2019. These Plans must now be implemented.

Should you require any further information please contact Ruth Crabb on (02) 6274 2081 or via email at post.approvals@environment.gov.au.

Yours sincerely

Chris Videroni, A/g Assistant Secretary
Assessments (WA, SA, NT) & Post Approvals Branch

11 January 2019

Lord Howe Island Rodent Eradication Project

EPBC 2016/7703

Monitoring and Mitigation Plan

Version 2.2

Document Amendments

Build Status

Version	*Date*	*Author*	*Reason*
1.0	13 March 2018	Andrew Walsh	First draft for TAG Comments
1.1	28 May 2018	Andrew Walsh and Dr Terry O'Dwyer	Second Draft addressing TAG comments and to align with other Project plans
2.0	25 July 2018	Andrew Walsh and Dr Terry O'Dwyer	Revised Draft addressing Department of Environment and Energy comments
2.1	11 Dec 2018	Andrew Walsh and Dr Terry O'Dwyer	Revised Draft addressing additional Department of Environment and Energy comments
2.2	2 Jan 2019	Andrew Walsh and Dr Terry O'Dwyer	Final version

Amendments in this Release

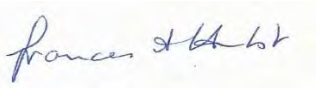
Section	*Amendment Summary*

Distribution

Version	*Date*	*Distributed to*
1.1	30 May 2018	Department of Environment and Energy
2.0	25 July 2018	Department of Environment and Energy
2.1	11 Dec 2018	Department of Environment and Energy
2.2	2 Jan 2019	Department of Environment and Energy

Technical Advisory Group Endorsement

We the members of the Technical Advisory Group have reviewed this Monitoring and Mitigation Plan and approve this version for submission to the Department of Environment and Energy.

Name	Role	Signature
Pete McClelland	Rodent Eradication Expert and Chair	
Dr Penny Fisher	Environmental Toxicologist	
Nicholas Carlile	Pelagic Seabird Expert	
Ian Hutton	Island Ecologist	
Dr Frances Hulst	Captive Management / Veterinary Expert	

Contents

Definitions

The following terms are defined in the approval for the project (EPBC 201/7703) under the *Environment Protection and Biodiversity Conservation Act 1999*.

Brodifacoum baits means either 5.5 mm or 10 mm cereal-based bait pellets of Pestoff 20R containing 0.02g/kg (20 parts per million) of the toxin Brodifacoum.

Commencement (where bolded in the text) means the commencement of the aerial distribution of Brodifacoum baits across the LHIG using helicopters.

Department means the Australian Government Department responsible for administering the *Environment Protection and Biodiversity Conservation Act 1999.*

Lord Howe Island World Heritage Area and National Heritage place means the area identified at Schedule 1 of the approval.

Integrated quarantine/biosecurity management plan means a quarantine/biosecurity management plan for the airport and wharf to prevent the reintroduction of rodents should the rodent eradication be successful.

Lord Howe Island Group means Lord Howe Island and its associated islands and **rocky islets** (excluding Balls Pyramid).

Minister means the Australian Government Minister responsible for administering the *Environment Protection and Biodiversity Conservation Act 1999.*

Mitigation Team means the team, including the **Mitigation Team** Manager, responsible for implementing relevant mitigation and monitoring activities on LHI under the **Monitoring and Mitigation Plan.**

Monitoring and Mitigation Plan means the plan to be prepared by the proponent that will guide mitigation and monitoring activities on the **Lord Howe Island Group** with the aim of minimising **non-target species** mortality from the aerial baiting as well as monitoring **non-target species** mortality, impacts on populations and population responses.

Non-target species means endemic flora and fauna species on the **Lord Howe Island Group**.

Observers means bird experts approved by the Lord Howe Island Board (LHIB) as being suitably qualified and/or experienced to observe and interpret the response of birds to the helicopter baiting flights.

PER means the final Public Environment Report dated 10 February 2017.

Rocky islets means any body of land of the **Lord Howe Island Group** excluding Lord Howe Island and Balls Pyramid that has permanent land above the mean high water mark and that can be safely accessed by a suitably trained person (boat or helicopter) for the purpose of setting and retrieving presence and absence monitoring equipment for **target species**.

Rodent Eradication Steering Committee means the Rodent Eradication Steering Committee established in October 2012, consisting of one representative from each of the following organisations, the Commonwealth Department of the Environment and Energy and the NSW Office of Environment and Heritage. The CEO of the LHIB, an elected LHIB member and a rodent eradication expert.

Settlement means the area identified at Schedule 1 as the Settlement.

Target species means *Rattus rattus*, *Mus musculus* and *Tyto novaehollandiae castanops* (the Masked Owl Tasmanian population).

Technical Advisory Group means a group of experts with operational and ecological experience, independent of the person taking the action to provide advice and recommendations on the mitigation and monitoring of **non-target species** mortality and recovery.

1 Introduction

1.1 Risk Mitigation Plan Requirements

The Lord Howe Island Rodent Eradication Program (REP) was approved with conditions under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) on the 18 Aug 2017 (EPBC 2016/7703).

Condition 2 of the approval states:

> "*To avoid, minimise and mitigate impacts from the aerial baiting on **non-target species** and the environment of the **Lord Howe Island Group**:*
>
> *(a) aerial baiting can only be undertaken between 1 June and 30 August.*
>
> *(b) during aerial baiting, **observers** must be at a location with clear line of sight to the Providence Petrel (Pterodroma solandri) and Masked Booby (Sula dactylatra) breeding grounds (as identified at Schedule 2). Trained **observers** must also be located within the boat observation zone (as identified at Schedule 2) and provide commentary to the helicopter pilot via radio regarding the behaviour of Providence Petrels and Masked Boobies, to supplement the pilot's observations and minimise impacts on Providence Petrels and Masked Boobies.*
>
> (c) *where it is safe to do so, aerial baiting in the vicinity of the Providence Petrel and Masked Booby breeding grounds must be undertaken at a bait dispersal altitude and times that minimises impacts on Providence Petrels and Masked Boobies*."

Condition 4 of the approval states:

> "*To minimise impacts from aerial baiting on **non-target species** and the environment of the **Lord Howe Island Group**, the person taking the action must establish a **Monitoring and Mitigation Plan** based on the advice from the **Technical Advisory Group**. The **Monitoring and Mitigation Plan** must be approved by the **Minister** prior to **commencement** of aerial baiting on the **Lord Howe Island Group***. The **Monitoring and Mitigation Plan** must:
>
> *(a) provide for the monitoring of mortality and cause of death of **non-target species**, for a period of at least 4 months after the **commencement** of aerial baiting;*
>
> *(b) establish a **Mitigation Team** Manager responsible for collection of qualitative and quantitative information on **non-target species** mortality, documenting and reporting this information and using this information to coordinate and adapt carcass search and removal operations. The **Mitigation Team** Manager must provide weekly reports to the **Department** and the **TAG** regarding **non-target species** mortality and efficacy of carcass search and removal operations. More regular reports must be provided if requested by the **TAG**. The **Mitigation Team** Manager must continuously undertake these tasks for a period of at least 4 months after the **commencement** of aerial baiting;*
>
> *(c) include protocols and impact thresholds, where the **TAG** determines that unacceptable impacts on **non-target species** are observed between the first and second aerial baiting events;*
>
> *(d) include protocols to ensure systematic, targeted and effective carcass search, collection and disposal in the vicinity of the **Settlement** and other accessible areas; (to avoid secondary poisoning of **non-target species**, but recognising that Masked Owl (Tyto*

novaehollandiae castanops) eradication depends on sufficient carcasses remaining uncollected) and specify appropriate resourcing;

*(e) include clear contingency planning and adaptive management measures where mortality of **non-target species** is recorded, with the aim of reducing further mortalities;*

(f) provide for a whole-of-island census, and breeding success monitoring of Lord Howe Woodhen and Lord Howe Island Currawong populations, twice a year, for a period of at least 2 years, following the release of captive birds.

*A report summarising the monitoring results collected on **non-target species** mortality in accordance with Condition 4(a&b) must be provided to the **Department** within 5 months following the completion of the final aerial baiting event.*

*The results of the whole-of-island census and breeding success monitoring conducted in accordance with Condition 4(f) must be provided to the **Department** within two months of completing each census."*

This document is intended to satisfy ***Monitoring and Mitigation Plan*** components of Condition 2 and 4 and should be read in conjunction with Appendix F of the Final Public Environment Report - *Non-target Impact Management Plan* which provides guidance for the REP team and project stakeholders in the implementation of mitigation, monitoring and adaptive management actions to minimise impacts on non-target species.

This Monitoring and Mitigation Plan outlines:

- Observer requirements during aerial baiting
- **Non-target species** that will be monitored under this plan
- How qualitative and quantitative information on **non-target species** mortality will be collected and reported
- How this information will be used to coordinate and adapt carcass search and removal operations where **non-target species** are thought to be impacted by poisoned carcasses
- The timing and duration of **non-target species** monitoring
- Guidelines for impact thresholds on non-target species between the first and second aerial baiting events
- Protocols and resourcing to ensure systematic, targeted and effective carcass search, collection and disposal in the vicinity of the Settlement and other accessible areas
- Contingency planning and adaptive management measures where unacceptable levels of mortality of **non-target species** is recorded
- Whole-of-island census, and breeding success monitoring of Lord Howe Woodhen and Lord Howe Island Currawong populations, twice a year, for a period of 2 years, following the release of captive birds.

1.2 Eradication and Mitigation Context

The one-off eradication proposes to distribute a cereal-based bait pellet (Pestoff 20R) containing 0.02g/kg (20 parts per million) of the toxin, Brodifacoum across the LHIG (excluding Balls Pyramid). The principal behind the eradication is that every rodent on LHI is exposed to a lethal dose of brodifacoum. This means that sufficient bait must be available in every rodent habitat for a duration that allows every individual to receive a lethal dose.

Due to the size and terrain on Lord Howe Island, the only feasible method to achieve this is by a combination or aerial broadcast in the rugged and remote parts of the island (the Permanent Park

Preserve (PPP)) and through a combination of hand broadcast and the use of bait stations in the accessible area (settlement).

The baiting will take place in a single year, targeted for winter (June - August) of 2019. June - August is preferred because this is the time of the year when the rodents are at their most vulnerable due to the relatively low abundance of natural food. Many of the seabird species are also absent from the island at this time of year. This is also the low season for tourists on LHI.

The bait will be distributed at a nominal dose rate of 20 kg (12 kg + 8 kg) of bait (or 0.4 g of poison) per hectare. The proposal is for aerial and hand baiting to be carried out twice, the applications separated by about 14 -21 days (depending on the weather). Bait stations will be armed with bait just prior to aerial and hand broadcast and be maintained until bait is no longer being taken by rodents. Further detail can be found in the Public Environment Report

In the same way that the size and terrain of the island limits the bait application methodology, it also limits the range of mitigation that can be applied to reduce impacts to non-target species. It is impossible to search for carcasses and or remove pellets from most of the island. Moreover, there is a plan to eradicate the introduced Masked Owl concurrently with the REP and it is the intention that this owl eradication will be at least partly achieved through Masked Owls consuming poisoned rodents. Therefore, it is preferred that some poisoned rodents remain available to Masked Owls. It is also impossible to hand broadcast around the creeks in the mountain areas.

The use of bait stations throughout the settlement area (168 ha) requires a servicing regime that does however provide:

- Some additional level of protection to a percentage of the bird populations considered at high or very high risk through:
    - Allowing intensive search for rodent carcasses (and ability to remove carcasses) over that area for species considered at secondary risk of poisoning (Lord Howe Currawong)
- Ability to intensively monitor and search for non-target species carcasses (or sick birds) in that area to inform adaptive management.

Veterinary Care

Whilst the REP will have access to veterinary and animal husbandry staff from Taronga Zoo during the operation, the priority for these staff is management of captive woodhen and currawongs. If other non-target species are found sick, a decision by veterinary staff will be made on what veterinary care can be provided considering animal welfare, likely duration and effectiveness of treatment and availability of hospital cages and staff.

Captive management

It should be noted that captive management of woodhen and currawong has been extensively planned and trialled, influencing the design, number of cages established and resources required for management of those species. The priority for Taronga Zoo staff is management of captive woodhen and currawongs. If unacceptable impacts to non-target species are observed, the TAG may consider emergency captive management considering animal welfare, likely duration and effectiveness of captive management and availability of suitable facilities and staff.

1.3 Establishment of Mitigation Team Manager

In accordance with condition 4 b), the LHIB establish the following Mitigation Team Manager:

Dr Terry O'Dwyer,

Senior Scientist

Conservation Science Team

Ecosystem Management Science

Science Division

NSW Office of Environment & Heritage

2 Risk mitigation protocols and impact thresholds for non-target species

2.1 Observer requirements during aerial baiting.

To avoid, minimise and mitigate impacts from the aerial baiting on non-target species and the environment of the Lord Howe Island Group, monitoring disturbance on both Masked Booby and Providence Petrel colonies during aerial-baiting applications are required. Observation locations are defined in Schedule 2 of the Project approval (see Figure 1).

2.1.1 Masked Booby colony: Muttonbird Point.

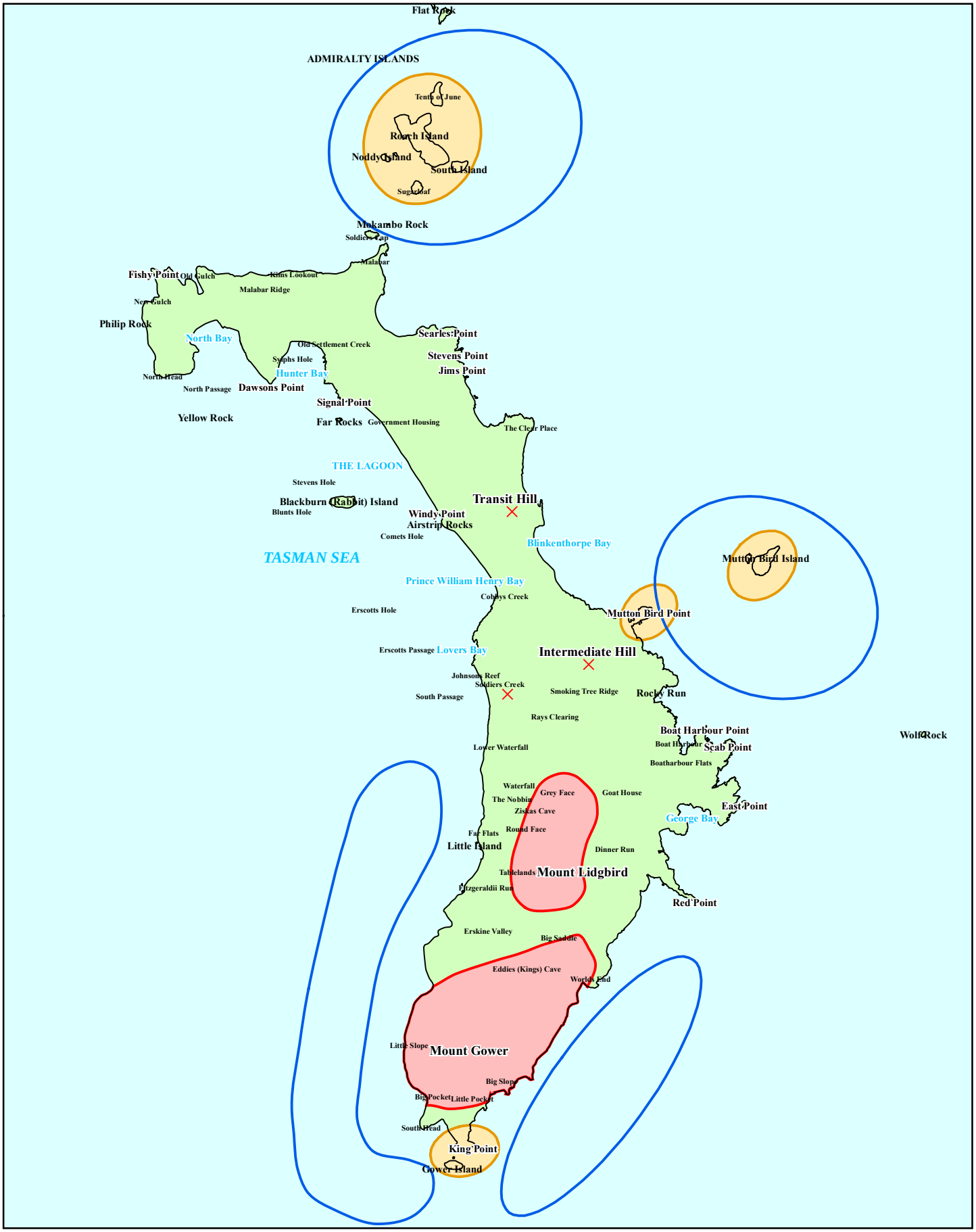
To define 'normal' activity, in the week prior to expected baiting date, an experienced observer will conduct three days of morning (between 08:00 and 12:00) observations of nesting Masked Booby activity over the Muttonbird Point colony from provided viewing platform using binoculars. Details on average bird movements in and out of the colony per 5 minute period, approach and exit heights and frequency of natural 'flushing' behaviour of incubating or roosting birds will be collated along with prevailing weather conditions.

On days of baiting, an experienced observer, with communication with helicopter pilots, will be in place to again carry out monitoring of nesting Masked Booby before, during and after baiting runs within 500 metres of Muttonbird Point colony. A 50% increase in 'normal' activity will trigger a cessation of baiting during that day. Further baiting attempts of the vicinity of Muttonbird Point will be developed with the knowledge of the most optimal conditions and time periods before further attempts are made to complete baiting of this area.

2.1.2 Providence Petrel colonies: summits of Mount Gower and Mount Lidgbird.

To define 'normal' activity, an experienced observer will conduct three days of morning (between 08:00 and 12:00) observations of aerial activity of Providence Petrel on the summits of Mt. Gower and Mt Lidgbird from 'the saddle' in Erskins Valley using a spotting scope during clear weather in the two weeks prior to expected baiting date. Details on average bird movements over the colony per 5 minute period, approximate approach and exit heights around the summits and frequency of natural 'flushing' behaviour will be collated along with prevailing weather conditions. It should be noted that baiting over Mt Gower and Mt Lidgbird is planned to occur on clear weather days in the mornings only (i.e. when Providence Petrels are typically not in the air over the mountains) so levels of activity are expected to be low during these surveys.

On days of baiting an experienced observer, with communication with helicopter pilots, will be in place to again carry out monitoring of aerial activity of Providence Petrel on the summits of Mt. Gower and Mt. Lidgbird. A 50% increase in 'normal' activity will trigger a cessation of baiting during that day. Further baiting attempts of the vicinity of the island summits will be developed with the knowledge of the most optimal conditions and time periods before further attempts are made to complete baiting of this area.



N

Scale 1:55,000

0 250 500 1,000 1,500

Meters

Geocentric Datum of Australia 1994 (GDA94)
Map Grid of Australia 1994 (MGA94) - Zone 57
(MGA94 is a Universal Transverse Mercator Projection)

ObservationPoints

Boat Observation Zone

Masked Booby Breeding Site

Providence Petrel Breeding Grounds

Lord Howe Island

Schedule 2
Location of Providence Petrel and Masked Booby breeding grounds

Lord Howe Island Board

Date Created:23/06/2017

2.2 Population estimates, search areas, and impact thresholds for other non-target species that will be monitored

2.2.1 Population estimates

Total island-wide population estimates for Silvereyes and Golden Whistlers are based on surveys carried out by the Canberra Ornithological Group (COG) in September 2017. These COG surveys provide a snapshot of birds occurring in a 50 m radius at 48 locations across the island. COG estimates have been extrapolated, using the known population of Woodhens as a calibration basis, to provide a total population across the whole island. Population estimates for Lord Howe Currawongs are based on Mark-Recapture studies performed in 2016 and 2017. Population estimates for **non-target species** that will be monitored are listed in Table 1

2.2.2 Search areas and timing of searches

Searches will be conducted every second day between the first and second bait drops and every second day for three weeks after the second bait drop. Searches will then be conducted weekly for 14 weeks after the second bait drop. For bush birds, 20 km of pre-determined tracks will be walked by experienced personnel. Tracks in all sections of the island will be included. A width of 5 m will be searched along each track giving a total search area of 100 000 m^2 (1% of the forested area). For Currawongs an additional 168 ha will be searched for rodent carcasses during servicing of bait stations in the settlement area.

2.2.3 Proposed Thresholds for Mitigation

Thresholds for mitigation have been based on a number of considerations, including the EPBC conservation significance of each species, the recommended number of founders to maintain sufficient genetic diversity in the population, the reproductive ecology of the species, and evidence of recovery of the same or similar species following eradications elsewhere.

For example, Tracy et al (2011) suggest that c. 60 individuals are sufficient to retain genetic diversity of threatened populations. Thus the threshold of 25% for the threatened endemic species considered in this plan (Silvereye and Golden Whistler) would retain several 1000 individuals of each species when mitigation actions are triggered,

The thresholds are also based on findings elsewhere that have shown increases in population numbers following eradications. For example, counts of Silvereyes on Red Mercury Island increased after the eradication of rats (Robertson et al 1993). Considering that Silvereyes will lay 2-3 clutches of 2-3 eggs per year, if conditions are suitable (Birds in backyards 2018), similar increases are expected to occur here in the absence of rodents. Further, on Motutapu Island, New Zealand, where most of the Purple Swamp Hen population was found dead following mammal eradication, the population had recovered to pre-eradication levels of several hundred individuals within one year. Reports of similar increases in bird numbers following eradications are widespread (Jones et al. 2016).

- An **endemic species** (e.g. Lord Howe Silvereye or Woodhen), which has high conservation value, has been assigned a threshold of 25% of the population being found dead or sick (attributable to baiting) to trigger mitigation measures.
- A **native (but non-endemic) species** (e.g. Sacred Kingfisher) has been assigned a threshold of 50% of the population being found dead or moribund (attributable to baiting) to trigger mitigation measures.
- An **introduced species** (e.g. Blackbird) which has little or no conservation value, has not been assigned a threshold level because losses of this species are deemed to be acceptable.

For the purpose of this plan, **non-target species** are defined as endemic flora and fauna species on the Lord Howe Island Group. As such, the vertebrate species that are included in this monitoring plan are the Lord Howe Woodhen (LHW), the Lord Howe Currawong (LHC), the Lord Howe Golden Whistler (LHGW), and the Lord Howe Silvereye (LHSE). Of these species only the LHW and LHC are considered to be at significant risk from the program and a detailed captive management plan has been designed to mitigate these risks. While no population-level impacts on LHGW and LHSE are expected from the REP, mortality of these species will be monitored throughout the REP and contingency plans that are designed to reduce mortality will be implemented if the level of mortality reaches threshold levels (see below).

Brodifacoum is not expected to have an impact on most endemic invertebrates (Hoare and Hare 2006; Lord Howe Island Board 2016). Certain species of mollusc have been impacted by brodifacoum elsewhere, however, studies on the Lord Howe Placostylus indicated that this species is unlikely to be impacted from the baiting program due to its preference for natural foods and because no mortality was recorded following consumption of brodifacoum baits in trials (Lord Howe Island Board 2016). Moreover, because this species can only be effectively surveyed on warm nights after rainfall, it is not considered practicable to monitor this species during the baiting program as these conditions will not be available. The other four endemic snails on LHI are considered to be extremely rare and thus also cannot be effectively monitored during the baiting program. In addition, only *Gudeconcha sophiae magnifica*, due to its larger activity range, was assessed as being likely to come into contact with bait (Lord Howe Island Board 2016).

No impact is expected to occur on any endemic flora because the low solubility of brodifacoum in water means that uptake of brodifacoum by plants is unlikely (Broome et al. 2016). As such endemic plants will not be monitored.

There are no endemic reptiles or freshwater fish on Lord Howe Island so these groups will not be monitored.

Guidelines for mitigation thresholds have been set at 25% of the population of each **non-target species** being found dead or sick during island-wide surveys.

To calculate the threshold number of dead or moribund individuals (attributable to baiting) encountered within the search areas to trigger mitigation, the following formula is applied:

*Total Population Estimate * Trigger Threshold % * % of Available habitat covered by search*

For example, the forest bird the Silvereye has a population estimate of 15917 in the Permanent Park Preserve (PPP), the trigger threshold is 25% and the percent of available habitat searched is 1%. (100 000 m^2 will be searched within the 10 600 000 m^2 PPP). Thus 15917*0.25*0.01 = 40 individuals found moribund or dead (attributable to poisoning) in the search area would trigger mitigation actions.

Because the threshold value is based on the percentage of available habitat that is being searched, this threshold value excludes individual birds brought in by the public or found outside the search area, although these can be considered by the TAG additionally. However, all dead non-target species found by the public, or outside the search area, will be recorded. This information will be considered in determining the need for adaptive management (separately from the thresholds for mitigation in Table 1). This information will also be considered during discussions on appropriate adaptive mitigation actions.

Table 1 gives the number of dead or moribund birds (attributable to baiting) found in the search area that would trigger adaptive mitigation measures for each species.

Table 1. Thresholds for non-target species that will be monitored through regular walking of predetermined tracks.

Species	Total Population Estimate	Trigger Threshold (% of total population)	Available habitat (ha)	Area of habitat searched (ha) Bait station servicing grid / track	% of available habitat searched	Number found in search area (attributable to baiting) to trigger mitigation
Silvereye	15917	25	1060	10	1	40
Golden whistler	7814	25	1060	10	1	20
Lord Howe Currawong	240	25	1400	178	13	8

3 Contingency planning and adaptive management for non-target species

3.1 TAG consideration of results

Based on the weekly reports of non-target mortality and carcass search results, the TAG will convene to:

- Consider reported non-target mortality (attributable to baiting) against thresholds described below
- Determine acceptability / unacceptability of non-target impacts
- Determine whether or not adaptive mitigation measures for non-target species described below (or other measures) need to be applied.
- Provide advice to the REP steering Committee
- Evaluate effectiveness of mitigation

Terms of Reference for the TAG are provided in Appendix A.

3.2 Thresholds and adaptive mitigation

3.2.1 Lord Howe Woodhen

The Lord Howe Woodhen is a medium-sized flightless bird. It is a dull olive brown with paler markings on face. The bill is pinkish-grey, slender and down-curved and around same length as head. Legs are thick and pinkish-grey. Birds mainly forage on forest floor for earthworms, molluscs and other invertebrates. Woodhens live only on Lord Howe Island. Populations are found throughout the main Island except for the northern hills area. They live in mountain and lowland rainforest and also Palm and Pandanus forest, particularly Kentia Palm forest on basaltic soils. They are also found in gardens around houses in the Settlement Area where birds are sometimes fed by humans. Lord Howe Woodhens mainly eat worms, insect larvae, gastropods and crustaceans. They mate during late spring-early summer. The incubation period is 20–23 days, a number of clutches may be laid each year. Adult Woodhens pair for life and each pair defends a territory of about 3 hectares. The young birds

are driven out of the natal territory by their parents, and only become established and active in the population if they can find a new territory or take over an existing one (NSW OEH 2018). More than 80% of the LHW population will be held in captivity until the risk of primary and secondary poisoning has passed.

Additional Mitigation Action

The use of bait stations only (and the associated servicing regime) in 168 ha of the settlement area will disallow access to bait in that area and allow intensive search for rodent carcasses (and ability to remove carcasses) over that area providing some additional protection to free-living woodhen in this area.

Search Protocol

Approximately 13% (1% of the PPP and 49% of the settlement) of the habitat for this species will be searched for moribund or dead woodhens (and rodent carcasses) through a combination of the weekly searches performed during servicing of the bait station network, and searches on the designated track network (see Figure 2).

Threshold for mitigation

Any additional free ranging LHW sighted during the baiting program will be observed and individuals exhibiting abnormal signs will be taken into the Captive Management Facility for veterinary assessment, appropriate treatment and ongoing monitoring. As such, a threshold for additional mitigation is not necessary for this species

3.2.2 Lord Howe Currawong

The Lord Howe Currawong is a subspecies of the Pied Currawong, which occurs in eastern mainland Australia. The Lord Howe Currawong is a fairly large, crow-like bird, slightly bigger than an Australian Magpie (*Cracticus tibicen*), with a long, robust and pointed bill, and bright, golden-yellow eyes. It is glossy black with a white tip to the tail, and conspicuous white patches on the outerwings, at the base of the uppertail, and on the lower underbody and base of the undertail. The Lord Howe Currawong differs from most other subspecies by its slightly longer and more slender bill, and smaller white patches and narrower white tail-tip. The Lord Howe Currawong is restricted to Lord Howe Island. It is distributed across the island, though more widespread and more abundant in the southern mountains and northern hills. The Lord Howe Currawong occurs in lowland, hill and mountain regions of the island. It is mainly found in tall natural rainforests and palm forests, typically undisturbed, but it also occurs in cleared and settled areas, remnant patches of forest and the ecotone between cleared land and forest. The subspecies also forages in colonies of seabirds on offshore islets. Lord Howe Currawongs breed in rainforest and palm forest, mainly on hill-slopes and mountains, with all breeding territories including a section of stream or gully and with most nests near water. Lord Howe Currawongs forage at all levels of their habitat, from the ground to the canopy, and sometimes aerially. They are omnivorous, eating a wide range of fruits, seeds, invertebrates, and small vertebrates, particularly rats and mice, and small birds, bird eggs and nestlings. Currawongs also eat fruits and seeds of some exotic plants and are implicated in the spread of such species on the island. They are the only remaining native predator of vertebrates on the island. Most breeding occurs in late spring and early summer (September or October to December), though there is some evidence of breeding occasionally occurring as early as July. The clutch is three eggs, though there are few records of clutch-size; in mainland Australia, clutches are of one to four eggs, usually three or four. While previous studies have shown that rodents do not make up a large part of the LHCs diet, there is a chance that some of the free-living individuals will succumb to secondary poisoning through the consumption of poisoned rodents. However, because more than 50% of the LHC population will be

held in captivity until all carcasses have decomposed, only a small proportion of the total population can be expected to be harmed. Moreover, the population is expected to rapidly recover post-release in a rodent-free environment.

Additional Mitigation Action

The use of bait stations only (and the associated servicing regime) in 168 ha of the settlement area will allow intensive search for rodent carcasses (and ability to remove carcasses) over that area. Thus an additional 12% of the free-living population will be protected by this measure.

Search Protocol

Approximately 13% (1% of the PPP and 49% of the settlement) of the habitat for this species will be searched for moribund or dead currawongs (and rodent carcasses) through a combination of the weekly searches performed during servicing of the bait station network, and searches on the designated track network (see Figure 2).

Threshold for mitigation

The need for mitigation is triggered if a cumulative count of eight (25% of the estimated population) dead or moribund birds (attributable to baiting) in the search area. Because the threshold value is based on the percentage of available habitat that is being searched, this threshold value excludes individual birds brought in by the public or found outside the search area. Population modelling based on fecundity of this species (three eggs per year) and a conservative recruitment estimate of 20%, suggest that the population would exceed current levels after two years from a base of 75% of the current population.

Adaptive mitigation

If threshold numbers are reached, the TAG will convene to discuss implementation of appropriate mitigation measures aimed at reducing further losses. Potential mitigation measures for this species could include capturing additional Currawongs and placing them in the Captive Management Facility (CMF) until capacity is reached, providing supplementary Vitamin-K to free-living currawongs by adding it to their food (sultanas) at feed tables (previous surveys of Currawongs have shown that individuals regularly visit feed tables, so many birds could be given daily supplements of Vitamin K in this way), and additional carcass search and collection in areas where Currawongs are deemed to be accessing poisoned carcasses.

3.2.3 Silvereye

This small, yellow-brown bird is named for the white ring of feathers around its eye. It is the smallest landbird on Lord Howe Island. It is a more robust bird than the mainland Silvereye, having a heavier build, larger feet and claws and a longer bill. This subspecies is found only on Lord Howe Island where it ranges from sea level to the mountains. It is widely distributed in the forests of the main island and is often seen feeding around island homes throughout the settlement area. They glean leaves and flowers for insects, visit flowers for nectar, and eat small seeds and fruits, including the exotic Cherry Guava. The nest is a small cup shape made of palm fibre, grass and spider webs, where 2-4 small eggs are laid in spring and summer (NSW OEH 2018). Silvereyes predominantly eat invertebrates and fruit, and previous trials on Lord Howe Island with non-toxic pellets showed that this species did not take any bait. Moreover, no impacts on this species have been observed on other islands in NSW that have been baited with brodifacoum (Nicholas Carlile pers. comm.). Predation of eggs and chicks is listed as threat to this subspecies (NSW OEH 2018)

Search Protocol

Approximately 1% of the available habitat for this species will be searched by walking the designated track network (see Figure 2). The available habitat for this species includes the entire forested area of the island and is based on observations by the Canberra Ornithological Group during annual island-wide surveys.

Threshold for mitigation

The need for mitigation is triggered if a cumulative count of 40 (25% of the estimated population) dead or moribund birds is made within the search area. Because the threshold value is based on the percentage of available habitat that is being searched, this threshold value excludes individual birds brought in by the public or found outside the search area. Population modelling based on fecundity of this species (three eggs per year) and a conservative recruitment estimate of 20%, suggest that the population would exceed current levels after two years from a base of 75% of the current population.

Adaptive mitigation

If threshold numbers are reached, the TAG will convene to discuss implementation of appropriate mitigation measures aimed at reducing further losses. Potential mitigation measures for this species could include deploying teams of mist netters (experienced bander and assistant) within 48 hours of the mitigation trigger. If required, thirteen metre or 20 m mist nets could be deployed along tracks within the Permanent Park Preserve and within clearings in the settled areas from first light for three hours daily for two weeks. Silvereyes trapped would be administered with appropriate amounts of vitamin K, injected subcutaneously or by gavage. Treated individuals are then marked by the removal of the tip of a single outer tail feather. If individuals are re-trapped they will be given additional treatments (up to four per week), with the docking of a specific tail feather denoting which day the treatment over the two week period has been made. Only birds not exhibiting symptoms of poisoning will be treated in this way. Birds exhibiting symptoms would be assessed for suitability for hospital care, thus avoiding further stress through repeated capture, treatment and release. Other potential mitigation measures could include trapping and treating sick birds, or taking healthy birds into captivity until it is deemed to safe to release them.

3.2.4 Golden Whistler

The male bird has a black head and face, with a broad yellow collar. The throat is white with a black band below. The breast and belly are bright yellow. In contrast, the female bird has olive-grey upperparts and is grey under, with a yellowish tinge. The Lord Howe subspecies differs from the mainland subspecies by its broader yellow collar on the male, a yellowish-grey belly on the female, and both sexes have a stouter bill. On LHI, Golden Whistlers are found in the forests, ranging from sea level to the mountain tops and are often seen feeding around houses throughout the settlement area. These birds hop from branch to branch looking for insects, spiders and insect larvae. They also forage in the leaf litter. Breeding occurs from September to January, producing two pale, spotted eggs. The nest is an open cup-shaped structure made up of palm fibre, vines and leaves and lined with grass (NSW OEH 2018). Golden Whistlers are insectivorous and unlikely to consume baits. Nor are they likely to be exposed to significant amounts of brodifacoum through eating poisoned invertebrates. Predation on eggs and chicks and competition or destruction for food resources by rats are listed as threats to this species (NSW OEH 2018).

Search Protocol

Approximately 1% of the available habitat for this species will be searched by walking the designated track network (see Figure 2). The available habitat for this species includes the entire forested area of the island and is based on observations by the Canberra Ornithological Group during annual island-wide surveys.

Threshold for mitigation

The need for mitigation is triggered if a cumulative count of 20 (25% of the estimated population) dead or moribund birds is made within the search area. Because the threshold value is based on the percentage of available habitat that is being searched, this threshold value excludes individual birds brought in by the public or found outside the search area. Population modelling based on fecundity of this species (two eggs per year) and a conservative recruitment estimate of 20%, suggest that the population would increase to near current levels after two years and exceed current levels after three years from a base of 75% of the existing population.

Adaptive mitigation

If threshold numbers are reached, the TAG will convene to discuss implementation of appropriate mitigation measures aimed at reducing further losses. Potential mitigation measures for this species could include deploying teams of mist netters (experienced bander and assistant) within 48 hours of the mitigation trigger. If required, thirteen metre or 20 m mist nets could be deployed along tracks within the Permanent Park Preserve and within clearings in the settled areas from first light for three hours daily for two weeks. Golden Whistlers trapped are administered with appropriate amounts of vitamin K, injected subcutaneously or by gavage. Treated individuals are then marked by the removal of the tip of a single out tail feather. If individuals are re-trapped they will be given additional treatments (up to four per week), with the docking of a specific tail feather denoting which day the treatment over the two week period has been made. Only birds not exhibiting symptoms of poisoning will be treated in this way. Birds exhibiting symptoms would be assessed for suitability for hospital care, thus avoiding further stress through repeated capture, treatment and release. Other potential mitigation measures could include trapping and treating sick birds, or taking healthy birds into captivity until it is deemed to safe to release them.

4 Protocols and resourcing to ensure systematic, targeted and effective carcass search, collection and disposal in the vicinity of the Settlement and other accessible areas

4.1 Carcass Search and Collection

To minimise impacts of secondary poisoning on non-target species, searches for and collection of rodent and non-target species, carcass searches will be undertaken as per the table below and shown in Figure 2. It should be noted that carcass collection is not possible over large parts of the forested areas of the island. In addition, there is a preference for some poisoned rodents to remain available to introduced Masked Owls to contribute to the eradication of this introduced species. Therefore, carcass collection will be limited to the settlement area and designated walking tracks.

Table 2 Search protocols

Search Method	Protocol	Species Applicable
Systematic rodent and non-target species carcass searches as part of bait station servicing regime.	Bait stations will be placed on a 10m grid throughout 168 ha of the settlement area and serviced at least weekly commencing from the first bait drop for up to four months by the ground	For birds occurring throughout the settlement area

	baiting team (approximately 30 people). The team will also search for non-target species and rodent carcasses during servicing. This 10 m grid search will allow 100% detection of dead carcasses in the search area.	(Lord Howe woodhen and Currawongs,
Designated walking track searches	20 km of pre-determined tracks will be walked by experienced personnel. Tracks in all sections of the island will be included. A width of 5 m will be searched for non-target species and rodent carcasses along each track giving a total search area of 100 000 m^2 (1% of the forested area).). Limiting the search area to a width 5 m will allow 100% detection of carcasses in the search area. Initially, pre-determined tracks will be surveyed every second day until the second drop. Surveys will then continue on a weekly basis for four months from the commencement of baiting.	For birds occurring throughout the forested area (Lord Howe Currawongs, Lord Howe Silvereyes, Lord Howe Golden Whistlers)

It will be the responsibility of the Eradication Team Leader and Mitigation Team Leader to ensure that resources are allocated accordingly.

If non-target species mortalities from poisoning are high, additional staff resources will be allocated from the broader REP team, and/or any other personnel on Lord Howe Island to ensure that carcass search and removal efforts minimise non-target species impacts. Where impacts on non-target species due to secondary poisoning are unacceptable, additional staff will be appointed to assist with rodent carcass collection and removal efforts.

Carcass search and removal efforts (dates, person hours, location, number of carcasses removed, state of decomposition etc) will be recorded and reported to the Mitigation Team Manager who will include the information in weekly reports to the Department and the TAG. This information will also be used to adapt systematic and targeted carcass search and removal activities across the island if necessary.

Staff involved in **non-target species** mitigation work will receive appropriate induction and training including training in the location of the colonies of EPBC Act listed bird species and methods for minimising impacts on these colonies, vegetation and soils.

4.2 Carcass Disposal

Carcass disposal will be via appropriate pit-and-cover operations within the vicinity of the Waste Management Facility precinct in areas off-limits to non-Board staff. A proportion of daily accessed carcasses will be set-aside for decomposition monitoring (caged carcasses within a natural forest setting) to inform the re-release of LHC from the captive management facility.

4.3 Brodifacoum Disposal

To prevent ongoing potential for non-target species exposure to brodifacoum, handling, transport, clean-up and disposal of surplus bait will be undertaken in accordance with the Australian Pesticides and Veterinary Medicines Authority minor use permit (PER85459) which stipulates the appropriate disposal of unused or spoiled bait.

5 Protocols for collection and reporting of qualitative and quantitative information on non-target species mortality

5.1 Data Collection

All members of the Ground Baiting and Mitigation Teams will carry a GPS unit to track the locations that have been searched and locations of carcasses that have been collected. Each team member will also carry a proforma to systematically record information (species, location, number, etc.) on non-target species mortality.

Where observed during the surveys, carcasses of rodents and non-target species will be collected and disposed of.

5.2 Non-target cause of Death

It is important to note that non-target mortality occurs regularly (in the absence of baiting) for a variety of reasons including natural mortality or from other human impacts (i.e. cars). Not all non-target mortality found during surveys can or should be attributable to baiting. Any carcasses of non-target species found will therefore be investigated to assess whether brodifacoum poisoning is a likely cause of death. This may include:

- Initial assessment of signs of brodifacoum poisoning (haemorrhaging). Signs of internal haemorrhaging are readily observable by opening the abdomen.
    - Where signs of internal haemorraghing are observed this will be reported to the TAG as a non-target mortality (attributable to baiting) until laboratory testing confirms otherwise
    - Where no sign of internal haemorrhaging is observed, these would still be reported to the TAG but as mortality unrelated to the baiting.
- Collection of biological samples (livers) for laboratory analysis of brodifacoum residue. This would be undertaken if internal haemorrhaging was observed. Samples would be analysed at NATA accredited laboratory with results reported back to the TAG. Fast turnaround time analysis will be requested.

5.3 Reporting

The Mitigation Team Manager will be responsible for compiling results of carcass searches / removal and efficacy and non-target species mortality into a weekly report for the TAG and the Department for four months after commencement of aerial baiting. The TAG will use the results to determine whether impacts on each non-target species from baiting are acceptable (in accordance with trigger thresholds identified in this plan) and whether further mitigation needs to be implemented.

A final report on the level of mortality on non-target species from baiting will be provided to the Department of Environment and Energy within five months of final aerial baiting

Figure 2 Survey Locations

6 Whole-of-island census, and breeding success monitoring of Lord Howe Woodhen and Lord Howe Island Currawong populations, twice a year, for a period of at least 2 years, following the release of captive birds.

6.1 Lord Howe Woodhen

Post-release surveys of LHW will follow the systematic approach of current annual surveys (Harden 1999) with additional surveys to monitor breeding success. These surveys will assess juvenile recruitment in the first three years following rodent eradication to determine breeding success and chick survival relative to earlier studies.

Annual surveys of LHW are carried out in November–December over two full working weeks following standardised survey protocols (Harden 1999). These surveys were instigated immediately after the 1980–1985 captive breeding and release program and will continue indefinitely. Where possible, all LHW encountered during surveys are individually identified by colour-number bands or an ABBBS metal band (if recaptured), or if they are not banded are captured and banded. Surveys thus constitute a census of the population, whereby a concerted effort is made to identify all surviving LHW occupying readily accessible parts of the island (Mount Gower–Erskine Valley, Boat Harbour–Grey Face, Far Flats, Settlement, and Clear Place). Up until 2002, this intensive survey was repeated in April to record the number of surviving juveniles, and thus obtain an index of breeding success for the population. A monitoring program incorporating two surveys per year will be re-instated for three years encompassing one year before (2018–19), immediately after (2019–20), and one year after (2020–21) the captive management of LHW. The April 2019 survey will provide a contemporary estimate of the breeding success index prior to the captive management program.

It is expected that the breeding success index will be lower than in 2019–20 because released LHW will have less time to successfully rear offspring over the optimal spring–summer breeding period. The November–December survey in 2020 will provide an estimate of the population size to compare with the estimate obtained prior to the captive management program in November–December 2018. The April 2021 survey will allow a determination of whether breeding success has returned to a level similar to that prior to the captive management program. If breeding success has not returned to a similarly high level, a survey will also be undertaken in April 2022.

6.2 Lord Howe Currawong

Population size of the LHC has been estimated previously using trapping, banding and mark-recapture analysis (Carlile and Priddel 2006). Full monitoring and population estimates recommenced in spring-summer of 2016 and 2017 to obtain pre-eradication population estimates. Birds are attracted to designated locations across the island with food where unbanded birds are caught, banded with an individually unique combination of colour-bands, and released. A second round of surveys then takes place to re-sight captured birds and capture unbanded birds. Population size can then be estimated using mark-recapture analysis, and the size of the population tracked over time. Two similar surveys will be performed in spring-summer 2019 and 2020 allowing comparisons of (i) the persistence of the population following rodent eradication with prior estimates, (ii) the survival of birds that were left in the wild during the period of risk compared to those held in captivity, and (iii) productivity of breeding birds in the first year of a rodent-free environment.

Four x ten-day survey periods (October 2019 to January 2020 and October 2020 to January 2021) will be carried out annually for two years following the eradication to monitor population changes of the species in a rodent-free environment, meeting requirements of condition 4f. The twice yearly

monitoring (Nov and April) in section 6.1 is applicable to woodhen as they can have two breeding events in a single year. Currawongs are only annual breeders. Monitoring four times during their breeding season allows not just nesting success to be studied in detail but also fledgling success and initial fledgling survival.

It is expected that if the species experiences negative impacts from a rodent-free environment (through reduced food availability, for example) these impacts will first become apparent during chick provisioning and post fledging survival. Specific attention will be paid to nesting attempts and provisioning behaviour of adults to determine any negative responses to a rodent-free environment. Post-fledging survival will be monitored through subsequent annual surveys.

6.3 Reporting

The results of the whole-of-island census and breeding success monitoring will be provided to the Department of Environment and Energy within two months of completing each census.

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Appendix 1 – Technical Advisory Group Terms of Reference and Membership

Australian Government
Department of the Environment and Energy

Ms Penny Holloway
Chief Executive Officer
Lord Howe Island Board
PO Box 5
LORD HOWE ISLAND NSW 2898

Lord Howe Island Eradication Project, NSW (EPBC 2016/7703)

Dear Ms Holloway

Thank you for your email of 13 September 2017, requesting approval of the Terms of Reference for the Technical Advisory Group (TAG) and of suitably qualified experts to establish the TAG, in accordance with condition 3 of EPBC approval 2017/7703.

As delegate of the Minister for the Environment and Energy, I approve, in accordance with condition 3 of EPBC approval 2017/7703, the attached Terms of Reference for the Technical Advisory Group (TAG).

I have noted the qualifications and experience of the experts nominated to be members of the TAG and approve the following in accordance with condition 3 of EPBC approval 2017/7703.

- **Primary members**: Mr Pete McCleland (Rodent Eradication Expert); Dr Penny Fisher (Environmental Toxicologist); Mr Nicholas Carlile (Pelagic Expert); Mr Ian Hutton (Island Expert); Ms Frances Hulst (Captive Management Program); and
- **Alternate members**: Mr Keith Springer (Rodent Eradication Expert); Dr Belinda Goldsworthy (Environmental Toxicologist); Dr Barry Baker (Pelagic Expert); Mr Hank Bower (Island Expert); Mr Michael Shiels (Captive Management Program).

Should any TAG member resign from the TAG, please ensure approval from the Department for any proposed appointment prior to making that appointment.

Should you require any further information please contact Nathan O'Brien on 02 6275 9682 or by email: post.approvals@environment.gov.au.

Yours sincerely

Greg Manning
Assistant Secretary
Assessment (WA, SA, NT) and Post Approvals Branch
Environment Standards Division

18 January 2018

Attachment: Approved Terms of Reference for Technical Advisory Group.

Lord Howe Island Rodent Eradication Project

Technical Advisory Group
Terms of Reference

Version 3.0

12 Jan 2018

Document Amendments

Build Status

Version	*Date*	*Author*	*Reason*
1.0	13 Sept 2017	Andrew Walsh	First draft.
2.0	5 Dec 2017	Andrew Walsh	Revised draft addressing Department of Environment and Energy comments
3.0	12 Jan 2018		Final incorporating conflicts of interests clause

Amendments in this Release

Section	*Amendment Summary*
p4	conflicts of interests clause

Distribution

Version	*Date*	*Distributed to*
1.0		Department of Environment and Energy
2.0		Department of Environment and Energy
3.0		Department of Environment and Energy, TAG Members, LHIB

Objective

The Technical Advisory Group (TAG) for the Lord Howe Island Rodent Eradication Project will be established to provide technical advice to the project Steering Committee to minimise potential impacts to non target species from the project.

Establishment

The establishment of the Technical Advisory Group (TAG) is a requirement of the approval from the Department of Environment and Energy (EPBC2016/7703), relevant conditions are detailed below:

- Condition 3:
  *Within one month of the date of this approval, the person taking the action must submit to the **Department** draft terms of reference for the **Minister's** approval for the establishment of a **Technical Advisory Group (TAG).***

  *Baiting must not commence until the membership of the **TAG** is approved by the **Department.** The members must include, but not be limited to, an environmental toxicologist, a pelagic bird expert and an island ecologist each with relevant tertiary qualifications and suitable experience in their field of expertise.*

  *The TAG will provide technical advice to the **Rodent Eradication Steering Committee** and be responsible for providing advice and recommendations for the*

development and implementation of the Monitoring and Mitigation Plan required at Condition 4.

- Condition4:

*To minimise impacts from aerial baiting on **non-target species** and the environment of the **Lord Howe Island Group**, the person taking the action must establish a **Monitoring and Mitigation Plan** based on advice from the **TAG**. The **Monitoring and Mitigation Plan** must be approved by the **Minister** prior to **commencement** of aerial baiting on the **Lord Howe Island Group**. The **Monitoring and Mitigation Plan** must:*

*(a) provide for the monitoring of mortality and cause of death of **non-target species**, for a period of at least 4 months after the **commencement** of aerial baiting;*

*(b) establish a **Mitigation Team** Manager responsible for collection of qualitative and quantitative information on **non-target species** mortality, documenting and reporting this information and using this information to coordinate and adapt carcass search and removal operations. The **Mitigation Team** Manager must provide weekly reports to the **Department** and the **TAG** regarding **non-target species** mortality and efficacy of carcass search and removal operations. More regular reports must be provided if requested by the **TAG**. The **Mitigation Team** Manager must continuously undertake these tasks for a period of at least 4 months after the **commencement** of aerial baiting;*

*(c) include protocols and impact thresholds, where the **TAG** determines that unacceptable impacts on **non-target species** are observed between the first and second aerial baiting events;*

*(d) include protocols to ensure systematic, targeted and effective carcass search, collection and disposal in the vicinity of the **Settlement** and other accessible areas; (to avoid secondary poisoning of **non-target species**, but recognising that Masked Owl (Tyto novaehollandiae castanops) eradication depends on sufficient carcasses remaining uncollected) and specify appropriate resourcing;*

*(e) include clear contingency planning and adaptive management measures where mortality of **non-target species** is recorded, with the aim of reducing further mortalities;*

(f) provide for a whole-of-island census, and breeding success monitoring of Lord Howe Woodhen and Lord Howe Island Currawong populations, twice a year, for a period of at least 2 years, following the release of captive birds.

*A report summarising the monitoring results collected on **non-target species** mortality in accordance with Condition 4 (a&b) must be provided to the **Department** within 5 months following the completion of the final aerial baiting event.*

*The results of the whole-of-island census and breeding success monitoring conducted in accordance with Condition 4(f) must be provided to the **Department** within two months of completing each census.*

Role

The primary role of the TAG is to provide technical advice to the Lord Howe Island Rodent Eradication Steering Committee and be responsible for providing advice and recommendations for the development and implementation of the Monitoring and Mitigation Plan to minimise impacts from aerial baiting on **non-target species** and the environment in relation to the Lord Howe Island Rodent Eradication Project.

Individual TAG roles and responsibilities are provided below.

Role	Responsibility
Rodent Eradication Expert and Chair	The rodent eradication expert will provide advice and input on matters relating to operational effectiveness of the eradication operation and rodent ecology and behaviour. The chair will be responsible for chairing TAG meetings
Environmental Toxicologist	The Environmental Toxicologist will provide advice and input into matters relating to fate of the toxin in the environment and non target species such as exposure, persistence and toxin sampling and monitoring.
Pelagic Seabird Expert	The Pelagic seabird expert will provide advice and input relating to seabird distribution, abundance, ecology and behaviour
Island Ecologist	The Island Ecologist will provide advice and input into matters relating to the distribution, abundance, ecology and behaviour of Non Target species on LHI
Vet	The vet will provide advice and input into matters relating to diagnoses, treatment and recovery of non target species, and cause of death, autopsy and toxin testing for deceased non target species. The vet may also advise on matters related to captive management of non target species

Terms of Reference
By accessing their expertise and the resources of their parent organisations, members of the TAG will:

1. Provide technical advice to the Steering Committee or the Project Manager for development, review and implementation of the Monitoring and Mitigation Plan as per the requirements of condition 4 of EPBC approval 2016/7703.
2. Review weekly reports regarding **non target species** mortality and efficacy of carcass searches and removal for a period of 4 months after the commencement of baiting
3. Determine acceptability of impacts to **non target species** in accordance with protocols and thresholds established in the Monitoring and Mitigation between the first and second aerial baiting events, considering the Department of Environment and Energy's relevant conservation advice and recovery plans
4. Provide advice for acting on protocols, thresholds, contingencies and adaptive management established in the Monitoring and Mitigation Plan where impacts to **non target species** are considered unacceptable between the first and second aerial baiting events
5. Minutes of TAG meetings including advice or recommendations to the Project Manager and Steering Committee will be provided by the chair within two days of each meeting

Membership
Membership of the TAG is based on expertise in rodent eradication, environmental toxicology, pelagic seabirds, island ecology and animal health with relevant tertiary qualifications and suitable experience in member's field of expertise. Alternate members have also been proposed as backups for the primary member in each role.

Proposed Membership

Role	Proposed Member	Qualifications and Experience
Rodent Eradication Expert and Chair		

Environmental Toxicologist		
Pelagic Seabird Expert		
Island Ecologist		
Vet Nurse		

Members are appointed for the term covering planning and implementation of the project to 6 months after commencement of baiting. In the event of member's withdrawal for any reason, the backup member for the role will take their place. The Department will be notified within 3 days if any member leaves the TAG.

The Steering Committee or Project Manager may request TAG members to attend Steering Committee meetings if required.

Operation

The TAG will operate according to the following procedures:

- The TAG is a forum for the discussion and review of scientific and technical aspects relating to **non target impacts** of the Rodent Eradication Project. It may make recommendations to the Steering Committee and to the Project Manager.
- If the TAG does not reach consensus on any matter, the Steering Committee will be advised of all TAG member views.
- Correspondence and advice will be collated by the Chair and presented to the Steering Committee and the Project Manager.
- A quorum will consist of two members plus the Chair.
- Most communications will be remote i.e. email or phone. If face to face meeting are required they may be called by the Steering Committee, but may also be called by the Chair or Project Manager in response to an urgent issue.
- Out of session issues may be canvassed in response to a request for advice from the Project Manager, and responses will be collated by the Chair and provided to the Project Manager and Steering Committee.
- Most input from the TAG will be via email coordinated by the Chair. The committee shall meet as required. Meetings may be held by phone, email or in person.
- Correspondence and advice from the TAG will be provided to the Project Manager and the Steering Committee by the Chair.
- Minutes will be made available to TAG members, the Steering Committee, the Project Manager.
- Costs of TAG members attending meetings will be borne by the project.
- Scientific and Technical advice for the overall project is not restricted to the experts nominated to the TAG, the project team can call on global expertise as required. Other experts may also be called to provide advice to the TAG.

Secretariat

The secretariat for the TAG will be provided by the LHIB. This will include coordination of meetings, provision of agendas and relevant supporting documents, minute taking and follow up of action items.

Conflicts of Interest

Members of the TAG will take all reasonable steps to avoid any conflict of interest (real or apparent) in connection with the TAG responsibilities and to disclose any personal interest in connection with the Rodent Eradication Steering Committee, and the Lord Howe Island Board. If any such conflict of interest arises, TAG members will complete a conflict of interest declaration form to be submitted for consideration by the Department. The declaration must list any material personal interests which could influence, or reasonably be seen to influence the TAG recommendations and decisions.

Lord Howe Island Rodent Eradication Project

EPBC 2016/7703

Biosecurity Plan

Version 2.2

Document Amendments

Build Status

Version	*Date*	*Author*	*Reason*
1.0	5 Jul 2018	Pete McClelland Jaclyn Pearson Andrew Walsh	For Independent Biosecurity Expert Review
2.0	1 August 2018	Pete McClelland Jaclyn Pearson Andrew Walsh	Addressing Biosecurity expert comments
2.1	7 Aug 2018	Andrew Walsh	Final Draft
2.2	2 Jan 2019	Andrew Walsh	Final version

Amendments in this Release

Section	*Amendment Summary*

Distribution

Version	*Date*	*Distributed to*
1.0	5 Jul 2018	Euan Kennedy (Independent Biosecurity Expert)
2.0	1 August 2018	Euan Kennedy (Independent Biosecurity Expert)
2.1	8 August 2018	Department of Environment and Energy
2.2	2 Jan 2019	Department of Environment and Energy

Executive Summary

The Lord Howe Island (LHI) Rodent Eradication Project (REP) aims to completely eradicate introduced rodents; Ship Rat and House Mouse from the island group. The Lord Howe Island Board (LHIB) will implement the REP in winter of 2019.

Post eradication, it is therefore imperative to implement and maintain a biosecurity system to prevent rodent reinvasion to LHI, through preventative quarantine measures, a detection and monitoring network and incursion response protocols.

The purpose of this 'REP Biosecurity Plan' is to provide detail of biosecurity measures that will help reduce the risk of accidental reintroduction of rodents on Lord Howe Island. All aspects of biosecurity including: prevention; surveillance; detection; incursion response; equipment and personnel requirements, are addressed in this Plan. The Plan also identifies any likely rodent incursion pathways to LHI. Guidelines for responding to reported sightings and possible incursions are also provided. Responsibilities are also listed, and a list of experts for advice and support is also provided.

This '**REP Biosecurity Plan'** integrates with and is part of the wider '**Lord Howe Island Biosecurity Strategy 2016'** which covers all biosecurity risks to LHI including: rodents, vertebrates other than rodents; invertebrates; plants and pathogens and a range of generic mitigation measures for all biosecurity risks.

This 'REP Biosecurity Plan' has been prepared using published scientific information, experience from similar programmes around the world, consultation with stakeholders and site assessments. This plan will need to be updated as eradication and biosecurity research produces results or technology that may affect or influence this Rodent Biosecurity Plan. LHIB and other involved personnel should follow an adaptive management approach, responding to reported sightings, completing regular monitoring and surveillance and adjust the biosecurity programme as required, particularly in regards to capacity, training and equipment.

Contents

1 Introduction

1.1 Risk Mitigation Plan Requirements

The Lord Howe Island REP was approved with conditions under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) on the 18 Aug 2017 (EPBC 2016/7703).

Condition 6 of the approval states:

> *"The person taking the action must submit an **integrated quarantine/biosecurity management plan** (**the plan**) for the airport and shipping port to prevent the reintroduction of rodents to the **Lord Howe Island Group** for the **Minister's** approval prior to **commencement** of the action.*
>
> ***The plan** must prescribe quarantine/biosecurity management protocols regarding visiting yachts, cruise ships, other vessels and shipwrecks and maintaining rodent free status on islets including the long-term use of rodent detection dogs.*
>
> *In developing and implementing **the plan** the person taking the action must seek and address advice and recommendations from an independent biosecurity expert*."

This plan is intended to satisfy Condition 6.

1.2 Who is this plan for?

The primary audience for this plan is the Department of Environment and Energy, the LHIB, partner agencies, stakeholder groups and the local community. A large number of practical measures are relevant to anyone visiting Lord Howe Island.

It is important that the general public are aware of the Plan once implemented, and the practical measures they can take to maintain biosecurity.

This plan is intended to meet legislative requirements under Australian and New South Wales biosecurity law as detailed in the 'Lord Howe Island Biosecurity Strategy 2016'.

1.3 Implementing Agencies

The LHIB is the primary agency responsible for implementation of this plan. Decision making responsibility lies with the LHIB but advice may be obtained from the REP Steering Committee or the Rodent Incursion Response Technical Advisory Group (RIRTAG) established for an incursion or such other organisations or individuals that may assist with the planning for or response to future incursions..

The local residents on Lord Howe Island, along with shipping and airfreight operators have the greatest role to play in biosecurity and prevention. They are the 'eyes and ears' of the project and will be able to assist with the reporting of any sightings and rapid response in the event of an incursion. They will also be able to provide on the spot information to visitors, particularly those who stay in guest accommodation on the islands.

It is important that the Lord Howe community along with freight operators remain vigilant and are involved in all aspects of the long-term biosecurity of the islands.

1.4 Plan Overview

To be effective a biosecurity plan needs to be:

- Achievable/ feasible – if an action is not achievable then there is no point having it in the plan.
- Affordable- need to have a very high likelihood of accessing the required resources for the foreseeable future
- Acceptable – the plan needs buy in from residents, this requires education and consultation.
- Enforceable – need legal backing (and willingness to use it) to enforce the stated rules

- Sustainable – biosecurity is for the long term.

To ensure that all the required actions are undertaken and to avoid replicating work, it is important that it is clear not only what needs to be done but who is responsible/ accountable for it being done and when it is to be completed by. In the case of LHI, the responsible organisation is the LHIB but the responsible position also needs to be identified, as does the implementation timeline. It is important that it is the position not the person that is identified so that there is not confusion should the individual be absent.

- **Responsible:** The individual, team or organisation that undertakes the work to achieve the desired result. They have responsibility for getting the work done or decision made. It is important that there is a designated individual allocated to the task and that they are empowered and supported by the LHIB.
- **Accountable:** The position who is accountable for the correct and thorough completion of the task. This must be one position along with a designated backup to act in their absence. The person/ group responsible for the task is accountable to this position. The person must be have authority (position and financial) to ensure they can complete the tasks.

In addition to having positions responsible and accountable for tasks it is important to know who must be consulted on and/or informed about the tasks.

- **Consulted:** The people who provide information for the action and with whom there is two-way communication. This is often subject matter experts.
- **Informed:** The people kept informed of progress and with whom there is one-way communication. These are people that are affected by the outcome of the tasks, so need to be kept up-to-date.

It is the responsibility of the person/position accountable for the task to ensure that, when relevant, all the necessary agencies/ individuals are kept informed on the task.

Over all responsibility for this plan lies with the CEO of the LHIB being ultimately accountable for ensuring that all required tasks are completed in a timely fashion and that any required audits are carried out. The actual tasks are clearly delegated to the relevant personnel. If anyone is uncertain about their or someone else's role they must discuss it with their manager.

1.5 Plan review

This plan is designed around the current level of social support for biosecurity on Lord Howe and prioritising the available resources. It is expected, based on experience elsewhere, that support will increase once the eradication is completed and residents experience the benefits of a rodent free island. While it is recognised that having a high standard of biosecurity in place prior to the eradication is crucial, enforcing tight and unrealistic controls at this stage is likely to lead to a backlash and reduced support for both the eradication and ongoing biosecurity. An important component of the biosecurity programme is ongoing community education, which is covered under the eradication Communication Strategy.

This plan is to be reviewed biennially i.e. an initial review 30th August 2020, i.e. one year post eradication at which time it is expected tighter controls on the island can be enforced based on practical experience to that point along with hopefully increased local support and resources.

2 Risk Species

This plan relates solely to preventing the introduction / reintroduction of invasive rodent species. Due to their commensal nature, presence at all likely source sites (airports and harbours), invasive breeding biology (quick breeding, large litters, rapid dispersal) and associated ecological and economic impact the primary target species are ship rat (*Rattus rattus*), Norway rat (*R norvegicus*) and house mice (*Mus musculus*). Each of these species has / will have a significant impact on the islands ecology and economy on its own but there is a greater cumulative effect due to the difference in their biology e.g. ship rats are more arboreal and impact forest birds more while the larger size of Norway rats means they can predate larger seabirds. Mice can reach plague numbers and impact plant recruitment and invertebrates. All three species pose a human health risk and damage crops and stored food products. In addition, while not posing such a high risk it is important to also stop other native rodents such as the Bush Rat (*Rattus fuscipes) and* Fawn-footed rat (*Melomys cervinepes)* from accessing the island.

Information on identifying species from specimens and from rodent sign is provided in Appendix 5.

3 Defining the Three Stages of Biosecurity

The three stages of the biosecurity continuum are:

1. **Prevention** of rodents reaching Lord Howe. **(Quarantine)**
2. **Surveillance** to rapidly detect any rodents that may arrive on Lord Howe
3. **Incursion response** readiness and ability to remove any rodents that may make it to Lord Howe. Guided by appropriate rapid response plans.

Outreach is often considered another stage but is outside of the scope of this plan. More detail is provided in the overarching LHI Biosecurity Strategy and Rodent Eradication Project Communications Plan.

3.1 Prevention (Quarantine)

Prevention methods aim to stop rodents reaching Lord Howe Island. This involves trying to block each of the identified pathways (Section 4) that rodents may use to access the island whilst still being realistic.
Prevention has been shown to be the most cost effective and practical stage to prevent a rodent invasion. This is particularly true for LHI where detection/ surveillance and removal/ response are likely to be problematic due to the size of the island, number of residencies and level of social support. However, it should also be noted that prevention off-island is where the Lord Howe Island Board has the least amount of control in the process.

- Prevention is critical for maintaining the biosecurity of Lord Howe Island. This will involve implementing ongoing detection and removal programmes on the primary access pathways, particularly the Island Trader which is recognised as presenting the highest risk.
- Prevention measures outlined in this plan are designed to reduce the risk of rodents being accidentally introduced to a minimum, while still being acceptable to the operators, local community, ongoing projects and visitors. It is planned to increase the measures over time, as biosecurity becomes more socially acceptable and hopefully available resources increase.
- Prevention requires actions leading up to and at the point of departure, where possible in transit, and at the point of arrival.
- Prevention, especially prior to arrival at the island, has been shown to be the most cost-effective approach to biosecurity i.e. it is much cheaper to detect and remove rodents before they invade the island than it is to try and locate and remove them once they are on the island.
- Prevention requires a high level of public support and assistance. While LHIB staff have a crucial role in undertaking the more formal aspects of biosecurity, they cannot be everywhere all the time and good biosecurity relies heavily on the public undertaking basic actions. More detail on engagement and biosecurity training is provided in the LHI Biosecurity Strategy and REP communications Plan.

3.1.1 Prevention Tools

A range of tools are available for prevention (as well as surveillance and response) and are discussed in more detail in Appendix 6

Prevention includes: reducing the number of rodents at the possible source sites (eliminating them if possible), this can be via habitat management - reducing or removing habitat, installing barriers, and removing likely rodent attractants. Where possible preventing rodents accessing the transport options e.g. working with suppliers, then detecting and removing any rodents that may access the transport options before departure, in transit and as a final option immediately after arrival.

Maintaining cleanliness and vigilance for rodents or sign of rodents around points of departure and while in transit is a major component of Prevention. Training has been provided to relevant stakeholders in detecting and identifying 'signs of rodents' such as teeth marks, droppings and footprints. This will be ongoing.

A range of devices will be used for rodent detection and removal at the Birdon (Island Trader) wharf at Port Macquarie in conjunction with habitat alteration. It is recognised that the priority for biosecurity is at the points of departure, especially for Lord Howe where there are only a small number of primary departure points for the island and there are logistical constraints on implementing the desired standard on the island. The Board will continue to work with the transport operators, especially the Island Trader as the most likely pathway, on improving this aspect of biosecurity.

3.2 Surveillance

Surveillance methods aim to rapidly detect any rodents that may arrive on the island.

- Surveillance is the ongoing actions required to have the desired level of confidence that, if a rodent does make it on to the island that it will be detected before it can establish a new population. Removal of any rodents detected is then covered under response.
- Surveillance requires planning in advance. Equipment and processes need to be in place, this includes: having lines of accountability and communication: agreed priority for any response actions e.g. access to staff, resource approvals and tools agreed beforehand

3.2.1 Surveillance Tools

A range of tools are available for use in detecting rodents and are discussed in more detail in Appendix 6. The suitability of the different devices must be considered for each situation based on required efficacy for rats and/or mice, any non-target risk, range of target and non-target species which may be detected in addition to rodents e.g. reptiles and amphibians, service schedule, whether they will remove the rodent at the same time it is detected (e.g. traps and poison), any legal constraints and cost (both purchase and ongoing

Table 1. Tools deemed feasible on Lord Howe for surveillance

Device	Rodent specific	Rat/mouse specific	Frequency of checking	Human risk	Non target risk	Cost (purchase and servicing)	Remove rodent	Efficacy
Rodent Detection Dogs	Y	N	O	L	L	H	N	H
Wax chew blocks	Y	Y	O	L	L	L	N	H
Chew cards	Y	Y	O	L	L	M	N	H
Tracking tunnels	N	Y	M	L	L	M	N	H
Trail camera	N	N	O	L	L	M	N	M
Rodent motels	N	N	L	L	L	L	N	M

Legend Y= Yes, N = No, H = High, M = Medium, L = Low, O = Opportunistic

The LHIB has two certified biosecurity dogs and three certified handlers. These dogs are focused on rodents but are also trained to detect reptiles and amphibians. The dogs are an important tool for prevention, surveillance and response. They are currently used extensively to check all vessels and the majority of aircraft upon arrival at the

island, and post eradication, will be a major surveillance tool checking around the settlement and wider island. The dogs are also used to check the Island Trader and its operational area in Port Macquarie as resources allow. It is planned to eventually have a third certified dog and handler based at Port Macquarie to check the Island Trader and its operational area leading up to and immediately prior to each voyage. The dogs on–island will also be an important component of any response to locate rodents and delineate the extent of any incursion.

The LHIB maintains a store with a range of detection and response devices. Currently the bulk of the equipment is stored in the LHIB equipment store, Bowker Avenue. Boxes are to be clearly labelled with the content details, and annual checks (every June so that the information can be included in the biennial review of the plan in August) of the equipment will be carried out by LHIB personnel.

Table 2 Monitoring methods for detecting rodents on Lord Howe Island and information on their use.

Method	Notes on surveillance use
Rodent motel	1 visit per month Can be used to house monitoring tools such as wax blocks Can target rodent incursion directly, i.e. by adding toxic bait or traps Possible non-target consumption of monitoring tools or bait (both toxic and bait on traps) between checks
Visual searches	Can be undertaken whenever trained personnel are out. Observations by the public can be followed up by trained personnel. Rodent tracks, droppings, runs, burrows and chews can all be recognised Identification of rodent species (depending on size and clarity of prints, droppings and burrows)
Certified rodent dogs	Can be used as ongoing training Can cover large distances relatively quickly. Socially acceptable and cost effective for checking the settlement and wider island. Can detect where a rodent has been as well as where it is. Can be trained to detect rats and/or mice.
Tracking tunnel	1 week per month - can be left for prolonged period if desired Tunnels can be placed out permanently, but plates only added when necessary Tracking cards can be baited with peanut butter Identification of rodent species (depending on size and clarity of prints)
Wax blocks/ Wax tags	1 visit per month Can be bought or home-made Identification of rodent species (depending on size and clarity of teeth-marks)
Trail Cameras	1 week per month - can be left for prolonged period if desired Video and still images available Can be put in place and set to record over multiple nights Identification of rodent species (depending on clarity of images) Identification of non-target species (depending on clarity of images)
Kill traps	To be left set permanently Traps must be set in either natural tunnels, wooden trap boxes, tracking tunnels or per manent stations to exclude non-target species Can target rodent incursion directly Traps must be maintained regularly to ensure they are functioning correctly Only target rats or mice
Live traps	Due to intensity of work required for servicing – set in response to a report Traps must be checked daily when set Can target rodent incursion directly Non-target species can be released unharmed Only target rats or mice

3.3 Incursion Response

Incursion response plans are aimed at rapidly removing any rodents that arrive on the island.

- Being ready to respond. This includes having authority to use tools and react appropriately (such as having permits in place to use bait).
- Undertaking immediate action to kill or contain an incursion if possible
- Having a response plan in place. Incursion Response requires a generic plan that directs the general actions - primarily information collection and general decision-making processes, so that a specific 'Response Plan' making the best use of the available resources to locate and remove the target rodent can be developed.
- Response plans can then be revised as new information becomes available.

3.3.1 Incursion Response Tools

A range of tools are available for an incursion response and are discussed in more detail in Appendix 6. As the primary aim of a response is to remove any rodents most responses use traps and poisons however, it is also important to ensure that no animals remain. This often involves the use of surveillance devices as part of the response. The suitability of the different devices must be considered for each event based on the aim of the task e.g. confirmation of species, distribution etc. when surveillance tools such as dogs, chew cards and tracking tunnels may be best compared to removing the animal when traps and poisons are required. For removal devices it is important to consider: required efficacy for rats and/or mice, any non-target risk, range of target species which may be affected, in addition to rodents e.g. reptiles and amphibians, service schedule, any legal constraints and cost (both purchase and ongoing). Relevant tools are covered in Appendix 6. Prevention and surveillance tools discussed previously can also be used during the incursion response stage.

Table 3. Options deemed feasible on Lord Howe Island for incursion response

Device	Rodent specific	Rat/mouse specific	Frequency of checking	Human risk	Non target risk	Cost (purchase and servicing)	Remove rodent	Efficacy
Traps – kill	Y	Y	M	L	L	M	Y	M
Traps – live	N	Y	H	L	L	H	Y	L
Glue boards	N	N	H	L	M	M	Y	H
Toxicants-anticoagulants	N	N	O	M	H	L	Y	M
Toxicants – acute	N	N	O	H	H	L	Y	M

Legend Y= Yes, N = No, H = High, M = Medium, L = Low, O = Opportunistic

4 Pathways

A ‘pathway’ is the route or method by which a rodent species moves from one location to another.

The most effective way of minimising introduction risks is to identify the invasion pathways and to establish barriers or protocols with the aim of preventing the introduction as far back along the introduction pathway as possible.

As Lord Howe Island is over 600 km from the nearest potential source of rodents, it is improbable that any rodent species could make it to the island unassisted by humans. This leaves two possible pathways: by air at the airport and by boat, with the greatest risk being at the wharf.

Pathways are categorised High Risk, Moderate Risk or Low Risk based upon frequency of likelihood of transporting rodents and exposure to source populations.

Access to LHI is by boat or plane and the island residents are heavily reliant on these modes of transport for both the economy and their own access to food and goods. In addition to the regular Qantas passenger service there are also regular arrivals by small freight plane from Port Macquarie and one off flights with single and twin engine planes from mainland airports and occasionally New Zealand.
A ship service (the Island Trader) runs fortnightly from Port Macquarie delivering most of the island’s freight including fresh and frozen produce and goods as well as large quantities of materials and equipment. The vessel ties up at the wharf making this the most likely site for an incursion. In addition, there are a range of other vessel types that visit the island, primarily yachts that moor in the lagoon within easy swimming range of the island. The risk from shipwrecks is always present and any part of the islands’ coast could be a potential incursion site.

On Lord Howe, the pathways culminate at two major points of Arrival: the wharf and the airport allowing targeted prevention and surveillance actions to be undertaken at (but not limited to) these points (see Figure 1).

Figure 1. Primary pathway culmination points for rodent incursion to LHI. Wharf and Airport.

4.1 Pathways and Current Risk Rating

The following pathways are present for transporting rodents to LHI. A risk rating has been assigned considering frequency, cargo, and cleanliness.

Table 4. Potential rodent pathways.

Pathway	Risk rating
Flights – Regular Passenger Transport (Qantas)	Low
Flights – Freight	Moderate
Flights – Other	Moderate
Island Trader freight boat	High
Private yachts	Moderate
Shipwrecks	Low
Storm enhanced dispersal (rafting on debris)	Low
Deliberate release by public	Low

4.1.1 Aircraft

Commercial Flights - Qantas

Regular passenger flights arrive daily from Sydney and weekly from Brisbane and Port Macquarie (seasonally). The risk is classified as *Low* as even though there is a high frequency of service, high hygiene standards are maintained both on the planes and at the mainland airports.

Other Airlines

Macquarie Air and Eastern Air frequent the island (generally once a week) primarily to bring small freight items, mail and occasionally passengers from the mainland. There is also a regular (usually daily) freight flight for a private aircraft based on the island. The risk is classified as *Moderate* as frequency of service is medium but cargo generally presents a higher risk and hygiene standards are harder to maintain.

Private aircraft

Private fixed wing aircraft, small single or twin-engine aircraft such as Cessnas, Kingairs or similar and occasionally helicopters from the mainland and very occasionally New Zealand via Norfolk Island. No international quarantine clearance service is provided on LHI (i.e. no cargo or luggage is allowed to disembark international planes). The risk is classified as *Moderate* as frequency of service is low there is limited ability to control hygiene standards.

Royal Australian Air Force and other Emergency Services

Very occasionally RAAF aircraft i.e. Hercules undertake training flights to LHI. The risk is classed as *low* due to the low frequency of flights, rare disembarkation of cargo and high hygiene standards.

An Air ambulance is sometimes deployed to the island. The risk is classed as *low* due to the low frequency of flights, rare disembarkation of cargo and high hygiene standards.

4.1.2 Vessels

Island Trader

This is the island's freight transport vessel; it presents the greatest risk of transporting rodents to Lord Howe. It has a fortnightly schedule bringing bulk stores and supplies, along with groceries and mail, to the island and removing waste. On the mainland at Port Macquarie, the vessel's proximity to suitable rodent habitat and the vessels size and layout means there is opportunity for rodents to hide on board. It ties up to the LHI wharf for extended periods (2-3 days) when unloading and back loading.

The risk is classed as *High* largely due to its frequency of visitation, the amount and type of cargo it carries and because it ties up to the island wharf for a couple of days at a time.

Private Yachts

These are a mix of a small number of locally based yachts and a variable number of off island based yachts both from mainland Australia and overseas ports that visit the island either as a destination or in transit. Moorings are provided within the lagoon with landing of people by tender. Yachts generally do not dock at the wharf. No international quarantine clearance service is provided on LHI (i.e. no cargo or luggage is allowed to disembark international yachts). Summer is the period of highest risk as this is when the most vessels visit the area. One local yacht does regular (every 2-3 months?) freight runs to the mainland. The vessel is maintained to a very high standard and all supplies are landed via tender which allows for thorough inspection

The risk is classified as *Moderate* as frequency of service is low there is limited ability to control hygiene standards.

Navy vessels

Occasionally Navy vessels visit LHI, however in general they anchor off the island with landing of people by tender.

The risk is classed as *Low* due to their design (sealed compartments): high standards of cleanliness: and because all landings are made by tender, so the main vessel does not come alongside the island.

Cruise ships

Currently no cruise ships visit Lord Howe Island, but this plan will be revised if this pathway should start.

The risk is classed as currently non-existent due to no current plans for visiting cruise ships.

Shipwrecks

An additional risk class is from shipwrecks either from vessels visiting LHI or in transit in the neighbouring seas.

The risk is classed *as low* due modern navigational equipment and the high standards of cleanliness on most vessels.

Storm enhanced dispersal (rafting on debris)

The distance to the mainland is beyond the swimming distance of rodents. Islands that are separated by over 2 km of open water are safe from incursion by rats (Russell *et al.* 2008). Mice can tolerate up to 3 hours of continuous swimming, but it appears that house mice do not swim as a method of dispersing to islands as all recorded house mouse incursions have been via transport of stores and equipment (Taylor 1978, Russell & Clout 2005).

Storms often carry debris washed from land (i.e. mainland Australia) which can form rafts that can hold rodents.

The risk is classed as *low* due to the distance to mainland Australia being over 600 km.

4.1.3 Deliberate release

As the island is inhabited and has visitors this is considered a potential pathway, as there is always a possibility of deliberate release.

The risk is classed as *low* due to the biosecurity measures in place, educational materials increasing the likelihood that people will understand the conservation importance of the project, plus social and economic outcomes. Rodent detection dogs also inspect a high percentage of passenger's luggage and cargo.

4.1.4 Mainland Suppliers

Whilst not a pathway in their own right, goods come from many mainland suppliers though the Island trader and occasionally planes. As prevention is the most cost effective and achievable stage of rodent biosecurity, priority will be given to any actions which may reduce the risk of rodents accessing the transport options. This includes managing the risk of rodents entering cargo before it is delivered to the transport operator. As such, the Board will work with the major suppliers to implement appropriate biosecurity actions to reduce the opportunities for rodents to access any packages. It should be noted that many suppliers can provide goods to the island and these are sourced directly by residents. This is very difficult to control.

5 Specific Biosecurity Plans: Prevention (Quarantine) and Surveillance

5.1 Supply chain

While the primary prevention focus is on the transport pathways / transport operators, it is important to also minimise the risk of rodents entering any equipment or supplies prior to it being received by the transport operator. As such, the Board will work with the major suppliers of both food and non-food items to put in place suitable quarantine precautions to minimise this risk. The major risks are: any containers holding food which may attract rodents into them; and bulk items e.g. building materials, in which a rodent could hide for the 2- 3 day voyage or the 3 hr flight.

It is proposed to implement an approved supplier programme where suppliers of significant quantities of goods and equipment can become approved suppliers that the board will give priority to purchasing goods from. Residents will also be encouraged to purchase goods form these suppliers although it is not possible to force this. The option of negotiating a "bulk deal" to also provide a financial inactive to purchase form these suppliers will also be investigated.

As the list of preferred suppliers is developed, it will be included in the biennial reviews of this plan and will be distributed to the community.

NB this is an additional step and does not in any way reduce the need for the highest possible standards by the transport operator.

5.2 Aircraft

5.2.1 Commercial Flights – Qantas

Table 5. Prevention methods to be used for Qantas at Sydney, Brisbane and LHI airports:

Preventative method	When	Who	Responsibility/training
Mainland Airports and Planes			
Cleanliness around the plane when grounded - planes are stored out on a clear hardstand area, usually lit at night, which is unattractive to rodents.	Daily	Qantas ground staff	LHIB to provide information, and any problems in capacity escalated back to LHIB
Baiting around the airport - bait stations are used at major airports (i.e. Sydney and Brisbane) as part of ongoing rodent control within their operating grounds	Daily	Airport staff	LHIB to provide information, and any problems in capacity escalated back to LHIB
Cleanliness inside the plane - planes are well cleaned to a high standard, minimising rodent-attractive food and therefore the likelihood of rodents in the body of the plane.	Daily	Qantas air staff	LHIB to provide information, and any problems in capacity escalated back to LHIB
Passenger information to prevent stow away rodents – Biosecurity information is provided with tickets booked through travel wholesalers and again on board	Daily	Travel wholesalers Qantas staff LHIB staff provide documentation and update	LHIB to provide leaflets and any problems in capacity escalated back to LHIB
Staff training to prevent stow away rodents – staff placing cargo and baggage on the planes will be trained be vigilant for rodents or sign of rodents (teeth marks, droppings, footprints). Training for detection response.	Each time baggage/cargo is put on the plane	Qantas ground staff LHIB to provide awareness information to airport staff	LHIB to provide information, and any problems in capacity escalated back to LHIB
LHI Airport			

Rodent detector dogs (Biosecurity dogs) will check a target 100 % of flights arriving on the island. They check the plane and the bags when on the arrival trolley in a dedicated biosecurity room. Dogs will also undertake weekly inspection airport infrastructure.	90% of flights arriving on LHI	LHIB dog handler	LHIB
Placement and servicing of a variety of devices (Figure 2) inside and outside the terminal	Weekly	LHIB	LHIB
Staff training to identify stow away rodents or sign – staff unloading cargo and baggage on the planes will be trained be vigilant for rodents or sign of rodents (teeth marks, droppings, footprints). Training for incursion response	Each time baggage/cargo is put on the plane	Local Qantas ground staff LHIB to provide awareness information and training to airport staff	LHIB to provide information, and any problems in capacity escalated back to LHIB

5.2.2 Other Airlines

Macquarie Air and Eastern Air frequent the island primarily to bring freight.

Table 6. Prevention methods to be used for other airlines

Preventative method	**When**	**Who**	**Responsibility/training**
Mainland Airports and Planes			
Cleanliness around the plane when grounded - planes are stored out on a clear hardstand area, usually lit at night, which is unattractive to rodents.	Daily	Macquarie Air and Eastern Air staff	LHIB to provide information, and any problems in capacity escalated back to LHIB
Baiting around the airport - bait stations are used at the Port Macquarie airport as part of ongoing rodent control within their operating grounds	Daily	Macquarie Air and Eastern Air staff	LHIB to provide information, and any problems in capacity escalated back to LHIB
Cleanliness inside the plane - planes are well cleaned to a high standard, minimising rodent-attractive food and therefore the likelihood of rodents in the body of the plane.	Daily	Macquarie Air and Eastern Air staff	LHIB to provide information, and any problems in capacity escalated back to LHIB
Staff training to prevent stow away rodents – staff placing cargo and baggage on the planes will be trained be vigilant for rodents or sign of rodents (teeth marks, droppings, footprints).	Each time baggage/cargo is put on the plane	LHIB to provide awareness information to airport staff	LHIB to provide information, and any problems in capacity escalated back to LHIB
Provide manifest of at risk items (Board to supply a list of relevant risk items to the operator)	Every Flight	Macquarie Air and Eastern Air staff LHIB	LHIB to provide information on risk items.
LHI Airport			
As for Qantas planes but Rodent detector dogs (Biosecurity dogs) will check 100 % of flights arriving on the island.	All flights arriving on LHI	LHIB dog handler	LHIB
Placement and servicing of a variety of monitoring devices (as above)			
Staff training (as above)			

5.2.3 Private aircraft and Air Force

Prevention methods used are:

Rodent detector dogs (Biosecurity dogs) will target 100% of flights, as they are higher risk. Notification is received through the LHI Airport controller (a LHIB staff position) or through Australian Border Force for international arrivals. Monitoring devices and staff vigilance as above

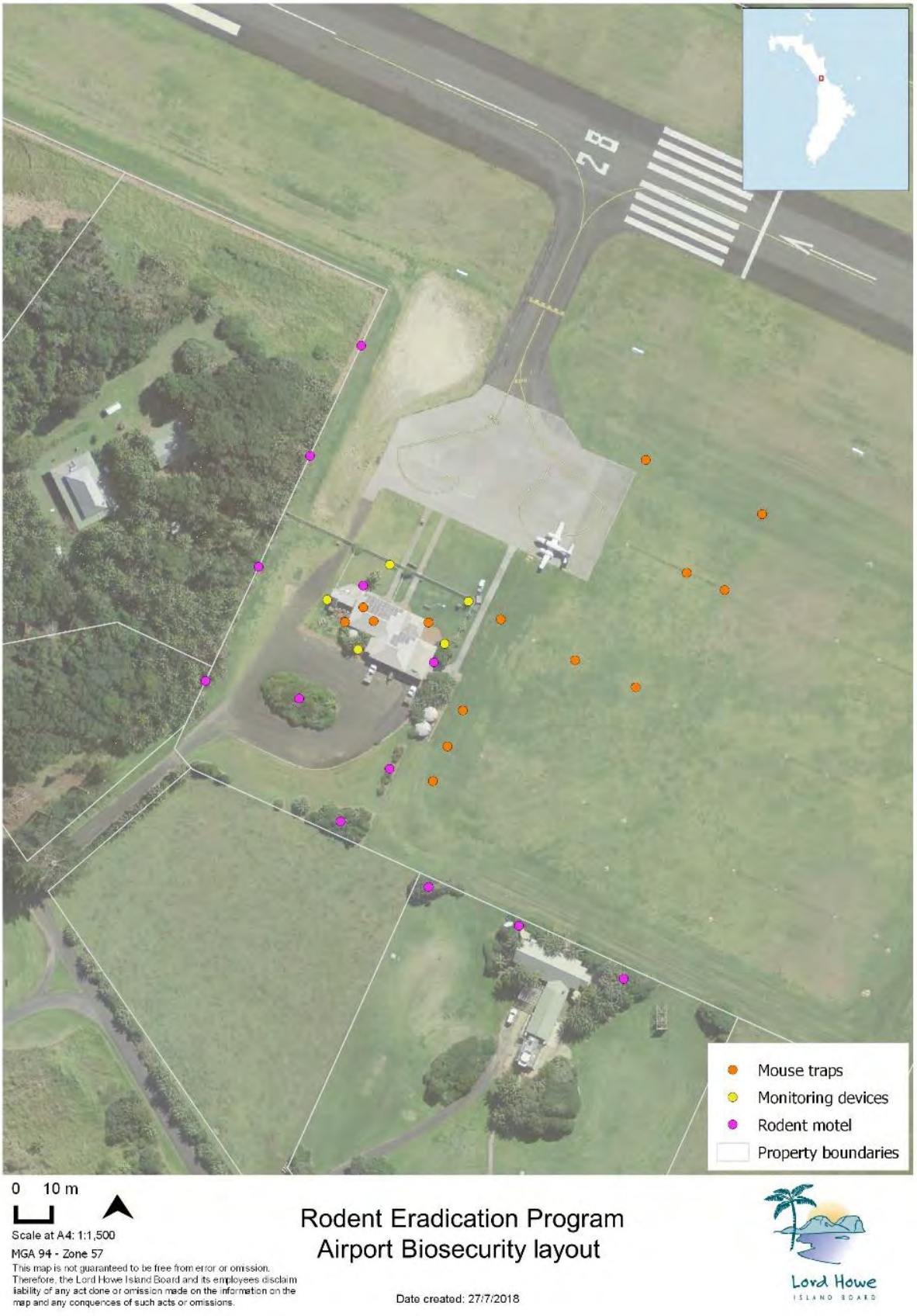


Figure 2 Rodent monitoring set up – LHI airport (Mouse traps around runway apron are placed under existing guidance cones)

5.3 Vessels

5.3.1 Island Trader – Port Macquarie wharf and vessel in transit

Prevention methods used are:

There is a contractual agreement between the LHIB and the owner of the *MV Island Trader,* Birdon that includes a 'Biosecurity Risk Management Manual' detailing biosecurity and rodent prevention measures for both on the ship and around the Port Macquarie wharf facility, which is also owned by Birdon. The manual details Birdon's commitment to biosecurity, through management, stevedoring staff and crew. This is to be audited annually by the LHIB.

All quarantine controls relating to the *Island Trader* are developed in conjunction with owner to ensure it is practical and workable for staff. Birdon management has overall responsibility to ensure that the Biosecurity Risk Management Manual is maintained and adhered to by all personal in the operations supply chain.

At Port Macquarie –reduce likelihood of rodents getting on board the vessel when tied to the wharf

Table 7. Actions required at the Birdon wharf, Port Macquarie

Preventative method	When	Who delivers action	Responsibility/training
Cleanliness around the vessel and storage facilities at the wharf. All waste is disposed though JR Richards waste contractors. The vessel is moored on the wharf with clear hardstand areas Vessel is cleaned after each voyage prior to crew signing off The Mate is responsible for inspecting the vessel prior to the recommencing of cargo operations. The Ship's superintendent is responsible for ensuring the cargo receiving and storage shed is clean at all times. The Ship's superintendent is responsible for ensuring that the commercial wharf is washed down with high pressure water after the vessel has been loaded and maintained in that condition until the return of the vessel from Lord Howe Island.	Daily	Birdon staff The Mate The ship's superintendent The ship's superintendent	Birdon staff with training and support from LHIB
Site management and inspection regimes Regular rodent baiting maintained on the wharf as well as in and around all storage sheds to reduce rodent numbers in the vicinity	Daily	Birdon staff	Birdon staff with training and support from LHIB
Rodent rope guards - used on the ropes when the boat is moored on the wharf so rodents are unable to access the ship using the ropes	All the time when moored alongside wharf	Birdon staff	Birdon staff with training and support from LHIB

Major suppliers training - requested to ensure that precautions are taken. This includes i.e. bait stations in packing and storage areas and inspection of all cargo, is undertaken when sending freight to the vessel. 1. Birdon transports cargo on behalf of LHI customers. 2. LHI customers are responsible for the packaging/identification of cargo to ensure that it is suitable for shipping and meets biosecurity regulations. 3. Consignment note declaration to be completed by the customer/customers supplier declaring the goods being shipped do not contain biosecurity risk material. 4. Inadequately packed cargo will not be received by Birdon mainland staff 5. 'Restricted imports' will not be received by Birdon staff unless the required approvals by the LHIB are supplied. 6. 'Restricted imports' and 'Notify able imports' will be advised to the LHIB prior to the vessel departing Port Macquarie 7. Cargo which has any evidence of biosecurity risk material will not be received 8. Biosecurity risk material detected after the vessel departs will be held in quarantine at LHI and the LHIB Biosecurity Officer will be notified. 9. 'Restricted imports' approved freight will not be released to LHI customers until it is cleared by the LHIB Biosecurity Officer 10. Provide Birdon with an updated list of notifiable imports (please see Lord Howe Island Biosecurity Plan 2016 for the full lists of 'restricted imports' and 'notifiable imports	Prior to sending freight to vessel Annually	Suppliers LHI customers Birdon staff LHIB	Birdon staff with training and support from LHIB World Heritage Manager
6 lockable bait stations as approved by the Board and 10 wax chew blocks maintained on the Island Trader at all times. Records detailing what devices (bait stations, wax tags, traps), where they are placed, service schedule and who is responsible for checking them are to be kept on a service record. **Checked 2 days prior to departure**, to allow time to follow up any possible reports, and **within 12 hours of departure**. In the event any rodent sign is detected, the World Heritage Manager is to be notified as soon as practicable and they will develop a response plan based on the individual situation.	In place daily, with weekly checks	Birdon staff	Birdon staff with training and support from LHIB
Security – contractual arrangements are in place with security from SNP. The cargo shed is locked, alarmed and monitored when staff are not on site. The vessel is monitored by the security firm during the night when the crew are not on duty.	Daily	Birdon and SNP	Birdon

Rodent detector dogs (Biosecurity dogs) based with handler at Port Macquarie will check the freight on the ship before departure. In the interim, this will be conducted regularly by LHIB dogs and handlers.	Every 2 weeks prior to the ship sailing	LHIB dog handler	LHIB
Staff training to prevent stow away rodents – staff placing cargo and baggage on the vessel trained be vigilant for rodents or sign of rodents (teeth marks, droppings, footprints) Birdon has biosecurity signage and identification material in place at Port Macquarie and Lord Howe Island. LHIB has requested that they provide training at least once a year. Birdon are well versed in the current requirements for the transport of non-approved (restricted) cargo such as plants, animals and contaminated building material.	When moving cargo or/and placing on the ship	Birdon staff	Birdon staff with training and support from LHIB

Figure 3. Island Trader berth – Port Macquarie (Google earth downloaded 3/7/2918)

In Transit – staff continue vigilance on board for any rodents that may have missed detection at Port Macquarie

Table 8. Actions to be undertaken while the Island Trader is in transit.

Preventative method	When	Who delivers action	Responsibility/training
Bait stations and chew blocks are to be checked between 6 and 12 hours prior to arriving at the LHI wharf.	On sailings (every 2 weeks)	Birdon staff	Birdon, with training and support from LHIB
Staff training to prevent stow away rodents – continue to be vigilant on vessel for rodents and sign of rodents.	On sailings (every 2 weeks)	Birdon staff	Birdon, with training and support from LHIB
Necessary action if rodent or rodent-sign found - *move to incursion response* - any possible sign of rodents is to be notified to LHI Harbour Master or LHI Police/Port Operations as quickly as possible but definitely before any cargo is unloaded, they in turn are to immediately notify the LHI World Heritage Manager.	Incursion response	Birdon staff	LHIB
If rodent- sign is detected – *move to incursion response* - the ship will moor out away from wharf, a tender will deliver LHI biosecurity dog and handler to the ship, to detect the rodent and dispatch them, and confirm when the vessel is all clear. Only when no further sign of rodents is found will the ship moor on the wharf and continue unloading with high vigilance continuing.	Incursion response	Birdon staff and LHIB staff	LHIB

5.3.1.1

On Arrival at Lord Howe Island – reduce likelihood of any stow away rodent on the boat getting onto the wharf

Table 9. Actions to be undertaken when the Island Trader arrives at and is tied up alongside the LHI wharf.

Preventative method	When	Who delivers action	Responsibility/training
Rodent rope guards – in place when moored to the LHI wharf facility.	When moored to the wharf (every 2 weeks for approx. 2 days)	Birdon staff	Birdon with training and support from LHIB
Staff training to prevent stow away rodents being transported away in cargo from the wharf – all personnel who are moving or working with the cargo educated to identify rodent sign and visually inspect all cargo coming off the ship. The more people who check each piece of cargo the higher the likelihood of seeing any sign that may be present. *If sign detected move to incursion response*	When cargo being moved on the wharf (approx. over 24 hr period every 2 weeks)	Birdon staff	Birdon with training and support from LHIB
Rodent detector dogs (Biosecurity dogs) based with handler at Lord Howe Island will check as much freight arriving on the island via ship as possible. *If sign detected move to incursion response.* Dogs will also regularly inspect the wharf area and buildings	On arrival to LHI wharf (every 2 weeks)	LHIB staff dog handlers	Birdon with training and support from LHIB
Placement and servicing of a variety of monitoring devices (see Figure 4) around the wharf and inside buildings	Weekly	LHIB	LHIB
Staff training to identify stow away rodents or sign – staff unloading cargo from the ship will be	Each time baggage/cargo is unloaded	Local stevedores LHIB to provide awareness information and	LHIB to provide information, and any problems in capacity escalated back to LHIB

trained to be vigilant for rodents or sign of rodents (teeth marks, droppings, footprints).		training to airport staff	
Food freight is to be stored in the hardstand shed for rodent detection dog inspections prior to transporting away from the wharf to the final destination. *If sign detected move to incursion response.*	On arrival to LHI wharf (every 2 weeks)	LHIB staff dog handlers	Birdon with training and support from LHIB
Community training - once cargo has been transported away from the wharf it is outside the main surveillance network and any rodent present is unlikely to be detected as quickly as desired. All residents who may receive freight trained to be aware of rodent sign on or in any packages they receive.	When cargo being moved from the wharf (approx. over 24 hr period every 2 weeks)	Community	Community with training and support from LHIB
If rodent- sign is detected - move to incursion response.	Incursion response	Birdon staff, community members and LHIB staff	LHIB

Birdon Auditing. The Ships superintendent is responsible for conducting an audit twice a year to ensure Birdon is biosecurity compliant with contractual requirements.

Reporting and records/documentation. Birdon management is responsible for the following documents, which form part of the biosecurity risk manual**.**

1. Incident form
2. Nonconformity form
3. Audit report
4. Consignment note declaration
5. Cargo manifest

Copies of documents will be stored at LHI and Port Macquarie.

5.3.2 Yachts

Table 11. Actions to be undertaken for a yacht visiting LHI.

Preventative method	When	Who delivers action	Responsibility/training
Information pack – when booking their mooring in advance with the LHI Board, they will receive biosecurity information via email, or over the phone. This will be a condition to their approval to attach to a mooring. This sheet will include a check list that will cover care when packing, checking the vessel prior to them departing, maintaining bait stations on board, actions to take if rodent sign is found either before departure or in transit as well as consent to undertake an inspection with a **rodent detector dogs (Biosecurity dog).** The handler will also check the bait station.	When booking a mooring	Individual in yacht, with support from LHIB	LHIB
Rodent detector dogs (Biosecurity dog), with the handler also checking the bait station.	On arrival to mooring LHIB	Rodent detector dog handlers	LHIB dog handlers
If rodent-sign is detected – the ship will be sent outside the lagoon if human life is not at risk i.e. due to severe weather, a tender will deliver LHI biosecurity dog and handler to the ship, to detect the rodent and dispatch them, and confirm when the vessel is all clear. Only when no further sign	If rodent-sign is detected	LHIB staff dog handler	LHIB dog handlers

of rodents is found will the ship be allowed on the moorings or on the wharf and continue unloading with high vigilance continuing.			
Placement and servicing of a variety of monitoring devices (see Figure 4) around the wharf and inside buildings as above	Weekly	LHIB	LHIB

5.3.3 Navy vessels

The same methodology as Yachts will be used

5.3.4 Cruise ships

The same methodology as Yachts will be used

Prevention and surveillance devices at LHI wharf.

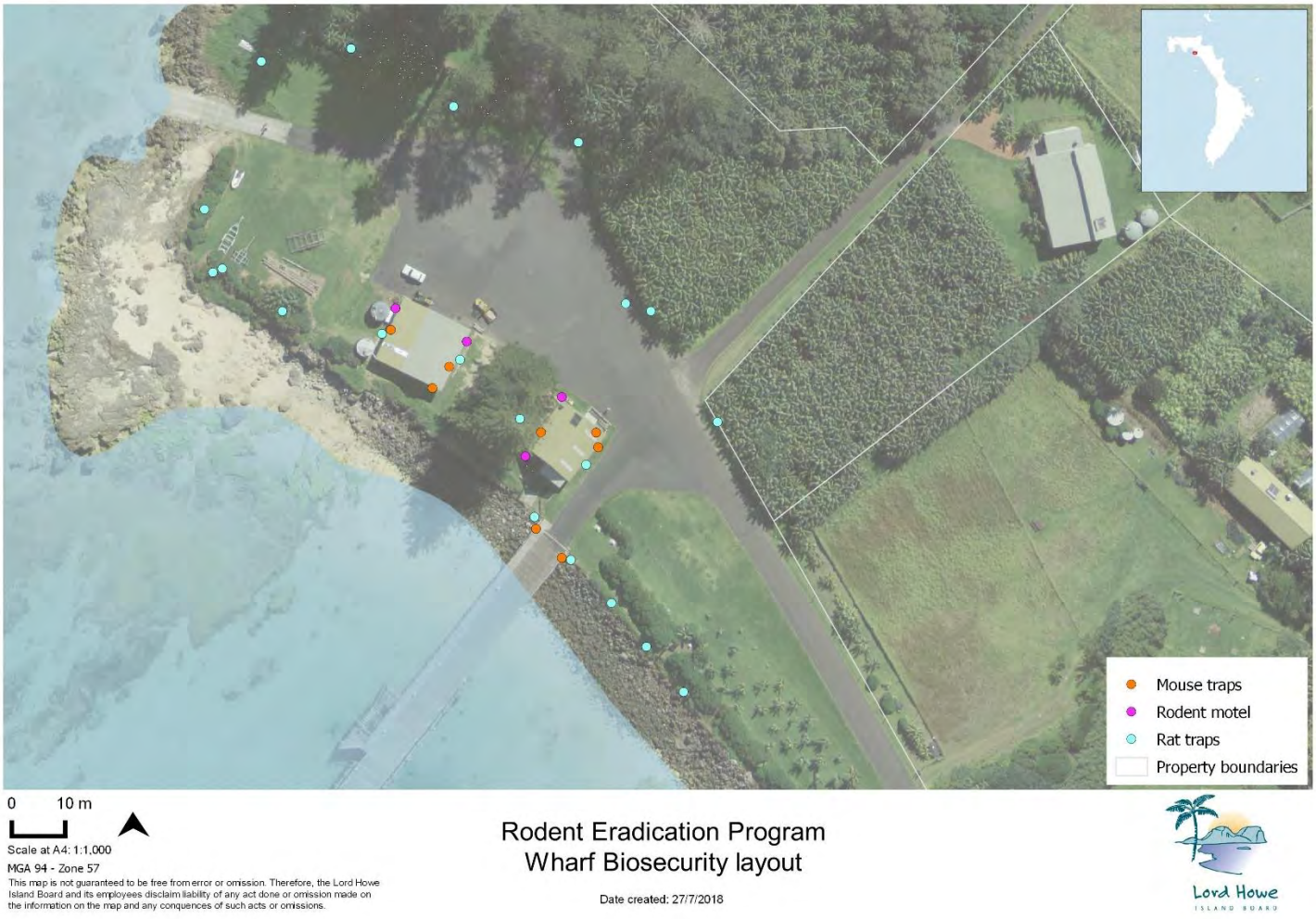


Figure 4. Rodent monitoring set up at LHI Wharf

5.4 Shipwrecks

A shipwreck on or within 1km of the LHI coast will be initially treated as a potential rodent incursion and trigger the following:

- Investigation into the risk of the vessel harbouring rodents (type of vessel, currency of Ship Sanitation Certificate, cargo, age, nationality etc.)

- Deployment of a range of monitoring tools (including detector dog searches) in predicted landfall areas around the shipwreck. Local weather and ocean current conditions, together with distance to nearest land will be used to predict possible landfall locations

Move into incursion response detailed in Section 6.

5.5 Storm enhanced dispersal (rafting on debris)

Move to incursion response.

5.6 Deliberate release

Move to incursion response.

5.7 Wider surveillance

Work undertaken elsewhere has shown that once rats leave the point of entry they can travel significant distances (several kilometres) in the first few days, possibly looking for a mate, food etc. or simply familiarisation. They then settle down in a suitable territory, which provides shelter, food and water. This is often around buildings if they are present. While a wide and comprehensive surveillance network is desirable for early detection, it is not realistic at this point hence the available resources are focused at the most desirable sites – entry points, major food sources etc. (see Figure 5). This network will be revisited with the biennial review of the plan and, depending on resources and local support, will be expanded as appropriate.

Figure 5. ***Rodent monitoring sites - LHI***

6 Specific Biosecurity Actions: Incursion

As it is impractical to have a response plan that covers all or even most of the possible incursion situations.

The start of an incursion response is based on:

- **rodent sightings**, or
- **sign-of-rodent**.

Either may be considered **Possible** or **Confirmed** (more detail below)

In the event of an incursion (Possible or Confirmed) the following process and flow chart (Figure 6) describes actions to be undertaken.

6.1 Step One - Immediate Action

Where an incursion is detected by a LHIB officer or member of the public the immediate response and highest priority is to kill / contain the rodent by any means possible with resources at your immediate disposal. Critical detail of the incursion should then be collected if possible. It is highly desirable to collect the body of any rodent that invades the island as it:

a) confirms the death and
b) it can be examined for data on species, age sex, breeding status as well as collecting genetic material which either independently or collectively if there are multiple incursions can be used to help build a risk profile for incursions which can then be used to refine both quarantine and response planning in the future.

6.2 Step Two - Report the Incursion

The incursion should be immediately reported to the Manager Environment and World Heritage (or next in line see Appendix 2 for contact details). This will prompt a rapid response plan being implemented for the specific situation – refer below.

6.3 Initial Investigation and Reporting Form

The MEWH should collect as much information to allow completion of the incident report form. This may be obtained from the person reporting the incident or further site investigation.

All sections of the form must be completed with as much detail as possible including contact details of the observer for later follow up if required. If the report is from a member of the public, a suitably trained Board staff member is to interview the reporter and fill in the form.

Any sign that is found should be photographed in situ, then carefully collected, and labelled. Any carcasses that are found should be collected and frozen. The incursion must be reported to the World Heritage Manager or their supervisor as soon as possible, but whether this is before or after the report form is completed will depend on the individual situation.

6.4 Step Three – Appoint an Incident Controller

An Incident Controller should then be appointed to oversee and report on the response. The IC is responsible for: developing the Rapid Response Plan for the incursion; overseeing its implementation including obtaining the required resources including personnel and expert advice; constantly reviewing any new information that is available and modifying the plan to take that information in to account; declaring the response complete; reporting on the response.

It is important that the location of all detection devices is accurately recorded and detailed records of all checks and any changes to the plan recorded. Failure to do so can lead to major issues with interpreting results later in the programme. All personnel involved in implementing the plan will be properly trained in deploying the devices and in identifying rodent sign – not just on the devices but also any incidental sign they may encounter.

6.5 Step Four – Validate.

Carefully consider the veracity of the report as this will direct both the nature and the intensity of the initial response. Reports can be classified as **Possible** or **Confirmed**. Some reports are definitive e.g. the collection of a rodent carcase or a clear sighting by multiple people, but most are not so clear cut e.g. a brief glimpse of an animal or bird is often mistaken for a rat or mouse while sign can often be misinterpreted. It is important to record the details for every report and to treat them seriously even if it is unlikely to be a rodent. It is better to have followed up 10 false reports than to miss one incursion. In addition, while one report may be doubtful multiple possible reports from the same area would be of greater concern.

If there is any doubt in its veracity, try to confirm the report. While it is highly desirable to remove any incursion as quickly as possible the level of resources required for a full-scale response are significant and will come at the expense of other work so needs to be justified.

Possible Category

If the report is in the possible category then a decision must be made on the likelihood of it actually being a rodent, this will be based on; what was actually seen and where; the experience of the observer; and relevant background information e.g. other possible sightings in the area.

In the case of **rodent sightings**, it is based entirely on the observer. In the case of **sign-of-rodent,** it is often possible to get an experienced person to look at the sign, be it directly or a photograph to refine the decision.

For either a **possible rodent sighting** or **possible sign-of-rodent** – monitoring tools can be used to confirm whether it is either a false alarm or whether it moves to the 'definite category'. The tools that can be used have been discussed in the previous chapter, (rodent detection dogs, wax chew blocks, chew cards, tracking tunnels, trail camera, rodent motels, etc.).

The rodent detector dogs will, in most cases, be the first tool to be used. The sooner a report is received and the area checked by a dog the higher the level of confidence in the result as rats in particular can rapidly disperse from the arrival site.

By using the monitoring tools, the rodent sighting or sign-of-rodent, will be determined as either:

- **A false alarm, whereby there is no further action** but vigilance needs to be maintained. For example, the sighting is confirmed as another species (e.g. a bird such as a rail which run in undergrowth and at low light can look like a rodent) or the 'sign of rat' is confirmed as another species (e.g. chew marks in wax blocks are confirmed as a birds beak markings).
- **Still of concern, whereby an appropriate incursion response is required** (e.g. no rodent is detected by the rodent dog, but the person who saw the rodent feels very confident that the sighting was real and the rat has moved away)

Confirmed, whereby there is a full incursion response is required (e.g. a rodent is identified by more than one person or rat droppings are confirmed). **Confirmed and Still of Concern Categories**

The possible variations required for a specific response means that it is crucial that it is flexible, targeted and based on the best information available. To assist with this a **'Rodent Incursion Response Technical Advisory Group' (RIRTAG)** will be established for each incursion to provide technical advice to the Decision Maker. It is important that the RIRTAG are engaged as early as possible so that the best use of resources can be made.

The RIRTAG will consist of 4 –5 people and will be chaired by the Incident Controller (IC). The IC will be the Board's World Heritage Manager unless otherwise stipulated by the LHIB CEO.

The RIRTAG will include:

a) At least two people with specific rodent expertise preferably including rodent incursion response.
b) At least one person with biosecurity expertise

c) At least one person with local knowledge of the incursion site.
d) The World Heritage Manager is the IC until the position is delegated to someone else. In the absence of the WHM, the LHIB CEO will appoint the IC.

The actual makeup of the group will vary depending on who is available. A list of possible names will be maintained.

The response continues until the decision maker, taking into account the advice of the RIRTAG and all other relevant information decides that there is a very low likelihood of any rodents being present- either the initial target or any others in the vicinity. This could be due to the invading rodent being removed or it being a false alarm.

6.6 Step Five - Confirming a report.

Unless a report is considered as being so unreliable as to not warrant any follow up aside from completing the reporting form, the initial response will focus on trying to confirm the presence of any rodents.

In the case of sign (droppings, chew marks etc.) the sample is to be carefully stored and photographs taken and distributed to experts for consideration. Faeces can also be sent for genetic analysis. As these can all take several days/weeks to get a reply an on the spot response should be started at the same time.

In the case of possible sign being found, the first priority is to have the area searched by rodent detector dogs, as unlike the other devices available the dog does not need to directly interact with the rodent to detect it. This should be supplemented by distributing detection devices in the vicinity of the where the animal was reported. Wax tags and tracking tunnels along with bait stations, and if available suitable traps and trail cameras are to be deployed as per step six below. The actual area covered will depend upon the specifics of the report and of the area e.g. if a rat is seen on the wharf the area surveyed will need to be larger, due to both the clear area in front of the wharf not being suitable for rodents and the likely behaviour of a rat to disperse and investigate the island after it arrives. Thought needs to be put into the specific placement of the devices to maximise the likelihood of a rodent interacting with them e.g. along possible runways rather than out in the open.

If an incursion report is “a rodent caught in a trap in the vicinity of one of the likely arrival points”, namely the wharf or airport, there is a reasonable likelihood that it is a sole invader. However this must not be assumed and at the very least a dog must be used to thoroughly check the area (several times over at least a week), and all existing biosecurity devices in the area checked and rebaited. If there is any doubt that it was not a sole invader then a full surveillance response must be undertaken.

The duration of the surveillance period will depend upon the intensity and extent of the surveillance, ongoing results and any other relevant information, including the level of confidence of the initial report, location and any supporting evidence e.g. if it can be linked to a possible access pathway (e.g. bulk supplies recently delivered to the area). Whether to continue with surveillance and how to best use the available resources will need to be reviewed regularly.

Surveillance must continue at the prescribed standard until a formal decision is made to cease. In most cases, expert advice on whether the level of surveillance undertaken has been sufficient should be sought (usually from the RIRTAG).

6.7 Step Six – Establish a Rodent Incursion Response Technical Advisory Group (RIRTAG)

If at any point during the report / surveillance period, the report is deemed probable a RIRTAG is to be set up as described above. The RIRTAG will consist of rodent behaviour, rodent eradication and biosecurity experts. The RIRTAG is to advise on/sign off the Response Plan. As time is often crucial to removing an incursion before the rodent moves or breeds, initiating a response is not to be delayed while the RIRTAG is bought together.

6.8 Step Seven - Implementing a Removal Response

If the presence of a rodent is confirmed or at least highly suspected, and the animal is not accounted for, then a full response must be implemented as soon as possible. The information from the surveillance work will be used to focus the response on the highest priority areas i.e. around the area(s) that any sign was found or anywhere the biosecurity dogs showed interest.

The initial Rapid Response Plan will need to be revised to cover the change in focus i.e. from searching to removal and must cover the required resources and how they will be utilised.

The removal response will consist of deploying removal devices i.e. traps and bait stations on a grid. This grid will be 30 m x 30 m for at least 120 i.e. 4 layers of devices from the detection point (sighting or sign), for rats and 10 m x 10 m for at least 60 m, 6 layers of devices for mice. Ideally, each site will have both a trap and a bait station but or devices will be alternated.

While the removal phase is underway, the surveillance devices will still be maintained in order to try to confirm the location of the rodent at that time in order to focus the response. Consideration will also be given to moving the detection devices in order to maximise their detection capabilities.

The RIRTAG is be convened weekly to be updated on any new information and provide advice on the best way to respond. The plan is to be updated accordingly.

It is important that even after a rodent has been removed which is believed to account for the report adequate surveillance is continued to ensure there are no other rodents present.

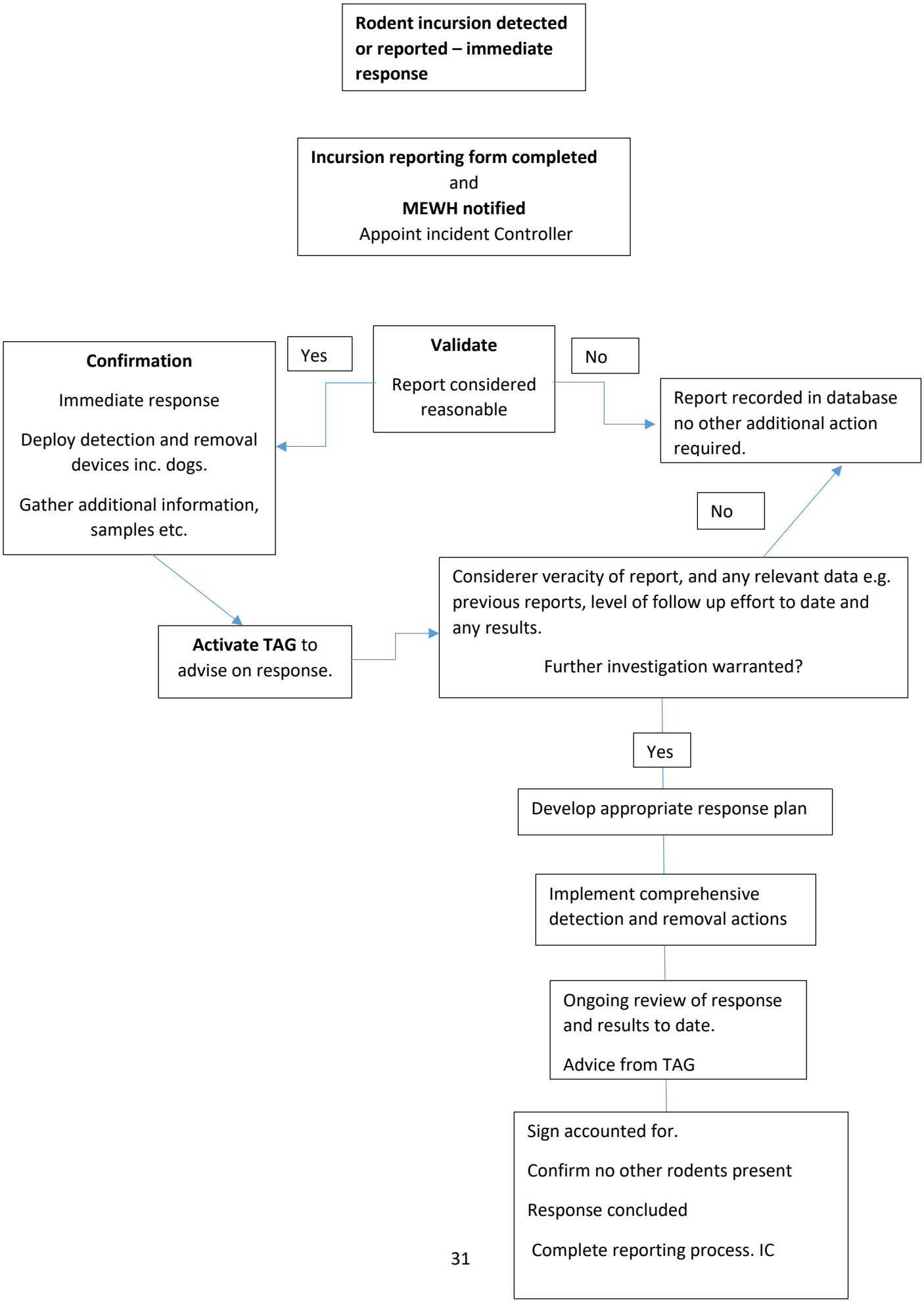
6.9 Step Eight – Declaration of result.

The Incident Commander is responsible for declaring the end of the response. This may be one of three outcomes:

- No rodent present following an appropriate level of surveillance
- Rodents were present but eradicated.
- Rodents still present and unable to be eradicated with the available resources.

This will be based on advice from the RIRTAG.

Figure 6 ***Detection action flow chart***



Summary of Actions for Rodent Incursion

Pest invasion is suspected or detected	A Response operation can be triggered by the following incidents: A rodent is recorded (i.e. collected, photographed, or seen) on LHI. The presence of a rodent on LHI is highly suspected (i.e., footprints, droppings or seeds found, insect damage seen, etc.). Threat of a new animal pest invasion is highly likely (e.g. shipwreck, report of deliberate introduction etc.). A pest is detected in transit to LHI. **Action** Kill or contain if possible Complete pest report form. **Responsibility: LHIB staff**
Complete Rodent Incursion Report Form	**Action** Complete Rodent Incursion Report Form with as much detail as possible. **Responsibility: LHIB officer who identified the incursion/potential incursion.**
Inform WH Manager	**Action** Inform World Heritage Manager of the invasion/report as soon as possible. **Responsibility: LHIB officer who identified the incursion/potential incursion.**
Notify LHIB CEO	If the report is deemed to be reliable **Action** Notify the LHIB CEO as soon as possible of any invasion event, they should in turn notify any other relevant people in the lone. **Action** Notify all relevant personnel. Any new incursion should be immediately reported to: Relevant LHIB staff. – Ranger, Flora Management Officer, Biosecurity Dog Handlers, Bush Regeneration Supervisor **Responsibility: WH Manager**
WH Manager responsibilities	Ensure that Co-ordinated Incident Management System or similar is used in the incident-response and appoint an Incident Controller (IC). The WH Manager fills this role by default unless the LHIB CEO appoints an alternate. Ensure that this Response process is followed.

	Acts as decision-maker for any contingency response in line with approved delegations. **Action** Biosecurity Manager / World Heritage Manager to keep LHIB CEO and other relevant agencies and residents informed. Ensure that there is appropriate financial control over operations.
Is confirmation of the report required?	**Action** Incident Record Form to be updated as information becomes available. Ensure that any information gaps are noted and filled in as soon as possible. Are all the following points known: Species? Sex? Breeding status? What is the pest's behavioural ecology? Is it a recent invasion / How long could the pest have been present? What is its rate of movement/dispersal?
Establish RIRTAG	**Responsibility: Incident Controller**As soon as an incursion is deemed probable a RIRTAG of local, National and International experts is to be assembled to provide advice on the response. Membership is likely to include experts on: Rodent behaviour, Rodent eradication Biosecurity Local knowledge All available relevant information to be provided to the RIRTAG including the initial reporting form.
Develop Plan to confirm the report (if required).	Determine the methods to be used for confirmation. Consider the resources that will be needed to confirm the report. Consider the possibility of false positive identification of the pest. Consider the possibility of not detecting the pest when it is present. Use expert advice (RIRTAG).

Responsibility: Incident Controller

Who owns the land where the incursion was identified (and neighbouring land)?

PPR, Board, Perpetual lease, special lease?

Action- determine who owns/leases the relevant land re access for response.

Responsibility: Incident Controller

Consult with the leaseholders of the land.

If the Board does not manage the land, consult with the leaseholders and other affected and interested parties and obtain support on the response to the incursion.

If agreement is not reached initially, try talking with the owners again with additional information on the consequences of doing nothing.

If no agreement is reached, monitor the situation and review progress. Consider options (forced access through a issuing a biosecurity direction under the Biosecurity Act)

Action- obtain required access for implementing response.

Responsibility: Incident Controller

Agreement to respond to the invasion

If agreement is not reached initially, try talking with the leaseholders again.

Expert advice may be required at this stage.

If agreement is reached obtain Expert Advice

If no agreement is reached, monitor the situation and review progress. Consider options (forced access through a issuing a biosecurity direction under the Biosecurity Act)

If forced entry not warranted/ suitable go to 9.4 Do Nothing Response.

Then monitor the situation and review progress.
Responsibility: Incident Controller

Obtain expert advice

Obtain expert advice on best way to undertake the response, set up a Technical Advisory Group (TAG) of technical experts. I.e. local knowledge, target species biology, eradication experts.

The experts (or RIRTAG) should advise on the response, including the development of a Rapid Response Plan for either/ both confirmation and removal.

LHIB CEO to approve the list of experts to be consulted,

Action- set up RIRTAG

Responsibility: Incident Controller

Is the local expert advice able to deal with the situation?

Determine whether the local/on site expertise is sufficient to deal with the invasion.

Responsibility: Incident Controller

If it's not sufficient then:

Seek expert advice from outside LHI

Seek relevant experts both nationally and internationally.

Use other expert contacts that local staff have developed.

Select experts to be consulted, request their assistance.

Responsibility: Incident Controller

Report confirmed

If the report is confirmed, begin planning the response.

Use expert advice.

Try to rule out a false positive result in the confirmation.

Responsibility: Incident Controller

Report not confirmed: follow-up required

If the report was not confirmed, more follow-up may be required.

Use expert advice and consider waiting or changing methods of detection.

Try to rule out a false negative result in the confirmation.

Action – try to confirm the report

Responsibility: Incident Controller

Report not confirmed: original report considered a false alarm

Report not confirmed, pest not likely to be present. Report was likely to have been a false alarm.

Use expert advice and consider recommending to the decision maker that no further action be taken.

<u>Undertake debrief and review</u>.

Action Update the Pest Invasion Form (send completed copy to LHIB CEO).

Responsibility: Incident Controller

Report confirmed Determine priority and urgency, and plan the response

Use expert advice (RIRTAG). Assess the risk to the island's values to determine level of response justified.

Determine the priority of the contingency response.

An invasion debrief may be required to solve immediate biosecurity risks i.e. identify how the IAS got to the island and through the quarantine processes so that the pathway can be closed.

What relevant pest species are already present on the island? – cumulative impact

Are specific species at risk - is a wildlife rescue operation warranted?

Consultation with leaseholders and other interested parties may be required.

Media liaison staff may be required to deal with any media interest.

Action - Develop a Rapid Response Plan

Responsibility: Incident Controller

Prioritising the contingency response

A pest incursion that has a High consequence requires a response that may need additional resources from both within and outside the LHIB, e.g. external experts or additional resources.

The following questions need to be considered:

What are the constraints? (Staffing, Logistical, Financial, Legal, Public Interest, and Ecological).

How soon can the response be implemented- for rodents the faster the response is started the better to try and remove any individual before it disperses and to remove all individuals before they breed. Is the target species likely to disperse, is there seasonal variability in their detection / susceptibility to removal techniques, logistical ecological or social constraints?

How long should the operation run? Is it until the rodent is confirmed absent, until allocated resources are consumed, until the operation is deemed a failure (need to set criteria for this)

What are the predictable results of the operation?

What are the key operational targets and decision-points along the way?

Decide on trigger points for reducing checks e.g., after how many days/months of no sign?

Options include:

Do nothing; - Adopted when the cost of a response is greater than the threat presented by the pest invasion or at least the cost is greater than the available resources, or when the invasion event was determined to have been a false alarm.

Control the pest (limit its impacts);

Adopted when eradication of the pest is not feasible, and the best that can be done to protect the biodiversity is to keep pest numbers to a minimum.

Undertake eradication.

Action - Prepare the Rapid Response Plan

Identify boundaries of treatment area.

Decide on treatment method (e.g. application of pesticides, trapping, etc., aerial or ground application).

Decide on the regime of pesticide application, timing, coverage, repeats, etc. or the same for bait stations or traps

Responsibility: Incident Controller

Response Plan approval	The LHIB CEO must approve the Response Plan. The LHIB CEO will need to be well briefed by the Incident Controller. **Action** – Obtain approval for the Rapid Response Plan **Responsibility: Incident Controller**
Implementing the Response Plan	Co-ordination of the Response Plan. Maintain clear lines of communication between Incident Controller, experts and the response team. Obtain all required approvals (use of toxicants). Undertake any required consultation/notifications. Follow requirements from other Standard Operating Procedures e.g. use of toxicants, access to properties under the Biosecurity Act etc. Logistical requirements are to be clearly outlined and actioned e.g., staff, transport, accommodation, food, operational equipment and supplies, etc. Ensure the public notification and media updates are carried out. Ensure all safety precautions are taken including safe handling of all pesticides and safety in the whole operation. **Action** – Implement Response Plan **Responsibility: Incident Controller**
Monitor and review progress	Establish monitoring programme.

Individually number and map all bait stations/traps.

Check the control measures (bait stations/traps/spray application) at a regular interval and keep accurate records.

Maintain clear lines of communication between Incident Controller, experts and the response team.

Undertake regular (likely weekly but depends on the target species and techniques being used) reviews of the response plan to ensure it is up to date.

Use Incident Controller and experts to review success against the key operational targets and decision-points that were set in the planning.

Modify response plan if required and request LHIB CEO to approve changes.

Action – monitor implementation of the response plan and adjust as required in response to any new information.

Responsibility: Incident Controller

Debrief and review

A debrief is to be held within two weeks of the completion of every response including those where the incursion was not confirmed.

A debrief relating to an actual pest invasion incident may be required more urgently than the one month deadline to reduce further biosecurity risks.

Debrief should include management and operational personnel.

A report from the debrief should be provided to relevant agencies and personnel with a copy kept on file.

The biosecurity plan is to be updated with any relevant information e.g. procedural changes.

Action- Do debrief of the response and make appropriate changes to the response plan

Responsibility: Incident Controller

Response plan guide

This is aimed for planning the initial response. As such, it is only indicative and will need to be customised to the specific situation based on local knowledge and feedback from the RIRTAG.

NB Many of these actions will be undertaking concurrently.

- Complete Incursion reporting form.
- The Biosecurity dogs are to be used to confirm the report/delineate the likely extent of the incursion.

- For rats, removal devices are to be set on a 30 m grid for 90 m radius around the rodent sign, with additional devices set at high-risk locations e.g. significant food sources. For mice, devices will need to be set on a 10 m grid for a 40 m radius.
- All traps must be set under trap covers (or inside) to reduce risk to non-target species.
- All bait to be deployed as per label or as approved under the Emergency Use Permit.
- Order additional bait if it may be required (to allow for delivery time).
- All existing surveillance devices throughout the island are to be checked and rebaited weekly for at least 4 weeks.
- Additional non-lethal surveillance devices may be deployed as deemed appropriate to both delineate extent of the incursion and the ongoing presence of rodents in the treatment area.
- Establish RIRTAG.

Appendix 1 Lord Howe Island Rodent Incursion Reporting Form

Lord Howe Island Rodent Incursion Reporting Form

Report reference (year-month-day- -number):_____

Interviewer name: _____

Organization/Position:_____

Date: _____**Type of interview (face to face/ phone):** _____

Observer- who saw the animal/ found the sign (complete a separate form for each observer):

Name: _____

Address while on LHI (short term follow up):

Permanent address if different from above (long-term follow up):

Phone number(s): home_____ cell_____

Email address:_____

Observation:

What was actually seen/ found? (Provide as much detail as possible. For example, was it a brief glimpse of an animal, tracks, scat, photo/video recorded, etc.)?

Continue on separate sheet if required.

Provide a detailed description of the sighting location (Describe the physical description of the location. If feasible, the interviewer should show the interviewee the island on a detailed topographical map and get them to identify the sighting location).

GPS location if available: _____

Draw a sketch map of the site if possible (use a separate sheet).

Photos or samples collected (yes/no)? : _____

If yes, obtain a copy of the photos and/or acquire the samples.

How confident is the observer regarding the identity of the IAS [high (very confident), medium, low (unsure)]? If high, explain why.

Describe the level of expertise the observer has with the species that was sighted (e.g., researcher working on seabird colonies with knowledge about rodents, tourist with limited knowledge about IAS and biological processes):

Did anyone else see the IAS? If yes, obtain contact information and interview them using a separate form and the same report reference number):

Report reference: _____

Report forwarded to Biosecurity Manage (Date) :_____

By:_____

ABG lead notified: (Date)_____

By:_____

Report confirmed Yes/No

Appendix 2. Contact list

LHIB contacts

If rodents or rodent sign are detected, immediately contact the following LHIB staff from top to bottom until someone is reached.

Name	Position	Contact number	Email
Hank Bower	Manager Environment and World Heritage	BH 02 65632066 ext. 23 AH 02 6563 2225 Radio • VHF CH 12 or 72 • Digital UHF - MECD	hank.bower@lhib.nsw.gov.au
Christo Haselden / Darcie Bellanto	Ranger	BH 02 65632066 ext. 24 AH 02 6563 2282 AH 02 6563 2239 Radio • VHF CH 12 or 72 • Digital UHF - MECD	Ranger@lhib.nsw.gov.au
Peter Adams	Chief Executive Officer	BH 02 65632066 ext. 10	peter.adams@lhib.nsw.gov.au

Invasive species or island restoration experts

The following list of people can be contacted for advice on interpreting sign and required action for possible rodent detections on LHI.

Name	Affiliation	Contact number	Email
Keith Broome	Island Eradication Advisory Group, Department of Conservation	+64	kbroome@doc.govt.nz
Euan Kennedy	Biosecurity lead Department of Conservation	+64	ekennedy@doc.govt.nz
Peter Corson	Biosecurity support Department of Conservation	+64	pcorson@doc.govt.nz
Pete McClelland	Private Consultant	+64 3 2304338	pmcclelland@xtra.co.nz
Richard Griffiths	Island Conservation	+64	richard.griffiths@islandconservation.org
Grant Harper	Private Consultant	+64 3 5211235	biodivrestoration@gmail.com
Barbara Triggs	Australian Museum		

Appendix 3– Quarantine Kit Checklist

The Quarantine Contingency kit should be maintained on LHI it should be stored together in a place where it is easily accessible. The World Heritage Manager is responsible for ensuring it is fully equipped. There is to be a biannual audit of the contents- March and September each year.

ITEM	NUMBER	EXPLANATION
Protecta™ lockable bait stations	50	For contingency response.
Protecta™ bait station keys	20	Opening locks on Protecta™ bait stations
20 R rodent bait – to be replaced by X-Verminator rodent bait	50 kg	For contingency response.
Rat traps- Victor Treadle	50	For contingency response.
Rat trap covers	30	For covering traps re non targets
Mouse traps- Victor	100	For contingency response.
Mouse trap covers	70	For covering traps re non targets
Flagging tape	5 rolls	For marking baiting and monitoring stations, traps etc.
Marker pens	5	For labelling tape etc.
Ziplock Plastic bags - variety of sizes	5 packs	For samples and specimens
Trail cameras	3	For locating and confirming species
Waterproof notebooks	5	For data recording
Pencils	5	For data recording
Wax tags	100	Available from Pest Control Research
Corflute chew cards	100	Available from Pest Control Research
Hand sanitizer	2	For handling carcases
Nitrile gloves (1 x box of each; large, medium and small)	3	For handling bait and carcasses
Ethanol	500 ml	For preserving samples
AA Batteries- for trail cameras	30	Purchase from local store as required
Peanut butter – for traps lure		Purchase from local store as required

Appendix 4. High Risk Rodent species for invasion of Lord Howe Island.

Detailed information on the ecology, behaviour, breeding and habitat use of each of the risk species (Norway rat, ship rat and house mouse) are summarised in Table 1.

Norway rat /brown rat/water rat/ sewer rat (*Rattus norvegicus*)

Norway rats originated from China and Mongolia (Novak 1999), but are now found throughout the world. Adult Norway rats are relatively large (up to 275 mm without tail), with a stout body, heavy tail and small ears. Although Norway rats have been recorded weighing up to 600 g in the UK, the average weight is 450 g; with males larger than females (Perry 1945, Cunningham & Moors 1996, King 1990, Novak 1999). Norway rats usually have a grey belly with a brown back, with long black guard hairs (Novak 1999). When males mature, they have prominent scrotum at the base of the tail and only breeding females have visible nipples (King 1990, Novak 1999).

Norway rats have very acute senses of smell, taste, touch and hearing, which are used to communicate with other rats, distinguish features in the habitat and for foraging (King 1990). Omnivorous and opportunistic feeders, they take advantage of any potential food source (Nowak 1999). Norway rats have been recorded as major predators of both land and seabirds as well as invertebrates and native mammals around the world, in many cases causing the extinction of endemic species (Atkinson 1985, Imber 1985, King 1990, Towns et al. 2006, Jones et al. 2008). Food stores, vegetation and crops are also targeted as additional food sources, and human infrastructure (buildings, electricity etc.) can be seriously damaged by Norway rats (King 1990).

Norway rats are strong swimmers, regularly swimming between islands up to 600 m apart and in exceptional cases 1 km apart (Evans et al. 1978, King 1990, Russell 2005, Russell & Clout 2005, Duncan et al. 2008). They are agile climbers, but usually climb less often than ship rats; they can jump up to 1 metre (King 1990, Baker et al. 1994). Norway rats are usually associated with water, but can live in a range of habitats from bare ground, coasts, grassland to lush forest and in particular urban areas and farms (King 1990, Nowak 1999).

Norway rats are extensive burrowers and create elaborate tunnels and tracks (King 1990). Food is commonly cached in these burrow systems (King 1990). Droppings are usually deposited in groups along these tracks, at feeding sites and on prominent rocks (King 1990).

Small groups of Norway rats will live together in colonies and other rats will be aggressively removed from the territory; one dominant male will breed with the resident females and evict young males as they mature or when the colony becomes overcrowded (Calhoun 1963, King 1990).

Males travel further and more extensively than females, although this may vary depending on habitat quality, food availability, predation pressure and other factors (King 1990, Nowak 1999). Home range can vary from 0.1 ha (in urban areas) to 3 ha or larger (in forested or rural habitats); this depends on food availability and habitat quality (Davis 1953, Moors 1985, King 1990).

Norway rats construct nests out of various items including grass, newspaper, cardboard, leaves and feathers (King 1990, Nowak 1999). They usually breed from spring to autumn, but can breed throughout the year in favourable conditions and habitats (King 1990, Nowak 1999). Gestation is up to 24 days and litter size varies from three to ten young (usually 6- 8); the average annual production can be up to 40 young per year (King 1990, Nowak 1999). The young are weaned about 28 days old (between 25-40 g) and can be sexually mature at two to three months old (King 1990, Nowak 1999). Most Norway rats live between twelve and twenty-four months with females having a longer life expectancy than males (Davis 1953, King 1990).

Norway rats are mainly nocturnal, mostly active just after dark and again just before dawn; however, this pattern can change depending on habitat, predation pressure, hierarchy, disturbance and food availability (Calhoun 1963, King 1990). Although Norway rats actively explore their surroundings, they are known to be very wary of new or

strange objects in their home range (i.e. neophobic) which affects control and eradication programmes in cities, farms and on islands (King 1990).

Norway rats are known transmitters of a number of diseases such as leptospirosis (Weil's disease), trichinosis, toxoplasmosis and salmonellosis (King 1990).

Ship rat/ black rat/ roof rat/ bush rat (*Rattus rattus*)

Originally from India, ship rats are found throughout the world (Novak 1999). They are relatively large (up to 230 mm without tail), with a slender body, long scaly tail, large ears and dark hairy feet and weigh up to 300 g (King 1990, Cunningham & Moor 1996, Novak 1999). There are three colour phases; rattus (black back and dark grey belly), alexandrinus (brown back and pale grey belly) and frugivorus (brown back and white or cream belly) (King 1990, Cunningham & Moors 1996). The proportion of colour phases can vary depending on the location, although frugivorus is usually the most common colour phase (King 1990, Cunningham & Moor 1996).

Males are larger than females (Novak 1999). When mature, males have prominent scrotum at the base of the tail and only breeding females have visible nipples (King 1990, Novak 1999). Ship rats have excellent senses of smell, touch, taste and hearing (King 1990). Generally omnivorous (but can also be specialist), ship rats take advantage of any potential food source and will often cache food (King 1990, Nowak 1999). When on the ground, ship rats prefer to eat food under cover; but in the trees, rats will feed on any available flat surface (King 1990).

Ship rats are major predators of land and seabirds, invertebrates, lizards and native mammals (Atkinson 1985, Towns et al. 2006, Jones et al. 2008). They are voracious consumers of vegetation, seeds and fruit and have caused the extinction of a number of plant species, particularly those on isolated offshore islands (Atkinson 1985, Bell 1978, Imber 1985, King 1990, Moors & Atkinson 1984, Moors et al. 1992, Towns et al. 2006, Jones et al. 2008). Although natural food makes up a high proportion of ship rat diet, human products (stores, vegetables and crops) can also be targeted (King 1990).

Ship rats are very agile and skilful climbers, and live both in trees and on the ground; they can jump up to 1 metre (King 1990, Baker et al. 1994). They are unwilling swimmers, but have been recorded swimming between islands up to 750 m apart (Evans et al. 1978, King 1990, Russell & Clout 2005, Duncan et al. 2008).

Ship rats do not often burrow preferring to nest in trees or under thick vegetation (King 1990, Nowak 1999). Despite their arboreal behaviour, tracks and runs on the ground are common in areas of ship rat activity (King 1990). Ship rats are usually associated with forests or vegetated areas, but can live in a range of habitats from bare ground, coasts, grassland to lush forest as well as human dwellings, buildings and farms (King 1990, Nowak 1999).

In natural habitats, ship rats do not live in colonies, preferring to disperse throughout the available area (King 1990). However, in urban areas, a small number of adult females and one dominant male will live together in a territory that will be aggressively defended against other rats (King 1990).

Home ranges for ship rats can vary from 0.1 ha to 1 ha in all types of habitats; this depends on food availability and habitat quality (Moors 1985, King 1990). Males have larger home ranges as females prefer to stay close to breeding sites although this may vary depending on habitat quality, food availability, predation pressure and other factors (King 1990, Nowak 1999).

Ship rats construct nests out of various items including newspaper and cardboard, but they are usually made from vegetation (twigs and leaves) and feathers, with new material added regularly (King 1990, Nowak 1999). They can breed throughout the year, but this generally depends on food availability and habitat (King 1990, Nowak 1999). Gestation is between 20 and 22 days and litter size varies from three to ten young (usually 5-6); the average annual production can be up to 40 young per year (King 1990, Nowak 1999). The young are weaned when they are between 21 and 28 days old and can be sexually mature at three months old (King 1990, Nowak 1999). Ship rats usually live between twelve and eighteen months in the wild, with females generally living longer than males (Daniel 1972, King 1990).

Ship rats are nocturnal and generally shy; however this depends on habitat, predation pressure, hierarchy, disturbance and food availability (King 1990). They explore all areas and objects within their home range, but can be cautious regarding new or strange objects within this area (King 1990).

Ship rats are commonly infested with fleas and mites as well as being known carriers of several diseases, including leptospirosis and salmonellosis (King 1990).

House mouse (*Mus domesticus*)

The house mouse originated from Asia (Nowak 1999). Formerly considered to be one variable species, following taxonomic examination several species are now recognised (Boursot et al. 1996, Nowak 1999). Two of these species are highly commensal (Mus musculus and Mus domesticus) and have been spread throughout the world, but only Mus domesticus is thought to be present in western Europe (King 1990, Boursot et al. 1996, Nowak 1999, Harris & Yalden 2008).

House mice are small, 70-90 mm long, have long tails, large eyes and round ears and only weigh 10-25 g, with no significant difference in size between males and females (Lawrence & Brown 1974, King 1990, Nowak 1999, Harris & Yalden 2008). They are a dull brownish grey colour, with a grey, brown or white belly (Lawrence & Brown 1974, King 1990, Nowak 1999, Harris & Yalden 2008). Mice feet are uniformly grey on the top side, which can be used in combination with ear size and foot size to distinguish them from juvenile rats (King 1990, Nowak 1999, Harris & Yalden 2008).

Mice have acute hearing, smell and sight and this plays an important part in recognition (species and territory), food location, mate selection and predator avoidance (Lawrence & Brown 1974, King 1990, Nowak 1999).

They are known to be omnivorous and opportunistic feeders and eat a range of food including invertebrates, plant material, lizards, birds and human products (King 1990, Nowak 1999). Mice are mainly nocturnal being most active around dawn and dusk, although they are often seen during the day, especially in summer (King 1990, Nowak 1999). They obtain most of their water requirements through the material they eat (King 1990, Nowak 1999).

Mice are agile climbers and can jump up to 0.5 metres (Baker et al. 1994). Mice can swim up to 500 m, although this depends on body condition, water temperature and water current (Ershoft 1954, Dawson & Howath 1970, Evans et al. 1978, Dohm et al. 1996, Russell & Clout 2005, Duncan et al. 2008). They can be territorial or colonial; having home ranges that vary between 0.5 and 2.5 ha (King 1990, Nowak 1999).

Mice construct nests out of various items including vegetation, feathers and paper and these nests can found under wood piles, in banks and in buildings (King 1990, Nowak 1999). Mice breed generally over spring and summer, but can breed throughout the year in optimum habitats although this can depend on population densities (King 1990, Nowak 1999). Gestation is between 19 and 21 days with litter size between two and twelve (usually 6-8). Young are weaned in 20 to 23 days and can be sexually mature in eight weeks (King 1990, Nowak 1999). Mouse numbers fluctuate seasonally as they can be adversely affected by poor weather and habitat conditions. Generally, mice do not live longer than 18 months in the wild (King 1990, Nowak 1999).

Mice live in a range of habitats from grassland to forest as well as houses, rubbish tips, farm buildings and other human dwellings (King 1990, Nowak 1999). They have a very close association with people; in several instances, mice have died out on isolated islands when people have left (King 1990, Nowak 1999). Mice have been transported around the world in cargo, farm supplies and other goods (King 1990, Nowak 1999).

Mice have been implicated in the extinctions of invertebrates and a reduction in the regeneration of vegetation (King 1990, Nowak 1999, Jones et al. 2003a, Jones et al. 2003b, Mackay et al. 2007). Recently mice have been shown to have an impact on seabirds as large as albatrosses (King 1990, Nowak 1999, Jones et al. 2003a, Jones et al. 2003b, Cuthbert & Hilton 2004, Mackay et al. 2007, Wanless et al. 2007, Wanless et al. 2008, Angel 2009).

Modified from St Agnes and Gugh Biosecurity Plan Elizabeth Bell, Dave Boyle and John Tayton, WMIL 14

Table 1. Summary of the description, ecology and behaviour of ship rat (*Rattus rattus*), Norway rat (*R. norvegicus*) and house mouse (*Mus domesticus*).

Modified from St Agnes and Gugh Biosecurity Plan. Elizabeth Bell, Dave Boyle and John Tayton, WMIL

	Norway Rat	Ship Rat	House Mouse
Origin	China and Mongolia	India	Asia
Distinguishing features			
Body	Long, stout body		Slender body
Length	Up to 275 mm without tail. Tail shorter than or equal to body)	Up to 230 mm long (nose to base of tail); tail length up to 250 mm. Tail significantly longer than body.	(up to 90 mm without tail)
Weight	average 450 g (can be up to 600); males are larger than females	up to 350 g; males are larger than females	10-25 g; no significant difference between males and females
Tail	Heavy short tail	Long scaly tail (longer than body)	Thin, long tail (up to 100 mm
Ears	Small ears	Large ears (cover eyes)	Large, round ears
Eyes			Large eyes
feet	Pale hind feet uniformly pale fur on the top s ide; 30-42 mm long	Uniformly dark fur on the top side; 28-38 mm long	Uniformly grey on the top, 15- 19 mm long ; which can be used in combination with ear size and foot size to distinguish them from juvenile rats
Colours	Brown back and pale grey bell y	Three colour phases: rattus (black back, dark grey belly); alexandrinus (brown back, pale grey belly); frugivorous (brown back, white or cream belly)	Dull brownish grey with a grey, brown or white b elly
Senses	Acute smell, taste, touch and hearing	Acute smell, taste, touch and hearing	Acute sight, smell and hearing
Habitat preference	Associated with water	Associated with forests and vegetated areas	Full range of habitats (commonly associated with humans)
Diet	omnivorous; commonly cache food; eating 30 g and drinking 20 ml per day	omnivorous; often cache food; eating 20 g and drinking 1 5 ml per day	Diet: omnivorous and opportunistic feeders); obtain water through diet
Swimming ability	Excellent swimmers (up to 1 km)	Reluctant swimmers (up to 750 m)	Excellent swimmers (up to 500 m)
Climbing ability	Agile (but less than black rats)	Agile (and skilful)	Agile

	Norway Rat	Ship Rat	House Mouse
Activity	Predominately nocturnal	Predominately nocturnal	Predominately nocturnal
Behaviour	Neophobic droppings deposited in groups or latrines	Neophobic (but less so than brown rats	Non-neophobic
Agility:	agile climbers; vertical jump up to 1 m	very agile and skilful climbers; vertical jump up to 1 m	a stride of approximately 4.5 cm; jump vertically up to half a metre
Breeding habitat	Burrow nesters	Nest in trees or under vegetation	Burrow and cavity nesters
Breeding cycle	Can breed all year round	Can breed all year round	Can breed all year round
Gestation	24 days	20-22 days	19-21 days
Number of young	3-10 (usually 6-8)	3-10 (usually 5-6)	2-12 (usually 6-8)
Weaned	28 days	21 to 28 days	20-23 days
Sexually mature	2 to 3 months	3 months	6 to 8 weeks
Life span	12 to 24 months females live longer than males	12 to 18 months females live longer than males	12 to 18 months
Home range	0.1 to 3 ha	0.1 to 1 ha	0.5 to 2.5 ha

Fig 1. House mouse
[Google images; downloaded 30/11/2013]

Fig 2. Mouse droppings. [Note: 6 mm long; 2 mm thick ; hard when dry; have a strong smell of ammonia
[Google images; downloaded 30/11/2013]

Fig 3. Mouse footprints.
Note: 15-23 mm long
[Google images; downloaded 30/11/2013]

Fig 4. Mouse teeth-marks. Note: similar to rat teeth marks; only 0.5 mm wide; 'neat' eaters.
[Image: E. Bell, WMIL]

Fig 5. Ship rat
[Google images; downloaded 30/11/2013]

Fig 6. Droppings of ship rat. Note: 6-14 mm long, elongated and pointed at one end
[Google images; downloaded 30/11/2013]

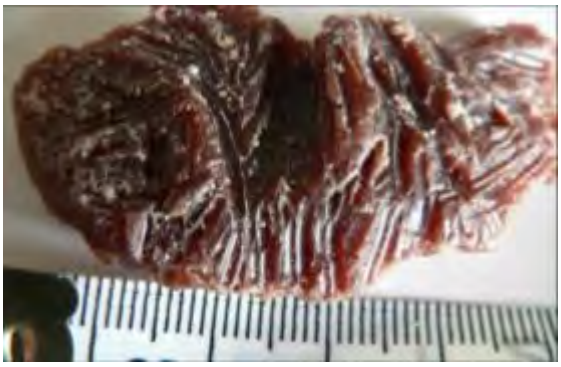


Fig 7. Teeth-marks of ship rat. Note: similar to marks; 1 mm wide grooves; 'messy' eaters
[Image: E. Bell, WMIL]

Fig 8. Footprints (tracks) of ship rat. Note: 4 toes on mice teeth long; clear split in central pad on rear feet front feet, 5 on rear feet; 2834 mm
[Google images; downloaded 30/11/2013

Fig 9. Norway rat
[Google images; downloaded 30/11/2013]

Fig 10. Droppings of Norway rat. [Note: 6-14 mm long, elongated and pointed at one end
[Google images; downloaded 30/11/2013]

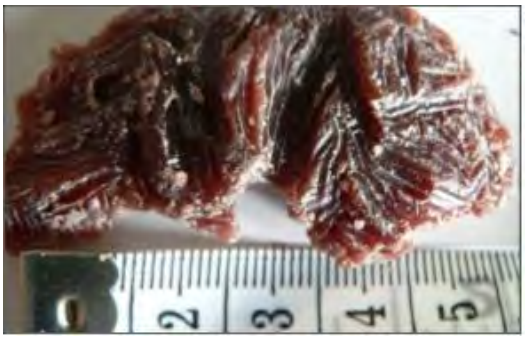


Fig 11. Teeth-marks of Norway rat.
Note: similar to mice teeth marks;
1 mm wide; 'messy' eaters
[Image: E. Bell, WMIL]

Fig 12. Footprints (tracks) of Norway rat.
Note: four toes on front feet, 5 on rear feet
; 30-42 mm long, solid central pad on hind feet.
[Google images; downloaded 30/11/2013]

Fig 13. Comparison of dry rat droppings
Google images; downloaded 4/07/2018

Appendix 5 Rodent detection tools to be used on Lord Howe

The available rodent detection tools are primarily passive, where the rodent has to interact with the device e.g. tracking tunnels, chew cards and traps with the only active tool being the dogs, which seek out the rodent and can detect where a rodent has been as well as where it is currently. While detection tools are normally non-lethal, traps and poison are also detection tools in that they will confirm the presence of a rodent.

Rodent Detection Dogs

Trained rodent detection dogs are a highly effective tool for locating rodents. They have the benefits over all other tools that they actively seek out the rodent rather than requiring the rodent to come to them. Also the rodent and dog do not need to be in the same place at the same time as the dog will, within limits, detect where the rodent has been. Detector dogs can also cover an area once to get a result whereas all other techniques need to be set up and then require ongoing checking. When a rodent detector dog indicates current or recent presence of any rodents other techniques will be used to try and confirm it and hopefully kill the individual(s).

On LHI, two rodent detection (and general biosecurity) dogs (and handlers) have been trained and certified and are permanently based on the island. Accreditation by the Canine Detection Certification Council was received in 2018 and ongoing certification requirements for both dogs and handlers will continue twice annually for each dog and handler combination. Accreditation includes; ability to identify target scent and avoidance of non-target species and scent; high-level obedience and control; and good temperament around people and other dogs. Each handler (three handlers on LHI) has a Statement of Attainment in dog Training from the Certificate IV Companion Animal Care and Management Course (ACM40310) from the TAFE NSW or approved equivalent.

It is planned that, one dog and handler will be based at Port Macquarie at the end of the eradication baiting phase and when moving into long term monitoring phase (August 2019). In the interim, LHI based dogs and handlers will regularly travel to Port Macquarie to conduct pre – departure inspections.

Fig 15. Lord Howe Island 'Rodent Detection Dogs' Sebi and Zuma, and trained handlers carrying out inspections and training at Port Macquarie on the *Island Trader*

Wax chew blocks

Wax chew blocks are flavoured wax blocks (peanut butter being a favourite flavour of rodents). When a rodent chews the block, their tooth marks are retained in the wax so their presence can be identified. These blocks can be easily made or bought commercially. There can be issues with non-target interference, which need to be checked, however with the absence of other mammal species on Lord Howe this is considered to be a very low concern.

Fig 16. Handmade chew block (with rat teeth marks)

Fig 17. Commercial chew block and with mouse teeth marks

Chew cards

Chew cards are pieces of corflute cardboard with peanut butter pressed into the holes. The standard design is a 9 x 18 cm card made of 3 mm white plastic corflute. When the rodent attempts to get to the peanut butter it leaves distinctive chew marks on the corflute, which can be identified as rat or mouse. Chew cards are cheap, effective for both target species although somewhat less for mice than rats. Depending on the specifics of the devices used, it can also include an ink card to try and get footprints.

Mice and rats have similar bite marks that are mainly distinguished on size. They leave pairs of incisor marks, nearly straight lined on top and more curved underneath. Incisor pairs are about 1 mm across for mice (less than half the width of the corflute channels) and about 2 mm across for rats (more than half the width of a corflute channel). Look for individual bites clear of continuous chewing along card edges. Rats frequently chew large chunks out of the cards leaving a relative cleanly cut edge. Mice usually chew small amounts, sometimes making just small, scattered nicks along the edge, or chew short channels between card partitions on just one surface. Continuous mouse chewing along the card edge also tends to be less cleanly cut than for rats, with a short chewed flange attached to the remaining card with numerous light tooth impressions beyond that, as opposed to cleanly cut edges frequently made by rats.

Fig 18. Examples of Chew Cards and Evidence of Rodent Damage

Trail cameras

Trial cameras are triggered by motion to record footage and therefore can give video or picture evidence of a rodent. They are best used to carry out surveillance where the presence of a rodent is suspected.

Fig 19. Trail camera

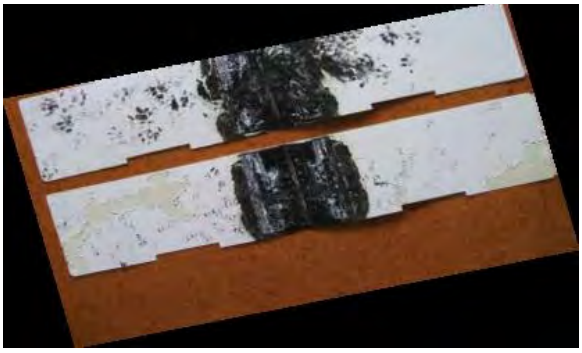
Rodent Motels

Rats and mice are known to actively seek out dry refuge when arriving on an island so the concept of rodent motels uses this behaviour to detect the presence of, and then ideally remove an invading rodent. The motel consists of a box approx. 50 cm x 50 cm x 15 cm with 2 or more entrance ways and internal dividers. Inside the motel, there are several open compartments, which can be used to contain dry bedding material (usually shredded newspaper) along with detection devices including chew blocks/cards, and can also hold traps or poison blocks in an incursion response.

Fig 20. Rodent motel

Tracking tunnels

Tracking tunnels come in a variety of designs from semi-permanent wooden structures to lightweight plastic. Rodents are known for entering tunnels but the tracking tunnels are usually baited/lured to act as an added attractant. Inside the tunnel is a plain card with an ink source- either inked card or an ink tray set up so that any animal that walks through it will leave footprints on the card, which can then be identified, to species. The design of the tunnel should be set to reduce non-target interference while still allowing easy access to rodents. The cost of using tracking tunnels is in a large part dependent on the servicing regime as they can be left for several days between checks if required, however this reduces the likelihood of being able to mount an effective response to any detection as the individual may have moved prior to detection.

	
Fig 21. Example Tracking Tunnel	Fig 22. Examples of Foot Print on a tracking card

A range of surveillance and incursion tools discussed later can also be used during the prevention stage.

		
Example teeth marks on a piece of plastic	Example of rodent droppings A = black rat (7-14 mm with tapered ends), B = brown rat (13-19 mm with rounded ends) C = house mouse dropping (small about 6 mm).	Example of footprints (Black rat)

Fig 14. Examples of rodent sign

Prevention and response tools

Traps – kill

Traps have the major advantages over toxicants of both killing the intruder and providing a body which can then be examined for species, age, sex and breeding status i.e. a female that has bred is of far more concern than a lone male. Overtime information on the invaders can be used to refine the biosecurity measures. However they have several disadvantages which need to be considered: they are labour intensive, both to set up and to monitor; they are often more expensive to purchase; they are generally species specific i.e. rat versus mouse, so you need to effectively set pairs of traps; there is a non-target risk with kill traps, particularly with rat traps i.e. they need to be set under covers to reduce the risk.

The most common and simplest kill traps are ‘snap traps’ which are lightweight and relatively cheap. DOC 200 break back traps are preferred for Norway rats but will also catch the lighter ship rats. DOC 200’s (or the smaller DOC 150’s) need to be placed in a purpose built wooden box which must be designed to deter (increased length an baffles) entry by woodhens, rails and currawong. If precautions are not taken weka, a close relative of the woodhen, in New Zealand are frequently caught. Rodent snap traps are appropriate for use in the rodent motels. The Victor treadle trap with a yellow plastic treadle is the preferred option as unlike most other traps the rodent only needs to inspect the bait to set it off whereas for most snap traps the animal needs to actively chew on the bait. The double spring on the rat trap also gives greater killing power. If snap traps are set outside rodent motels, it is important to use a cover to minimise the risk to non-targets. The cover can be made from a range of materials including corflute, plastic sheet, sheet metal or wood. Bait for the traps is highly variable but peanut butter with fish oil and rolled oats to bind it is the standard bait. The bait will be selected depending on factors including longevity, attractiveness, frequency of servicing and availability.

There is a self-resetting trap available (Good nature A24. However, while these have major benefits when targeting multiple individuals as they do not need to be reset/ serviced as often, they often do not provide a carcass for identification (it can be removed by scavengers), they have varying efficacy including not being suitable for mice and they can impact non-target species such as woodhens and rails. As such, use of this design will be minimised.

Fig 23. Rodent snap traps

Fig 24. DOC 200 kill trap

Fig 25. Goodnature A24 kill trap

Traps – live (cage traps)

The advantage of using live traps over kill traps is that they largely eliminate the non-target risk as any non-targets that are caught can be released. However, this requires at least daily checks for animal welfare reasons. The benefit of reduced non-target risk has to be balanced against the greater cost of the trap and the possible risk of neophobia i.e. rodents avoiding a new object especially one where they have to enter a box, and the intensive servicing required (daily). In addition, many live traps are more reliable for rats than mice i.e. the larger body size facilities the traps operation. For these reasons live traps will not be widely used.

Fig 26. Elliott/ Sherman Trap

Fig 27. Live/cage Traps

Poisons.

Toxicants have proved crucial in eliminating incursions elsewhere including when rodents would not enter traps. They are also the most cost effective method for reducing rodent numbers around likely source sites e.g. wharfs and for targeting rodents when in transit (providing the duration of the trip is sufficient for the individual rodent to access the bait. Where suitable and legal, second generation anticoagulant rodenticides will be used as they have been shown to be the most effective, although this does raise issues concerning longer term cumulative impacts where there is ongoing and prolonged anticoagulant use.

An emergency use permit has been applied for to allow for the rapid off label use of the desired rodenticides in response to an incursion. Initially this will cover the 20R compressed cereal pellets used for the eradication as these have been shown to be the most attractive to rodents, however due to issues relating to the ongoing provision of

this bait the permit will also cover the X-verminator rodent blocks which also contain brodifacoum for longer term use. The permit would cover 5 years and will need to be renewed in advance of it expiring.

It is likely that toxicant use on the island will be very limited due to the anticipated interference/ consumption of bait by invertebrates. This will be monitored once rodents have been removed and a decision made on its future use.

The specific details of any rodenticide use for biosecurity response on Lord Howe Island will be decided by the World Heritage and Environment Manager.

Pestoff 20R pellets containing 20 ppm brodifacoum.

X-verminator wax blocks containing 50 ppm brodifacoum.