

Operational Plan for the Eradication of Three Exotic Mammal Species from Three Islands in the Phoenix Group, Kiribati

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Version History

Version	Author	Date Written	Change/Reason for change
1-3		Jan-Feb 2007/08	In house drafts
4		Feb. 2008	Version for comment from IEAG meeting
5		March 2008	Draft incorporating outcomes from IEAG meeting & transferred to new format
6		March 2008	Final Draft for submission to IEAG and PII
7		April 2008	Final version

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1. OPERATIONAL PLAN

1.1. Overview

1.1.1. Scope

This plan covers an expedition to the Phoenix islands in 2008 to eradicate introduced mammal pests on Rawaki Island (rabbits); McKean Island (Asian ship rats); and Birnie Island (Pacific rats).

This expedition is part of a wider project to begin the restoration of the Phoenix islands and to build the capacity of the Government of Kiribati (GoK) to manage invasive species in the Phoenix Islands Protected Area. Details of this wider project which provides the background and justification for the eradications in the plan can be found in the Phoenix Islands Restoration Kiribati Project Plan

1.1.2. Outcome target

The objectives are primarily to establish pest-free status for three islands in the Phoenix group to allow for the recovery of terrestrial ecosystems and threatened species. This work is urgent because of the perilous state of the Phoenix petrel and some other seabird populations.

The overall objectives are :

1. Eradication of rabbits (*Oryctolagus cuniculus*) from Rawaki (Phoenix) Island
2. Eradication of Pacific rats (*Rattus exulans*) from Birnie Island
3. Eradication of Asian ship rats (*Rattus tanezumi*) from McKean Island

1.1.3. Eradication Design

Rodent eradication will rely on making palatable toxic bait available to every individual rat through hand spreading bait in two applications to achieve a comprehensive coverage of each island, and supplemented on McKean with bait in crab-resistant stations.

Rabbit eradication will be achieved in three stages. The first stage will provide a knockdown of the population through poisoning with hand spread toxic bait. The second stage will employ a range of control tools to eliminate surviving rabbits. These tools will be deployed sequentially starting with those causing the least disturbance to rabbits and progressing toward higher disturbance methods. The third stage will involve comprehensive searching for sign of surviving rabbits, and eliminating survivors.

The project is designed to take advantage of seasonal migration and off-peak breeding of non-target bird species, and suitable weather and sea conditions for the fieldwork.

1.2. Site description

The Phoenix Islands are part of the independent nation of Kiribati and are a group of eight atolls in the central Pacific Ocean, 1100 km North of Samoa, east of the Gilbert Islands and west of the Line Islands (Map 1). Part of Kiribati, the largest atolls are Kanton (or Abariringa) and Enderbury Island. The other islands include Rawaki (formerly Phoenix), Manra (formerly Sydney), Birnie, McKean, Nikumaroro (formerly Gardner), and Orona (formerly Hull). The three islands selected for this stage of the eradication project are Rawaki, McKean and Birnie (Map 2). No reliable maps are available for each islands.

These three islands are small, low (c. 6 m a.s.l maximum elevation) atolls with the windward (eastern) sides being strewn with coral rubble boulders, the interior and especially the lee sides comprising of coral sands, and a central hypersaline lagoon. All three islands have not been inhabited since the early 20th century and receive very few visitors. The vegetation of the three islands is succulent herbage that does not exceed 1m in height and varies in area of coverage from large areas with 0% (sand plains) to 5-10% (coral rubble areas) to small areas of c. 90% cover (leeward sands).

The terrestrial fauna of the islands consists of 18 seabird species in populations ranging from a few individuals to colonies of c. 10000 birds, five species of non-breeding shore bird, 2-3 species of pan-Pacific reptiles, marine turtles, and various invertebrate species, including the terrestrial hermit crab *Coenobita perlatus* which varies in density from 6 to 25 individuals/100 m² on the target islands.

These islands are within the equatorial zone and outside the sub-equatorial cyclone zone (but this must be passed through to reach the islands from Apia). Cyclone season is generally from December to March or April. The climate is hot and dry with infrequent rainfall. Temperatures are high but moderated by daily sea breezes. Rainfall is more frequent during the southeastern tradewind season (April to November), but tropical downpours (of c. 10 mm/hour) can occur at any time. Climate is strongly influenced by the El Nino Southern Oscillation (ENSO) with more stable periods of lower wind and less rainfall during La Nina years (such as is currently the case in early 2008).

There are no dwellings on these three islands, but the remains of guano harvester huts are present on Rawaki and McKean. The nearest inhabited island is Kanton with a population of 41 people (2005 census).

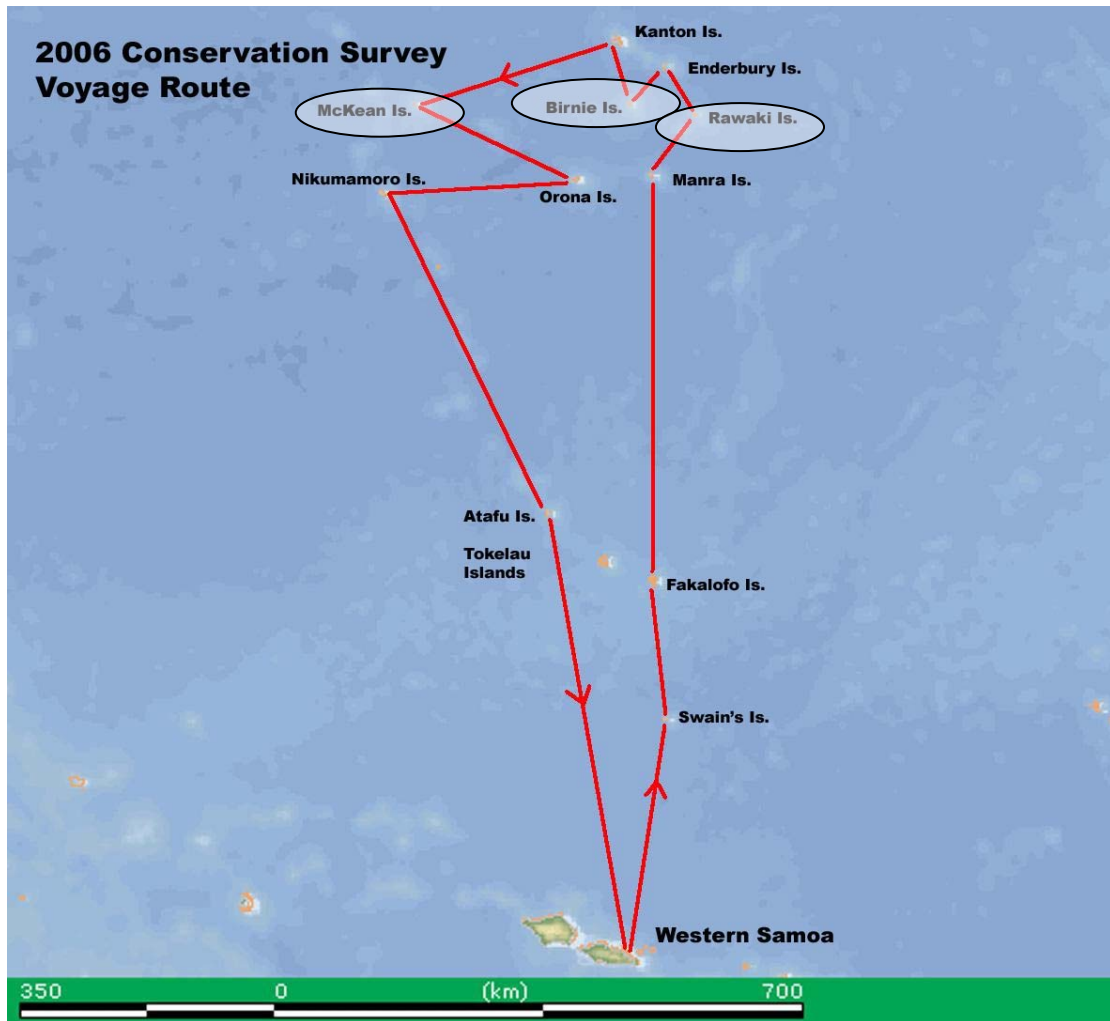
Key physical features and vegetation of the islands

Island	Total area (ha)	Land area (ha)	Lagoon	Substrate	Vegetation
Manra		c.500	Closed	Not visited	Forest, scrub, coconut
Rawaki	73.24	58.14	Closed	Rubble, c.50% sand	Grass, scrub
Enderbury	596.6	500+	Closed	Rubble, extensive sand	Grass, scrub
Birnie	50.95	48.2	Closed	Rubble, limited sand	Grass, scrub
Kanton		c.900	Open	Varied, extensive sand	Forest, scrub, coconut
McKean	74.32	48.77	Closed	Rubble, < 30% sand	Grass, scrub
Orona		c.600	Open	Rubble, sand	Forest, scrub, coconut
Nikumaroro		c.400	Open	Rubble, sand	Forest, scrub, coconut

Note: Land areas are total atoll area minus lagoon area.



Map 1. Location of the Phoenix Islands.



Map2. Location of the target islands. Track from the 2006 conservation survey marked in red.

1.3. Target pests

Relevant information on the biology and behaviour of the target species on the target islands in April and May 2006 is given in Pierce et al. (2006) and information relevant to the eradication operation is summarised here.

1.3.1. Rabbit (*Oryctolagus cuniculus*)

The rabbits on Rawaki appear to match the description of the Dutch tri-coloured breed. Densities are high with a mean of 63 animals ha⁻¹ on the favoured leeward side (where density can reach 130 animals ha⁻¹ in some habitats) of the island and 11 animals ha⁻¹ on the less favoured windward side. Animals are very tame and can be approached to within 1 m at night. Only 40% of rabbits are visible during the day. Rabbits are usually seen as single individuals or in small groups of up to 6 in the open, but cluster together in shade. Activity increases 1-2 hours after dusk. Breeding appears to be seasonal and no animals had indication of current breeding and very few juveniles were seen in April-May 2006. Diet was predominantly the stems of two species of plant, coprophagy is common, and all animals had very low body fat. The population is thought to be under extreme climatic, particularly rainfall, limitation

1.3.2. Asian ship (or house) rat (*Rattus taeniumi*)

The population of Asian ship rat on McKean is the only population known within the Phoenix Islands. They arrived on the island when a fishing vessel was grounded on the island in c. 2000 and appear to have replaced a population of Pacific rat on the island. Densities of animals is high with a mean of 50 animals ha⁻¹ on the favoured leeward side (where densities can reach 110 animals ha⁻¹ in some habitats) and 27 animals ha⁻¹ on the less favoured windward side. Breeding appears to be seasonal, with 9% of adult females pregnant and juveniles making c. 15% of the population in April-May 2006. This species appears to be shy and is predominantly nocturnal with behaviour increasing 1 hour before dusk. Little indication was found of neophobia. Diet is probably predominantly both animal (particularly seabird eggs and chicks) and plant material.

1.3.3. Pacific rat (*Rattus exulans*)

The identity of the rodent species on Birnie is unknown, but is presumed to be Pacific rat. No information is available for the population on Birnie, but on the larger nearby Enderbury population density was high with a mean of 80 animals ha⁻¹ on the favoured leeward side (where densities can reach 150 animals ha⁻¹ in some habitats) and 43 animals ha⁻¹ on the less favoured windward side. On Enderbury, breeding is seasonal, no females had any indication of current breeding activity and juveniles made up 25% of the population. Animals are very tame and can be approached to 10 cm. Behaviour is predominantly nocturnal with behaviour increasing 1-2 hours before dusk. Diet is probably predominantly of both animal (particularly seabird eggs and chicks) and plant material.

1.4. Operational detail

1.4.1. Timing

The expedition is scheduled to depart Apia on 21 May 2008, arrive in the Phoenix group 25 May, and be completed by 25 June 2008. A schedule of tasks is provided in Section 1.5 and as Appendix 1.

1.4.2. Bait Packaging, Storage, and Transport

Fuller details for bait packaging and transport are provided in Section 2.1, a brief overview is given here.

1.4.2.1. New Zealand

Pest-Off 20R bait will be packaged in 10 kg bags within 200 l waterproof barrels with clay-based desiccant (to minimise humidity) and stored in a sealed shipping container at a warehouse in NZ prior to transport to Samoa via Rarotonga.

1.4.2.2. Transport to, and storage at, Apia, Samoa

For transport from NZ to Apia, Samoa the shipping container will be stored in the hold of a transport vessel. Once at Apia the container will be held in a warehouse. The target date for arrival of the container in Samoa is 3 weeks before departure to the Phoenix Islands. A customs broker has been contracted to coordinate activities that will maximise bait protection from sweating, ants, etc.

1.4.2.3. Transport to Phoenix Islands

Prior to departure for the Phoenix Islands the container will undergo biosecurity procedures (see Section 1.4.9). The majority of the bait (in the 200 l plastic barrels) will be stored on the deck of the Bounty Bay under tarpaulin covers. The remainder of the bait will be stored in the forward hull sections of the Bounty Bay in dry bags. During transit to the Phoenix Islands air flow will be promoted to bait storage areas when weather permits.

1.4.2.4. Landing and storage of bait on Phoenix Islands

The ideal landing conditions will be days with little westerly swell. During these conditions bait will be landed by loading the plastic barrels or heavy duty dry bags into the inflatable and ferrying these ashore. The plastic barrels or heavy duty dry bags will be manhandled to the storage site near the landing site and stored under a waterproof tarpaulin shade canopy. The tarpaulin canopy must extend beyond the barrels, allow some airflow around barrels, and be sufficiently secure to remain intact for 1 month. If weather conditions do not permit the landing of the inflatable the bait may be floated and handlined ashore from the inflatable, or direct from the Bounty Bay, onto the beach in either the sealed plastic barrels or in heavy duty dry bags and then transported as

above. The decision on which method to use will be made by the Bounty Bay Captain in consultation with the Eradication Leader.

1.4.2.5. Transport on the islands

On the day prior to bait use the 10 kg bags will be transported around the island in backpacks by a small team of 2 people creating temporary bait dumps in the plastic barrels along the periphery of the lagoon. The temporary bait dumps will be on dry ground and marked with flagged poles. If the bait is not used that day the lids will be secured on the barrels overnight. These barrels will be covered by tarpaulins if the heat of the sun was considered to be a problem. As bait is used from each barrel during bait deployment it will be topped up as necessary from the main storage area at the landing site.

1.4.3. Eradication Methods

This operation will involve hand-spread cereal pellet baits containing Brodifacoum (Pest-Off 20R in 12 mm nominal size), Pest-Off 20R in bait stations, fumigation of burrows, hunting and trapping. Rawaki island, with the highest diversity of bird species, will be the highest priority island for eradication effort, followed by McKean and then Birnie Islands. The operation on Birnie is also to test whether a bait application density of 2 x 12 kg ha⁻¹ (=24 kg ha⁻¹ total) (similar to that used on other successful eradication programmes in the tropics) will be successful on islands with expected high non-target (crab) bait consumption. Further descriptions of how these methods will be applied are given in the technical specifications for each of the major task areas (Sections 2.2, 2.3, 2.4).

1.4.3.1. Rawaki Island (rabbits, c. 58 ha)

Stage one (initial knock-down of numbers):

Two hand spreads of Pest-Off 20R bait are planned. The first on Operation Day 2 at 50 kg ha⁻¹ over the 36 ha leeward side and 25 kg ha⁻¹ over the 24 ha windward side. A second application at Operation Day 5 at 20 kg ha⁻¹ over the leeward side and 12 kg ha⁻¹ over the windward side will occur three days following the first application. This second application has the dual purpose of compensating for potential bait loss due to consumption by crabs and to maximise the chances of rabbits discovering bait as a food source.

Note: a higher application rate of bait will be used on Rawaki because the larger body size of rabbits relative to rodents means each animal needs to eat about 10 baits to receive a lethal dose cf about 2 baits for pacific rat and about 6 baits for ship rats.

A total of 3408 kg of bait will be required for this.

Stage two (removal of remaining rabbits):

Following the initial knock-down in rabbit numbers a number of techniques will be employed from Operation Day 14 (9 days after second bait application) to remove the remaining rabbits. These techniques will be applied in the order from least disruptive to rabbit behaviour to most disruptive. These techniques are (in order of use):

- Gassing of rabbit burrows using Magtoxin
- Shooting using suppressed .22 calibre rifles both during the day and at night while using spotlights
- Trapping (both leg-hold and live) at burrow entrances
- Excavation of burrows occupied by rabbits (as indicated by trained dog)
- Flushing of rabbits and shooting using 12 gauge shotgun
- Long-range shooting using centre-fire .22 calibre rifle from elevated shooting platform.

Stage three (provisional confirmation of success:

Monitoring for surviving rabbits will use a combination of dogging and sign searching. The rabbit team will remain on the island for the maximum possible duration (currently to Operation Day 26, a total of 12 days on the island) in order to detect any remaining rabbits. If there is evidence for continued rabbit presence at the end date of this operation then a further attempt to remove remaining animals will be made in the follow-up trip in 2009.

A total of $2400 \text{ kg} + 1008 \text{ kg} = 3408 \text{ kg}$ of Pest-Off 20R bait ($1 \times 50/25 \text{ kg ha}^{-1} + 1 \times 20/12 \text{ kg ha}^{-1} = 70/37 \text{ kg ha}^{-1}$ in total), 6 kg of Magtoxin will be required for Rawaki.

1.4.3.2. McKean (Asian ship rat, c. 49 ha)

Stage 1 (initial knock-down of numbers)

Pest-Off 20R Rodent Bait, in a 2 gram (12 mm diameter) nominal size, will be hand spread at 20 kg ha^{-1} over the 30 ha leeward side and 12 kg ha^{-1} over the 20 ha windward side of the island on Operation Day 10.

On Operation Day 11 210 bait stations will be established over the whole island on a 50 m x 50 m grid and each of the stations will be stocked with 100 g of bait.

Stage 2 (removal of remaining rats)

Pest-Off 20R Rodent Bait, will be hand spread at 20 kg ha^{-1} over the 30 ha leeward side and 12 kg ha^{-1} over the 20 ha windward side of the island on Operation Day 18 (10 nights since first bait deployment).

The bait stations will be restocked to 100 g on Operation Day 18 and visited the next day to replenish (to 100 g) eaten bait.

Stage 3 (safeguard)

The bait stations will be rebaited with a fresh 200g of bait on Operation Day 24. These stations will be left in situ as a safeguard against any rats remaining.

A total of $2 \times 840 \text{ kg} = 1680 \text{ kg}$ of bait will be required for hand spreads.

A total of 347 kg of bait will be allowed for bait station deployment.

A total of 2027 kg of bait ($2 \times 20/12 \text{ kg ha}^{-1} = 40/24 \text{ kg ha}^{-1}$ in total + bait in stations) will be required for McKean.

1.4.3.3. Birnie (Pacific rat? c. 48 ha)

The identity of the rodent species present on Birnie is presumed to be Pacific rat. This will be confirmed on Operation Day 6.

Stage 1 (initial knock-down in numbers)

Pest-Off 20R Rodent Bait, in a 2 gram (12 mm diameter) nominal size will be hand spread on Operation Day 7 at 12 kg ha^{-1} over the entire island.

Stage 2 (removal of remaining rats)

Pest-Off 20R Rodent Bait will be hand spread on Operation Day 20 (14 nights following initial bait application) at 12 kg ha^{-1} over the entire island.

A total of $2 \times 600 \text{ kg} = 1200 \text{ kg}$ of bait ($2 \times 12 \text{ kg ha}^{-1} = 24 \text{ kg ha}^{-1}$ total) will be required for Birnie.

1.4.3.4. Contingency bait quantity

The area of each island has been rounded up when calculating bait quantities required (Rawaki from 58 ha to 60 ha, McKean from 49 ha to 50 ha, Birnie from 48 ha to 50 ha) to compensate for any discrepancies in calculations of island land area. A total of 7800 kg of Pest-Off 20R bait will be taken on the expedition which will allow for 1165 kg (15%) contingency on top of the total anticipated to be required. This will remain on board the Bounty Bay during the operation and deployed wherever necessary on the three islands. Examples of situations where the contingency bait may be required is due to loss or deterioration of bait in transit or a greater than calculated island area. Other contingency options are to not undertake the second bait application on Birnie (saving 600 kg of bait), not to undertake the operation on Birnie (saving 1200 kg of bait), or not to undertake the second bait deployment on McKean (least preferred option, saving .2400 kg)

1.4.3.5. Post-operational surplus bait

Any surplus bait that has not been deployed on the island will be returned to Apia and then shipped to Christmas Island for use in island biosecurity programmes. Any baits

that have been deployed on the islands will be left. It is expected that these will weather to undetectable quantities over a 2-3 month period.

1.4.4. Monitoring

Monitoring design and methods are provided in detail in the monitoring technical specifications, below is an outline of what is proposed.

1.4.4.1. Pre-operation Monitoring

Pre-operational monitoring will be concurrent with the beginning of the eradication.

Target pest species

Numbers of target pests on each of the islands will be determined using nocturnal transects as used in 2006 (Pierce et al. 2006). Breeding and body condition will be determined by autopsy of a sample of animals. The target species on Birnie (assumed to be Pacific rat) will be confirmed by examining caught individuals immediately following arrival on that island.

Non-target crab species

The density of hermit crabs will be determined by counting the number in measured transects on each island following Pierce et al. (2006).

Native species

The distribution and density of key threatened and sensitive native bird species on each island will be determined by the biota team on arrival on each island. Nesting sites and or concentrations of threatened or of concern species will be marked and these positions made known to the eradication team. Bristle-thighed curlews and other waders that may be threatened by the poison operation will mostly have departed for Arctic breeding grounds during the operation; those individuals present will be monitored to determine whether any mortality occurs (refer AEE and Biota Monitoring Plan).

1.4.4.2. Operational Monitoring

Bait deployment and bait longevity

The initial bait density immediately following hand spreading will be determined by counting the number of baits in 100 randomly-sited 50 x 50 cm quadrats. If initial bait density is below target density (12 kg/ha = 0.15 pellets/ha per quadrat, 20 kg/ha = 0.25 pellets/quadrat, 50 kg/ha = 0.63 pellets/quadrat on average) this will be immediately communicated to the eradication team and bait application rate will be adjusted accordingly. The quantity of bait used during deployment will also be monitored by counting the number of 10 kg bags used at regular periods throughout deployment and comparing this with the area treated. The quantity of bait remaining following

deployment over the days the team remains at each island will be determined by counting the number of baits in randomly sited 50 x 50 cm quadrats.

Target pests

The density of target pests during the eradication will be monitored using nocturnal transects over the nights when the team returns to each island and, during the mop up stage of the rabbit eradication, by catch per unit effort. Target pest reaction to baits and bait stations will be done by observation of individuals. A sample of target pests will be collected on the days following bait deployments to determine proportion of animals with visible signs of bait consumption. A liver sample from 50 rabbits will be collected during the second visit to Rawaki. These liver samples will be bioassayed in NZ to determine the percentage of bait take from the first toxin deployment within the rabbit population.

Native species

The reaction of native species, particularly those at risk from the eradication, will be monitored by biota team throughout the eradication in order to provide knowledge useful for larger operations. In particular, numbers of bristle-thighed curlews and other waders and two species of frigatebirds (potential scavengers) may be present. Numbers of all at risk species will be determined before, during and after the operation on each island. Any concerns about the welfare of individuals/species will be communicated to the eradication team immediately. Any individuals found dead where mortality is thought to be due to toxins will have a liver sample frozen and analysed for toxin residues on return to NZ (refer AEE and Biota Monitoring Plan).

1.4.4.3. Post-operation monitoring

There will be no specific post-operation monitoring of target pests during this trip. Confirmation of eradication of rabbits will come in the follow-up trip in 2009. Initial confirmation of probable eradication of rodents will come in a follow-up trip in 2009 and final confirmation of eradication will not be done until a follow-up trip in 2010, or later. There may be opportunities to use NEAq and Pacific Expeditions to gain access to the islands for follow-up monitoring later in 2008 and/or in 2009 and beyond.

1.4.5. Expedition Team

Position	Roles	Responsible to	Key Result Measure
Project Leader Ray Pierce	<ul style="list-style-type: none"> • Planning and organization of project • Daily operation management • Reporting to Project Manager • Project documentation 	Project Manager (Keith Broome)	<ul style="list-style-type: none"> • Project completed to time and budget • Project documentation (including final report) completed
Eradication Leader Derek Brown	<ul style="list-style-type: none"> • Planning of eradications to Best Practice standard and documented in Operation Plan • Resolve problems encountered during the eradication in accordance with Best Practice and in consultation with Eradication Advisor & Eradication Team Leader • Daily task setting for Eradication Team 	Project Leader	<ul style="list-style-type: none"> • Operation Plan completed and followed • Changes are made to Operation Plan as needed • Eradications are completed to specifications • Eradications are successful
Eradication Advisor Mike Thorsen	<ul style="list-style-type: none"> • Input into Operation Plan • Monitor progress of eradications • Monitor adherence to eradication specifications (on-ground quality control assurance (QCA)) • Eradication issue identification and advice on resolving 	Project Leader & Project Manager (QCA)	<ul style="list-style-type: none"> • Technical aspects of Operation Plan are complete • Eradication issues are resolved to Best Practice standard
Eradication Team (3 persons from Kiribati, yet to be named)	<ul style="list-style-type: none"> • Undertake eradications 	Eradication Leader	<ul style="list-style-type: none"> • All eradications are completed
Rawaki rabbit team (yet to be named)	<ul style="list-style-type: none"> • Undertake removal of remaining rabbits 	Eradication Leader	<ul style="list-style-type: none"> • All remaining rabbits removed
Biota Monitoring Ray Pierce	<ul style="list-style-type: none"> • Determine abundance of all bird species on each island • Identification of key breeding sites for seabirds on each island • Monitor effects of eradication 	Project Leader	<ul style="list-style-type: none"> • Impacts of eradications on seabird species are documented

	techniques on bird species		
	<ul style="list-style-type: none"> • Determine crab densities on each island 		
Captain R.V. Bounty Bay Graham Wragg	<ul style="list-style-type: none"> • Transport of materiel and personnel to islands • Island landings • Provision of medical assistance • Provision of communication equipment • Provision of stores and camping equipment • In charge of emergency situations 	Project Leader	<ul style="list-style-type: none"> • All materiel and personnel transported to islands • All island landings are completed safely • Project Team are well supplied
Crew R.V. Bounty Bay	<ul style="list-style-type: none"> • Assisting Captain • Camp set-up and pack-up • Cooking duties • Assist in transport of bait within islands 	Captain	<ul style="list-style-type: none"> • Camps established on each island

1.4.6. Personnel Transport

The NZ-based members of the operational team will travel by air from Auckland, NZ to Apia arriving 18 May, 3 days before scheduled departure date of 21 May to the Phoenix Islands. The GoK members of the operational team are scheduled to arrive in Apia 1 week before 21 May. Transport to, between, and returning from the Phoenix Islands will be on the R.V. Bounty Bay. The operational team will return to NZ and Kiribati from Samoa the day after their return from the Phoenix Islands, or when flights permit.

1.4.7. Boat

The 35 tonne steel-hulled catamaran R.V. Bounty Bay is used for the transport of the operational team and all equipment to, between, and returning from the Phoenix Islands. The Bounty Bay will arrive in Apia three days before the scheduled departure date for the Phoenix Islands. During these three days the boat will be refuelled, watered, food stores obtained and all materiel stored on board. The Bounty Bay and crew will be responsible for transporting teams and bait etc onto islands in an inflatable, establishing camp, and assisting in bait transport on the islands. Scheduled departure date from Apia is 21 May 2008 and return date is 25 June 2008. The total distance travelled during this operation has been calculated at 2500 nm.

1.4.8. Weather Forecasting

A forecast of four days (three nights) without significant rainfall (less than 10mm) is preferred for each island visit. Forecasts will be obtained daily from the US Navy website: https://www.fnmoc.navy.mil/wxmap.cgi/cgi-bin/wxmap_all.cgi?type=prod&area=ngp_ausnz&prod=prp&dtg=2008022312 via satellite phone. If there is significant chance of greater than 10mm rainfall bait deployment will be delayed.

1.4.9. Operation Quarantine

The risk of importation of pest plants/animals (particularly yellow crazy ant, present at the port in Apia) species will be managed by adopting the following quarantine protocol.

- The floor of the area that will be used to store the container holding bait to be sprayed with Ripcord® insecticide (active ingredient 200 g l⁻¹ cypermethrin, diluted with water to 40ml l⁻¹) and out to a distance 5 m beyond container edge. External skirt and door seal area of container to be sprayed with Ripcord on arrival of the container in Apia and Presto ant bait to be broadcast (at label rates) around outside of the sprayed floor area.
- R.V. Bounty Bay to carry rodent bait stations for at least one month prior to departure, revitalized at Apia
- R.V. Bounty Bay to carry commercial ant toxin stations for at least one month prior to departure and during the entire trip, revitalized at Apia
- R.V. Bounty Bay to spray internal areas (excepting electronic areas) with Ripcord during the voyage from Rarotonga to Apia
- All camping equipment to be visually checked and sprayed with Ripcord during the voyage from Rarotonga to Apia
- All expedition gear (excluding bait) going ashore sprayed with Permethrin-based (as these have a residual effect) household fly spray, preferably when in barrels well in advance of landing
- All personnel to visually check and clean personal equipment of seeds

1.4.10. Communication

During voyage

The R.V. Bounty Bay has SSB HF and VHF radios for ship to ship, and ship to shore, communications. Most communications to NZ and Kiribati will be by email (and voice) on the ship's Iridium satellite phone.

On Islands

Handheld VHF radios are used for ship to shore communications and also between shore parties on the island.

For personnel remaining on island without immediate boat support

A handheld Iridium satellite phone and 406 EPIRB will be available for each island team that are to stay on any island without immediate boat support.

1.4.11. Contact details

R.V. Bounty Bay	Transport	Prior to, and during, field work you can email: info@pacific-expeditions.com SSB & VHF radios (callsign: E5VG) When we are at sea you can email us directly at: 881631528555@msg.iridium.com You will need to break up your messages to a maximum of 160 characters per email (which includes spaces). Multiple emails work well and are free of charge
Keith Broome Ray Pierce	Project Manager Project Leader & Biota Monitoring	+64 274263497 +64 94375711 raypierce@xtra.co.nz Skype name:raypierce1
Mike Thorsen	Eradication Leader	Home: 64 3 4822802 Mobile 027 3500175 email: mike.esr@xtra.co.nz mthorsen@doc.govt.nz
Derek Brown	Eradication Team Leader	derek.brown@xtra.co.nz 102 Cullensville Road RD 1 Picton 7281 Ph 027 2399235

1.4.12. Official Progress Reporting

The Project Leader will provide e-mail or phone notification to Keith Broome once the eradication is underway and will provide further reports during the eradication. Notification will also be made at the completion of the eradication and on return to Apia. Keith to pass on notifications to the relevant authorities.

1.4.13. Legal and other requirements

1.4.13.1. Government of Kiribati Consents and importation permits

PIPA have identified permit requirements for importing toxins, firearms and dogs to Kiribati along with landing permits. These have been applied for and communication from PIPA on 13 March indicates these permits are being prepared.

1.4.13.2. Public notification

The residents of nearby Kanton Island will be notified of this operation by MELAD.

Warning signs will be placed at the landings on each island cautioning any visitors of the presence of toxic baits.

1.5. Risk Management and contingency plan

A separate Health and Safety Plan is available to cover health and safety risks to personnel.

The planning phase of the project contains a number of milestone actions. The Project Manager and Project Leader will continually review progress towards, and achievement of, milestones in order to assess project viability within the listed timeframes (see Timetable of Key Events). If crucial actions are not completed within sufficient time to allow completion of pre-operation planning and tasks a decision will be made on postponing the operation. The latest this operation can begin (due to weather pattern constraints) is September 2008, but the Bounty Bay is unavailable from July 2008. Postponement beyond September 2008 would result in the rescheduling of the operation during the following winter, if funding is available.

If the operation itself is delayed, due to adverse weather or other unforeseen circumstances, provision will exist for minor postponements.

1.5.1. Public Interest Risk

Low risk

Experience suggests a moderate level of public and media interest in the operation can be expected, primarily from international conservation organisations.

Provisions to minimise risk.

- All details of the operation will be made available on request, and following approval from the GoK, from conservation organisations

1.5.2. Conservation Impact Risk

Low risk

Potential negative impacts on conservation values are low but the likelihood of small losses i.e. individuals of some species as opposed to effects at the population level, may occur. It must be stressed that the short-term negative effect on non-target species will be considerably outweighed by the long-term gains for species and ecosystems. Bristle-thighed curlew and frigate birds are the species considered most at risk from this operation. A high proportion of bait is expected to be consumed by hermit crabs (*Coenobita perlatus*) and secondary poisoning may be an issue. Crabs are not susceptible to the toxins to be used in this operation and no effect on this species is expected.

Provisions to minimise risk.

- An AEE will be done to evaluate the environmental risks and this will be evaluated by independent DOC staff and permission for the poison laying will be sought at the appropriate level within GoK.
- This operation is scheduled to occur at a period of time when bristle-thighed curlew are at low numbers on the island.
- Breeding sites of important bird species¹ on each island to be clearly marked and identified to the Eradication Leader and Eradication Team. Care must be taken around these sites to minimise disturbance, particularly when using dogs

1.5.3. Staff Risks

Moderate risk

Hazards to staff from the operation are moderate due to the remote location and include health and safety risks and possible risks associated with poor communications. This project is a unique opportunity and experienced staff involved will undertake this project to the highest levels possible.

Provisions to minimise risk.

- All hazards associated with the operation and how they will be managed will be identified in the Operational Safety Plan. All staff will be fully briefed on these operational hazards prior to participation and will adhere to all management actions as identified in the plan.
- Regular discussions with all members of the team and include health and safety concerns in these discussions.
- Training of less experienced staff will occur both on Christmas Island before the operation and refreshed on the islands before undertaking each task.

¹ Important bird species are Phoenix petrel, Pacific storm petrel, Christmas Island shearwater, bristle-thighed curlew, frigate bird, grey noddy

1.5.4. Operational Risks

High risk

Because the operation is logistically difficult and dependent on a large number of variables there is an increased opportunity for error and a potential risk of not achieving eradication. The possible consequences of operational failure extend beyond failing to achieve eradication. A failed operation would harm existing political and public goodwill towards similar island eradication operations and could make it more difficult to obtain support for future operations. Funding may also not be as forthcoming. All risks will be updated, minimised, and as far as possible quantified, as the planning for this operation proceeds. The risk of not achieving eradication is however more than offset by the potential conservation gains that will be made if eradication is achieved.

Provisions to minimise risk.

Adequate technology and expertise is on-hand to undertake this task, and if planned and implemented correctly, the risk of failure will be minimised to an acceptable level. The techniques to be employed in this operation have either been used previously in other eradication programmes or have been subject to trial testing. The project is consequently based on sound and proven techniques. Beyond receiving adequate funding, the success of the operation will lie with careful planning (and peer review) and adherence to the predetermined contingency options when putting the plans into practice. Likely problems have been identified, and contingency options developed. With such a large project, extra problems may arise, and these will require some flexibility to accommodate. It is critical that a core of expertise is available to review and advise on response options. Weather conditions will be one of the most significant factors but other critical factors include bait storage, transport and bait spread.

1.5.4.1. Boats

There are few options for the transport of bait and bulk supplies to the islands. Of these the best option is the use of adequately sized motor vessel with a crew experienced in working in the conditions expected.

Boat safety

The use of boats is considered to be the most significant risk factor in the operation due to the remoteness and difficulties of landing. Boat operations and safety are the responsibility of the boat contractor. If a serious accident does occur it is probable that this will end the eradication programme.

Provisions to minimise risk.

- Full safety briefings for all team members involved in the operation will take place prior to the commencement of the operation.
- All relevant NZ DOC SOP's will be followed as will marine regulations for the territorial waters where the boat is operating and home port (see Safety Plan).
- The Captain will be in charge of all island landings and only experienced personnel will manage the physical part of landing materiel and personnel.

Boat loading

There is a large quantity of materiel associated with an operation of this nature. Capacity to transport this materiel is limited by both the weight carrying capacity and deck/storage volume of the R.V. Bounty Bay. Loading weight is dictated by the 'loadline' (inscribed in the vessels hull at/above the waterline). Past experience shows that by careful loading of fuel, water, food, personnel, stores and bait etc the vessel should still be within its safe loading limits. Storage space is an issue, but until all the materiel is assembled in one place it is difficult to determine if this is a significant issue.

Provisions to minimise risk.

- A strict limit on personal gear and non-essential materiel
- Allow adequate time for boat loading to ensure efficient use of space
- If boat capacity is exceeded, a contingency option is to leave the contingency Pest-Off 20R bait (1165 kg) in storage at Apia. If this contingency bait is required this may add up to 9 days to the operation timeline. This would be undertaken following the first round of bait applications to all three islands and leaving a team of 4 on Rawaki to do the second bait application and to start Stage 2.

1.5.4.2. Toxic Baits

Moderate risk

There are several aspects associated with the use of toxic baits: personal safety, bait quality, and bait quantity.

Contamination to personnel

As toxic compounds are present within the baits to be used in this operation, accidental poisoning of people is a risk that can be minimized by adopting safe toxins handling procedures.

Provisions to minimise risk.

- All toxic materials to be clearly labelled and identified to all personnel on Bounty Bay
- All staff handling toxic bait to be adequately trained, supervised and use DOC Standard Operating Procedures.
- Personal protective gear to be provided and worn when handling toxic materials
- Provision of clean water for washing hands after handling baits

Bait deterioration

Deterioration of the Pest-Off 20R bait can occur during mishandling (bait becomes broken to small ineffective particles), or due to the high temperature (bait toxin breaks down) and humidity (bait becomes mouldy or rancid) in the storage or operating environment. All precautions with bait during transport will be taken, including checking

the bait prior to leaving the factory, again prior to departure and ongoing monitoring on the islands. The best practical options for bait storage will be used. A number of different options have been examined and the most appropriate have been selected by the project manager in consultation with the IEAG.

Provisions to minimise risk.

Currently, the preferred option is to transport the bait, in 10 kg bags in sixty waterproof 200 l plastic barrels that include adequate clay-based desiccant, in a sealed shipping container from ACP, Wanganui to Auckland where it will be shipped to Apia. The bait will remain stored in the shipping container in cool ventilated conditions (provided by customs broker) at which point it will undergo biosecurity measures. On arrival of the Bounty Bay in Apia the sixty 200 l waterproof plastic containers will be stowed on the deck under shade tarpaulins. Any remainder will be stowed in the 10 kg bags in heavy duty dry bags below deck. All opportunities will be taken to promote airflow around bait during suitable conditions when on the boat. During wet or rough conditions bait storage areas will be sealed. The bait will be landed onto the islands in the 200 l containers and/or heavy duty dry bags either by inflatable or by floating them ashore along a line. On the islands bait will be stored until needed underneath waterproof tarpaulins that allow air circulation. The bait to be used for each day will be transported to temporary bait dumps and stored in open 200 l plastic barrels. If rain is likely these barrels will be sealed with their lids. Unused bait will be returned to the bait store. Using this procedure it is estimated that the bait in each 10 kg bag will be handled at least four times. Care will be taken when handling the 10 kg bags and bait and the preferred option is each bag at each movement point is transported by one person (rather than by using a human chain).

In the event of bait being found to be damp it will be air dried in direct sunlight.

Insufficient bait quantity

The quantity of bait has been calculated on recommended sowing density. If the actual sowing density is greater than recommended, the island size is larger than calculated, or bait-take by non-target species (particularly crabs) is much higher than expected this could lead to a shortfall in bait. This problem is particularly pertinent to the Pest-Off 20R bait.

Provisions to minimise risk.

- Allow 15% contingency in addition to the calculated quantity of Pest-Off 20R bait required.
- Recheck island size by counting the number of 25 m grid points on each island once grid is installed
- Carefully monitor (via number of 10 kg bags used and on-ground bait density) bait application rate and communicate a need to adjust application rate to eradication team if application rate exceeds 110% of recommended

1.5.4.3. Personnel

While it is necessary for practical reasons to keep the team as small as possible, there needs to be sufficient capability to cover individual illness or injury. Other risks are loss

of motivation due to environmental conditions, project setbacks, individual experience and failure to follow eradication plan due to loss of motivation or individual experience.

Provisions to minimise risk.

- The size and skills of the field team provide sufficient backup should one or two personnel be unavailable for work due to illness or injury.
- Ensure eradication team contains enough members with proven experience
- Setbacks are identified early and rectified
- Regular discussion with members about progress and their expectations
- Motivation of inexperienced members by experienced members, particularly by the Eradication Leader
- Monitor adherence to eradication plan by Eradication Advisor
- Ensure members new to eradications are adequately trained (a workshop for GoK staff will be held on Christmas Is.).

1.5.4.4. Poor weather

Weather poses a high risk to this operation and potentially could delay the eradication beyond the period for which funding is available. Potentials for delay due to weather include long periods of wet weather delaying bait applications, or a significant westerly swell that prevents landing on an island.

Provisions to minimise risk.

- A forecast of at least four fine days (three fine nights) without significant rainfall (less than 10 mm) is preferred before commencing bait deployment.
- The timing of the operation has been scheduled for when long periods of settled and calm weather could be expected.
- To guard against weather risks, accurate weather forecasting is essential. Long range weather forecasts specific to the central Pacific will be obtained daily from the US Navy weather website via satellite phone.
- If the operation is delayed, due to adverse weather or other unforeseen circumstances, provision exists for minor postponements that will allow the operation to proceed until September 2008, but the Bounty Bay is unavailable from July 2008. Postponement beyond September 2008 would result in the rescheduling of the operation to the following year, if funding is available.

1.5.4.5. Other unforeseen operational issues

The best way to ensure that the project is not jeopardised by any “minor” unforeseen problems is forward planning and having contingencies in place. All stages of the planning process being reviewed regularly by the IEAG.

1.6. Task list, schedule, milestones

This section provides only a brief summary. Detailed specifications and timings are contained in Appendix 1

Phase	Timing	Task	Responsibility	Completed?	Milestone? (must be achieved for operation to proceed)
Planning					
	March 2008	Review of draft operational plan	IEAG and PII	Yes	
	March 2008	Finalise operational plan	Pacific Expeditions Ltd	Yes	Yes
Pre-operation	February 2008	Order Pest-Off 20R bait	Pacific Expeditions Ltd	Yes	Yes
	March 2008	Obtain relevant importation permits for baits, firearms, etc	Pacific Expeditions Ltd		Yes
	March 2008	Finalise eradication team	Pacific Expeditions Ltd	Yes	
	15 April 2008	Bait manufactured by this date	Animal Control Products	Yes	
	Late April	Biosecurity training for GoK on Christmas Island	Pacific Expeditions Ltd and PII		
	24 April 2008	Bait leaves NZ	Animal Control Products		
	1 May 2008	Bait arrives Apia	Animal Control Products		Yes
	17 May 2008	Eradication team arrives at Apia	Pacific Expeditions Ltd		
	17 May 2008	R.V. Bounty Bay arrives Apia	Pacific Expeditions Ltd		
	18 May 2008	Bait and stores quarantine procedure	Pacific Expeditions Ltd		
	18-20 May 2008	Boat loading	Pacific Expeditions Ltd		

Operation	20 May 2008	Boat departure for Phoenix Islands	Pacific Expeditions Ltd		Yes
		See Appendix 1 for details of task timing during the operational phase of the eradication	Pacific Expeditions Ltd		
	25 June 2008	Boat returns to Apia from Phoenix Islands (no delays)	Pacific Expeditions Ltd		Yes
	30 June 2008	Boat returns to Apia from Phoenix Islands (if use full allotment of contingency days)	Pacific Expeditions Ltd		
		Eradication team departs Apia	Pacific Expeditions Ltd		
Post-operation	October 2008	Project debrief	PII		
	October 2008	Final project report due to stakeholders	Pacific Expeditions Ltd		Yes

1.7. Additional documents

< Provide links to relevant documents >

1. Project plan
2. Communication plan
3. AEE
4. Consents
5. HSE plan
6. Safety briefing
7. Emergency procedures
8. Pierce, R.J; Etei, T, Kerr, V; Saul, E; Teatata, A; Thorsen, M; Wragg, G. 2006. Phoenix Islands conservation survey April-May 2006: a feasibility study for the ecological restoration of the Phoenix Islands, Kiribati. Unpublished Report. Available at: http://www.issg.org/cii/PII/Electronic%20references/Phoenix_Islands_Conservation_Survey_Low_Res_12-9-06.doc.pdf
9. Central Otago rabbit bait trial report
10. Biota monitoring plan

