

Resolution Island Operational Plan

Stoat Eradication

SOUTHLAND CONSERVANCY 2008



Department of Conservation
Te Papa Atawhai

Resolution Island Operational Plan

Stoat Eradication

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1.0 Executive Summary

Resolution Island, including Five Fingers Peninsula, is the largest of the islands on the Fiordland coast, covering 20 860 hectares and rising to 1 069 m and above sea level. The only animal pests found to inhabit Resolution Island are stoats, red deer, and mice. Resolution Island is classified as a Restoration Island, reflecting its primary conservation function. This status also means that the island has open access.

A comprehensive pest eradication programme covering both Secretary and Resolution Islands was funded in 2004. The removal of stoats from Secretary Island was initiated in 2004 and red deer in 2006. This operational plan outlines the programme for eradicating stoats from Resolution Island and its continued maintenance in a stoat-free state.

Key learning points from earlier stoat eradication operations, including Secretary Island, have been incorporated into the planning process for Resolution Island. Approximately 230 km of trap line will be cut across the island to create a network of stoat-trap tunnels. Thirteen re-locatable bivvies and a mini-repeater on Mt Lort, to provide VHF communication, will also be established in the set-up phase of the programme.

A minimum of 2 315 trap tunnels will be required to yield an average tunnel density of one trap tunnel per 9 ha with a spacing of 105 m between tunnels along trap lines. Additional tunnels will also be laid out at likely invasion points around the coast (total ~ 135 tunnels) and popular anchorages (targeting stoats and rodents, total ~ 84 tunnels). The majority of tunnels will contain a single-set DOC 150™ stainless steel trap; the exception will be trap tunnels that are targeting both stoats and rodents which will be double sets. Wooden tunnels will be used on the western half of the island and a combination wood and wire mesh tunnels used on the eastern half. A comparison of stoat captures over time may help to determine the future utility of combining different tunnel types for stoat eradication.

Wooden tunnels with double-set DOC 150™ traps will be established on the adjacent mainland and stepping-stone islands to minimise the risk of reinvasion by stoats.

Pre-baiting will be undertaken in June and July 2008. Stoat trapping will commence in August 2008 with two complete checks over a period of 10-12 days. Trap checks will then take place three times annually until two consecutive checks are carried out with zero stoat captures. At this time the number of annual checks will drop down to two – one in November and one in February.

A number of indices will be used to determine the success of this programme, including the number of adult and juvenile stoats trapped over time, and the ratio of male-to-female stoats. Tissue and bone samples will be taken for DNA and stable-isotope analysis and compared against samples from the mainland population.

The eradication of stoats from Resolution Island will give protection to many native species vulnerable to predation on the mainland including the Southern tokoeka (kiwi) and the rare *Powelliphanta fiordlandica* (a large land snail). It will also enable a number of endangered species, or other threatened species no longer present on Resolution Island, to be re-introduced.

2.2 THREAT STATUS

Three mammalian species have established on Resolution Island: stoats (*Mustelia erminea*), red deer (*Cervus elaphus scoticus*), and mice (*Mus musculus*). Possums (*Trichosurus vulpecula*) have never been recorded on Resolution Island.

One of the earliest conservation efforts in New Zealand was undertaken by Richard Henry, the ranger on Pigeon Island near Resolution Island from 1894 to 1906 (Hill and Hill, 1987). Richard Henry transferred hundreds of threatened birds (mostly kiwi and kakapo) from the mainland to several Fiordland islands, including Resolution Island. A very accurate record of the first sighting of a stoat on Resolution Island was documented by Richard Henry in 1900 (Hill and Hill, 1987). He was a keen naturalist and made detailed observations of the fauna in the area. After the arrival of stoats he observed a notable decline in native birds, especially robins and weka.

During this time Henry also recorded what has since been interpreted as Norway rats (*Rattus norvegicus*) on Resolution Island and some of the surrounding Islands (King, 1990). Potential rat tracks were recorded in silt close to Disappointment Cove on the northern coast of Resolution Island in 1986/87 (Ian Flux *pers. comm.*) However, no further sign of any rat species was recorded until 2006, despite rat monitoring being in place on the island since 2000.

In May 2006 a ship rat was caught at Fixed Head on Resolution Island during a routine stoat trap servicing trip (Edmonds, 2006a). Extensive trapping and monitoring around the capture site and at additional locations on the island have indicated no further rat presence (McMurtrie, 2006). Resolution Island is presently assumed to be a rat-free island.

Three red deer were liberated at the Seaforth River at the head of Dusky Sound in 1909 (Logan and Harris, 1967). Red deer probably arrived on Resolution Island in the 1930's and had established in high numbers by 1947 (Sutherland, 1955, 1957; Wodzicki, 1950). Commercial deer recovery, mainly aerial hunting, was conducted on Resolution Island between 1960 and 2001 (Murray Willans *pers. comm.*). Small-scale recreational hunting has continued on the island to this day although it is not a significant site for recreational hunting due to its remoteness.

2.3 ISLAND CLASSIFICATION

Resolution Island was designated as a reserve for the protection of native fauna and flora in 1891 (Hill and Hill, 1987) and became the world's first island sanctuary. During the formation of Fiordland National Park from 1904 to 1952 and in early versions of the Fiordland National Park Management Plan (1981, 1991) no specific classification was placed on Resolution Island. Under the Conservation Management Strategy (CMS) for Mainland Southland/ West Otago (1998) Resolution Island was categorised as an "Open Sanctuary" Island. This classification was upgraded to "Restoration" in 2007 (see page 92, Fiordland National Park Plan 2007) to reflect its primary conservation function (Appendix 1).

2.4 TREASURY FUNDING FOR SECRETARY AND RESOLUTION ISLANDS

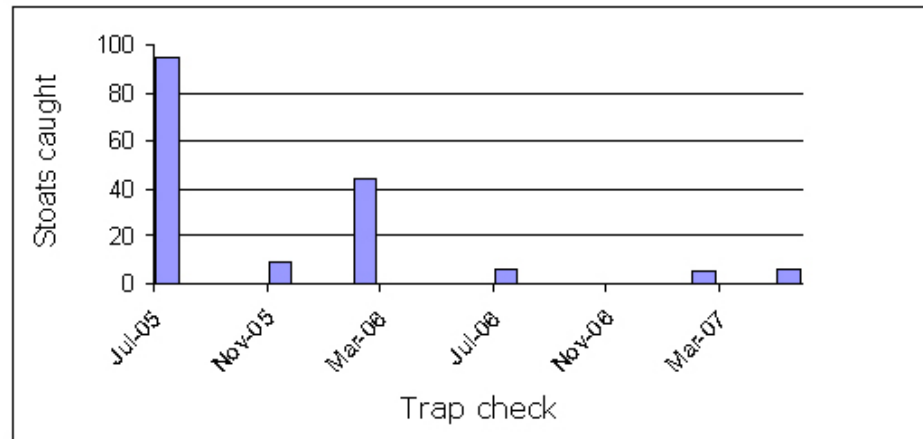
In November 2003 a joint proposal for pest eradication of Auckland, Secretary, and Resolution Islands was put forward to the government. In May 2004 funding was approved to undertake restoration of both Secretary and Resolution Islands. Stoat eradication on Secretary Island started in July 2004 (Golding et al., 2005) and the first year of deer knock-down commenced in November 2006 (Crouchley et al., 2007).

2.5 KEY LEARNING POINTS FROM PREVIOUS STOAT ERADICATION PROGRAMMES

- Eradication, if possible, takes considerably longer for large islands (e.g. Secretary Island 8 140 ha) or medium-sized islands with mice present (Coal Island 1 189 ha) than it does for small islands (<1 100 ha) or medium-sized islands without rodents (Anchor Island 1 130ha).
- A bias in the sex ratio of stoat captures towards females on Secretary Island indicates that the density and coverage of trap lines on the island is sufficient to pick up good numbers of females which may typically be more difficult to trap due to their smaller home ranges (c.f. males).
- Wire mesh tunnels need to be sufficiently robust (in presence of kea, kaka, and weka) to decrease the likelihood of a trap being sprung.
- Wire mesh tunnels should not be used above bush line where there is a greater risk of weather setting traps off.
- Wooden tunnels need to be anchored by wooden pegs or nailed to trees at the outset to insure kea do not associate wooden tunnels with obtaining eggs.
- Eradication of stoats from Coal Island was achieved even in the presence of mice.
- Single-set DOC 150's™ with a 3:1 ratio of wood-to-wire mesh tunnels achieved eradication of stoats from Coal Island within 8 months.
- Chalky Island has remained stoat free despite several stoat plague seasons.
- One stoat was observed on Anchor Island in April 2007 following a stoat plague.
- Preliminary genetic analysis (tissue/ bone) of stoat samples from Secretary Island and the mainland collected in winter 2005 show some allelic variation between the two populations (Dianne Gleeson *pers. comm.*). These results are consistent with the predictions made by Elliott et. al. (un pub.; see section 2.6) where the rate of immigration to islands like Secretary Island would be low even in plague years (i.e. 1 stoat every 4 years).
- Stoat captures on Secretary Island have declined dramatically since trapping started in July 2005 (Figure 2). Following a zero-trap catch in November 2006, 5 stoats were caught in the trapping period November 2006 to February 2007 and a further 6 stoats in the period from February 2007 to May 2007, indicating that they may still be present on the island. The level of trapping effort is set to

continue at three trap checks per annum until two consecutive checks yield zero captures. Additional effort is also being put into rebaiting traps on circuits with the biggest gaps between trap lines (see Appendix 3).

Figure 2. Stoat captures on Secretary Island from July 2005 to May 2007.



2.6 PROGRAMME OBJECTIVES

This operational plan outlines the programme for eradicating stoats from Resolution Island and its continued maintenance in a stoat-free state. A separate operational plan will be completed for the knockdown and control of red deer on Resolution Island.

There are three key objectives of the stoat programme:

1. To enhance the existing ecological values of Resolution Island by eradicating stoats

The eradication of stoats from Resolution Island will give protection to many native species vulnerable to predation on the mainland. Of particular importance is Southern tokoeka (kiwi, *Apteryx australis* “southern”) as Resolution Island is the only location within the southern species range where stoat eradication or control in the short-to-medium term is planned (Edmonds, 2006b).

Other species that will benefit from the removal of stoats include kakariki (*Cyanoramphus* sp.), South Island kaka (*Nestor meridionalis meridionalis*), kea (*Nestor notabilis*), New Zealand falcon (*Falco novaeseelandiae*), little blue penguin (*Eudyptula minor*), Fiordland-crested penguin (*Eudyptes pachyrbynchus*), mottled petrel (*Pterodroma inexpectata*), and many species of native land snail including the rare *Powelliphanta fiordlandica* (Goulstone and Gardner, 1975).

2. To minimise the risk of stoat and rat re-establishment by

a) reducing stoat density on the adjacent mainland and stepping-stone islands

b) ongoing surveillance and contingency operations for stoats and rats that do reach Resolution Island

Considerable knowledge has been gained about stoat control and eradication through field operations and research in Fiordland. Standard trapping methods for eradication have been established through successful stoat eradications from

Te Kakahu-o-tamatea (Chalky Island) in 1999 (514 ha) and Anchor Island in 2001 (1 130 ha; Willans, 2000 and 2001). Slight variations to these methods have been implemented on large islands including Coal Island (Loe, 2005) and Secretary Island (Golding et al., 2005). Stoat-capture results from these two larger islands have been taken into consideration in planning for the removal of stoats from Resolution Island.

3. To reintroduce threatened species to Resolution Island

The removal of stoats and deer from Resolution Island will not only be of benefit to native flora and fauna already present on the island but will increase the potential for introducing a wide range of other native species threatened on mainland New Zealand. Due to its significant landmass and wide range of habitats (e.g. exposed coastal scrub and large sheltered river valleys) Resolution Island could support large self-sustaining populations of threatened and endangered species compared to some of the smaller coastal predator-free islands that exist today. Planned future introductions are outlined in the Secretary and Resolution Island Restoration Plan (Wickes and Edge, *in prep.*).

2.7 OPERATIONAL OBJECTIVES

To establish a network of marked trap lines, flyable bivvies, and VHF communications over Resolution Island for the purpose of removing all stoats from the island and maintaining it in a stoat-free state.

3.0 Set-up Phase

3.1 TRAP LINES

The success of the stoat trapping on Resolution Island will rely on a network of trap lines that are well maintained and cover the whole island (Figure 3). Routes will be cut, cleared and marked following similar guidelines to the Standards New Zealand Handbook: Tracks and Outdoor Structures (SNZ HB 8360, OLDDM- 724390). Stoat knockdown is planned to take place in winter, when the days are short, so markers along trap lines will have a small piece of reflector tape attached, particularly on lines leading to bivvies. Reflective markers will improve safety by assisting staff who are late returning to their field camp.

The proposed trap network for Resolution Island is based on trap lines established on Secretary (Appendix 3 and 4) and Coal Islands, providing an average tunnel density of one trap tunnel per 9 hectares (Figure 4). Due to a lack of detailed knowledge on the terrain on Resolution Island the final placement of these trap lines are expected to vary slightly. Proposed trap lines follow main ridge lines, valleys floors and spurs. The trap line placement over the island has been designed to account for the stoat-trap network as well as future deer control on the island.

Home range estimates for stoats vary according to gender, season, and food availability (King and Powell, 2007). Murphy and Dowding (1994) reported an average home range for four male stoats of 206 (SE \pm 73) ha and 124 (SE \pm 21) ha for five female stoats in Fiordland *Nothofagus* forest when rodent numbers were low. The trap lines proposed for Resolution Island, therefore, should ensure that every stoat on the island is likely to encounter a trap tunnel during the pre-baiting and knock-down phase of the operation, as the majority of stoats should be no greater than 700 m from a trap at any point on the island. Figure 4 also shows a 700 m buffer either side of each track. There are approximately 31 locations on the island that will be greater than 700 m away from a trap line, however, these areas are small (less than 35 ha) and often in extremely steep terrain.

Commencement of track work is planned for September 2007 with cutting and marking to be completed by April 2008. To achieve this timeline for track completion, work will be tendered out to external contractors.

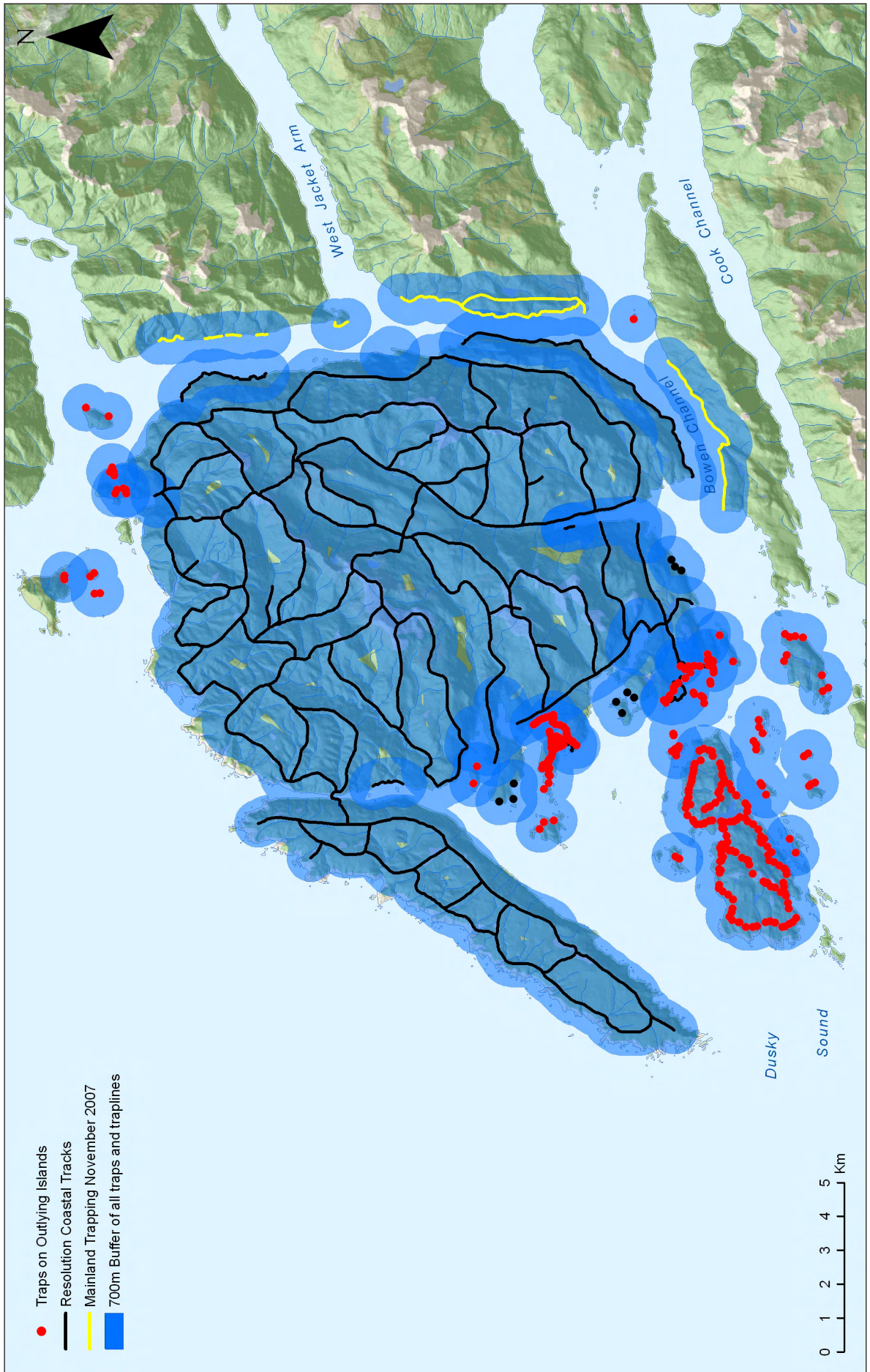
The progress and standards of the tracks will be monitored using GPS navigational equipment and site inspections conducted by an audit team including the Project Team and Visitor Assets staff from Te Anau Area Office.

Progress checks will also provide an early indication of whether the number of traps/tunnels estimated for the project is adequate and therefore allow time to purchase extra tunnels and traps if required.

Figure 3. Proposed block, track, VHF repeater and bivy locations on Resolution Island.



Figure 4. Proposed trapping coverage for Resolution Island, the mainland, and adjacent islands showing a 700 m buffer around each trap tunnel.



3.2 BIVVIES

The proposed locations and names of 13 two-person bivvies are shown in Figure 3. These bivvies can be moved by helicopter and can therefore be shifted periodically during the track building operation and long-term work on the island if required (DOCDM-106122 and 106317, Business Case: Resolution Island Bivvies).

3.3 COMMUNICATIONS

Communication between Te Anau office and DOC staff on Resolution Island will be via single sideband (SSB) radios at bivvy locations and VHF handheld radios while in the field. Contractors will be required to provide a communications plan as part of their Safety Plan which must include daily communication with a contact person on the mainland. A portable mini-repeater is to be erected close to Mt Lort (see Figure 3) to provide local VHF coverage around Resolution and Anchor Islands and an emergency link to Te Anau Base via the Mt Irene Marine Repeater on VHF Channel 66 (DOCDM-654468 and 67590, Business Case: Resolution Island Communications).

3.4 TRANSPORTATION

The Department's boat, 'MV Southern Winds', is based in Doubtful Sound and will provide both transport and accommodation in and around Resolution Island during the project for Departmental staff. Limited use may also be available for contractors in order to get supplies to Resolution Island; however, contractors will be responsible for arranging their own transport to and from the island. MV Southern Winds also has two small tenders which can be used to transport staff to shore.

Helicopters will be used to position teams and stores on the island as well as transporting bivvies, traps and tunnels, etc. Three suitable companies currently operate out of Te Anau. Either one of these companies will be used depending on availability, the nature of the work, or the machine required.

3.5 TRAP DESIGN AND LAYOUT

3.5.1 Trap choice

A combination of the methods developed during the aforementioned smaller stoat eradications have been applied to larger islands, namely Secretary and Coal Islands (Appendix 4a and b). The results from the Coal Island eradication are particularly relevant to Resolution Island for two reasons. First, Coal Island was the first attempt to eradicate stoats from an island where mice are present. Mice are a food source for stoats and are also present on Resolution Island. Second, the Coal Island stoat programme also demonstrated that eradication was achievable using a different trap type, a single-set DOC 150™ kill-trap, rather than the double-set Mark IV Fenn™ used in previous operations.

It is proposed, therefore, that only, stainless steel DOC 150™ traps will be used on Resolution Island. These traps have the additional advantage over the Mark IV Fenn™ in that they:

- i) Meet the current humane/animal ethics regulations
- ii) Target rats effectively
- iii) Are less likely to spring accidentally
- iv) Have less chance of stoats escaping capture compared with Fenn™ traps
- v) Can only be set to one tension therefore less ‘trapper’ variability
- vi) They can be modified at the factory to be more/less selective to the weight of the species being targeted.

Traps will be placed in tunnels as a single-set as per the Coal Island operation (i.e. a single trap within each trap cover). Capture records from the Secretary Island knockdown showed a very low double stoat capture rate during the initial knockdown (3 out of 945 tunnels). Subsequent trap checks have recorded no double captures.

Single sets are also a cost- and labour-efficient system compared with double sets. Using single-set traps for this operation represents a cost saving of approximately \$85,000.

Stainless steel DOC 150™ traps will be used compared to the zinc plated traps for the following reasons:

- i) Problems were encountered with zinc plated DOC 150™ traps on the mainland adjacent to Secretary Island. Oxidation around the trigger pin and plate caused the trap to not spring-off as easily. Two stainless steel single set DOC 200™ traps have been trialled on an exposed section of the Secretary Island mainland and have shown no sign of weathering.
- ii) Stainless steel traps will require significantly less trap maintenance (i.e. they will not have to be on an 18 month replacement schedule) and therefore be more cost effective in the long term on Resolution Island.

3.5.2 Tunnels

Three tunnel types (wooden, wire, and aluminium) were used for the Te Kakahu and Anchor Island programmes. A variety of tunnel types were used because, although extensive research has been undertaken to determine the tunnel type most stoats prefer (Burns, 2003; Butler, 2003), it is possible that a few individual stoats will favour something different from the majority. This argument is an important consideration when aiming for eradication.

The Te Kakahu Island operation showed a bias towards stoat captures in wire tunnels (wire = 7 stoats/ 18 tunnels, wood = 3 stoats/ 84 tunnels, aluminium = 5 stoats/ 38 tunnels) although the sample size for the number of stoats caught is small. On Anchor Island the number of stoats caught in each tunnel generally reflected the proportion of different tunnel types used in the operation (wire = 4 stoats/ 27 tunnels, wooden = 10 stoats / 95 tunnels, aluminium = 4 stoats / 39 tunnels).

Aluminium tunnels were not used on subsequent eradications on Bauza, Coal, and Secretary Island’s due to:

- i) The presence of weka on Bauza and Secretary Island’s would have resulted in a high level of trap interference with aluminium tunnels as the design had no base and were pegged into the ground.

- ii) In an effort to streamline the trapping programme wire tunnels were selected over aluminium as they represented a greater design difference over wooden tunnels.
- iii) The shift to the DOC 150™ trap on Coal Island meant that a solid floor was needed in all tunnel designs. Aluminium tunnels, therefore, would end up being virtually the same as the wooden ones in design. Coal and Secretary Island knockdown results showed no preference by stoats towards a particular tunnel type with the number of stoats caught in each being similarly proportional to the total number of each type.

Some problems were subsequently encountered with the wire tunnels on Secretary Island including interference with the traps and bait by kea, kaka, and weka. Many of the coreflute lids had also been damaged, the primary purpose of which was to protect the traps from the weather.

Despite these issues it is possible that when aiming for eradication using a combination of tunnel types is still the best approach. This theory, however, has not been clearly demonstrated by the results of recent stoat eradication operations. The Resolution Island programme offers a good opportunity to test the value of using a combination of wood and wire tunnels over wood only for eradication purposes; the island is large and based on the results from Secretary Island, 200-300 animals are likely to be caught within the first 12 months of the programme.

In order to assess the value of wood and wire tunnels versus wood only, the island will be split along a boundary line depicted in Figure 5. A combination of wooden and wire mesh tunnels will be used on Resolution Island to the east of this line (see Appendix 6a and 6b for tunnel design). Wire mesh tunnels will only be placed below bush line, thereby minimising interference from kea and kaka and the effects of strong winds and rain (note: weka are not present on Resolution Island). The shorter tunnel length of single-set tunnels will also provide a sturdier construction than the double-set tunnel used on Secretary Island.

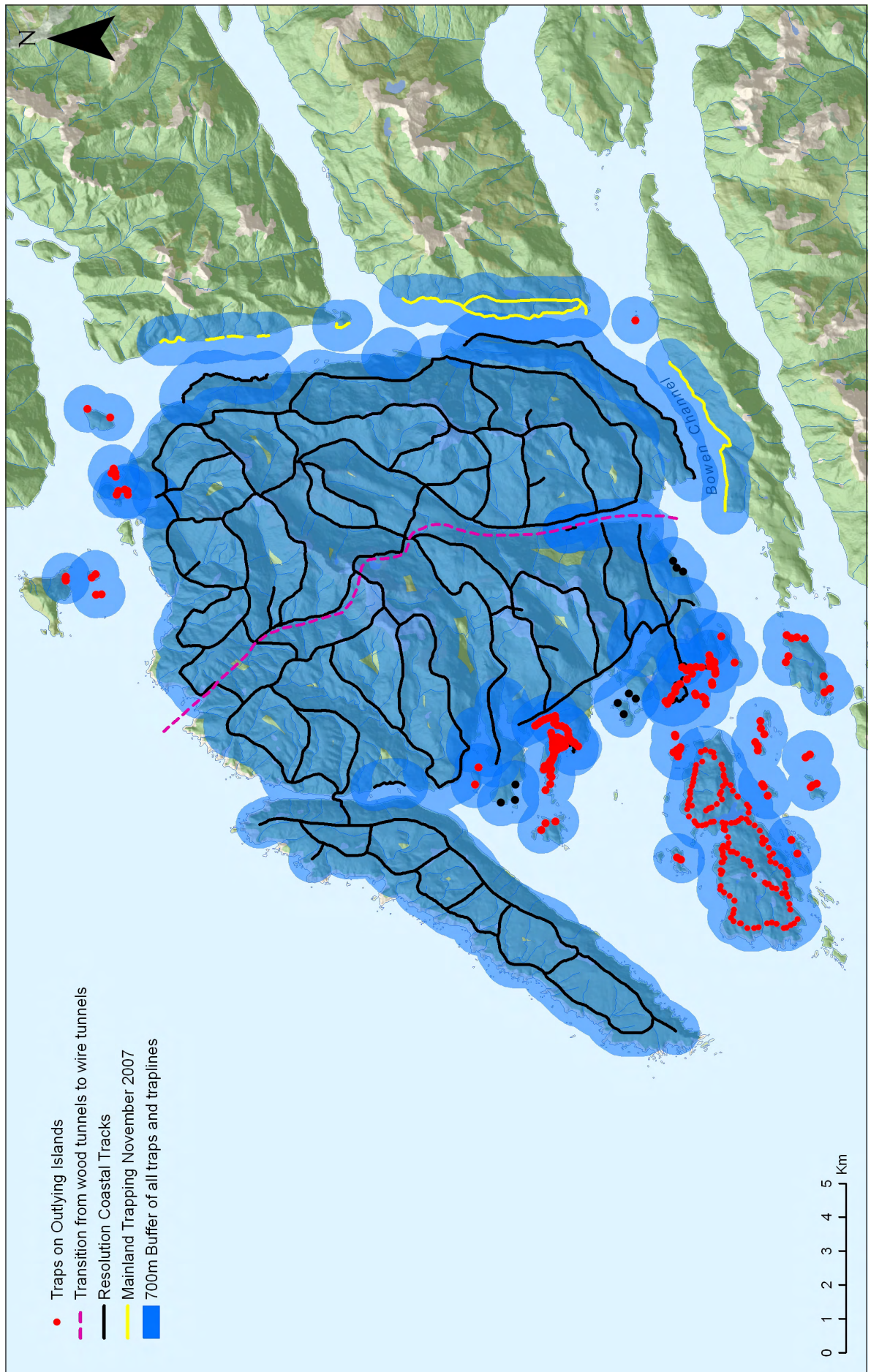
All tunnels to the west of the boundary line will be wood.

The pattern of stoat captures over time will then be examined to determine whether the decline towards zero stoat captures (i.e. eradication) is any different between the two treatments. We would be looking for any difference between the two options in the time taken from start of knock-down to two consecutive trap checks with zero stoats caught - this outcome is when we would reduce the number of annual trap checks from three to down to two and represents a significant cost saving in terms of ongoing management (see Figure 6). It is considered that this assessment would be far more meaningful than simply looking at the proportion of stoats caught in each tunnel type.

Due to the considerable distances travelled by stoats, capture data from a central buffer zone would have to be discounted. Analysis of the data will include plotting stoat captures over time for both treatments using a 2 km, 3 km, and 4 km buffer between the two.

If the decline towards two consecutive zero-stoat captures is no different between the two treatments then we would conclude the following: despite all of the other variables (habitat, aspect, food source, trap-line spacing etc.) between the two treatments, using wire mesh tunnels is unlikely to positively effect the outcome of a stoat eradication operation on this scale. The same conclusion would also be drawn if “eradication” happened faster for the wood-only treatment.

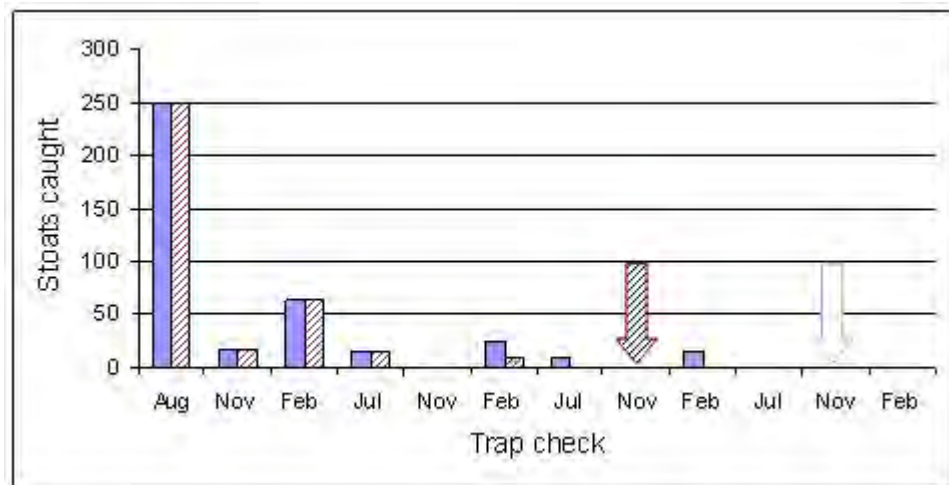
Figure 5. Proposed trapping coverage for Resolution Island, the mainland, and adjacent islands showing a 700 m buffer around each trap tunnel. The pink line denotes the boundary between wooden tunnels (to the west) and a combination of wooden and wire tunnels (to the east) on Resolution Island.



Conversely, if “eradication” proceeded faster for the wood-wire treatment then we would conclude that having a combination of tunnels still appears to be the best option for eradication. Due to our inability to control those variables described above it would not be possible to say convincingly that the inclusion of wire mesh tunnels was the key reason for reducing the length of the knock-down phase of the operation, simply that we have reasonable evidence to support their continued use. The total number of stoats caught in each treatment area may also need to be considered when assessing the results if capture totals are dramatically different between the two treatment areas (possibly habitat differences influence population densities).

Internal baffles will not be used as they are optional under current best practise for DOC 150™ traps set out in Appendix 5. Wooden tunnels will be constructed so that a baffle can be added to the tunnel later in the programme if it is deemed necessary.

Figure 6. Hypothetical stoat captures over time for the two different tunnel treatments. Under Treatment 1 (blue/ shaded) stoat captures decline to zero faster than they do for Treatment 2 (dark red/ diagonal line). The difference between these two outcomes would mean that stoat trap checks would drop down from three to two annual checks a year earlier under Treatment 1.



All tunnels will be anchored with pegs from the outset to ensure kea and kaka don't learn to associate rolling a tunnel with obtaining an egg as has been the experience on Secretary Island and other mainland control operations including the Murchison Mountains and Clinton, Arthur, Cleddau programmes.

All wooden tunnels used for this programme will be of sturdy construction and the traps will be anchored to the tunnel base using stainless steel TEC screws (12 gauge x 25mm).

3.5.3 Tunnel placement

Approximately 2 315 tunnels will be required to yield an average density of one single-set trap per 9 ha (see Table 1). Tunnels will be spaced at approximately 105 m intervals (measured using a hip-chain) along all trap lines on Resolution Island during the summer of 2007/2008. Additional traps will be placed at various coastal locations (mainly the eastern coastline) of Resolution Island (Figure 4). These coastal traps will be serviced by boat and spaced at approximately 150 m intervals yielding a total of 135 traps. The exact distance will largely be determined by the terrain and safe landing sites.

TABLE 1. TWO- AND THREE-DIMENSIONAL LAND AREAS AND TRAP DENSITIES FOR ISLANDS ON THE FIORDLAND COAST.

ISLAND	2-DIMENSIONAL LAND AREA (HA)	2-DIMENSIONAL TRAP DENSITY (PER HA)	3-DIMENSIONAL LAND AREA (HA)	3-DIMENSIONAL TRAP DENSITY (PER HA)
Coal	1189.14	1:9	1189.83	1:9
Anchor	1130.52	1:7	1131.78	1:7
Secretary	7990.66	1:8.5	8573.60	1:9
Resolution	20778.70	1:9	20807.31	1:9

Tunnels will be placed on level ground alongside trap lines or in a position where an operator can easily service them. Tunnels will be placed in the most accessible sheltered position which may mean placing the tunnel a short distance off the track, especially on exposed ridgelines. Each trap site will be marked in both directions with a pink triangle, individually numbered, and a GPS location recorded. In tussock areas tunnel sites will be marked with a coloured (tangerine) fibre glass pole and a pink triangle attached with stainless steel screws. Wooden pegs will be used to anchor tunnels where possible as well as the use of rocks and branches around the tunnel to protect them from high winds.

Coastal traps will be laid out in November and December 2007. The laying out of the island traps along cut tracks will take place in April and May, 2008.

4.0 Knockdown Phase

4.1 TIMING OF KNOCKDOWN

Winter is the ideal time for undertaking knock-down trapping as all prey populations will be at their lowest in number (see Appendix 7). Trapping on Resolution Island needs to be completed no later than August 31 2008 due to natural food supplies becoming much more abundant.

Moderate to high seed fall events of both beech and rimu have caused mice to continue breeding into the winter (King, 1982; Ruscoe et. al., 2004). If a beech seeding event is predicted to occur in autumn 2008 (based on temperature and seed-fall data from nearby Anchor Island) the knockdown of stoats on Resolution Island will be postponed to winter 2009.

4.2 PRE-BAITING

In previous stoat eradication operations in Fiordland trap tunnels were pre-baited prior to the initial knock-down. It is difficult to know how significant pre-baiting was in terms of the success of these programmes. For small-scale operations pre-baiting is relatively low cost and the amount of bait taken during pre-baiting in earlier operations suggests that the initial knock-down period may be reduced by this practise. Pre-baiting may also attract stoats that are reluctant to enter a tunnel because they can detect that other stoats have previously entered them. Data from Secretary Island indicated an increase in bait-take from within tunnels following the second pre-bait demonstrating that stoats may have learnt to associate the tunnels with food, thereby increasing the effectiveness of the initial knock-down.

Two pre-baits will be undertaken on Resolution Island. The first will be from June 17-28, 2008, and the second from July 15-27, 2008 (see 8.0 Milestones).

All traps will be unset inside the tunnels during the pre-baiting period. On Secretary Island traps were removed from 50% of all tunnels during the pre-baiting. On Coal Island this system was not used. The percentage of bait taken from tunnels on Coal Island was similar to that on Secretary Island (90-99%).

4.3 BAIT TYPE

Tunnels will be baited with one fresh hen's egg and a piece of salted meat (c.3 cm cube) on the bait block. Three meat types will be used: beef, rabbit and venison. These bait types should cater for any individual stoat preference. During pre-baiting an additional hen's egg will also be placed outside the trap tunnel on the ground to encourage stoats to become familiar with the tunnels and traps and learn to associate them with food. In order to minimise disturbance by kea this additional egg will be only placed outside tunnels that are below bush line or in scrubby vegetation.

where the tunnel is not visible from the air. After the first pre-bait, tunnels will be left undisturbed for a period of two weeks, after which time the level of bait take will be measured and all tunnels will be re-baited. The second pre-bait will be left for a minimum of one week before bait take is re-measured and trapping commences.

4.4 TRAPPING

All traps will be set on Resolution Island over a period of 3-4 days during August 2008. The pre-baiting period should provide a clear indication of the time required to service all of the traps on the island. The final trapping schedule will be confirmed after the first pre-baiting. It is envisaged that a team of 13 DOC staff or contactors will be required for trapping Resolution Island. Each person will be allocated a block and will service approximately 20-30 traps per day during the initial 2-week knockdown period (Table 2). A team of 6 DOC staff/ contractors will be based on the MV Southern Winds to service coastal traps and trap lines accessible by boat on Resolution Island and the adjacent mainland. This team will consist of one skipper, a dinghy driver, and 5 trappers.

The quality of the trapping effort during the initial knock-down will have a large influence on the success of the eradication operation. It is crucial that all staff responsible for trap setting are experienced stoat trappers to ensure traps are set properly and that problems are identified and rectified immediately. The use of DOC 150™ traps screwed into the correct position within the tunnel should minimise the risk of poorly set traps (as is the case when using MarkIV Fenn™ traps). All trappers will be briefed on the standard of trapping required prior to departure. Any problems throughout the stoat trapping period will be discussed during nightly scheduled calls.

6 August 2008	Transport to Resolution Island
7 August 2008	Set 1/3 of allocated traps (approx 20-30 traps)
8 August 2008	Set 1/3 of traps (approx 20-30 traps)
9 August 2008	Set last 1/3 of traps (approx 20-30 traps)
10 August 2008	Check traps from day 1
11 August 2008	Check traps from day 2
12 August 2008	Check traps from day 3
13 August 2008	Rest day
14 August 2008	Replace meat and check traps from day 1
15 August 2008	Replace meat and check traps from day 2
16 August 2008	Replace meat and check traps from day 3
17 August 2008	Transport off the island

Table 2: Proposed daily schedule for each person during the first stage of the knockdown.

4.5 DATA COLLECTION DURING KNOCK-DOWN

The amount of bait taken from each of the two pre-baiting period's will be recorded. During the trap checks detailed daily trap records will be kept by each person and include the following information:

- Date
- Name of trapper
- Trap location
- Tunnel type
- Animals caught target or non-target
- Sprung traps
- Bait taken and bait type used
- Stoat body weight
- Stoat sex

The whole stoat carcass will be frozen as soon as possible and kept for analysis. Each stoat will be aged using skull measurements and the size of the baculum bone (in males). Body length (snout to tail tip) will be measured, a tail tip sample collected for DNA analysis, bone sample for stable isotope analysis, and stomach contents collected for diet analysis.

5.0 Maintenance Phase

5.1 MANAGING RE-INVASION

Resolution Island is exposed to the mainland on three sides, the southern, eastern and northern coasts (Figure 1). Stoats are known to swim, with the maximum accepted stoat swimming range approximately 2.2 km (e.g. Pigeon Island - Lake Wakatipu, Loh, 1993; Centre Island - Lake Te Anau, Edmonds, 2006a, DOCDM-48961).

All of Resolution Island is beyond 500 m in a direct line from the mainland, however there are stepping-stone islands in between. Given its proximity to a source population of stoats, and the results from the Stoat Immigration Study (Elliott et al. *un pub.*), ongoing but low and manageable re-invasion to Resolution Island is likely. Trap lines will be established at set off points on the mainland and on stepping stone islands to minimise this risk.

Four key areas where stoats are likely to re-invade from the mainland to Resolution Island have been identified (Figure 4):

- i) Northern coast - Mainland to Entry Island and then to Resolution Island
- ii) Southern coast from Long and Indian Islands
- iii) East coast (Part 1) - mainland between Breaksea Sound and Wet Jacket Arm
- iv) East coast (Part 2) - mainland between Wet Jacket Arm and Dusky Sound

i) Northern coast

Access from the mainland north of Resolution Island would most likely be via Entry Island or the Gilbert Islands. These islands have been trapped as part of the Stoat Immigration Study since 2000. Stoats were caught on the Gilbert Islands on a regular basis; however, these stoats most likely swam from Resolution Island as it is very close (60-120 m). Only one stoat has been caught on Entry Island (over 6 years of trapping) which shows that there is very little immigration of stoats either from the mainland (1.1 km) or from Resolution Island (1 km). The frequency of stoat re-invasion to Resolution Island via Entry Island, therefore, is likely to be very low. These islands will continue to be trapped as part of the Resolution Island programme (see Table 3 for details of traps currently in place on these islands).

TABLE 3: TRAPS CURRENTLY ON ISLANDS SURROUNDING RESOLUTION ISLAND.

LOCATION	NUMBER AND TYPE OF TRAP	SIZE OF ISLAND	DISTANCE TO RESOLUTION ISLAND	CAPTURE HISTORY
Front Island	2 double MkIV™ Fenn sets	1 ha	1.6 km	No stoats caught since Dec 2000
Gilbert Islands	4 double MkIV™ Fenn sets on East Gilbert; 4 additional tunnels to be re-established on West Gilbert	25.4 ha	120 m	Regular stoat captures since Dec 2000
Hawea Island	2 double MkIV™ Fenn sets	9 ha	1.4 km	No stoats caught since Dec 2000
Useless Island	2 double MkIV™ Fenn sets	3.2 ha	490 m	Regular stoat captures since Dec 2000
Cormorant Island	4 double MkIV™ Fenn sets	13.5 ha	270 m	Infrequent stoat captures since 2000. Stoat caught May 2001 and Nov 2003
Indian Island	18 double sets - combination of MkIV™ Fenns and DOC 150's™	167 ha	1.2 km	Regular stoat captures since Dec 2000
Parrot Island	6 double MkIV™ Fenn sets	40 ha	710 m	Infrequent stoat captures since 2000.
Pigeon Island	27 double MkIV™ Fenn sets	70 ha	80 m	No stoats caught since July 2005.
Fixed Head Island	4 double MkIV™ Fenn sets	22.4ha	120 m	Regular stoat captures since Dec 2000
Entry Island	4 double MkIV™ Fenn sets	38 ha	1 km	One stoat caught in May 2001 since trapping 2000

ii) Southern coast

The closest distance from Indian Island (167 ha) to Resolution Island is 1.2 km and from Long Island (1 890 ha) to Resolution Island 915 m. Stoat re-invasion via either of these islands is likely to be very low. Indian Island was trapped as part of the Stoat Immigration Study and stoats and ship rats captured frequently (mice are also present). Under the Resolution Island Programme Indian Island will continue to be trapped (Table 3).

Long Island lies to the south-east of Resolution Island. The Bowen Channel separates Long Island from Resolution Island. The Cook Channel separates Long Island from the mainland with the closest distance between the two 500 m. Stoats and ship rats are present on Long Island. Forty double set DOC 150's™ will be placed at 150 m spacing's along 6 km of coastline on Long Island nearest to Resolution Island.

iii) East coast (Part 1)

This section of mainland is approximately 1 km from Resolution Island and is very steep sided. The rate of stoat re-invasion directly via the mainland is assumed to be low. Due to the steepness of the terrain and rough sea conditions along the northern section of Acheron Passage trapping effort will be targeted (c.f. continual trap line extending the length of Thompson Sound for the Secretary Island Programme, Golding et. al. 2005). Capture data from the Secretary Island mainland

trapping indicates a higher capture rate for traps positioned at the end of waterways (see Appendix 8). Therefore two double set DOC 150's™ tunnels will be placed at six river mouths, and two at the entrance headland into Wet Jacket Arm (total 14 trap tunnels).

iv) East coast (Part 2)

The narrowest point of this section across the Acheron Passage to the mainland is approximately 520 m which is well within stoat swimming range and poses the largest risk of stoat re-invasion from the mainland population to Resolution Island. However, results from the Stoat Immigration Study have shown that the risk of re-invasion is significantly reduced for islands greater than 500m from the source population (Elliot et al, un pub.). A 4.1 km track will be cut just east of the steepest and closest segment of this section on the mainland. For the remaining part of this section (1.4 km of coast) tunnels will be placed at 150 m spacing's along the coast. Forty double-set DOC 150™ traps in wooden tunnels will be required. Placement of these traps will be determined by terrain and safe landing sites.

All mainland traps will be constructed in accordance with current DOC best practise for double DOC 150™ traps. Internal baffles will not be used initially, however the tunnels will be constructed so that a baffle can be inserted if required (Appendix 6c).

All mainland and stepping-stone trap tunnels will be baited in the same manner as the Resolution Island traps. Surrounding stepping-stone islands not previously mentioned but listed in the Table 3 will be will also be trapped as part of the Resolution Island Programme.

5.2 TIMING OF TRAP CHECKS

After the initial pulse of trapping (2 weeks in August 2008) traps will be left set and re-baited with fresh hen's eggs and meat. Traps on Resolution Island will then be serviced in November, February (to detect dispersing juveniles), and May, until there are two consecutive trap checks with zero captures. Consideration may be given to reducing the number of traps on the island in future however experience from Secretary Island indicates that this level of trapping effort may need to be maintained in the long term.

After the initial knock down period, mainland and stepping-stone traps will be serviced twice per annum in February and November. This timing of trap checks allows traps to be baited with fresh bait just prior to the juvenile dispersal period and then cleared after the majority of juveniles have dispersed. This programme has worked successfully on Great Island in Chalky Inlet (Murray Willans, *pers. comm.*).

6.0 Monitoring and Programme Evaluation

6.1 RESULT MONITORING

Based on the results from Secretary Island the eradication of stoats from Resolution Island is likely to take a minimum of two years. Stoat captures should decline significantly after the initial knock-down in August 2008, with a likely pulse of animals being caught in February 2009 and again in the February in 2010. The pattern of stoat captures on Resolution Island is also likely to be effected by the timing and frequency of masting events in Fiordland and the extent of immigration to the island.

A number of indices will be used to determine the success or otherwise of this programme, including the number of adult and juvenile stoats trapped over time, the ratio of male-to-female stoats, and if necessary, DNA analysis.

Due to the varying home ranges of male and female stoats the sex ratio of male-to-female captures should provide a good indication of whether or not the whole population on Resolution Island is exposed to the trapping programme (King, 1994). Ideally at least 50% of all adult captures should be female. If the converse is true and more adult males are being caught than adult females, then it is likely that some female home ranges do not overlap with trap lines.

Following the initial knock-down programme tail tip samples will be collected from each fresh stoat capture and bone samples from stoats that have been dead for a longer period of time. A preliminary analysis will be undertaken of 10 stoats from Resolution Island and 10 stoats from the adjacent mainland to determine whether there is sufficient genetic structuring to distinguish island from mainland stoats. This work is currently being undertaken for the Secretary Island stoat eradication programme and is yielding some promising results. Sufficient genetic differences have been found between the island and mainland stoats to confirm that a) levels of immigration to Secretary Island are very low, and b) DNA analysis will be a useful tool for determining which stoats have swum to Secretary Island (D. Gleeson, *pers. comm.*). If the capture rates on Resolution Island do not decline to zero over the first two years of the programme then DNA analysis may enable us to determine whether new immigrants are being caught or whether we are still targeting the original resident population. This approach would rely on sufficient genetic variation existing between the Resolution Island and mainland stoat populations. DNA analysis may also enable us to look at relatedness amongst the stoats being caught when we get down to low numbers.

Stable isotope analysis of bone collagen is also being investigated for the Secretary Island Programme by examining stoats captured on the island and comparing them to the adjacent mainland population. Stable isotope analysis examines the mineral composition of tissue samples based on variation in diet and has been used recently to examine habitat partitioning in three species of rat on Pearl Island off the coast of

Stewart Island (Harper 2006). It is likely that the diet of stoats resident on Secretary Island is quite different to that of their mainland counterparts due to the absence of rodents on Secretary Island (diet analysis based on gut samples is also being undertaken). We opted to use bone collagen as often stoats are too degraded by the time they are removed from the trap to examine muscle tissue. Moreover, variation in the mineral composition of bone collagen is built up over the life of the animal rather than a short period of time (c.f. four weeks for muscle tissue; Harper, 2006) so bone collagen should be more useful to determine recent arrivals on Secretary Island. If successful this technique could be applied to Resolution Island although, its effectiveness may be limited to the fact that mice are present on Resolution Island.

At least one trained stoat dog will visit the island every four-six months as part of the trap servicing programme. Searches will be conducted on and off the stoat track network. All sign or indication of stoat presence while using dogs will be recorded using G.P.S. and the location will be checked again on subsequent trap checks. A G.P.S. recording of all routes covered with a dog will also be made. During the November 2008 stoat check special attention will be paid with dog searches to areas that have the largest distance between trap lines (i.e. areas where it is possible that stoat may not have encountered a trapping tunnel). Later (Feb, May 2009) dog searches will be focused on areas where stoats were last caught.

Deer control is currently planned to start in spring 2010. The timing of this work will be reviewed pending results from the Secretary Island deer eradication programme.

6.2 OUTCOME MONITORING

Outcome monitoring for stoat control and/or eradication has been undertaken for many species and a wealth of information is readily available documenting the negative impact stoats have on New Zealand's native fauna King (2005). The terrain, scale, and isolation of Resolution Island would require significant resources in order to undertake any species monitoring. For these reasons outcome monitoring will be restricted to the Southern Fiordland Tokoeka. Resolution Island is currently the only area planned to have stoat control/ eradication in place in the short-to-medium term where the Southern Fiordland Tokoeka persists. Kiwi call counts have been conducted at various locations on Resolution Island in 1987 (Kiwi Call Scheme, 1991) and 2003 (Colborne, 2003). The methodology of kiwi call counts on Resolution Island will be based on the Nationwide Kiwi Call Count Monitoring Scheme protocol and conducted on a 5-yearly basis beginning in February 2008.

7.0 Quarantine Management

Island quarantine for this programme will be undertaken in accordance with the Island Biosecurity Plan: Southland Conservancy (Agnew and Roberts, 2006). All food items including fatty or waxy items (soap, candles etc.) will be packed into plastic containers with lids that can be tightly sealed with a cable tie, or 20 L buckets with sealable lids. Food from the supermarket and butcher will be packed directly into sealable containers and then be re-packed at the Te Anau Quarantine Store ideally on the day of departure. Particular care will be taken to ensure that all food products are clean and well packaged, especially with vegetables (i.e. potatoes must be the pre-washed, lettuce must not have dirt on the root system).

All personal gear (staff and volunteers) will be checked using the self quarantine check list (Fiordland Island Quarantine Procedures DOCDM-60768) and then inspected by DOC staff prior to each trip.

All contractors undertaking work on Resolution Island will have to provide a quarantine plan as part of their tender in accordance with the Island Biosecurity Plan: Southland Conservancy (Agnew and Roberts, 2006). The strength of their quarantine plan will be evaluated during the tender selection process and will be monitored as part of the contract audit process. Contractors will also be inducted on departmental quarantine procedures when they undertake a site visit to Secretary Island as part of their briefing.

Wooden trap tunnels will be constructed in winter 2007 and stored at the Te Anau AO Workshop. Within two days of departure from the workshop each tunnel will be swept out to remove seeds, spiders, bird nesting material etc., and have the trap screwed in place. Tunnels will then be stacked onto pellets and completely wrapped in shrink wrap. Inspection of shrink wrapping at each stage of transportation will enable staff to determine quickly if a rodent has taken up residence in tunnels before they leave their final point of departure for the island (e.g. Borland, MV Southern Winds, Deep Cove). Fumigation may also be considered at this time depending on how quickly they can be transported. The final method of transportation will be via boat for coastal trap tunnels and helicopter for all other trap tunnels. Each tunnel will be individually inspected at this time, as was the case for Secretary Island.

The 13 bivvies and annexes constructed for the programme will be temporarily stored outside at the Te Anau AO workshop. Each will be placed on clean blocks to ensure the sub-floor is not in direct contact with the ground. Bivvies will be made as rodent proof as possible; all potential entry points will be blocked and a rodent bait station placed inside. An inspection of these entry points and the bait station is to be conducted immediately prior to flying them to the island from Borland.

Each bivvy will be thoroughly cleaned on the inside; floors must be vacuumed and the wall, bench and floor spaces washed down with Vercon™ (an anti-viral/bacterial agent). The person cleaning the bivvy must wear clean foot-wear, preferably rubber gumboots treated with Vercon™ while cleaning. A fumigation bomb will be released inside the bivvy to kill any unwanted invertebrates prior to flying it to the island.

A draft weed management kit similar to Secretary Island will be developed for Resolution Island (Huggins, 2007). This kit contains information on the current

known distribution of plant pests on Secretary Island. It includes guidelines for reporting, collection and identification of weeds, methods of weed control, and surveillance and monitoring.

There have been historical records of Norway rats on Resolution Island (King, 1990; Ian Flux, *pers. com.*). However monitoring at key sites in recent years has not detected the presence of Norway rats on the island. One ship rat was trapped on Resolution Island in May 2006. After a concentrated trapping effort around the capture area and at other high-risk locations (boat landing sites and anchorages) on the island no further ship rats were caught (Pete McMurtrie, *pers. comm.*; see DOCDM-41613). Due to this incursion and the risk of future ones, rat monitoring traps and bait stations will be placed at these key sites on the island (Table 4).

The addition of these 'rat traps' (which will be baited for rodents and stoats) will slightly increase the trap coverage over the island. These rat traps will be checked as frequently as possible and at least twice per annum. A double-set tunnel with 2 DOC 150™ traps will also be set up at each of the 13 bivvy sites. Bait stations will only be used inside bivvies due to the presence of mice on the island.

TABLE 4: SITES ON RESOLUTION ISLAND WHERE TARGET RODENT TRAPPING AND MONITORING WILL BE UNDERTAKEN.

SITE	TRAP TYPE	HISTORY
Disappointment Cove	10 double-set tunnels with SS DOC 150™ traps	Established 2005 - currently Mark IV Fenn™ traps
Stevens Cove	5 double-set tunnels with SS DOC 150™ traps	Established 2000 - currently 2 tunnels with Mark IV Fenn™ traps
Acheron Passage site	6 double-set tunnels with SS DOC 150™ traps	
Duck Cove	20 double-set tunnels with SS DOC 150™ traps	Established 2005 - currently 10 tunnels with Mark IV Fenn™ traps
Entrance Cove	6 double-set tunnels with SS DOC 150™ traps	
Fixed Head	6 double-set tunnels with SS DOC 150™ traps	
Basin	6 double-set tunnels with SS DOC 150™ traps	
Facile Harbour	12 double-set tunnels with SS DOC 150™ traps	
Whidby Point	3 double-set tunnels with SS DOC 150™ traps	
Little Harbour	4 double-set tunnels with SS DOC 150™ traps	
Cormorant Cove	12 double-set tunnels with SS DOC 150™ traps	
Total	84 double-set tunnels with SS DOC 150™ traps	

8.0 Milestones

DATE	ACTIVITY	
Oct 06	Order traps from Curtis Springs with payment available July 1 2007	COMPLETED
Nov 06	Obtain CAPEX approval (in principle) for Bivvy Construction	COMPLETED
Dec 06-Jan 07	Obtain building consent	COMPLETED
Jan -Feb 07	Tender for construction of flyable bivvies and gain final CAPEX approval	COMPLETED
Feb 07	Obtain CAPEX approval for radio repeater	COMPLETED
March 2007	Comments received on first draft of stoat operational plan	COMPLETED
June 2007	Building work completed on six bivvies and six sites prepared on Resolution Island.	COMPLETED July 2007
June 2007	Order timber for trap tunnels	COMPLETED June 2007
June 2007	Finalise operational plan	DRAFT COMPLETED June 2007 for IEAG meeting. Final Plan completed October 2007.
July 2007	Six bivvies to be located on the island .and install VHF repeater. Undertake inspections for Building Consent.	COMPLETED August 2007
July 2007	Begin construction of trap tunnels with priority given to double-sets for mainland trap line	UNDERWAY
July 2007	Pay for traps	Delay in supply from CURTIS SPRINGS
July-Sept 2007	Complete preparation work on remaining 7 bivvy sites	COMPLETED September 2007
July - Aug 2007	Route navigation and flagging of tracks in Block one undertaken	COMPLETED September 2007
Aug 2007	Briefing for contractors to include quarantine, terms of contract, historic training	COMPLETED pre-departure September 2007
Aug 2007	Begin laying out coastal tunnels during audit trips	Tunnel construction of double-sets COMPLETED early October 2007. Tunnel laying of mainland traps to be initiated Nov-Dec 2007
Oct 2007	Install remaining 7 bivvies on Resolution Island	COMPLETED Oct 07
Nov 2007	Briefing for contractors to include quarantine, terms of contract, historic training	COMPLETED Nov 07
Nov - Dec 2007	Route navigation and flagging in Blocks two and three undertaken	
Nov - Feb 2007	Track cutting and final marking in Block one undertaken	
Nov - Dec 2007	Route navigation and flagging in Blocks two and three undertaken	
Dec 07	Complete laying out of coastal tunnels. Check progress on tunnel construction and establish whether any work needs to be out-sourced	
Jan - Apr 08	Track cutting and final marking for Blocks two and three undertaken	
Feb 07	Check progress on tunnel construction and establish whether any work needs to be out-sourced	
March 2008	Confirm trap availability and that all trap tunnel construction is completed.	

March 2008	Confirm track cutting programme is on schedule. If not, make adjustments as necessary.	
April 2008	Confirm trap tunnel placement programme is on track, if not make adjustments as necessary.	
May 2008	Complete tunnel laying.	
May 2008	Confirm stoat trapping team	
June 17 - 28, 2008	First pre-bait	
July 15 - 27, 2008	Second pre-bait	
August 1, 2008	Confirm trapping programme is organised to proceed as planned and the team have a clear understanding of the agreed plan.	
One day prior to commencement of trapping	Assemble trapping team in Te Anau and run a briefing to confirm the programme.	
May 2011	Review progress with trapping programme.	

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10.0 Internal Department of Conservation documents.

DME NUMBER	DOCUMENT NAME
DOCDM-41613	Resolution and Secretary Rat Incursion Information
DOCDM-65468	
DOCDM-67590	Business Case: Resolution Island Communication
DOCDM-106122	
DOCDM-106317	Business Case: Resolution Island Bivvies
OLDDM- 724390	Standard New Zealand Handbook: tracks and outdoor structures
DOCDM-60768	Fiordland Island Quarantine Procedures Self Checklist
DOCDM-48961	Stoat capture record for Centre Island
DOCDM-147395	Progress Report for deer eradication work on Secretary Island, May 2007

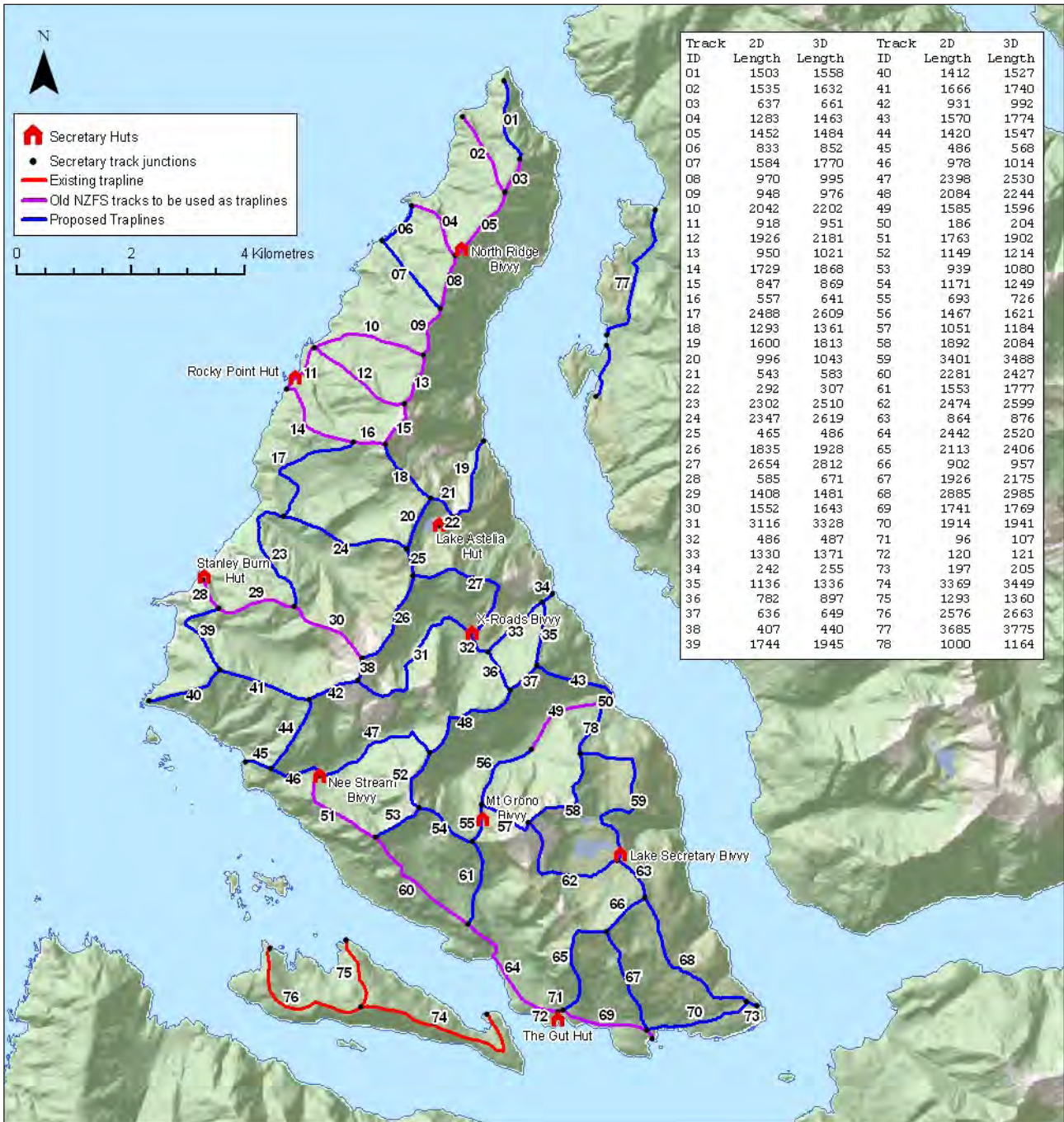
Appendix 1

ADAPTED FROM TABLE 1 FIORDLAND NATIONAL PARK MANAGEMENT PLAN (2007): ISLAND MANAGEMENT CATEGORIES: RESTORATION.

Primary Conservation Function	Recovery of viable populations of threatened species of particular communities.
Criteria for recognition	Opportunities for restoring habitats of threatened species and for restoring threatened communities, both those of islands and the mainland; modified and extremely modified islands of all sizes.
Protective action for species and biotic communities	Consistent precautions against establishment of introduced plants and animals (with certain exceptions, see below) and against illegal visits and fires.
Protective and restorative action for archaeological sites	Sites of archaeological value protected with restoration of selected sites where appropriate
Restorative action for biotic communities	Restoration of island Communities formerly present and extension of some still existing. Restoration of mainland communities where appropriate on islands free of limiting factors of the mainland.
Translocation of species not natural to the island	Island Communities: as for refuge islands excepting use of certain introduced plants as temporary cover. Mainland communities (on islands): permitted for appropriate mainland species and, in special cases, for animal taxa from the Pacific or Australia ⁸
Habitat manipulation for particular species	Island Communities: choice of communities to be restored sometimes influenced by habitat requirements of threatened species. Mainland communities (on islands): major manipulation of habitats sometimes needed
Scientific activity	Experimentation using carefully monitored trials to measure progress of programme.
Visitors, education and interpretation	i) low impact activities not possible in an open sanctuary; ii) permitted visitor to a few selected islands with interpretation/supervision: iii) volunteer help with restoration work on some islands. Refer 4.14

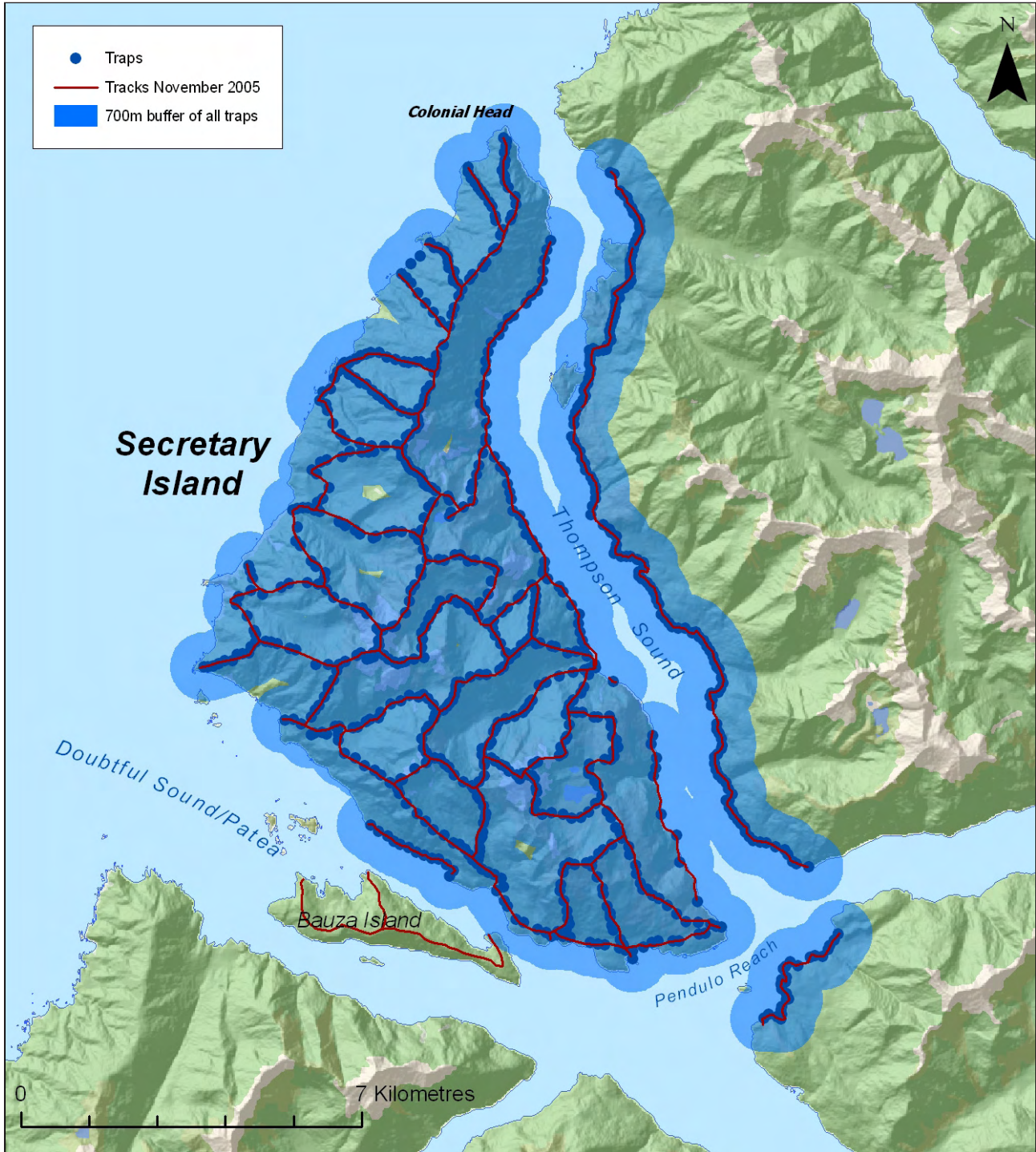
Appendix 2

TRAP LINES ON SECRETARY ISLAND AS OF APRIL 2005 SHOWING 2-DIMENSIONAL AND 3-DIMENSIONAL DISTANCES FOR EACH LINE.



Appendix 3

TRAP LINES ON SECRETARY ISLAND AS OF APRIL 2005 SHOWING A 700M BUFFER AROUND EACH AS AN INDICATION OF TRAP COVERAGE.



Appendix 4

SUMMARY OF STOAT ERADICATION METHODS USED ON FIVE ISLANDS IN COASTAL FIORDLAND.

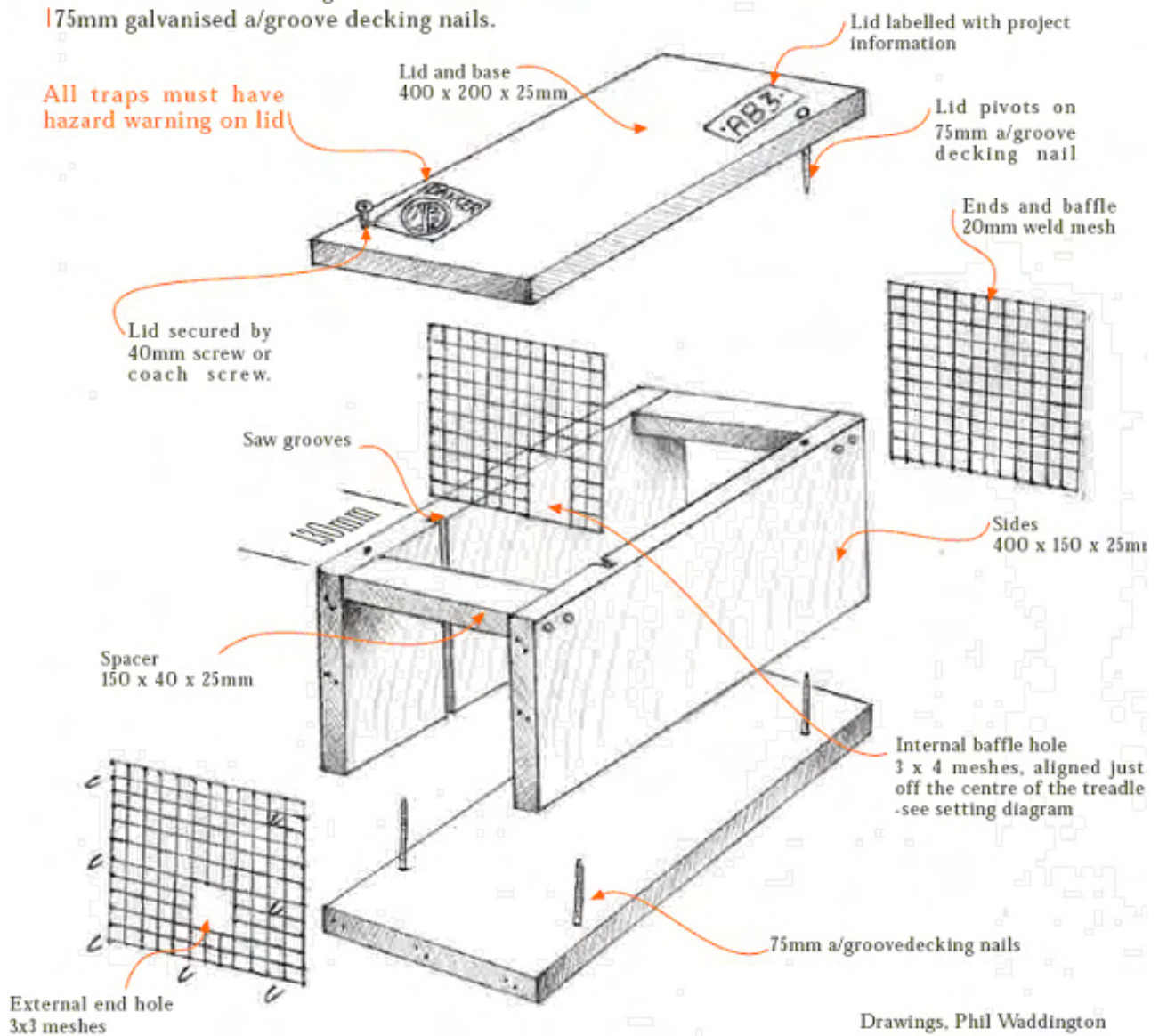
	TE KAKAHU IS.			ANCHOR IS.			BAUZA IS.		
Time	1999			2001			2002		
Area (ha)	514			1130 (1100 excluding lake)			480		
Traps used	MkIV Fenns			MkIV Fenns			MkIV Fenns		
Trap distance	70-80m (some 50m)			150m			200m		
No. trap tunnels	140			161			41		
Meters track/ha	25			17.76 (18.1 excluding the lake)			15.6		
Ha/ trap set	3.4			6.8 (excluding the lake)			11		
Tunnels used	Tunnel types	% of tunnels	% total stoats caught	Tunnel types	% of tunnels	% total stoats caught	Tunnel types	% of tunnels	% total stoats caught
	Wooden (floors)	60	20	Wooden	59	62	Wooden	?	100
	Aluminium (no floors)	27	33	Aluminium	24	22	Aluminium (floors)	0	
	Wire mesh (no floors)	13	47	Wire mesh (no floors)	17	22			
Pre-baiting	13th-16th June			c.30th June and 7th July			25th June and 15th July		
	Half fish half eggs			1st- just eggs no tunnels 2nd inside and out of tunnels alternating meat and eggs			All pre-baiting was eggs and meat and eggs on nails c.1m above ground		
	Pre-baited for 2 weeks								
	Both pre-baits were for 2 weeks								
	Almost all baits taken by the re-bait on 15th July								
Trapping	29th June- initial checks every 2nd day for 18 days			20th July- initial checks every day for 8 days			5th August- initial checks		
	Baited with 1 egg or 1 day old chick or fish			Baited alternatively with meat and eggs			Each tunnel baited with a hens egg and a piece of meat		
	1st night c.80% of traps set, 2nd night the rest set and other checked. For the next 12 days traps were checked, more tunnels were put in place in relation to sign. 14 days total.			1st night half baited, 2nd night other half baited, for the next 5 days all traps were checked. 7 days total			Report vague but traps set over 2 nights and checked for 2 days.		
Catch data	Initially 15 caught during winter 1999 1 caught October 1999			18 initially during winter 2001 1 caught November 2001			5 initially during winter 2002 4 caught November 2002 1 caught February 2003 1 caught April 2003		

SUMMARY OF STOAT ERADICATION METHODS USED ON FIVE ISLANDS IN COASTAL FIORDLAND.

	SECRETARY IS.			COAL IS.		
TIME	2005			2005		
AREA (HA)	8140			1163		
TRAPS USED	MkIV Fenns			DOC 150TM		
TRAP DISTANCE	100-150m			100-115m		
NO.TRAPS	945			130		
METERS TRACK/ HA	2D = 100km 3D = 108km			18km		
HA/ TRAP SET	8.6			9		
TUNNELS USED	TUNNEL TYPES	% OF TUNNELS	% TOTAL STOATS CAUGHT	TUNNEL TYPES	% OF TUNNELS	% TOTAL STOATS CAUGHT
	Wooden (floors)	67	65	Wooden (floors)	66	65
	Wire mesh (floors)	32	35	Wire mesh (floors)	33	35
PRE-BAITING	2 times - 20-26 July and 5-11 July			4 times 10June to the 20July		
	Egg and meat inside trap and egg on ground and 1m up tree outside trap			Eggs and Meat inside and one egg outside		
	Pre-baiting 4 to 1 week prior to trapping			Pre-baited 7 to 2 weeks prior to trapping		
	95 % bait take from 1st pre-bait 99% bait take from 2nd pre-bait			Estimated at 95% bait take		
TRAPPING	20-29 JULY			2ND AUGUST		
	Baited with one egg and piece of meat (beef, venison or rabbit)			Centre track baited with egg and fish Remaining tracks baited with egg and venison		
	All trap check twice between 22-29 July			All traps checked on 3rd August		
CATCH DATA	95 - initially 20-29 July 2005			21 initially 3rd August 2005		
	9 - November 2005			0 - August 2005		
	44 - February 2006			4 - November 2005		
	6 - July 2006			11 - January 2006		
	0 - November 2006			0 - March 2006		
	5 February 2007					

Appendix 5 Tunnel Designs

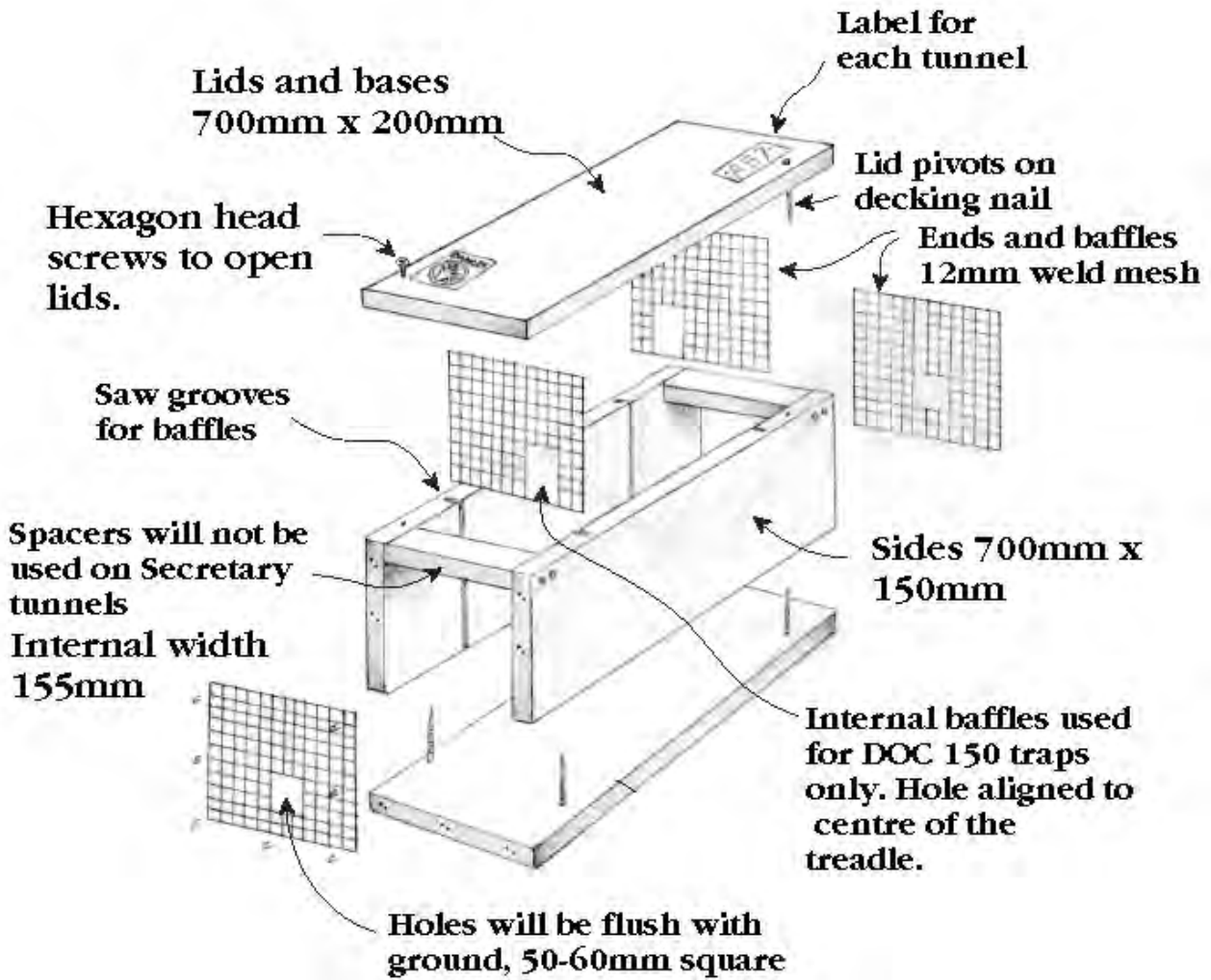
5A. SINGLE-SET WOODEN TUNNEL DESIGN (NOTE INTERNAL BAFFLE WILL NOT BE USED BUT SLOTS WILL BE CREATED IN THE BOX IF REQUIRED IN THE FUTURE).



5B. SINGLE-SET WIRE MESH TUNNEL DESIGN



5C. DOUBLE SET WOODEN TUNNEL DESIGN. (NOTE TUNNEL LENGTH INCREASED TO 900M)



Appendix 6

Food availability for stoats on Resolution Island. High-lighted areas (excluding invertebrates) illustrate when animal begin nesting to when the young are present.

	January	February	March	April	May	June	July	August	Sept	October	Nov	Dec
Mice												
Grey Duck												
NZ Scaup												
Kereru												
Kaka												
Parakeet												
Piordland Crested Penguin												
Rifleman												
Brown Creeper												
Grey Warbler												
Pantail												
Bellbird												
Silver eye												
Blackbird												
Redpoll												
Tomtit												
Kiwi												
Titi ^a												
Invertebrates												

Appendix 7

STOAT CAPTURES ON THE MAINLAND ADJACENT TO SECRETARY ISLAND, JULY 2005 - NOVEMBER 2006.

