

APPENDIX IV ORNITHOLOGICAL REPORT

OPPORTUNITIES FOR SHOREBIRD
PROTECTION ASSOCIATED WITH
PROPOSED LAND DEVELOPMENT
AT TE ARAI, NORTHLAND –
REVISED REPORT

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CONTENTS

1.	INTRODUCTION	2
2.	AVIFAUNA VALUES	2
3.	THREATS TO WADERS AND TERNS	4
3.1	Adult mortality	5
3.2	Breeding failures	5
3.3	Habitat degradation	6
4.	FAIRY TERN MANAGEMENT	6
4.1	Management to date	6
4.2	Responses to management	7
5.	POTENTIAL EFFECTS OF THE PROPOSED DEVELOPMENT AT TE ARAI	8
5.1	Predation by cats	8
5.2	Predation and disturbance by dogs	9
5.3	Increased rodents and predators	9
5.4	Increased human disturbance	10
6.	EVALUATION OF PROPOSED MANAGEMENT APPROACH	12
6.1	Exclusion of house-based cats	13
6.2	Dog control or exclusion	13
6.3	Predator impacts	15
6.4	Human disturbance	16
6.5	Monitoring	20
	ACKNOWLEDGMENTS	21
	REFERENCES	21
	APPENDICES	
1.	Management plan for protection of shorebirds and other dune biota at Te Arai23	
2.	Letter of commitment to DOC in respect of shorebird protection	

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1. INTRODUCTION

Darby Partners Ltd are considering options for the development of 620 ha of coastal land between Te Arai Point and the Mangawhai Sandspit, in Northland. One option is for the development of up to 850 new residences, including visitor accommodation, while maintaining a high level of open space. The area is predominantly duneland that has been planted with radiata pine (*Pinus radiata*), while a coastal fringe of shrubland includes indigenous plants on the foredune and adjacent back dune (Slaven 2005). Several small wetlands are also present. Highest values for indigenous biodiversity are, however, centred on the Mangawhai Harbour and Sandspit to the north and associated dunelands, including a site at the mouth of the Te Arai Stream. These areas support breeding pairs and/or roosts of the 'Critically Endangered' New Zealand fairy tern (*Sterna nereis davisae*). Other shorebirds also breed in these areas (Williams 2006, Dowding 2006), of which Caspian tern (*Sterna caspia*) and northern New Zealand dotterel (*Charadrius obscurus aquilonius*) are ranked as 'Nationally Vulnerable' (Hitchmough 2002).

There are the two main areas of potential conflict between coastal development and the protection of threatened shorebird species - increased predation pressure from domestic pets and increased direct disturbance from people. Both forms of pressure are increasing in coastal areas in northern New Zealand, particularly in eastern Northland and Auckland. The Mangawhai area is nationally important for New Zealand fairy tern and there is a genuine concern that further development in this area could have a negative impact on the population.

Wildland Consultants were commissioned to review existing ecological data available for the site, assess potential impacts of the proposed development, and evaluate proposed means of avoiding negative impacts on fairy terns and other shorebirds. A pest management plan was also developed as part of this project (refer to Appendix 1).

An earlier version of this report (August 2005) was revised in September 2006 following the release of a report (Dowding 2006) prepared for the Department of Conservation and consultation between the Government, Te Uri o Hau, and Darby Partners Ltd. Two additional site visits were conducted in late September 2006.

2. AVIFAUNA VALUES

Natural values of the Mangawhai-Te Arai area are reasonably well known (c.f. Hansen 2005, Slaven 2005), being particularly well known for avifauna values. Up to half of the total New Zealand population of fairy tern breeds, feeds, and flocks in the area. More than 1% of the total population (possibly as much as 6%; Dowding 2006) of northern New Zealand dotterel is also present. Important bird habitats are described below.

Mangawhai Estuary

The open waters of Mangawhai Estuary are utilised for fishing by white-fronted terns (*Sterna striata*), Caspian terns, and New Zealand fairy terns, while the intertidal

habitats are utilised for invertebrate feeding by many wader species. Key waders include three threatened plover species: northern New Zealand dotterel, banded dotterel (*Charadrius bicinctus*), and wrybill (*Anarhynchus frontalis*), and northern hemisphere migrants, including bar-tailed godwits (*Limosa lapponica*). Mangrove and saltmarsh habitats in the inner harbour support populations of banded rail (*Rallus philippensis*) and North Island fernbird (*Bowdleria punctata vealeae*).

Mangawhai Dunelands and Supralittoral Zone

The supralittoral zone (above EHWS¹ tide level) and dunes of the Mangawhai Sandspit support several breeding bird species, including at least five threatened species (Table 1).

Table 1: Threatened or near-threatened shorebird species recorded breeding at Mangawhai – Te Arai in 2000-2005. Details of pairs from Walls (2005), Williams (2006), Dowding (2006); threat rankings from Hitchmough (2002) and Hitchmough and Bull (2004).

Species	Threat ranking	No. pairs and % total breeding popn.	Locations
NZ fairy tern	Nat. Critical	3-4 (c.50%)	Southern sandspit, bund wall
Caspian tern	Nat. Vulnerable	25+ (2-4%)	Southern sandspit/dunes
New Zealand dotterel	Nat. Vulnerable	8-45 (6%)	Throughout
Banded dotterel	Gradual Decline	<5 (< 1%)	Sandspit
White-fronted tern	Gradual Decline	Variable (< 1%)	Southern sandspit
Variable oystercatcher	Not threatened	40-50 (c. 2%)	Throughout

Note: In the 2005-06 breeding season 5 of the 11 breeding pairs of NZ fairy terns utilized Mangawhai Sandspit (Dowding 2006, Williams 2006).

Many birds roost in the supralittoral zone along the length of the Mangawhai sandspit, including a zone that extends to the south and includes the Te Arai area. Specific sites tend to be favoured for roosting, including the mouth of the Te Arai Stream (Walls 2005).

Te Arai Stream

This small estuary and stream provide ideal feeding and nesting sites for New Zealand dotterels and variable oystercatchers. A large flat upper beach [c.500 m long and up to 150 m wide] provides excellent nesting habitat for these species. It is also potential fairy tern nesting habitat, given the presence of scattered patches of bivalve shells and a sparse cover of debris and pingao (*Desmoschoenus spiralis*). Fairy terns, Caspian terns, and white-fronted terns frequently roost on the adjacent upper beach and foredunes and, in recent years, up to 15 post-breeding fairy terns (50 % of the population) have been found roosting here in summer-autumn (Walls 2005). Up to 14 New Zealand dotterels and 6 variable oystercatchers were present here during my visits on 23 and 30 September 2006. Two fairy terns were present on 23 September,

¹ EHWS = Extreme High Water Spring tides.

but they were displaced to the north side of the stream-mouth by a four-wheeled motorcycle being driven along the EHWS line, and later they were scared from the entire site by several people with two dogs. On both days 2-4 each of New Zealand dotterels, pied stilts, spur-winged plovers and Caspian terns were feeding in the lower 300 m of estuary.

Between the fore dunes and hind dunes is a large dune-slack that extends from Te Arai Stream to a point c.600 m to the south. Two New Zealand dotterels were present and feeding here on 23 September 2006. New Zealand dotterel footprints were widespread throughout this area on both the 23 and 30 September 2006 and some dotterel footprints were also found in smaller, more elevated dune depressions within 300 m of the Te Arai Road carpark. Although the dunes themselves are not the preferred nesting habitat, of New Zealand dotterels (c.f. the gentle-sloping upper beach at Te Arai Stream), it is very likely that some pairs may attempt to nest here. If the local population continues to increase (in response to active management), these sorts of sites are likely to become increasingly utilised for nesting by the dotterels.

The stream itself provides habitat for a wide range of fauna, including freshwater fish and bird species. On 30 July 2005, banded rail footprints (50 mm long with thin toes) were found in the stream c.300 m from the river-mouth and two pairs of the nationally vulnerable grey duck (*Anas superciliosa*) were present in the same area. It is possible that other threatened species could also use the stream, particularly if the adjacent wetlands were enhanced.

Ocean Beaches

Small numbers of variable oystercatchers and occasionally dotterels forage in the intertidal zone along the ocean beach at Te Arai. In 2003-04 and 2004-05 one pair of fairy terns attempted to breed at the Poutawa Stream mouth, several kilometres to the south of Te Arai.

Marine

The Jellicoe Channel area, offshore from the site, supports a wide diversity of seabirds, particularly members of the Procellariiformes², including several species of petrels and shearwaters that nest on islands in the Hauraki Gulf. Three species of terns also forage in these waters. Caspian terns and particularly fairy terns tend to forage close to the coastline.

3. THREATS TO WADERS AND TERNS

Threats to waders and terns occur at two main life stages - high levels of adult and subadult mortality (usually from predation) and low breeding success (caused by a variety of factors, including disturbance). These are discussed further below.

² Shearwaters, petrels, albatrosses, storm-petrels and diving petrels

3.1 Adult mortality

Most New Zealand waders and terns have evolved for long periods in the absence of predators and most exhibit poorly developed avoidance behaviour in relation to the suite of introduced mammalian predators now present in New Zealand. Many species suffer heavily from the effects of mammalian carnivores, and the breeding season is when they are generally most vulnerable. New Zealand dotterels and New Zealand fairy terns appear to conform to this pattern, but quantitative data are scarce. An adult fairy tern was killed by a cat at Mangawhai in the 2004-05 season, even though the area was subject to predator control (Hansen 2005). New Zealand dotterels often fall prey to stoats and other predators (King *et al.* 2001). Outside the breeding season, various bird species are able to frequent safer sites, e.g. unstable islands of sand or shell in harbours, and they are likely to be less vulnerable at this time.

3.2 Breeding failures

The most common causes of shorebird nest failures are:

- weather and tidal flooding;
- predation of eggs or chicks;
- disturbance by humans and/or domestic animals;
- infertility.

These are described and discussed below:

Weather and Tidal Flooding

In a 13 year review of nesting shorebirds at Mangawhai-Waipu-Ruakaka, Booth (1998) found that bad weather events and/or tidal flooding accounted for 32% of total nesting failures of fairy terns, New Zealand dotterels, and variable oystercatchers combined (n = 238 nest attempts). This figure was greatest for Mangawhai (43%, n = 53). The frequency of flooding of fairy tern nests varies from year to year, with an average of four eggs lost per season (Taylor *et al* 2004).

Predation

Booth (1998) found that, at sites where there was no predator control, predation accounted for at least 9% of shorebird nesting failures at the three Northland study sites (at least 21% at Mangawhai). The proportion of failures due to predation could have been far greater, however, because 42% of total failures (25% at Mangawhai) were from “unknown causes”, many of which are likely to have been predation. Prior to predator control being implemented, 32% of all fairy tern eggs and chicks were lost to predation, but after predator control was implemented this dropped to 12% (Taylor *et al.* 2004). Predators suspected of eating eggs and chicks include rats (*Rattus* spp.), hedgehogs (*Erinaceus europaeus*), mustelids, cats (*Felis catus*), and possums (*Trichosurus vulpecula*), while avian predators (particularly Australasian harrier - *Circus approximans* and black-backed gull - *Larus dominicanus*) are also potential predators of fairy terns.

Disturbance

Disturbance of nesting shorebirds by human activity and their animals and vehicles is an international problem (Schulz and Stock 1993) and has been recognized for 20 years as a key management issue for fairy terns (Parrish and Honnor 1997). Direct effects can include trampling of nests or chicks, while frequent disturbance can result in excessive chilling or overheating of eggs, or abandonment of local nesting attempts. Indirect effects can be just as lethal and can include avian predators having increased chances of detecting eggs and chicks (Schultz and Stock 1993).

Humans, dogs, and vehicles, collectively, accounted for 4% of shorebird nest failures in Booth's (1998) review. As with predation events, however, many of the "unknown causes" could have been disturbance-related. The current and projected increase in human population pressure on northern New Zealand coasts presents a significant problem for several coastal bird species. The pressure on beaches in the Rodney and Whangarei Districts are likely to become even greater in the future as development increases.

Other

Inbreeding depression could become a major problem for fairy terns because of the small size of the population (Ferreira *et al.* 2005) and this may already be occurring. A large number of infertile eggs have been recorded in recent years, e.g. five of the ten fairy tern eggs of known fertility laid in the 2004-05 season were infertile, plus intraspecific interference and egg predation of close neighbouring conspecifics (Ferreira *et al.* 2005; Walls 2005; Williams 2006).

3.3 Habitat degradation

Shorebirds prefer to nest in relatively stable parts of the upper beach and dune areas that often contain molluscan shells, debris, and sparse vegetation. This type of habitat can become degraded by increased human use associated with pedestrians, vehicles, and horses. Increased activity in breeding areas can therefore reduce the quality and availability of nesting habitat.

4. FAIRY TERN MANAGEMENT

4.1 Management to date

Since 1985, wardens have been appointed annually to monitor and protect fairy tern nesting areas. In the early 1990s the focus of fairy tern management was on advocacy, compliance, and banding at Mangawhai, Waipu, and South Kaipara Head (Parrish and Honnor 1997; Booth 1998; Ferreira *et al.* 2005). Management was expanded at all three sites during the mid to late 1990s to include egg manipulation and predator control. Egg manipulation mainly comprised shifting eggs to other nests in order to increase the chances of successful hatching. Aspects considered included the risk of flooding, infertile eggs and the level of experience of breeding pairs (Parrish and Honnor 1997).

Predator control focused on a broad suite of mammalian predators including cats, mustelids, rats, and hedgehogs, as well as Australasian harriers and black-backed gulls. Predator control occurred only during the breeding season. At Mangawhai mammalian predator control is usually concentrated near the southern boundary of the reserve and at a few other sites. In 2004-05, the trapping regime comprised 41 Victor soft-jaw traps, 16 Mark 6 Fenn trap sets (combination of single and double sets), and three Russell box traps. The traps were baited with a variety of lures (egg, fish, rabbit, possum) and the leg-hold traps appear to have been operated for 4-5 nights of each week (Walls 2005). This trapping regime effort seems modest for such a threatened species and could be improved with a more intensive regime using more effective methods, e.g.

- Replace soft-jaw traps (which allow some cats to escape as apparently has occurred at Mangawhai) with more efficient kill traps e.g. SA (modified Conibear) traps;
- Increase the number of Fenn and box trap sets to maximize the chances of a predator encountering a trap first, instead of a threatened shorebird;
- Fenn traps should preferably be double sets, to maintain and possibly increase catching ability when rodents are captured in one of the two sets;
- Diversify trap types and use additional traps that have been proven to be effective (e.g. DOC 200/250 traps);
- Use predominantly rabbit baits for mustelids (Pierce *et al.* 2005);
- Include a targeted rat control programme.

4.2 Responses to management

Productivity of fairy terns at the three management sites (data combined since 1991) has been higher (but not significantly so) compared with pre-1990 data (Ferreira *et al.* 2005). The apparent increase in fledglings is attributed to the increased management effort, although the full suite of management effort has not yet been fully tested. This increase in fledglings, together with higher adult survival, appears to have halted the decline of the species. A population model suggests that fairy tern numbers should be increasing by 1.5% per annum, but field observations suggest that the population is stable (Ferreira *et al.* 2005). The failure of the population to respond significantly at this stage could reflect a number of factors, including:

- juvenile dispersal – some birds have dispersed to other New Zealand sites;
- stochastic events, e.g. storms, disturbance or predation that prevent maximum possible productivity and adult survival. Cyclones have caused significant nest losses in some years, while a cat is suspected to have preyed on an adult and nests at Mangawhai in 2004-05 (Walls 2005);
- inbreeding depression and associated problems, e.g. infertility. Thirty-three infertile eggs were recorded between 1991 and 2002 (Ferreira *et al.* 2005). In

2004, five out of ten eggs of known fertility at Mangawhai were in fact infertile which, together with predation, caused the failure of all four nests in that season (Walls 2005). The high level of infertility is one of the most intractable problems facing New Zealand fairy terns.

- site carrying capacity – the fact that no single site has supported more than a few pairs could mean that resources are limited at existing breeding sites. The recent record of breeding at Pakiri adds weight to this hypothesis.

Despite 15 years of active management effort, the situation for this species is clearly still very precarious. Some other managed sites in northern New Zealand have experienced high predation levels on nests of shorebirds, especially New Zealand dotterels, and although methodology has not been formally reviewed, management failures are likely to include ineffective trapping regimes as well as disturbance (R. Pierce pers. obs.). This view is supported by a formal review of shorebird breeding success at Northland sites, including at Mangawhai, where predation accounted for 21-46% of nesting failures when there was no predator control (Booth 1998, refer Section 3.2).

5. POTENTIAL EFFECTS OF THE PROPOSED DEVELOPMENT AT TE ARAI

The proposal to develop Te Arai has potentially significant implications for shorebirds, particularly for fairy terns, utilising the Mangawhai Estuary and Mangawhai Wildlife Refuge.

The potential effects are discussed below, including predation by cats, predation and disturbance by dogs, increased rodent and predator numbers, and increased human disturbance.

5.1 Predation by cats

Feral (and domestic) cats represent a significant threat to shorebirds, including fairy terns, as they are capable of killing all life stages – eggs, chicks, fledglings, and adults (Gillies 2001; in prep). Recent studies have revealed that house-based cats can have a very similar home range (a few kilometres in length) and diet (mainly mammals, reptiles, birds, and invertebrates) to feral cats (Gillies and Clout 2003). This is not surprising, considering that well-fed house-based cats are strong animals and retain their hunting instinct. Neck-bells can reduce predation rates on adult birds (Ruxton *et al.* 2002), but they are unlikely to make any difference to nest and chick predation, including effects on shorebirds.

If house-based cats were to be permitted at Te Arai they would readily roam to the Mangawhai Sandspit and Te Arai Stream, where they could potentially prey on adults, eggs, and young of all three species of tern and several wader species. The impact is also likely to be high at the Te Arai Stream, which is used by New Zealand dotterels and roosting fairy terns. If fairy terns nest here in the future they would be highly susceptible to predation from house-based cats.

House-based cats could be captured in traps, but there is potential for the development of trap-shy behaviour. In addition, every time that a house-based cat is captured, it renders a trap temporarily ineffective for the capture of other predators. Other coastal fauna species, e.g. lizards, would also be under increased predation pressure from cats. Clearly, house-based cats would not be acceptable in this environment, and it is for that reason that they are banned from the proposed development.

5.2 Predation and disturbance by dogs

Dogs can be trained and controlled more effectively than house-based cats. Dogs on a leash would not represent a significant threat to shorebirds at Te Arai if owners act responsibly. However, the ability of dogs to roam over vast distances means that any dogs unsupervised on even a short term basis could potentially gain access to any of the breeding and roosting areas at Mangawhai Sandspit and Te Arai within a very short period of time. Wader chicks are particularly vulnerable to unsupervised dogs because of the birds' tendency to initially run from a threat before hiding, a behaviour which attracts dogs. Dogs are likely to bite and kill any wader or tern chicks that they encounter.

If domestic dogs were permitted at Te Arai they would be able to be controlled most of the time. However, it is likely that dogs will occasionally get loose from time to time and wander undetected, especially at night. Wandering dogs are likely to be attracted to beaches, dunes, streams, and bird colonies. Access roads near the beach will also make it easier for non-residents to bring their dogs to the beaches during the day. Experience with kiwi management in Northland indicates that, even with the best intentions, predation events do happen, with devastating results for kiwi (Pierce and Sporle 1997).

Some shorebirds (e.g. variable oystercatcher) may be able to sustain some productivity loss from dog predation because they are long-lived and respond very well to standard shorebird protection management. However, there is little or no capacity for reduced productivity of New Zealand dotterels, Caspian terns, and, especially, the precarious fairy tern population (refer to Section 4.2 above). Dog management at Mangawhai and Te Arai clearly needs to be addressed in order to avoid or minimise the risk for fairy terns. The most effective way of achieving this is to totally exclude dogs.

5.3 Increased rodents and predators

Rodents could potentially be attracted to dwellings and therefore pose a threat to birds nesting at Te Arai and the base of the sandspit. They are also a threat to lizards, snails, and other biota in duneland vegetation. These habitats would, potentially, be within the home ranges of Norway rats (*Rattus norvegicus*) associated with some of the possible house sites. Somewhat surprisingly, Norway rats have not been recorded at Mangawhai shorebird sites (Hansen 2005). However, footprints seen at the edge of Te Arai Stream on 30 July 2005 were probably Norway rats (R Pierce pers. obs.). Rodents can increase in numbers where there are few predators, which can result in two effects, including direct impacts on invertebrates, lizards and shorebirds and, secondly, attracting mammalian predators to an area. Effective rodent control generally is likely to be undertaken willingly by some residents, but this would need

to be a monitored requirement of any land development (refer to action plan in Appendix 1).

5.4 Increased human disturbance

The development of a residential community would be accompanied by a large increase in foot traffic to the Mangawhai Wildlife Refuge (sandspit) and the Te Arai Stream, and possibly the Poutawa and Pakiri Streams to the south. Unless residents and visitors are carefully “managed”, this is almost certain to have significant negative impacts on the sand-dune environment and fairy terns and New Zealand dotterels in particular (as a result of increased and, at times, potentially chronic levels of disturbance). Critical times for fairy terns and other birds include storms or extreme high water events, which can occur several times during a breeding season. At these times, curious residents will be attracted to the sandspit environment and, unwittingly, place nesting birds and their eggs and chicks at considerable risk, potentially resulting in:

- birds abandoning breeding attempts because of excessive human activity in or around potential nesting sites;
- increased predation rates as a result of disturbed birds being away from their eggs and chicks for greater periods of time, which are consequently exposed to aerial predators;
- nests and eggs being trampled;
- habitat degradation.

These potentially chronic impacts could be avoided only if there were clear and strict codes of conduct, with total compliance, and wardens were present at critical sites and times. This approach is proposed for the development.

Following consultation with public agencies, particularly the Department of Conservation and a specialist report (Dowding 2006) several points were raised:

- (i) That the numbers of some species were underestimated or understated in the August 2005 version of this report (e.g. New Zealand dotterel) and the overall ecological value of the area was understated;
- (ii) Concern that the measures proposed (in August 2005) will not be effective given the projected increase in human population in the area. Dowding (2006) commented “It is my opinion that the most important potential impacts of the proposed development are those directly associated with human activities”, including night-time activities and associated disturbance, which are largely undetectable;
- (iii) Non-compliance with pet regulations;
- (iv) Use of vehicles (particularly quads and trail-bikes) on beaches and dunes;

- (v) Chronic disturbance to breeding birds at Mangawhai Refuge and Te Arai Stream;
- (vi) Impacts on shorebirds throughout the Mangawhai-Pakiri embayment and possibly further afield;
- (vii) No targets or performance measures provided.

Comments on the above points are set out below:

- (i) Species numbers. The underestimate of New Zealand dotterels stemmed from apparently incorrect figures for that species provided in a Department of Conservation report (Walls 2005). I concur with Dowding (2006) that the values of the Mangawhai Sandspit and Te Arai Stream warrant recognition as an “Outstanding” ecological site.
- (ii) Effectiveness of management. This is a genuine concern. However the revised proposal limits the number of dwellings to 850 and provides wider (500 m) buffers between dwellings and the sensitive area to the north of northern boundary. The camping ground is also proposed to be relocated to the southern part of the plantation forest, and the Forest License for this area has already been purchased. The intention is to develop a culture of care and partnerships between the residential community, Te Uri o Hau, and DOC at Te Arai, in which the protection of dunelands and shorebird habitat is paramount. This culture will rely partly on a ranger and wardens, but a key element will be to engender a sense of ownership and common responsibility by the community, rather than just providing funding and treating this issue as the responsibility of another group or agency (Te Uri o Hau 2006). This will see the community involved in the monitoring of peoples’ activities, including actively discouraging entering the dunelands and shorebird nesting areas, day and night. The culture of care approach will result in more residents being actively involved in managing dunelands and shorebird habitat, and maintaining designated minimal-disturbance areas for nesting shorebirds. A formal role for wardens will be retained for the fairy tern nesting areas, where negative impacts cannot be accommodated.
- (iii) Non-compliance with pet regulations. The culture of care, peer pressure, and presence of wardens will prevent nearly all pets from being brought to the development. The few that may be brought in are likely to be detected quickly by either formal monitoring by wardens, observations and peer pressure by residents, or be eliminated in the trapping regime. The trapping regime will provide a severe disincentive to bringing pets into the area and the Te Arai area will no longer harbour a reservoir of cats that can invade the Mangawhai Sandspit and Te Arai Stream. In contrast to small subdivisions where non-compliance and ineffective monitoring can be a particular problem (R. Pierce pers. obs.), the Te Arai proposal will overcome these potential problems due to a culture of care and community-enforcing mechanisms. It will provide more effective protection from predators than is currently the case: dogs, cats, and mustelids currently present in the forest and dunes present chronic threats for fairy terns, Caspian terns, and other birds at Mangawhai (Hansen 2005). The

incidents observed in September 2006 (disturbance to breeding site and fairy terns by motorcycle, people and dogs), have less chance of occurring during continuous monitoring and peer pressure within the community.

- (iv) Vehicle impacts. This is currently an issue at Te Arai, but it is expected that the problem will diminish as the development proceeds and particularly as the culture of care becomes instilled, resulting in all residents complying. Visitors' vehicles are also likely to decrease over time as any private access routes will be sealed off by residents. The increased presence of care-minded people in the area will ensure that breaches are detected and dealt with. In the absence of residents adjacent to sensitive sites, vehicle impacts are likely to increase.
- (v) Chronic disturbance at Mangawhai Wildlife Refuge and Te Arai Stream. These are the two most sensitive areas and the concern is justified as these areas are currently increasingly disturbed by the public and there have been only modest attempts to stop disturbance at the latter site in the past. However, the present proposal for Te Arai provides an opportunity to manage disturbance to a low level. The proposal offers tight controls and an educated and caring community, which is likely to provide improved future protection. Sites with nesting fairy terns will, however, be afforded intensive protection by wardens. The alternative way forward, that of fragmented development in the wider area with less effective regulations, could result in significantly increased disturbance and habitat degradation that is more difficult to address.
- (vi) Impacts further afield. The concern that increased human use will occur elsewhere in the wider area is valid. However, the nearest sensitive area beyond Te Arai-Mangawhai is Poutawa Stream to the south, and this site will also be managed in a manner similar to Te Arai Stream.
- (vii) Monitoring targets. It has been intended from the outset to monitor outcomes for shorebirds. Specific targets need to be set in conjunction with the Department of Conservation. They should not rely solely on seasonal breeding success, because fairy terns appear to suffer significant inbreeding depression with associated infertility (Ferreira *et al.* 2005) and all shorebirds can have bad years due to severe weather or predation intensity (Booth 1998). Instead, monitoring targets should take into account overall breeding success and causes of failure, with the latter being a pivotal measure. An appropriate management target for fairy terns and New Zealand dotterels would be as follows: the proportion of nest losses due to disturbance and predation in any year are not significantly greater than the mean recorded at Mangawhai in the period 2000-2005

6. EVALUATION OF PROPOSED MANAGEMENT APPROACH

A number of management options have been proposed by the joint venture to accompany the Te Arai development, as summarised and evaluated below:

6.1 Exclusion of house-based cats

Management proposed

- Cat exclusion. Cats will be banned from the community, i.e. no household will be permitted to own or tend a cat – this will be a legally binding condition of purchase, tied in by a covenant and this condition will also comprise part of the residents' association rules.
- It is envisaged that the community will police this as a culture of care pervades Te Arai, and a ranger will be appointed to undertake enforcement (refer to Section 6.4).

Evaluation

- Options for mitigating the effects of domestic cats, such as cat curfews, cat-bells, and cat neutering, will never be adequate to prevent predation of threatened species. The situation for fairy terns, in particular, is critical, with absolutely no margin for mistakes. Stochastic events (such as predation) could tip the balance against the demographics of this species (Ferreira *et al.* 2005). There is no justification for increasing the presence of cats, whether feral or house-based, at Te Arai, and the management proposed above will ensure that cats are kept at extremely low levels. Any attempts to flout the rules will be discouraged by residents, the ranger, Te Uri o Hau, and the traps set for feral cats.

Actions recommended

- Cat exclusion, as proposed – **essential**
- Cat trapping – refer to Section 6.3
- Ranger, iwi, and community to ensure total compliance and maintain rahui - **essential**.

6.2 Dog control or exclusion

Management proposed

- While dog ownership may be allowed, dogs need to be strictly controlled at Te Arai and on the beach. Restrictions at the Te Arai stream mouth are critical during the shorebird nesting season (1 July – 31 March). It is envisaged that the community will police this and the ranger will be responsible for enforcement.

Evaluation

- Dog impacts on shorebirds could currently be occurring in the Te Arai-Tern Point-Mangawhai area with the limited control which is in place. Dog restrictions would provide a degree of protection for some shorebird species, including variable oystercatcher. However, there is often no indication of potential problems with dogs until it is too late, such as a dog having run away from its owner or controller and into a shorebird nesting area. There are likely to be rare occurrences of dogs roaming at night and being attracted towards concentrations

of shorebirds, resulting in losses of eggs and chicks (but probably not adults). Predation losses of the more common species, e.g. variable oystercatcher, if only occurring on a rare basis, could potentially be balanced by the sustained improvement in predator and people control, with generally moderate to high hatching and fledging success.

- The key area of concern is potential dog impacts on fairy terns. Unlike predation of other shorebird species, a single predation event can be disastrous for fairy terns, potentially tipping the population into decline. The potential for dogs to wander long distances and kill indigenous fauna is well known, particularly for kiwi (Pierce and Sporle 1997), so the risk for terns nesting in the Mangawhai Wildlife Refuge is significant. Additionally, there is potential for fairy terns to nest at other nearby coastal sites, including Te Arai Stream. On 23 September 2006 two fairy terns vacated the Te Arai Stream area apparently in response to several people and two dogs. Different dogs (but no fairy terns) were in this area the following weekend.
- Unlike other stochastic events (e.g. storms and extreme high tides) that produce population catastrophes, predation from domestic animals can be managed by eliminating or reducing the potential threats. The simplest and most effective way of overcoming the risk of dog predation would be to establish a dog-free covenant on the property, with bylaws prohibiting visitors with dogs. If dogs were to be permitted at Te Arai, very tight regulations and monitoring would be needed, along the following lines:
 - evaluation and registration of dogs and their owners;
 - dog ownership should be restricted to one, limited, inland part of the property;
 - dog exercise areas would also need similar restrictions, with animals kept on a leash at all times;
 - dogs to be kept indoors at night;
 - offending visitors would be evicted or dogs destroyed and owners fined, with rights to own or keep dogs at the offender's property withdrawn;
 - ranger surveillance of nesting terns (Mangawhai) and key dotterel sites (especially Te Arai Stream);
 - establish tight monitoring and thresholds of success, e.g. review controls if any dog predation or disturbance is detected.

Whilst the above thresholds are likely to be adequate to protect New Zealand dotterels and other species, there is still no guarantee that predation of fairy terns by dogs would not occur. Therefore the following mitigation is proposed.

Actions recommended

- Exclude dogs - **essential**;
- Implement rule changes prohibiting dogs from public access areas at Te Arai stream and at the northern end of property, with appropriate signage – **essential**;
- Ranger and community to ensure total compliance - **essential**;

- Community care approach;
- Rahui to be established.

6.3 Predator impacts

Management proposed

- Ranger to implement ongoing pest (i.e. possum) and predator (i.e. mustelids, hedgehogs, rodents, and feral animals) control programme, funded by the Trust (refer to Section 6.1). To be implemented over the entire property, but with particular attention to the mouth of the Te Arai Stream and along the northern boundary of the property. This programme will be undertaken in conjunction and co-operation with any such work the Department of Conservation is undertaking in these areas;
- The progressive removal of pine forest will remove what is most likely a reservoir of pests and predators from the local area.
- In addition to predator control, a predator-proof fence could be constructed along the northern frontage of the property with the Mangawhai Spit Wildlife Refuge as well as along the north-western boundary adjacent to the golf course, if proven to be necessary. This would provide a degree of protection for shore birds nesting on the Mangawhai Spit from predators moving north through the Te Arai settlement.

Evaluation

- Possums, rodents (Norway rats, ship rats, and mice), hedgehogs, feral cats, and mustelids are likely to frequent the proposed development area, including Te Arai Stream. These would need to be monitored and controlled in order to protect nesting and roosting shorebirds and to prevent any ripple effects and subsequent negative impacts.
- A predator-exclusion fence between the proposed development and Mangawhai Sandspit could provide some benefit to fairy terns and other bird species nesting within the wildlife refuge. However, it is highly likely that some mammalian species could readily enter the refuge by travelling around the ends of the fence (most species) or by swimming across the Mangawhai Estuary (Norway rats and mustelids). Technology may improve, however, and the effectiveness of exclusion fences will be tested in the near future, e.g. at Tawharanui Peninsula.
- At this stage it would seem that the most cost-effective approach would be to control predators on the sandspit and to create a much larger buffer trapping area to the south and south-west. This would effectively eliminate most cats and mustelids approaching the wildlife refuge from the south, and avoid the need for a predator fence.

Actions Recommended

- Maintain spring-summer control of cats and mustelids across the property, primarily by trapping (refer to Appendix 1) – **essential**;
- Maintain spring-summer control of hedgehogs and rats at Te Arai Stream and along the northern boundary, primarily by trapping – **essential**;
- Provide further support to DOC, to enhance their predator control regime within the Mangawhai Wildlife Refuge (refer to Appendix 1) – **essential**;
- Maintain programme of diffuse autumn-winter control for cats and mustelids – **Priority 2**;
- In addition to managing core predators, maintain rodent and hedgehog control throughout the coastal dunes from Te Arai Stream (both banks) southwards for c.600 m in order to protect lizards, invertebrates, small birds, and other sites with sensitive biota - **Priority 2**.
- Evaluate the need for a predator fence – **Priority 2**.

6.4 Human disturbance

Management proposed

- Te Uri o Hau will declare a conservation Rahui over the area.
- A funded trust will be established from the return on the land development to pay for a permanent on-site wildlife ranger to work in co-operation with DOC. The ranger will be accommodated, on-site, within view of the Te Arai Stream mouth. An additional formal surveillance shelter will be constructed at the northern end of the property, to overlook the Mangawhai Spit Wildlife Refuge.
- All households within Te Arai will belong to a Residents' Association. The Association will be responsible for implementing a culture of care through its rules, in partnership with Te Uri o Hau and DOC.
- During the shore bird nesting season, pedestrian use of a large defined area around the Te Arai Stream mouth will be prohibited (Refer Appendix 2). No designated beach access will be closer than 500 m from the stream mouth and the access will be monitored and adjusted as needed in support of nesting or prospecting shore birds. It is envisaged that the Community will police this and the ranger will be responsible for enforcement. A formed walkway will facilitate pedestrian movement behind the stream mouth, well away to the west.
- Formal public pedestrian access to Te Arai beach will be provided at all key locations (i.e. from carpark and settlement areas in proximity to the beach). This will eliminate the need for any vehicle activity on the beach from within the Te Arai Community itself, thereby reducing the risk of vehicles disturbing nesting shore birds. In addition, with regard to non-locals and their use of vehicles on the beach, the presence of a residential community will result in Council bylaws

prohibiting such activity, and the enforcement of bylaws. The wildlife ranger could also be empowered to enforce council bylaws.

- The land use design proposed for the Te Arai Community has part of the golf course located between the Mangawhai Spit Wildlife Refuge and the permanent housing areas. This extends the distance between the permanent resident community and the fairy tern breeding grounds on the Spit. There will also be one point of arrival for Village Resort visitors who can be advised, on arrival, to keep out of the nesting sites to the north and south.
- Community education regarding the plight of shore birds and the importance of their local nesting grounds will be a principle written into the rules of the Residents' Association, with the aim being to create a community objective to keep these safe. The conservation of these species and the maintenance of their local breeding grounds will be incorporated into the marketing of the community, and will be also incorporated into appropriate interpretation and signage at key locations.
- TUOH joint venture has made a commitment to the Department of Conservation with respect to shorebird protection. This is attached as Appendix II. I have reviewed and endorse the general content of this document. I note that some of the details of the rahui and code of conduct have yet to be finalised, for example the specific rules of the community of care approach. I also suggest one amendment of that document in Section 2 under Pet Management – that “Management of the cat ban and dog control and any potential threats from pets specified in the Shorebird Management Plan” be replaced with “Management of the pet ban and monitoring and removal of any pets detected as specified in the Shorebird Management Plan.”

Evaluation

- The above proposals would alleviate most pressures on shorebirds, particularly at the Te Arai Stream, which has been coming under increased human pressure. The proposals should also be refined over time to provide more effective and wider protection. One requirement is to minimise damage to fragile nesting habitat of shorebirds and fairy terns at the Mangawhai Wildlife Refuge. In western Europe, critically important coastal sites such as these are often gazetted as nature reserves (with entry by permit only) or foot traffic is restricted to defined routes (R. Pierce pers. obs.). Because this is not the case at Mangawhai, the acceptable level of human use of the dunelands would need to be addressed in consultation with the Department of Conservation. Potential options include semi-permanent fencing of the most sensitive habitats and/or gazettal of the wildlife refuge as a Nature Reserve (under the Reserves Act 1977).
- The critical requirement is to avoid human disturbance of birds nesting in the Mangawhai Wildlife Refuge, particularly fairy terns and Caspian terns. In recent years, the standard approach has been to fence off sensitive sites (with posts and tapes) for the breeding season and allow human access up to c.100 m from the nesting birds. There are occasions when this approach has been less effective,

e.g. when pairs nest close to MHWS or when tern chicks move to sites near to thoroughfares (K. Hansen, Department of Conservation, pers. comm. 2005).

- Clearly, the presence of markedly increased numbers of people in and around nesting sites could increase the frequency of disturbance, which also increases the risk of fatal disturbances. This will be addressed through the adoption of a community care approach supported on a daily basis through the work of seasonal wardens. The role of the wardens should be to manage people issues rather than predator control, which should be undertaken by a professional trapper (refer to Section 6.3).
- The wardens' role with the Department of Conservation fairy tern programme should be integrated with the Department. For example, fairy tern protection is likely to be more effective if the wardens operate across the wildlife refuge rather than basing them at a building at Te Arai (although Te Arai Steam mouth is a logical location for a ranger headquarters and should also include an observation post and interpretation panels). Currently there can be up to four pairs of fairy terns nesting at Mangawhai at any time, so there would be a need for 2-4 wardens located concurrently at the edge of each territory. The number of wardens needed and the focus of their efforts could change in the future. For example, it is not known whether an increase in the fairy tern population would result in a larger fairy tern colony at Mangawhai or whether isolated pairs will nest at new sites, such as Te Arai and Pakiri (Taylor *et al.* 2004). If fairy terns start nesting at Te Arai, then additional effort may be required.
- One of the spin-offs from increased shorebird protection is that increasing numbers of pairs of New Zealand dotterels and variable oystercatchers are likely to nest in the wider area, e.g. along the beach and within the dunes to the south of Te Arai Stream. This does present a potential conflict between the needs of the birds and the activities of residents and beach users who concentrate at this point of high accessibility and interest. Management of these areas will need to be adaptive to accommodate nesting birds.
- Dowding (2006) pointed out that people tend to seek out secluded parts of the beaches, so these birds could be at greater risk. However, the current pattern of use at Te Arai (and many other sites), is markedly different with human utilisation of the area being clearly of poisson nature (decay curve pattern) and heavily focussed on access points. This pattern can potentially be enhanced by providing amenities and other resources that focus activity away from the more sensitive areas and warning people from entering the sensitive areas.
- The fact that many fairy terns and New Zealand dotterels in general breed at "attractive" coastal sites that are readily accessed, e.g. estuaries, means that they will come under increasing and significant human pressure. This is likely to be the case in the Te Arai area unless a culture of care is instilled amongst the community and responsibility is taken to identify sensitive sites on an ongoing basis, to raise awareness amongst residents and visitors, and fence off sensitive areas. The project is likely to attract many conservation-minded people as residents with ensuing landcare initiatives as has occurred prolifically in Northland in recent years.

Actions recommended

- Explore options for gazetting all or part of the Mangawhai Wildlife Refuge as a nature reserve or other suitable protected area classification. This would allow legal exclusion of people from the fairy tern nesting sites (which vary from year to year), using a moveable boundary delineated with ropes and signs. Corridors could be retained for traditional access to ensure local community support of protection initiatives is retained. This approach should be explored more widely for a number of sites in northern New Zealand, to help accommodate the anticipated general increase in human pressure over coming decades – **essential**;
- Appoint a permanent professional ranger who is responsible for protection of shorebirds and other biota at Te Arai and Mangawhai – **essential**;
- Appoint seasonal wardens to assist with monitoring of fairy tern, Caspian tern, and New Zealand dotterel nesting sites at Mangawhai Sandspit and at Te Arai Stream mouth (and liaise with the Department of Conservation on their particular roles and associated infrastructure requirements, e.g. buildings). Wardens' roles should be integrated with the community of care approach (see below) - **essential**;
- In conjunction with the Department of Conservation, erect fences and signs seasonally at Mangawhai Sandspit at all potential fairy tern nesting sites, Caspian tern colonies, and New Zealand dotterel nesting clusters throughout the breeding season. This approach could be refined over time as more effective mechanisms are identified and agreed with DOC – **essential**;
- Fence and identify all New Zealand dotterel nesting clusters at Te Arai Stream, as described for Mangawhai above. The fences need to cover a wider area than is currently (September 2006) the case in order to protect all the current sensitive breeding areas and potential breeding areas of fairy terns – **essential**;
- Provide directions and physically protected foot access thoroughfares at Te Arai and Mangawhai, taking into account sensitive habitats (such as dunes, indigenous shrubland, pingao sites) – **essential**;
- Provide ranger accommodation within the protection area defined (refer to Appendix 2) at the Te Arai Stream mouth –**essential**;
- Discuss the potential roles of wardens and infrastructure needs with the Department of Conservation – **essential**;
- Initiate discussion with the Department of Conservation on the value of extending the existing Conservation Act covenant to include the defined protection area at Te Arai Stream – **essential**;
- Declare an appropriately considered conservation rahui over the area that provides effective protection of shorebirds and other biota from disturbance and damage – **essential**;

- Develop a culture of care that includes early detection of new sensitive areas (e.g. pairs of dotterels breeding at new sites to the south of Te Arai Stream) and provide secluded habitat for these birds – **essential**;
- Evaluate the potential for management of other sensitive habitats, e.g. Te Arai Stream, adjacent low-lying habitats, and dune vegetation, and implement appropriate management, including carefully planned restoration planting. For example, the Te Arai Stream and the adjacent wetlands have the potential to support populations of whitebait (*Galaxias* spp.), other indigenous fish species, and wetland birds, while the ecological values of the dunes could be greatly enhanced – **Priority two**.

6.5 Monitoring

Management Proposed

- Outcome-based targets for monitoring of shorebirds will be set in conjunction with the Department of Conservation.

Evaluation

- The effectiveness of the management regime should be determined by monitoring operational efficiency and outcomes, in conjunction with the Department of Conservation.

Actions Recommended

- Monitor operational effectiveness of the above using rat indexing and maintenance of a sightings register (for cats/mustelids/dogs); allow for the use of “predator-dogs” to search for specific predators – **essential**;
- In conjunction with DOC set targets for breeding success of fairy terns in the Mangawhai area and New Zealand dotterels at Te Arai Stream, and monitor outcomes of the suite of management actions for these shorebirds – **essential**;
- Report on outcomes annually - **essential**.

7. CONCLUSIONS

The Te Arai-Mangawhai area has outstanding conservation values because of the presence of nationally important habitat for New Zealand fairy terns and several other species of threatened shorebirds. The proposed subdivision development will be accompanied by a suite of management actions to protect the shorebird populations in the area. These actions include the adoption of a community care approach, exclusion and active management of domestic pets, control of predators and other pests, habitat enhancement, advocacy, surveillance, and monitoring. Implementation of these management actions in a professional and rigorous manner at Te Arai-Mangawhai will result in significantly enhanced productivity and an increase in overall values for

shorebirds at these sites. The principal concern is of the numbers of people and the potential disturbance to fairy terns in particular, and therefore the proposed culture of care and rahui need to be carefully designed, implemented and monitored. It is important to note that if the Te Arai project does not proceed, there may be no effective mechanisms to provide for ongoing protection of threatened shorebirds and their habitats in this important area.

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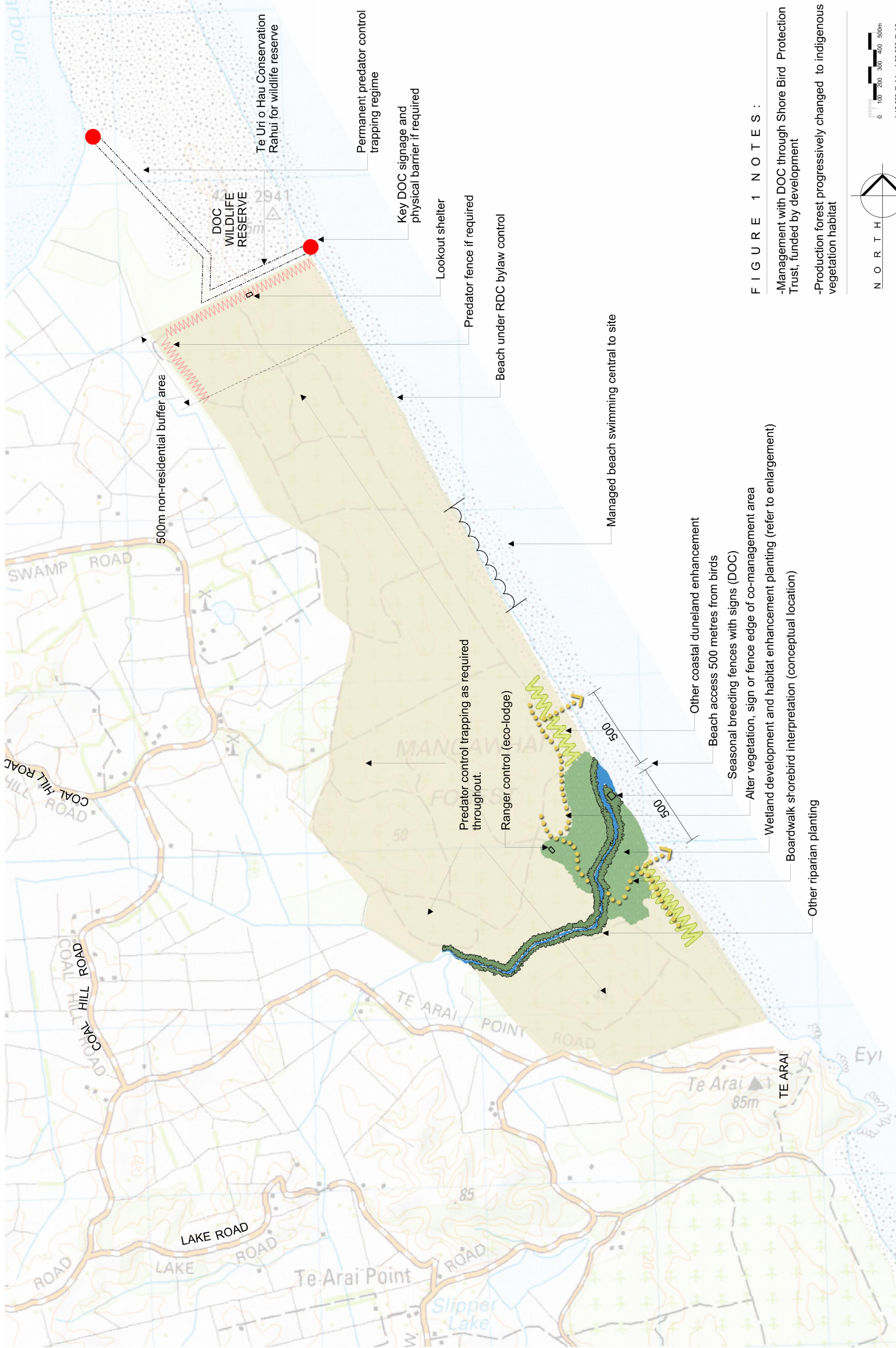
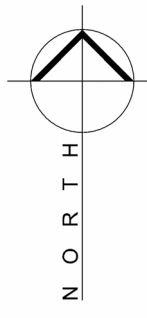
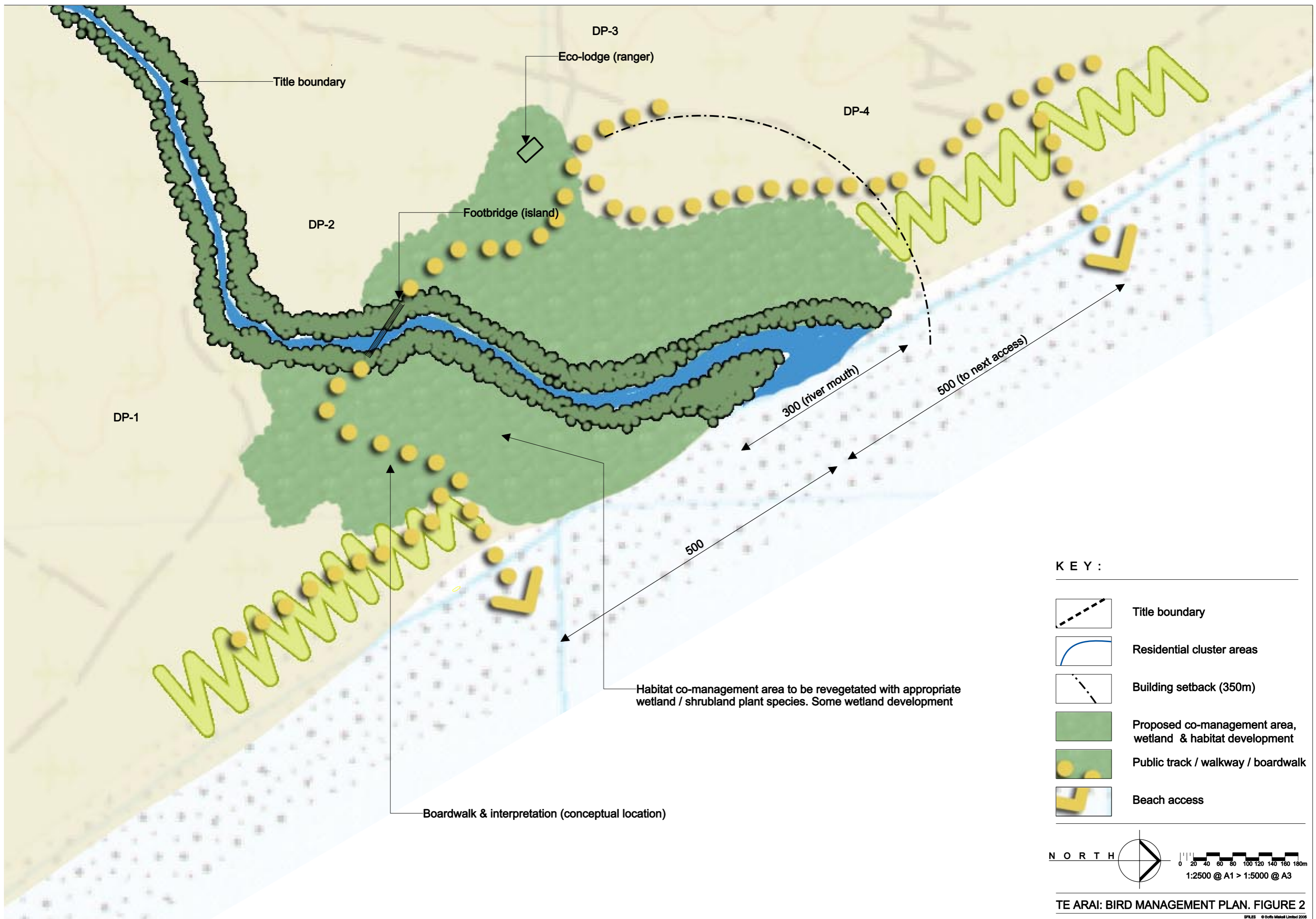


FIGURE 1 NOTES :

- Management with DOC through Shore Bird Protection Trust, funded by development
- Production forest progressively changed to indigenous vegetation habitat





Title boundary

DP-3

Eco-lodge (ranger)

DP-4

DP-2

Footbridge (island)

DP-1

300 (river mouth)

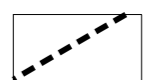
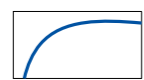
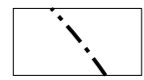



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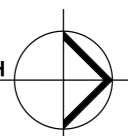
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Habitat co-management area to be revegetated with appropriate wetland / shrubland plant species. Some wetland development

Boardwalk & interpretation (conceptual location)

KEY :

-  Title boundary
-  Residential cluster areas
-  Building setback (350m)
-  Proposed co-management area, wetland & habitat development
-  Public track / walkway / boardwalk
-  Beach access

N O R T H 

0 20 40 60 80 100 120 140 160 180m

1:2500 @ A1 > 1:5000 @ A3

TE ARAI: BIRD MANAGEMENT PLAN. FIGURE 2

SPL&S © South Maitland Limited 2006

MANAGEMENT PLAN FOR PROTECTION OF SHOREBIRDS AND OTHER BIOTA AT TE ARAI

1 OBJECTIVES

- To maintain effective control of top predators (dogs, cats, mustelids) throughout the year.
- To maintain effective control of mammalian predators at Te Arai Stream during the shorebird breeding season, August-January.
- To maintain effective control of mammalian predators in a managed buffer to Mangawhai Sandspit during the shorebird breeding season.
- To maintain effective protection of duneland biota.
- To minimise human impacts in sensitive sites.
- To increase awareness of biota of the Te Arai area.
- To monitor success of the ecological programme.

2. MANAGEMENT METHODS

2.1 Control top predators throughout Te Arai

Target Species

- Dogs, cats, and mustelids (ferrets, stoats, weasels).

Timing

- Continuous.

Method

- Dog exclusion covenant in place throughout all of the Te Arai development.
- Dog exclusion advocacy, with a system for providing reports (of dogs) to duty warden(s).
- Dogs excluded from beaches at Te Arai by Council bylaw (integrate with Rodney District Council).
- Appoint pest control operator to undertake predator control for two days/week in July-February and two days/month for remainder of the year.
- Establish cat-free covenant for all of the Te Arai development.

- Cat traps, set continuously at key points, especially secluded stream banks, re-invasion boundary points to south and west, and the northern perimeter. Traps required are a combination of modified Conibears (SA traps, *c.20*), modified Timms traps (*c.20*), and cage traps and box traps (*c.20*), all baited mainly with fresh rabbit or fresh fish. Kill traps (SA and Timms) to be checked fortnightly in winter, weekly in summer (October-March). Include new technology (trap types and baits) as appropriate.
- Mustelid traps, set continuously. Traps required are double set Fenn Mark 6 traps, placed under white plastic tunnels. Avoid tunnels with floors, which reduce rat capture rates, or black plastic tunnels, which result in “cooked” baits in sunny locations. Baits should be mainly salted rabbit (follow standard prescription, i.e. 2.5 cm cubes of hairless rabbit meat soaked overnight in non-iodised salt mix, drain blood, ensure baits are firm, keep frozen until day of use). Place bait on elevated wire between the two traps. Haze traps to direct animal over the trap plate. Check monthly in cooler months and fortnightly in warmer months (October-March). Fresh rabbit is a useful alternative to salted rabbit, and checking should be undertaken twice weekly if used. Investigate other efficient kill-traps that become available, e.g. there are indications that the DOC 200/250 trap design is effective.
- Possums – contract control is needed when indices exceed 10% residual trap catch (RTC) or equivalent bait take level.

Monitoring

- Record sightings of dogs and outcomes of incidents.
- Cat and mustelid captures entered on database and monitored throughout year.
- Check for predator footprints on beach and at estuary.
- Rabbit browse on pingao.
- Possum indices.

Contingency Plans

- Increased dog control – several options are available and advice should be sought from the New Zealand Landcare Trust and Department of Conservation.
- If trap-shy cats and mustelids are present, liaise with other predator controllers (e.g. DOC kiwi programme) – options include the use of predator dogs or alternative trapping and baiting methods.
- Rabbits – if rabbits become common and are affecting sensitive plants (e.g. pingao), implement control using Pindone poisoning or night-shooting.
- Rats – if rats increase in numbers, consider widespread control – refer to Section 2.2 below.

2.2 Te Arai Stream

Target Species

- Norway rat, ship rat, hedgehog, dogs, cats, mustelids, and possums.

Timing

- 1 August – c.30 January, later if unfledged chicks are present.

Methods

- Rats are best controlled by poisoning with bait stations placed on a c.100 m grid from c.200 m north of Te Arai Stream and extending to c.600 m south of the stream. The grid should be 2 lines wide behind the dunes and additional stations should extend along both banks upstream for c.500 m (refer to map). Initiate control in late July-early August using diphacinone (Ditrac) placed in plastic tubing (500 mm long x 70 mm wide) with multiple baits pegged in place by wire pegs that pass through baits and the station and into the ground. There are also submarine-shaped bait stations designed especially for these baits and which are more weather proof. All bait stations need to be ground-based because of the terrestrial behaviour of Norway rats.
- Rat numbers are best monitored initially by the rate of bait-take from the bait stations. Once bait take has ceased, this should be verified using other methods, e.g. tracking tunnels in the rear-dune area (n=25 on the inside of the dotterel nesting areas), rat capture rates in Fenn traps and checking for rat footprints along the muddy edges of the Te Arai Stream prior to shorebird breeding. If rat sign persists, provide more poison in the bait stations. If there is no additional bait take, consider setting standard rat traps at 50 m intervals along the Te Arai Stream, and trialling alternative baits and lures.
- Mustelids – as per wider Te Arai programme (refer to Section 2.1 above), with the addition of Fenn traps at 100 m intervals along the stream edge upstream of the dunes and at 100 m intervals along the rear of the dunes running south from the Te Arai Stream for the duration of the nesting area (c.600 m). Repeat on northern side for c.200 m. Baits and checking regime as per Section 2.1 above.
- Cats – as per wider Te Arai programme, with the addition of c.10 kill traps (modified Timms and modified Conibear) located at c.200 m intervals behind the colony, including stream banks - baited with fresh rabbit pieces and minced rabbit respectively, and checked and rebaited weekly.
- Hedgehogs –as per mustelids above.
- Possums – control needed only if RTC exceeds 10% (refer to Section 2.1 above). Site-specific control options could include Timms traps baited with apple/cinnamon and modified Conibear traps (SA traps) lured with flour/cinnamon.

- Rabbit contingency – as per Section 2.1 above.
- Gulls – discuss control methods with the Department of Conservation if there are concerns regarding black-backed gull impacts on shorebirds. Effective gull control has been undertaken at other sites using the narcotic Alphachloralose.

Monitoring and Contingencies

- As per Section 2.1 above.

2.3 Buffer to Mangawhai Wildlife Refuge

Target Species

- Norway rat, ship rat, hedgehog, dogs, cats, mustelids, and possums.

Timing

- 1 August – 30 January, or later if unfledged chicks are present.

Method

- Rats – use bait stations as per Te Arai Stream, i.e. placed at 100 m intervals along two parallel lines also 100 m apart. Note that another double line buffer should ideally be established by the Department of Conservation between the Tern Point subdivision and Mangawhai Sandspit.
- Mustelids – as for the Te Arai Stream regime, i.e. double lines of Fenn traps located at *c.*100 m intervals along likely hunting pathways. Baiting regime as per Te Arai Stream.
- Cats – as per wider Te Arai programme, with the addition of *c.*20 kill traps (modified Timms and/or modified Conibear) along the boundary - baited with fresh rabbit and minced rabbit respectively and checked and rebaited twice weekly.
- Hedgehogs – as per mustelids above.
- Possums – as per Te Arai Stream.
- Rabbit contingency – as per Section 2.1 above.

Monitoring and Contingencies

- As per Section 2.1 above.

2.4 Protection of dune biota

Target Species

- Norway rat, ship rat, hedgehog, dogs, cats, mustelids, possums, and rabbits.

Timing

- Continuous.

Methods

- Determine target area, i.e. example of best representative habitat, which is likely to include the back dunes extending c.600 m south of Te Arai Stream. Undertake invertebrate survey.
- Rats – use same bait stations as per Te Arai Stream, but maintain control year round. Monitor bait take and remove baits if none are being eaten; monitor rodents, including mice.
- Mustelids – as for the Te Arai Stream regime.
- Cats – as per Te Arai Stream regime.
- Hedgehogs – as per mustelids above.
- Possums – as per Te Arai Stream.
- Rabbits – monitor sensitive plants, e.g. pingao, for signs of rabbit browse and implement control as per Section 2.1 above.

Monitoring and Contingencies

- As per Section 2.1 above.

2.5 Minimise human impacts on biota

Target Species

- People.

Timing

- Spring and summer for shorebird protection, ongoing for sensitive habitats.

Methods

- Appoint and train, with Department of Conservation support, four part-time wardens to undertake compliance and law enforcement and advocacy. The aim is

to provide protection (from people) for the fairy tern nests and chicks at Mangawhai Spit, and shorebirds generally at Te Arai.

- The principal aim of this monitoring is to ensure disturbance from people is kept to an absolute minimum during nesting. Likely nest sites will be identified from bird behaviour and these areas will then be roped off and signs erected to ensure that people do not enter.
- It is anticipated that one warden will be stationed at Te Arai throughout the nesting period and that others will be based at Mangawhai as required, i.e. when pairs of fairy terns are nesting. It could be that two pairs can be safely observed by one warden, but it is likely that up to three wardens will occasionally be needed to check simultaneously.
- Roles will also include some general behavioural monitoring of terns, e.g. responses to predators.
- Develop a culture of care among residents and encourage residents to take part in the structured management and monitoring programmes.

Monitoring and contingencies

- Assess and review annually.

2.6 Advocacy

Target Species

- People.

Timing

- Throughout year but especially in spring and summer for shorebird protection.

Methods

- Appoint wardens (refer to Section 2.5 above).
- Erect interpretation panels at Te Arai Stream and along the northern boundary to highlight habitat and species values, threats, codes of conduct, how people can be involved, and any other relevant matters. News updates could also be provided.
- Construct a warden headquarters beside the Te Arai Stream.

Monitoring and Contingencies

- Review annually.

2.7 Outcome monitoring

Target biota for Monitoring

- Dunes, vegetation, fairy tern, New Zealand dotterel, other sensitive fauna. For threatened fauna, performance targets should be agreed with the Department of Conservation and include, for example, an assessment whether annual nest failures due to predation and disturbance is significantly different to that recorded in previous years of management.

Timing

- Throughout the year, but especially spring and summer for shorebird protection.

Methods

- Wardens trained in collection and recording of shorebird data, as agreed with the Department of Conservation.
- Confirm monitoring responsibilities with the Department of Conservation and collect appropriate data.
- Set up vegetation photo points in key sites being managed (e.g. dunelands and wetlands at Te Arai) and consider monitoring other biota, e.g. dune invertebrates, whitebait.
- The following fairy tern data should be collected each season at Mangawhai, in collaboration with Department of Conservation: total numbers of pairs, and for each pair, colour bands, number of nests initiated (don't visit nests, determine from observations), number of nests hatched, number of chicks hatched, number of chicks fledged, and causes of failure (where known).
- The following New Zealand dotterel data should be collected each breeding season at Te Arai, in collaboration with Department of Conservation: total number of pairs, and for each pair, colour bands, number of nests initiated (don't visit nests), number of nests hatched, number of chicks hatched, number of chicks fledged, and causes of failure (where known).
- Record details of any terns seen at Te Arai – date, species, number, behaviour, observer.
- Analyse and report on outcome monitoring annually.



D A R B Y P A R T N E R S L I M I T E D

16 August 2006

Rolien Elliot
 Warkworth Area Manager
 Department of Conservation
 PO Box 474
 Warkworth
 Auckland

Dear Rolien,

We are in receipt of your communication (email 11th August 2006) where you summarise both Northland and Auckland Conservancy questions. We appreciate your visit on 10th August to explain these with us. We will not respond to each of the questions specifically. They are however, all covered in the following. In short our intention is to establish a Community of Care Programme and back this with; a Shorebird Management Plan (with DOC); Dune Management Plan (with DOC, ARC, RDC); an inland Vegetation Management Plan (with RDC); a Coastal Park (with DOC, ARC, RDC jointly) under a Deed with DOC.

In respect to shorebird protection, the Te Uri o Hau Joint Venture will deliver:

Principal Mechanisms:

1. A Community of Care Programme undertaken through the Residents Association:
 - Te Uri o Hau and RDC will be represented on the Residents Association.
 - Residents Association rules will commit all residents/owners to the “community of care” rules.
 - Sales and Purchase agreements will commit owners to the Residents Association including prohibitions on pets and that rules/commitment/restrictions will be registered on titles.
 - Community of Care rules will be agreed with DOC before implementation.
 - Specific rules will be developed for The Village visitor accommodation.
 - Educational interpretation material will be attached to visitors booking confirmations.
 - Public access control.

2. A Shorebird Management Plan will be prepared by the JV’s Ornithologist (Dr Pierce) and agreed with DOC, RDC, ARC and the Fairy Tern Recovery Group as appropriate, to cover:

Ranger Management

A permanent community appointment with DOC advice and located on site. The Ranger will be warranted with powers under relevant legislation. He/she will be responsible under the Residents Association for:

- Predator control, full site, stepped up prior to and during breeding season particularly in the wildlife areas.
- Pet management; Management of the cat ban and dog control and any potential threats from pets specified in the Shorebird Management Plan.
- Nesting protection; in association with DOC surrounding nesting areas encompassing fencing signage and advocacy.
- Advocacy, Interpretation and Education; in association with DOC for the preparation and application of educational and interpretation material. This could include videos, pamphlets, ranger talks.
- Liaison and partnership with DOC wardens generally during shorebird nesting periods.
- Public access control over access to beach and foredune system in conjunction with DOC for wildlife management and with RDC for beach control and bylaw enforcement.
- Monitoring and auditing of the Shorebird Management Plan will rest with DOC and the NZ Fairy Tern Recovery Group.

It should be noted that the Ranger may also have responsibility to the Residents Association for supervising general Forest Management and Vegetation responsibilities.

3. A Dune Management Plan will be prepared by the JV's Dune Management specialist (Dr Dahm) and agreed with DOC, RDC and ARC as appropriate. (Refer Dune Management report 2006 for detail)
4. A Vegetation Management Plan will be developed for the full site as a component of the Te Arai Special Zone and subsequent Resource Consents. While RDC focussed it would also be of benefit to DOC. It will include:
 - Forest Management
 - Revegetation management
 - Financial commitments incorporating timeframes
5. NZ Fairy Tern Recovery Plan. A financial contribution will be made towards the implementation of the NZ Fairy Tern Recovery Plan. This will be negotiated with DOC in the context of the overall commitments. Te Uri o Hau will continue to be represented on the Fairy Tern Recovery Group.
6. A Coastal Park will be provided as a component of the commitment to the Special Te Arai Zone. To be achieved by a perpetual lease in the North, (Te Arai Beach) and extended to the South of Te Arai Point, (Pakiri Beach) to the Poutawa Stream initially, by part transfer of the Forest License and ultimately following Treaty Settlement, by perpetual lease as at Te Arai Beach. These commitments will be achieved by a specific legal Deed in expectation eventually of a joint DOC, ARC and RDC management regime.

Other Mechanisms

7. DOC Covenant at the mouth of the Te Arai Stream will be extended with any specific management requirements spelt out in the Shorebird Management Plan, the Dune Management Plan and the Vegetation Management Plan, as required.
8. Pedestrian Access will be provided at Te Arai Beach under the Special Zone at limited locations agreed with DOC, RDC and ARC as required, to include:
 - fencing
 - surface hardening
 - a minimum distance from the Te Arai Stream mouth of 500m.
 - barriers to prevent vehicles and motorbikes at these points.
 - Prominent signage

Details will be provided under the Dune Management Plan. No access will be provided from the development to the Mangawhai Spit. (Refer to Dune Management Report, 2006)

9. A shorebird Conservation Rahui will provide a cultural layer of protection. In relation to this there will be:
 - interpretation
 - signage
 - physical restrictions or barriers as required
10. The Te Arai Development will be capped at 850 residences with a 500m separation to the Mangawhai Wildlife Reserve. "The Village" visitor accommodation will be located 2km from its southern edge to the Dotterel nesting/Fairy Tern flocking area at Te Arai Stream. It will be 2.5km and 3.5km respectively from its northern edge to the Fairy Tern nesting sites (2005/06).

Further comment

Most of the points are gathered up in the commitments above or will be for the detailed management plans. The specialist reports for the special zone Ornithology (Dr Pierce), Dune Management (Dr Dahm) and Landscape/vegetation (Rachel de Lambert) provide detail (now revised) and recommendations from those specialists. Each of these plans are provided for under the Te Arai Special Zone and would come in to being on the approval of the subsequent resource consent for the first stage for development.

The Community buy in and ownership will be important. In that respect there are now many good examples around the country, many more known to DOC. Creating a new community enables that culture to be incorporated at the outset which is preferable to endeavouring to graft it on to an existing community.

At the outset the Te Uri o Hau Joint Venture takes the role of the Residents Association with the latter taking over progressively as the population builds.

The Department of Conservation can rely upon the agreed commitments offered by TUOH Joint Venture as they will be articulated in a legal deed that will bind existing and future land owners.

Finally, as from the outset of this project the joint venture continues to approach issues surrounding DOC interests and responsibilities from the point of view of providing a net environmental benefit.

Yours sincerely

Ewen Henderson
Te Arai Project Manager

cc Esther Gray – Te Uri o Hau Settlement Trust
cc John Darby – Darby Partners Limited
cc Warwick Murray – Department of Conservation