IN THE MATTER OF **the Resource Management Act 1991**

AND

IN THE MATTER OF **Proposed Private Plan Change 85 to the Kaipara District Operative District Plan: Mangawhai East**

EXPERT EVIDENCE OF IAN SOUTHEY

On behalf of the **New Zealand Fairy Tern Charitable Trust**

28th January, 2026

Introduction

1. This statement of expert evidence addresses matters related to birds arising from Private Plan Change Request 85, to change the zoning of 94 ha of land from rural to residential and commercial to permit development that is fully described in the applicants proposal and referred to in this evidence as the site.

2. I am providing expert evidence on behalf of the New Zealand Fairy Tern Charitable Trust and particularly address the loss of existing feeding habitat on this area for Australasian Bitterns and on issues arising from development that will flow on to affect birds in nearby habitats, in particular, the New Zealand Fairy Tern and other Threatened and At Risk bird species using the harbour.

3. I am familiar with the Code of Conduct for Expert Witnesses produced by the Environment Court (2014) and undertake to follow it for this hearing. I confirm that the issues addressed in this brief of evidence are within my area of expertise unless specifically attributed to others. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed.

Relevant experience

4. I have had a strong and active interest in fairy terns, especially since 2012, and have become a member of the New Zealand Fairy Tern Charitable Trust (the Trust or NZFTCT). I have assisted the trust in a variety of hearings regarding fairy terns before Regional and District Councils and in the Environment Court since 2017.

5. Relevant ongoing field research carried out by me, some of which is ongoing, that informs this submission includes:

    a. Every year since 2014 I have monitored and mapped the feeding territories of fairy terns on Mangawhai harbour.
    b. From November 2019 to January 2020 members of the NZFTCT and I observed foraging patterns by the pair of fairy terns that occupied the feeding territory adjacent to the area covered by Proposed Plan Change 85 site, mapping dive sites, and recording the physical condition of the environment, the presence of people and the reaction of fairy terns to them.
    c. Since 2012 I have made an effort to monitor fairy terns over the non-breeding season and have built up a data base to monitor survival.

d. In 2022 I helped Alex Flavell-Johnson (Conservation Manager for the Shorebirds Trust) to design a monitoring program for bitterns between Marsden Point and Pākiri although I have been unable to assist with this over the last year.

6. This submission is also based on my own knowledge of birds in general, and a search of the relevant literature. I was not able to visit the site to refresh my knowledge of it but have reached out for key information. I am, however, intimately familiar with the harbour immediately adjacent to it as I frequently monitor the fairy terns that use it.

Ecological information provided in the application

7. There were two ecological assessments provided covering about half of the site each. The ecologists' assessments were brief with only two and three days' field work focused more on plants than animals which were largely assessed using publicly available databases rather than a site specific assessment.

8. The list of 49 bird species for the site and its surrounds is, however, accurate and tolerably complete. The site is mostly agricultural land and the bird fauna is largely of exotic and common native species and unremarkable. Looking at the threat status of the birds listed, however, two 'Threatened, nationally critical' species stand out as red flags. These are the Australasian Bittern and the New Zealand Fairy Tern but there are a further three 'Threatened' and twelve 'At Risk' bird species recorded.

9. Mangawhai Harbour encroaches on to the site in two places and both have been proposed by the ecologists as SNAs. Both have native saltmarsh vegetation and the southern area contains mangroves which were reasonably considered potential habitats for bitterns and other 'At Risk' wetland bird species. The possibility of fairy terns roosting on sparsely vegetated saltmarsh was also considered.

10. A distinction is drawn between bird species recorded on the site and species recorded near to the site. The potential effects on wildlife adjacent to the site do not appear to have been considered. There several reasons why linkage between the site and adjacent habitats should be considered in planning including:

(i) Many individual birds will move back and forth across the boundary on a daily or seasonal basis and even if the site provides only part of their requirements, it may be a critical part of their requirements.

(ii) More residential housing means that more people and their pets will use the adjacent harbour for recreation and disturb the birds there. The provision of easier access could exacerbate the issue by drawing visitors as well.

(iii) More residential housing and commercial businesses will increase traffic density near the site and increase the risk of roadkill.`

(iv) Some fish species that may be prey for some birds, including eels and inanga, may move between wetlands and the harbour, migrating as part of their life cycle or on a more frequent basis.

Impacts from development on the site will spread into the surrounding areas, including Mangawhai Harbour, and it is imperative that they be considered when assessing Private Plan Change 85.

Bird species on the site and in the harbour adjacent to it

11. There is set of exotic and native terrestrial birds that are commonly found on open farmland with trees or hedges and will also use mangroves. This includes iconic species like Tui and Morepork but they can thrive in a built environment that includes gardens with trees and even small stands of trees. I do not consider them at risk from development unless it is intensive and note that they are widespread and common elsewhere.

12. One group of birds may inhabit the dense cover formed by rush and shrub dominated saltmarsh and mangroves on site - Australasian Bittern, Banded Rail, Fernbird. All of these birds are threatened or at risk species but none of them was identified on site although bitterns were seen immediately adjacent to it (Appendix 14). Australasian Bittern, assessed as 'Threatened - nationally critical" is the most important of these birds.

13. The sea and shore birds feeding on the intertidal flats and channels in the harbour include a variety of migrant and breeding waders, gulls, terns, herons, and shags (table 1). The most important species is the New Zealand Fairy Tern, ranked as 'Threatened-nationally critical' and New Zealand's rarest endemic bird with 60-80% of the total breeding population feeding in Mangawhai Harbour over the last five years.

	Threat category	Whole harbour	Adjacent to PPC 85 site	Status
Threatened species				
White Heron	Nationally critical	O	O	
Fairy Tern	Nationally critical	R	R	B
Reef Heron	Nationally endangered	O		
Grey Duck	Nationally vulnerable	R	R	B
Caspian Tern	Nationally vulnerable	R	R	B
Wrybill	Nationally increasing	R		NZM
Brown Teal	Nationally increasing	O		
New Zealand Dotterel	Nationally increasing	R	R	B
At Risk species				
Lesser Knot	Declining	R	R	IM
Banded Dotterel	Declining	R	R	B + NZM
South Island Pied Oystercatcher	Declining	R	R	NZM
Black-billed Gull	Declining	R		B
Red-billed Gull	Declining	R	R	B
Bar-tailed Godwit	Declining	R	R	IM
White-fronted Tern	Declining	R	O	B
Variable Oystercatcher	Recovering	R	R	B
Pied Shag	Recovering	R	R	B
Black Shag	Relict	R	R	B?
Little Shag	Relict	R	R	B
Little Black Shag	Nationally uncommon	O	O	
Royal Spoonbill	Nationally uncommon	R	R	
Not Threatened				
White-faced Heron		R	R	B
Pied Stilt		R	R	B
Ruddy Turnstone		R	O	IM
Black-backed Gull		R	R	B

Table 1. The bird species using the intertifal flats and waterways in Mangawhai Harbour (pers. obs.) noting those found adjacent to the PPC 85 site. R = regularly present, O = occasionally present, B=breeding, IM = International migrant, LM = migrant within New Zealand.

14. My approach is to choose the two most threatened species, Australasian Bittern and New Zealand Fairy Tern. Each of these species has particular issues of their own but are also affected by the same general issues as other species using the same habitats. Any decisions that affect either of these two species should have a similar impact on other important bird species that use the same habitats.

15. It is important, however, to note that fairy terns are not the only high value birds species that are present on the harbour but I know them best. Also notable are New Zealand Dotterel, the biggest population in New Zealand (Riegen & Sagar 2020), as well as birds from the more common migrant populations, one of the very few remaining breeding populations of Banded Dotterels in Northland is present, the Caspian Tern colony supports 4-5% of the national breeding population (Eagles 2021), the 12th largest wintering population of Variable Oystercatchers and a remarkably good selection of international migrants that includes many rarer visitors.

Fish

16. More than 60 casual records of bitterns from the Mangawhai area have been collated by Alex Flavell-Johnson since 2022 and include 12 records of birds seen on and adjacent to the site. This concentration of sightings indicates that the fish they eat must be at least moderately abundant in the wetlands on site. In particular, one of the database records notes a bittern seen eating eels "most evenings this month", the repeated visits suggesting that food must be reasonably common. Fish abundance has not been assessed but other species like Inanga (*Galaxias maculatus*) could be present in numbers in these wetlands too.

17. Eels and Inanga are diadromous, meaning that they move between the sea and freshwater during their lifecycle. In these cases they enter freshwater as juveniles, elvers and whitebait, in the spring, sometimes in large numbers. Schools of these small fish may provide a good food source for birds as they pass through the harbour as well as in terrestrial wetlands. This includes both fairy terns within the harbour and Bitterns in fresh and brackish water.

Issues related to fairy terns

Population viability and management.

18. New Zealand Fairy Terns are New Zealand's rarest bird and carry a Threatened – nationally critical conservation ranking. In the last five years there have been just 9

or 10 breeding pairs and 6-8 of them breed at Mangawhai so it is a critical site for them at present and essential for their recovery. They do not use the site itself but make regular use of the harbour immediately adjacent to it so it is difficult to believe that they would be unaffected.

19. New Zealand Fairy Terns have faced a variety of problems that have prevented population increase. At Mangawhai alone these include predation of breeding adults and chicks, storms strong enough to kill breeding adults as well as chicks (Hansen 2006), and the aftermath of mangrove removal (Southey 2020) that has reduced productivity below that needed for replacement in most years (Corkery et al in press).

20. Fairy Terns have been managed by the Department of Conservation in the wild since the 1980s with support from members of Birds New Zealand and the New Zealand Fairy Tern Charitable Trust. Management techniques have been improving, especially in recent years, and investment in them is growing. Unfortunately, the impacts on fairy terns are changing. Protection of nests from people, predators and weather has resulted in more eggs hatching but a smaller proportion of chicks are now surviving to become independent and adult survival has decreased so there has been no net gain (Corkery et al in press) excepting, perhaps, a sound lesson that change needs to be identified and managed sooner rather than later.

Fairy Terns in Mangawhai Harbour

21. Each male fairy tern on Mangawhai Harbour defends a feeding territory during the breeding season, and, if he is paired, he shares it only with his mate (Southey in press). Defended feeding territories cover the whole harbour (e.g. Figure 1) from the entrance to about 1km above the causeways and I have monitored and mapped them since 2014.

22. Although fairy terns also feed at sea (Ball 2023) and from lakes (Preddey & Pulham 2017), no fairy tern without a feeding territory even attempts to breed (Southey in press). While feeding territories appear to be a prerequisite for breeding, they don't guarantee that it will occur. Up to 10 separate feeding territories have been defended over a breeding season since 2014 but some of them are small, occupied by single males only or with pairs that did not lay any eggs (Southey in press) and sometimes breeding success is poor for those birds that do lay.

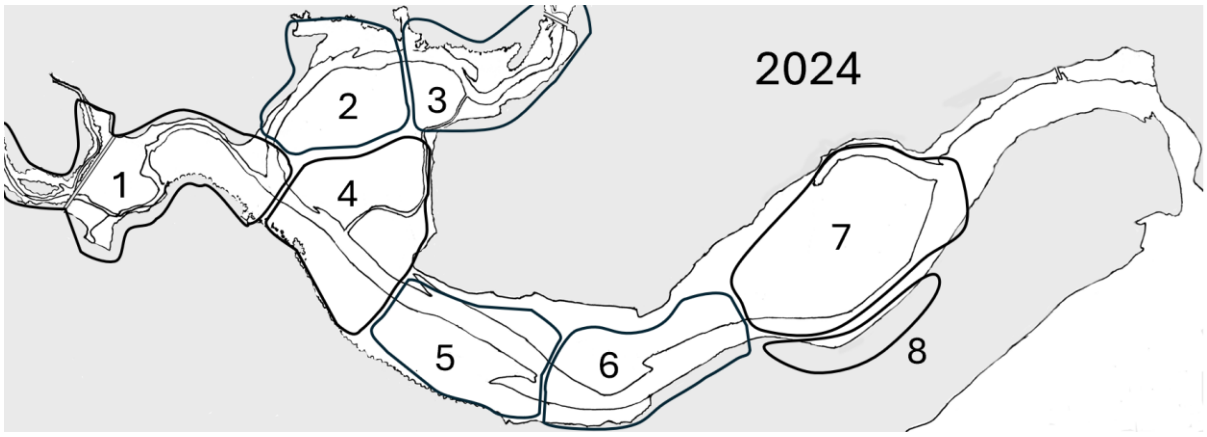

Figure 1. The mapped feeding territories of fairy terns on Mangawhai Harbour during the 2024-25 season. Each of them supported a breeding pair. Land and mangroves are shaded, main channels are outlined, the sea is at bottom right and the site falls within territory 1.

23. Although fairy terns have not been seen on site, and are unlikely to use it at present, my chief concern is that impacts from the site may adversely affect fairy terns. The fierce defence of all feeding territories give little possibility for birds to move away and the full impact will fall on particular pairs, each of which is about 10% of the total breeding population.

24. There are now four feeding territories above Moir Point and one of them shares a boundary with the site (Figure 1). From 2017-2022 there were five territories there, two of them sharing a boundary with the site (pers. obs). There has always been another territory boundary between 100 and 200m downstream to the Northeast of the access at the end of Raymond Bull Road. Up to three feeding territories could be influenced strongly by activities on the site but impacts could reach further afield. There are two obvious ways this could happen.

Issues with food supply caused by modification of fish habitat on site

25. The first way that development of the site could affect fairy terns, as outlined earlier (paragraph 17), involves depletion of diadromous fish stocks on site and reducing the number of larval fish moving up the harbour including the time period when female fairy terns are gaining condition to lay eggs. Coming in from the sea these fish pass through six different feeding territories between the harbour entrance and the site and could provide food for all of those birds.

26. It makes sense to have a better understanding of what fish species are present, to have some idea of their numbers and where their key habitats are so their importance as food for threatened birds can be assessed. It also makes no sense to damage the wetland habitats without a fuller understanding of the natural values present and a plan to manage them throughout the site.

Impacts of increased human disturbance on fairy terns

27. A greater concern, however, is that the increased number of people living and working within the site when it is developed, will enter the harbour for various kinds of recreation in greater numbers than they already do and will interfere with the ability of fairy terns to feed and carry out other behaviour that is important to their lives and may negatively affect their productivity and survival.

28. The negative impacts of often inadvertent disturbance by humans and their pets on bird populations are now well understood. The ubiquitous nature of human disturbance to migrant shorebirds has seen it recognised as a critical threat (Mengak et al. 2019). Vital activities like feeding and resting are interrupted and birds respond with alert and evasive behaviour and these behaviours can impact reproductive success and survival (Palacios 2022). A formal definition is:

    "*Human disturbance of shorebirds is a human activity that causes an individual or group of shorebirds to alter their normal behavior, leading to an additional energy expenditure by the birds. It disrupts or prevents shorebirds from effectively using important habitats and from conducting the activities of their annual cycle that would occur in the absence of humans. Productivity and survival rates may also be reduced.*" (Mengak et al. 2019).

29. People and dogs are usually perceived by wildlife as predators and, as they approach birds, the initial response is a reduction in the feeding time and/or efficiency (Mengak et al. 2019) due to increasing vigilance which reduces feeding activity and efficiency (Goss-Custard et al 2006). As it becomes more severe, birds move away from their feeding site by walking, and when more severe by flying, which is energetically expensive and it may take long periods of time before they return and resume feeding (Mengak et al. 2019). When alternative habitats are available birds are less likely to return to the site they were disturbed from so many kinds of repeated disturbance in a variety of habitats have resulted in a permanent reduction in abundance for disturbed species due to emigration (Borgman nd).

30. Disturbance issues caused by people are well known but the role of dogs has received more attention recently. Although owned dogs are rarely perceived as a problem there are many issues associated with them including, but not limited to, the killing and displacement of wild life which can occur even when they are leashed (Bateman & Gilson 2025). Restrictions on roaming dogs elsewhere limit the potential for damage from dogs generally but they often enter public areas that are also sensitive wildlife areas with their owners for exercise and enrichment (Bateman & Gilson 2025) and this often means beaches including the open or the sparsely vegetated dune habitats there where birds feed and nest on the ground so they are particularly at risk.

31. A study on nesting New Zealand Dotterels showed that people flushed birds from their nests but when walking with a dog on a lead the dotterels left their nests earlier and stayed away longer than a person walking or running (Lord et al. 2001). When dogs are off lead, however, the amount of disturbance caused by them is disproportionately high (Bateman & Gilson 2025). For example, observations of shorebirds in California showed that 11% of dogs on leads disturbed birds but 34% of dogs off leash disturbed birds (Papworth & Thomas 2025).

32. Escape decisions are usually considered as economic decisions that weigh costs and benefits (Blumstein 2019). The currency is energy and birds can sometimes restore the balance by moving away or feeding at other times but these options are not always effective or available. Balancing cost and benefit also means that hungry birds may sometimes accept greater risk to consume more food and may seem tolerant but simply have a more pressing need (Borgman nd, Gomez-Serrano 2021). When these costs cannot be balanced their effects can be seen in reduced body condition, lower survival for birds and reduced parental care that can lead to nest failure or failure to complete migration flights in disturbed sites (Gibson et al. 2018, Gomez-Serrano 2021, Borgman nd, Bateman & Gilson 2025).

33. Unlike real predators, neither recreating people nor their pets leave an area quickly so disruptions to normal behaviour can last for a very long time. No matter how good the habitat is, disturbance can best be seen as habitat degradation when birds are prevented from using for some of the time or total habitat loss when they are unable to use it at any time (Palacios 2022).

34. There is some capacity for birds to work around the impacts of disturbance by feeding at times when levels of disturbance are lower, moving to alternative sites, becoming more tolerant or speeding up their food intake so that the population level impacts are actually minor even when disturbance is obvious from behaviour (Goss-Custard et al. 2006, Ramellini et al. 2024). Population level impacts on

energy reserves and survival can, however, be realistically assessed using models of energy intake and expenditure (Goss-Custard et al 2006, Stillman et al. 2007).

35. With considerable experience over several decades there are now established and often tested guidelines for assessing and managing problems with human disturbance and wildlife, especially for coastal birds (e.g. Gill 2007, Stillman et al. 2007, Stigner et al. 2016, Menkgak et al. 2019).

Behaviour of people at Mangawhai and the response of fairy terns.

36. One study of human activity during the summer of 2021-22 showed that more people used the deeper, wider and sandier lower parts of Mangawhai Harbour at low tide (74.7% of observations) when fairy terns fed and they tended to concentrate near access points. Human activity lifted from the 3rd week of December and remained high, sometimes very high until at least late January with particularly high numbers during weekends and public holidays (Ball 2023).

37. An earlier study, from November 2019 to January 2020, observed just a single fairy tern feeding territory that shared a boundary with the site, watching between the end of Raymond Bull Rd and the campground and back to the pub for 64.7 hours (4045 minutes) at all stages of the tide. During this time 101 potential disturbance events involving people were observed on the study site and one that did not, a stray dog. There were 723 minutes during the observation period when there was at least one potential human related disturbance on the study area but there was often overlap so together they totalled 1233 minutes (Southey 2020).

38. Over the whole harbour the most common activities of people were walking (24.5%), Sunbathing 17.8%, powered and unpowered boating (17.8%) and walking dogs 13.8% (Ball 2023). In the localised study walking (28%), walking dogs (42%) and boating 24% were the most common activities. The upper harbour site was used substantially more for walking dogs but not for sunbathing (Southey 2020). Most dogs were walked off leash. Over the whole harbour only 20.8% of dogs were on leads and in the upper harbour only two dogs were walked on leads (4%) in spite of bylaws requiring leashing on most of the harbour, including the upper harbour site.

39. Observations of actual disturbance of fairy terns have been relatively rare. IOver the whole harbour only two incidents of people disturbing fairy terns were seen (Ball 2023). In the upper harbour potential agents of human disturbance were not often present on the harbour at the same times as fairy terns even though both were most often present in the upper harbour over the low tide period (Figure 2). Even when both were on the harbour at the same time they were not usually close enough to interact.

40. In the upper harbour fairy terns did not obviously alter their behaviour for people walking but five times they were obviously disturbed by dogs (12%) and twice by kayaks (20%). Kayaks were only observed 10 times and four of these were near high water when fairy terns were not present so 33% might be realistic. Twice aircraft flew overhead and put up most of the birds in the upper harbour, an area of about 1.2 km^2, and once a pair of fairy terns was put to flight with them. The distances of displacement were 10-80 m from dogs (average 38 m) and 50 and 80 m from kayaks (Southey 2020). Further work is required to quantify this properly.

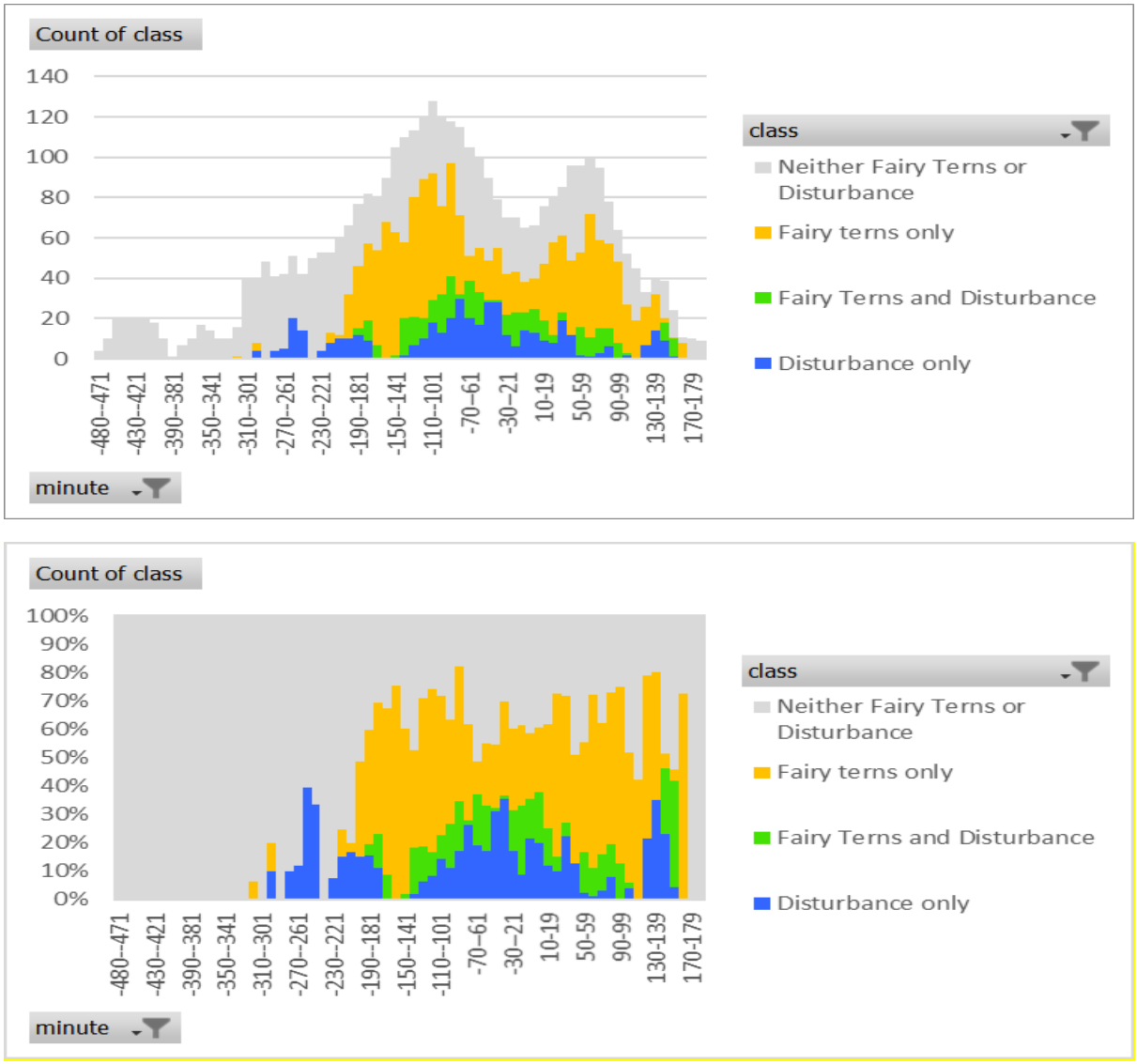

Figure 2. The overlap between potential disturbance events and fairy terns. The first graph shows the number of observations and the second the percentage of observation time. In both cases the data are presence or absence of at least one event during a single minute, indexed from low tide and added into 10 minute blocks (from Southey 2020).

41. Fairy terns seem remarkably tolerant of people and will fish up to about 10 m of a person standing still at the water's edge (pers. obs.). They already appear to be habituated to people to some degree and it may be driven by need during the breeding season – the nutritional stress of breeding and the high costs of feeding territory defence from other fairy terns (Southey in press). It does not seem reasonable to expect further accommodation to disturbance.

42. The low frequency of disturbance observations may reflect the deliberate avoidance of people by fairy terns rather than a lack of sensitivity to disturbance. There are several reasons to think this:

    i. At present most fairy terns are in the upper muddier parts of the harbour less used by people and, in the lower harbour, three of four feeding territories have deep channels separating them from human access points.

    ii. Maps of the whole harbour also show that areas with high human use are not heavily used by fairy terns and vice versa. This was especially true for resting birds. When fishing, fairy terns were more tolerant but still avoided the area most used by watercraft (Ball 2023).

    iii. Some areas were avoided when people were present but used when they were not (Ball 2023).

    iv. The amount of time it took to complete a foraging trip and return to the nest was greater over weekends (22 minutes), when more people were present on the harbour, than on weekdays (15 minutes) which correlates with the influxes of people seen then (Ball 2023).

43. Identifying behavioural change does not necessarily identify a detrimental impact at a population level (Goss-Custard et al 2006, Stillman et al 2007) but may instead show the flexibility that allows the bird to cope with the problem. There has been little work on population level impacts but a comparison of fairy tern demographic parameters between two time periods, 1991-2003 and 2014-2025 show some marked differences (Table 2). Targeted conservation management has been successful at improving nest success and first year survival but the goal posts have moved and fewer chicks are now surviving to fledge and adult survival has declined. On average there has been no change in population size (Corkery et al in press).

	1991-2003	2014-15 to 2024-25
Breeding pairs	6.5	8.9
Clutch size	1.76	1.70
Hatch rate of eggs	38%	55%
Fledging success	74%	64%
First year survival	63%	73%
Second year survival	95%	91%
Recruitment	60%	65%
Adult survival	95%	89%

Table 2. Some key demographic parameters for the New Zealand over two time periods. The numbers are averages taken from Corkery et al (in press) and the degree of variation can be found there too.

44. In most years recently the number of adult fairy terns alive has actually declined but, after exceptional years of high productivity and good first year survival, there has been strong recruitment in 2014 and 2025 that have made up the deficit and kept the population about stable (Corkery et al in press).

45. There has been a substantial increase in the number of people using Mangawhai Harbour between these two time periods. While more work needs to be done, the negative changes in fledging success and adult survival of fairy terns could both plausibly be impacts of increased human disturbance. There are good reasons to consider that there may be some degree of exclusion from the harbour, or parts of it by people that could reduce food intake (paragraph 43) and may contribute to the negative population level effects seen. Also, Reduced annual survival has been noted in a comparison between birds breeding in more and less disturbed areas (Gibson et al 2018) and can be predicted using models of energy intake and expenditure (Stillman et al 2007).

46. There are, however, good alternative explanations for these changes that need to be considered that include:

    i. The lagoon on the sand spit, which was heavily fished during the first period no longer produces food.
    ii. There appears to have been a substantial reduction in the quantity and/or the quality of food since mangrove removal in the harbour during the winter of 2014 which has been detrimental and the recovery from this may still be ongoing.
    iii. With more breeding pairs there may be more competition between fairy terns for food which could reduce provisioning rates for chicks and place more stress on adults.

47. Unfortunately, the net effect of the demographic changes to population growth from conservation management, for whatever reason, is none whatsoever. The improvement and deterioration of different vital parameters cancel each other out. At least the ongoing conservation work has ensured that we still have any fairy terns when we might not otherwise.

The captive rearing of fairy terns

48. The Department of Conservation recently began a program to deliberately bring wild eggs in for artificial incubation, to rear the chicks in captivity and release them back into the wild from 2021 (Wiles et al 2024). If successful it may boost productivity enough to allow the population to grow more consistently and expand its size. The effectiveness of the captive rearing program has improved with experience but the survival of wild reared fairy terns in their first year is variable and has been very low in some years so captive rearing may not always as effective as it has been recently.

49. The captive rearing program also relies on the capability of wild birds to lay sufficient eggs to support it. Some clutches are only one egg instead of two, and, especially after the mangrove removals in Mangawhai Harbour we saw birds with one egg clutches, many of the two egg clutches contained a non-viable egg (Southey 2020). It may not always be reasonable to expect female fairy terns to lay surplus eggs to harvest for the captive rearing program.

50. While captive rearing has a strong potential to allow the fairy tern population to recover it imposes additional costs on the wild breeding population that supplies the eggs. When food is readily available, the costs of producing additional eggs may be trivial, but if there is difficulty obtaining sufficient food they may reduce productivity and possibly increase mortality in valuable breeding birds. Reproductive stress already appears to occur naturally with some pairs in some years and egg harvest could increase it.

51. Harvest of wild eggs for captive rearing also imposes a time penalty on fairy terns. Certainly, the time taken to recover condition to lay a second clutch, at least a week or 10 days, delays the fledging of chicks, if successful, and decreases the likelihood of the families of early breeding birds being able to leave the harbour before the influx of summer visitors.

52. Problems with disturbance may affect the particular pair of fairy terns breeding adjacent to the site by reducing their use of the most productive parts of their feeding territory. Some idea of detailed habitat use of the pair that previously occupied this site was revealed by almost 65 hours of observations intensively following them from November to 2019 to January 2020 (Southey 2022). It did not cover the area adjacent to the campground. The most intense feeding was in a zone extending from the Raymond Bull Road access about 320 m southwest along the mangrove edged shore where 35% of all dives were made, 8.3 per metre of channel. Adjacent areas, including the opposite side of the channel, had a moderate intensity of use, together 43% of dives, at about four per metre of channel. Along the boundary of the site 64.1% of all dives occurred so there would have been strong potential for conflict with this individual pair and human activities adjacent to the site (Southey 2022).

53. This could be unfortunate because the pair most likely to be affected by issues from the site is particularly valuable for recovery of the species. They are highly productive having donated eggs for the captive breeding program annually since 2022 and also managing to fledge six chicks in the last five years. The prior occupants were also known to be productive (Southey 2020) suggesting that it is particularly good habitat.

54. If the deterioration of key demographic parameters of fairy terns in Mangawhai has been influenced by human disturbance and the trend continues with more people on the harbour, the addition of more disturbance could be fatal for the species because, even with all the help they get, they are still walking a tight rope with no safety net. The total population of the total fairy tern population is just too small and the proportion dependent on Mangawhai too great to expect any alternative outcome. It is possible, however, to have more certainty of the likely outcome of this development, the methods exist, they just need to be adapted to the situation and the work carried out.

Bittern

55. Australasian bitterns have a Threatened -nationally critical' conservation ranking. It is hard to pin down a population estimate because these are usually cryptic birds and poorly understood, although that is changing. Estimates in the 1980s suggested that about 1000 birds were present but they have declined since then, severely at some sites (O'Donnell & Robertson 2016) so this may have been an underestimate. Such cryptic birds are very hard to find and assess but viable survey methods may soon provide an up to date estimate.

56. Northland is identified as one of three strongholds for bitterns in New Zealand with 17% of records even though observer coverage was relatively sparse. In distribution maps Northland is consistently conspicuous for the density of records but numbers have been consistently declining, especially since 1970 (O'Donnell & Robertson 2016). Even so it remains one of the most important regions for bittern conservation (Figure 3).

Figure 3. The distribution of individual records of Australasian bitterns in New Zealand between 1990 and 2011 (from O'Donnell & Robertson 2016) showing how concentrated they are in Northland.

57. Bitterns between Pākiri and Marsden Point have been monitored by a community group lead by Alex Flavell-Johnson since 2022. The monitoring is by listening for booming males around sunset. These birds advertise their presence to females who may come and nest within the male's territory. Some males may attract more than one female while others fail to attract any, but in the absence of other evidence, the booming sites are considered breeding sites.

58. Between 22 and 24 booming males have been recorded over those four years and they tend to be in the same places. Mangawhai is clearly the regional hot spot with at least 14 booming males in, or immediately adjacent to the harbour (figure 4).

59. Bitterns are mobile and may move to find mates (Williams 2024) so the whole area from Bream Head to Pakiri and probably beyond is likely linked by birds moving through the area and able to replace members of a pair when one dies. In this way a strong local core population like the one at Mangawhai may be necessary to maintain the wider scatter of breeding sites in the region.

Figure 4. Sites where booming bitterns have been recorded 2022-25 (map provided by Alex Flavell-Johnson). The white dots are where bitterns have been recorded and the yellow circle encloses Mangawhai Harbour and adjacent sites.

60. One of these booming males has been recorded each year within 400m of the site boundary and the booming site was confirmed as a breeding site when a chick was photographed on the edge of the wetland where the booming was heard (figure 5).

61. Records of casual sightings are also kept and there are 11 of them recorded since 2022 within 500m of the swamp including four that overlap the site. The applicant's ecologists have also recorded bittern sightings in this area and I have seen one

there myself, but well before the database was begun. Bitterns will almost certainly feed regularly in mangroves in the tidal inlet that crosses Black Swamp Road. With an obvious channel (the proposed southern SNA) is likely to support good numbers of Short-finned Eels (*Anguilla australis*).

Figure 3. Bittern records to the south east of Mangawhai Harbour. The purple spots are regular booming sites, the yellow spot is where a chick was photographed and the blue dots are casual bittern sightings submitted to the database since 2022. (Map provided by Alex Flavell-Johnson).

62. There is a halo of sightings around two swamps where bitterns boom (figure 3and the months of sightings fall between September and January which are within the breeding season (Williams 2024). Even in the open bitterns are not always easily seen but one of the records states “seen feeding on eels – most evenings this month” so this food source may be significant for breeding birds.

63. Generally the use of farm drains, ponds, and wet pasture tends to be in winter, when bitterns are often moving between feeding habitats and not while breeding (Williams 2024). The higher food demand when breeding and the limited availability of wetlands with tall vegetation locally may force them out of cover to feed in drains and other wetlands. This would indicate that the drains on site hold a significant source of food and, for bitterns to leave the safety of cover, it also suggests that it is a necessary source of food.

64. Food does seem important to bitterns. Although few have been radio tracked so far and fewer of them have died but 71% (5 of 7) of those that have died so far had starved. Many of the bitterns handed in to Bird Rescue are starving, 17.6% of 103 bitterns autopsied had starved and a further 5.8% had severely depleted body fat but died of impact trauma. The association of impact trauma and starvation suggests that hunger may sometimes lead to more risky behaviour (Williams et al 2025). A scarcity of food may be why the bitterns on Black Swamp Road are feeding in atypically exposed habitats during the breeding season. Analysis of stable isotopes and feather growth in museum specimens show that modern bitterns generally have changed their diet and nutritional stress has become more common in recent years (Kennard 2025).

65. The site appears to provide a food source that is important for at least one breeding pair of bitterns. The ecological impact assessment for the southern region (Appendix 14, p. 12) indicates that natural wetlands will be protected but that artificial drainage channels may be piped. The site where most bitterns have been seen feeding seems particularly at risk from development as coincides with the area of highest proposed residential density and a "Neighbourhood Centre zone" on the corner of Black Swamp Road and Raymond Bull Road" (p.3 of the Private Plan Change request). This would result in the loss of possibly critical feeding habitat for the breeding bitterns that are currently using the drains on site.

66. The requirement to cross the road to get food places these bitterns at risk. The most common cause of death in autopsied bitterns is impact trauma, especially impacts with vehicles but also with wires. Sixty four of 103 bitterns died of impact trauma, for 30 the cause was not specified, for 24 it was vehicle strike and 8 collided with wires (Williams et al. 2025). If the number of vehicles using Black Swamp Road increases and improved roads allow increased speed, the risk to bitterns from road traffic will also increase.

67. If the site is developed with loss of habitat it may still become unavailable to bitterns due to the dramatically increased human presence that can be expected. Bitterns are secretive birds and seldom found in close proximity to people so repeated use of paths planned to go to and along wetland habitats could drive them away. As discussed, human disturbance does alter the behaviour of many bird species increasing energy expenditure and reducing foraging opportunities which can lead to the avoidance of key habitats, reduced reproductive success and increased mortality. Unfortunately, there is little useful information to evaluate the effects of placing paths along and through potential habitat for bitterns, or other wetland birds.

68. One further risk that may occur is predation by domestic dogs. Although no instances of dog predation have been recorded, their dependence on stealth and camouflage for protection suggests that they are likely vulnerable to dogs. Some bitterns fly away from danger quickly but another typical response is to freeze and some of these birds can be captured by hand (Williams 2024). With good noses dogs should be able to find these birds and have the ability to kill them, perhaps even when on a lead.

69. Two other species of At Risk swamp birds, notably Fernbird and Banded Rail, may also be on site. Although their presence on site remains unconfirmed there is good habitat for feeding and breeding Banded Rails in both of the proposed SNAs and I would be surprised if they were absent. From aerial photographs the rushy and scrubby habitat for fernbirds seems more restricted on the site but it is present. Both species have vulnerabilities similar to bitterns – habitat degradation, human disturbance and extra predation pressure, especially from dogs.

Summary

70. Mangawhai Harbour is a nationally outstanding habitat for birds. Even the highly modified site for PPC 85 currently provides feeding habitat for the 'Threatened – nationally critical' Australasian Bittern which also breeds just a few hundred metres from the boundary. There are many 'Threatened' and 'At Risk' bird species using the harbour immediately adjacent to the site, including the core population of the 'Threatened – nationally critical' New Zealand Fairy Tern but there are other? species that deserve attention too.

71. Development of the site, as proposed, will destroy known feeding habitat for bitterns, and food is a particular point of vulnerability for bitterns. If they survive the development, disturbance by people may drive them out of the habitats they now use for feeding and they will be vulnerable to death on the roads and predation by dogs.

72. The fairy tern population in Mangawhai is well known and intensive work by the Department of Conservation and many local volunteers have been required just to keep the population stable and viable while the town has grown considerably and pressures on them have increased. The very large proportion of the population that lives and breeds in the harbour needs to increase in numbers and not to be placed under further pressure as the recovery of the species is unlikely to be possible without an increase in the population at Mangawhai.

73. There are already very good reasons to think that too many people using Mangawhai Harbour for recreation are already proving detrimental to fairy terns but it must be admitted that other factors could produce the same results. Given the great rarity of fairy terns and their constant exposure to risk from both natural and human caused problems my opinion is that it is necessary to have a clear idea of the likely impacts of new developments.

74. In the meantime the low use of the relatively remote eastern shore of Mangawhai Harbour, including the site if not developed, could, in principle, provide some respite as human disturbance increases so, for the welfare of fairy terns and bitterns I think this area is best left relatively undeveloped. The developers have not recognised or acknowledged the potential problems they might cause for some of our rarest birds, nor have they made any attempt to show that the potential problems could be mitigated or avoided. There are well known ways to understand the risks of this kind of development on wildlife, so the impacts could be predicted with some confidence if the work was done.

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