BEFORE THE WHANGĀREI DISTRICT COUNCIL AND NORTHLAND REGIONAL COUNCIL

Under	The Resource Management Act 1991
And	
In the matter of	a resource consent application by Northport Limited under section 88 of the Resource Management Act 1991 for a port expansion project at Marsden Point
Application No.	Whangārei District Council: LU2200107 Northland Regional Council: APP.040976.01.01

STATEMENT OF EVIDENCE OF ANTONY JULIAN BEAUCHAMP
(AVIFAUNA)
on behalf of the Director-General of Conservation
Submitter No. 158
18 September 2023

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INTRODUCTION

1. My name is Antony Julian Beauchamp. I hold the qualification of Ph.D in Zoology, and a post graduate diploma in Environmental Health. From 1991-2000 I worked as a health protection officer on shellfish sanitation and marine biotoxin monitoring throughout Northland for Northland Health Ltd. I then worked for the Department of Conservation ("the Department") in Northland firstly as Conservancy Advisory Scientist until 2008, and then as the Technical Support Officer Ecology and Environment, Technical Advisor Threats and more recently as a Technical Support Officer Biosecurity and Weeds.

2. As a Technical Support Officer in the Department, I have provided support for the Tara iti programme since 2006 and am a member of the Tara iti Recovery Group. I was an expert witness for the Department on the impacts of the sand removal at Mangawhai Harbour entrance, mangrove removal at Mangawhai in 2012, Ruakaka racecourse development in 2014, and issues with Tara iti and other wader use of Mangawhai Harbour in the Mangawhai Harbour Wharf Trust hearing in 2020.

3. I have been a member of the Ornithological Society of New Zealand (Birds New Zealand) since 1979, and the Regional Recorder of the birds in the region for the Whangarei branch since 2010. As part of those duties, I have undertaken and managed data collection about wader roosts in Whangarei harbour and published an assessment of the counts from 1974 to 2000. I also managed a collection of red-billed gull census data and accessed CINZ land to look at wader breeding there.

4. For the Department of Conservation, I have supported field staff in all aspects of fairy tern management in Waipu and Mangawhai estuaries, monitored waders as part of mangrove removal at Mangawhai and assessed disturbance impacts on the waders at Ruakaka Estuary.

5. Privately, I have also carried out monitoring of the changes in status of the Port Whangarei wader roost sites and settlement ponds[1] and continue to monitor public access areas at that site. I have also mapped and carried out counts (almost monthly 2012-2023) on the waders using the area of Whangarei Harbour north of Matakohe/Limestone Island and carried out evening and night work on wader and gull use of the Port Whangarei and Portland wharf roosts.

6. I have published 37 papers on birds.

CODE OF CONDUCT

7. I confirm that I have read the Code of Conduct for expert witnesses as contained in the Environment Court's Practice Note 2023. I have complied with the Code when preparing my written statement of evidence and will do so when I give oral evidence before the Hearing Panel.

8. The data, information, facts and assumptions I have considered in forming my opinions are set out in my evidence to follow. The reasons for the opinions expressed are also set out in the evidence to follow.

9. Unless I state otherwise, this evidence is within my sphere of expertise, and I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

SCOPE OF EVIDENCE

10. In my evidence, I:

- Provide an executive summary of my key conclusions.
- Provide a description of the existing environment as it relates to Marsden Bay.
- Describe past wader use in the Northport area, Marsden Roost and Marsden Bay.
- Comment on the overall approach taken by the applicant's experts.

[1] Beauchamp, A.J. Parrish, G.R. 1999. Bird use of the settlement ponds and roost areas at Port Whangarei. Notornis 46: 470-483.

- Comment on various aspects of Dr Bull's and Ms Webb's evidence in chief.
- Discuss cumulative effects.
- Discuss the relevance of the National Policy Statement for Indigenous Biodiversity (NPS-IB)
- Discuss the proposed sandbank renourishment area.
- Comment on conditions proposed by the applicant.
- Set out my conclusions.

11. I have read the following documents:

- Application for Resource consent for the expansion of Northport and AEE.
- Tonkin & Taylor; Vision for Growth Port development: Coastal processes assessment Prepared for Northport September 2022.
- Refining NZ Crude Shipping Project (AUT.037197) resource consent.
- Boffa Miskell Northport Eastern Expansion, Coastal Avifauna Assessment 3 October 2022.
- Boffa Miskell Northport Eastern Expansion, Additional Winter2022 Avifauna Data Analysis, prepared for Northport Ltd 25 November 1922.
- 4sight consulting. Wader bird survey October 2019 – February 2000 for Northport Limited May 2020.
- 4sight consulting. Wader bird survey expanded areas December 2019 February 2020 for Northport Limited May 2020.
- 4sight consulting. Baseline Nesting Bird Survey October 2019 – January 2020 for Northport Limited May 2020.
- Rob Greenaway & Associates, Recreation effects assessment. September 2022.
- Statement of Evidence of Dr Shane Kelly (Marine ecology excluding Avifauna, Mammals and Biosecurity) 24 August 2023.
- Statement of Evidence of Leigh Sandra Bull – Coastal Avifauna.
- Technical Memo – Marine Ecology Dr Drew Lohrer, 19 July 2023.
- Technical Memo – Coastal Avifauna Ms Claire Webb, 27 July 2023.
- Technical Memo – Recreation, Mr Craig Jones, 28 July 2023.
- BlueGreen – Memo. Supplementary Information Under section 92 of the RMA – Northland Coastal Avifauna

- Draft Proposed NRC conditions: Northport Limited Port Expansion, SH15, Marsden Point.
- Northland Regional Council & Whangarei District Council Officer s42a Report.

EXECUTIVE SUMMARY

12. The current footprint of Northport and the proposed expansion is in an area that is used by large amounts of wading birds (waders). Bird counts by Birds New Zealand since 1970 confirms Marden Bay is an important roost and foraging site for 15 species of threatened birds. The coastal marine area surrounding the site is identified as either a "Significant Bird Area" or "Significant Marine Mammal and Seabird Area" in the Proposed Northland Regional Plan.

13. The reclamation proposed as part of the eastern expansion of the port will result in the permanent loss of low-mid tide foraging and high tide roosting habitat for New Zealand dotterel (Threatened, nationally increasing), and variable oystercatcher (VOC, At risk, recovering). This is assessed by the applicant's avifauna expert Dr Bull as a "moderate" level effect.

14. To avoid the loss of high tide roosting habitat, the applicant is proposing to construct a sandbank to the west of the port, prior to work on the reclamation being undertaken. Dr Bull considers that this will avoid the adverse effects from the loss of high tide habitat, and she assesses the level of effect resulting from the reclamation with the sandbank in place as "low".

15. The applicant is not proposing any other measures to address the permanent loss of roosting or foraging habitat due to the reclamation, nor is it proposing to monitor the use of the sandbank which would confirm whether it is being used as a roost or not.

16. There is nothing demonstrating that New Zealand dotterel and VOC would use the sandbank as a roost. In my opinion, New Zealand dotterels are more likely to continue to use shore-based roosts as they are already doing in Northport. VOCs may use the roost but are just as likely to retain their use of beach margins and short cut grassed sites.

17. Given the above, I do not consider it a sound approach to factor in the successful uptake of the sandbank as a replacement hightide roost in assessing the adverse effects of the reclamation on New Zealand dotterels and VOCs.

18. Dr Bull's assessment is that the reclamation would have a moderate level adverse effect on New Zealand dotterels and VOCs without a replacement hightide roost. I consider the level of adverse effect remains at moderate.

19. In addition to the above, the proposed sandbank's location is in a frequently used foraging area for lesser knot, an "At risk- declining" international migrant and summer resident in New Zealand. Lesser knot numbers have declined in Whangarei Harbour by over 75% during the past 15 years. Lesser knot is the common name of the subspecies of the "red knot". New Zealand has committed to arrangements with the Chinese government for their protection of areas used by red knot as stop-over habitat[2] [3].

20. The sandbank is expected to gradually erode due to wave overtopping. This is expected to result in the raising of the seabed between the sandbank and nearby beach. The sandbank will therefore require regular top-ups to replace the sand that is washed away. The effects of this have been assessed by the applicant's coastal processes expert as "negligible" (Coastal Processes Assessment, Appendix 10 to application, pages 8 and 44).

21. Dr Bull also considers that the creation of the sandbank will result in a "low" level of adverse effect on lesser knots, on the basis that they are expected to move to areas of higher benthic invertebrates to the west. However, the sandbank itself and the habitat it covers as it erodes, is expected to reduce the wet pooled foraging areas for lesser knots and bar-tailed godwits which are important habitat in Marsden Bay.

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[2] Shorebird Centre engagement with China, Korea, and the East Asian-Australasian Flyway - Page 4 of 4 - Pūkorokoro Miranda Shorebird Centre (shorebirds.org.nz). Lesser knot is a subspecies of Red Knot.

[3] I note that New Zealand has a Memorandum of Arrangement with the Chinese government agency "The National Forestry and Grassland Administration" to protect the habitat that is used as stop-over habitat for red knot (lesser knot being the common name of the subspecies that visits NZ) in the Yellow Sea. New Zealand is also a member of the East Asian-Australasian Partnership that is the voluntary grouping of nations in the flyway for protecting red knot habitat.

22. While there is data confirming that lesser knot forage and roost in the areas to the west of the Northport in middle Whangarei Harbour, there no information on how or if foraging habitat has changed. However, it is clear lesser knots are flying to Marsden Bay to feed, so the birds consider Marsden Bay as important forging habitat.

23. Given that waders are totally dependent on having healthy foraging areas for feeding, and benthic invertebrates are susceptible to sediment deposition, any impacts that could cause even temporary disruption to waders' food supplies are of concern to me.

24. I do not consider it appropriate to take a harbour-wide approach to assessing effects on New Zealand dotterel and VOC. I consider that the populations of both species in Marsden Bay should be considered as not frequently exchanging with other populations in the harbour.

25. Further, the Applicant does not appear to have fully considered how reducing the beach in the east of Northport may mean more humans (and dogs) accessing Marsden Bay in the west where the Applicant is hoping the displaced birds will also go.

26. Considering the above, it is my opinion that:

- The reclamation proposed to the east of Northport will result in the loss of what could be important foraging and roosting habitat for Threatened and At risk avifauna species.

- The applicant's proposal to create a sandbank to the west of Northport to offset the loss of roost habitat by the reclamation is inappropriate, given:

    - It will result in loss of habitat for another At risk wader, the lesser knot.
    - There is no certainty that any of the displaced New Zealand dotterels and VOCs will use it as a roost.

- These effects have not been fully quantified using a system-wide approach, given the absence of data on avifauna behaviour and movement

both in Marsden Bay and the wider harbour, and the assertions that birds will move in specific ways and activities will be mitigated is not supported by evidence.

- Therefore, the effects on threatened taxa have not been avoided.

- The impacts on birds have been assessed against current populations and habitat use. If the development is not instigated within 5 years of the granting of consent, then a full reassessment of avian impacts should be required, because of the substantial reduction in international migrant wader populations over the past 50 years.

- I note that birds (manu) like other taonga species are precious to Patuharakeke for a variety of reasons. Shore and seabirds in particular are associated with mātauranga Māori, as seasonal tohu and indicators of cultural health or mauri.

- In the event the Hearing Panel was minded to grant the consents for the development, options, based on more accurate data may include:

    - Predator control over the Northport land, which is another area where large numbers of New Zealand dotterel also roost.
    - Protection of VOCs through fencing off their roosting site at the Marina Channel entrance in Marsden Bay, and other sites used by them within the marina complex by agreement with the land owners.
    - Data collected on the way that waders are using the environment to assess its importance of each mitigation.
    - Supporting the protection and development of high tide roosts in other parts of Whangarei Harbour.

DESCRIPTION OF THE AREA

27. Whangarei Harbour is one of the important harbours for waders In New Zealand. Consequently, the majority of Whangarei Harbour (89.5 ha) was declared a Wildlife Refuge under the Wildlife Act 1953, in 1962. This refuge included all the Marsden Bay coastline including Blacksmiths Creek Estuary, which is located between Northport and Marsden Bay, and between One

tree Point to Mair Bank (Fig 1). A wader roost site has been present at the entrance to Blacksmiths Creek since at least the 1970s[4], and fields and beaches in the wider area were also used by roosting waders.

28. The wider Marsden Bay area has been extensively modified by the Marina Canal development and the beach and sandflats modified by the construction of the Marina channel. The sediment balance to the west of the Northport reclamation has been altered [5], and the beach and roost site and land at the entrance to Blacksmith's Creek has retreated (Fig 1). Dogs are not allowed on the beach at Marsden Bay, to protect birds.

29. The beach between Northport and the CINZ (formerly NZ Refining Co Ltd) wharf is currently used extensively by fishers and people walking their dogs. Fishers do not cause much disruption to birds because the VOCs and dotterels roost at the western end of the remaining beach and can be avoided by access down the grassed esplanade or dunes. Red-billed gulls also bathe and roost away from this human activity.

30. The applicant proposes an eastern extension and reclamation to the east of Northport between the port wharf and CINZ wharf. The application is for a further reclamation of 11.7 ha extending over 380 m of coastline[3] and including 1.77 ha of dunes and the construction of a 0.54 ha bird roost west of Northport. This would leave approximately 330 m of beach to the east of the reclamation to the CINZ wharf. The only remaining publicly accessible outer southern harbour sandy beach at full tide would be in Marsden Bay.

[4] Munro, M. 1971. Birds of Whangarei Harbour. Notornis 18: 202-206.
[5] Tonkin & Taylor 2022. Vision for growth Port Development: Coastal Process assessment.

Fig. 1. - The location of Wader roosts and breeding areas for birds in Marsden Bay. The Marsden Spit Government Purpose Wildlife Reserve overlay define the beach front and spit in 1962.

Past wader use of the Northport CINZ area, the Marsden Roost and Marsden Bay.

31. This CINZ site has been a breeding site for red-billed gulls since at least the 1970s, and fields between the refinery wharf and the roost at Blacksmiths Creek (Marsden Spit Government Purpose Wildlife Management Reserve) were used by bar-tailed godwit, lesser knot, and New Zealand dotterel for foraging and roosting[6].

32. Surveys were carried out of the birds using Marsden Point Beach before the construction of Northport by Grant in 1994[7] and by Wood in 1997[8]. These data showed that nine species with current threat classifications used Marsden Bay and the beach to the west of Northport.

33. During the March 1997 survey, 11 New Zealand dotterels were observed foraging in the intertidal area and roosting on the shell banks until they were surrounded by water, and then flew towards the CINZ site where breeding has been recorded since 1983[9].

[6] Munro 1972. Report on birds of Whangarei Harbour, Unpublished.
[7] Grant, G. 1994. Shorebirds and their use of the intertidal flats at Marsden Point, Whangarei Harbour. January 1994 to December 1994. Department of Conservation. Funded by Northport.
[8] Wood, C. 1997. Marsden Point shore birds Second quarter report May 1997. For Department of Conservation.
[9] Grant, G. 1984. Shorebirds and their use of the intertidal flats at Marsden Point, Whangarei Harbour. January 1994 to December 1994. Department of Conservation. Funded by Northport.

34. Variable oystercatcher numbers were around 20 in 1994 and they roosted in the current eastern section of the beach (3-20 birds), the area now under Northport (2 birds), the Blacksmith Creek Roost (2-9 birds). Between 5 and 34 variable oystercatchers also used the area east to the CINZ wharf for roosting with godwit and knot in the highest spring tides (Fig. 2).

35. In January and February 1997 up to 72 lesser knots foraged in the areas now covered by Northport, and up to 26 foraged in the area immediately west of the Northport (area W3 in Boff Miskell assessment[10]). The number of lesser knot foraging at the site exceed the number roosting there so the birds were flying to the site from elsewhere.

36. For current status of the site, see Appendix 3.

Fig. 2 Marsden Bay sandspit roost 1994 (Grant 1994 grid 1) This entire structure has gone.

CURRENT STATE AND USE OF WHANGAREI HARBOUR COASTAL BIRD HIGH TIDE ROOSTS

37. There are five major roost areas on the southern side of the Whangarei harbour: Port Whangarei, Portland, Skull Creek, Takahiwai and Marsden Bay, and Whangarei Airport (Onerahi in Fig 3). These are shown in Figure 3. There are also some more minor roosts sites on the Northern side of the harbour. Ruakaka Estuary and some of the outer beaches are the spring tide

[10] Bull EIC map 3.

roost sites for bar-tailed godwit and lesser knot from Whangarei Harbour. Some data on daytime roost use in Whangarei harbour has been collected since 1973[11] [12] [13] annually by Birds New Zealand Whangarei Branch in February/March and June, and in November [14]. This information provides data on total numbers of birds for regions in the whole harbour (Appendix 1) but does not itemise the numbers of birds at the various roosting sites (Appendix 2). It also does not provide a complete picture of the relationship between foraging sites and roost site use.

38. The importance of Whangarei daytime roosts for waders in Whangarei Harbour was assessed in 2007 [17], and the numeric importance of Whangarei Harbour for the species of waders was assessed in 1999 and 2020 [14] [16]. Between 2005 and 2019 Whangarei harbour roost sites were the second most important place for variable oystercatchers, the fourth most important place for lesser knot in summer, and the eleventh most important place for New Zealand dotterels[16].

[11] Riegen, A.C; Sagar, P.M. 2020. Distribution and numbers of waders in New Zealand. Notornis 2005-2019. Notornis 67: 591-634
[12] Parrish, G.R. 1984. Whangarei Harbour wildlife survey. New Zealand Wildlife Service technical report no. 8.
[13] Sagar, P. et al. 1999. Distribution and number of waders in New Zealand, 1983-1994. Notornis 46: 1-43.
[14] Beauchamp, A.J, Parrish, R.G. 2007. Wader (Charadriiformes) and royal Spoonbill (Platalea regia) use of roosts in Whangarei Harbour and Ruakaka Estuary, Northland, 1973-2000. Notornis 54: 83-92.

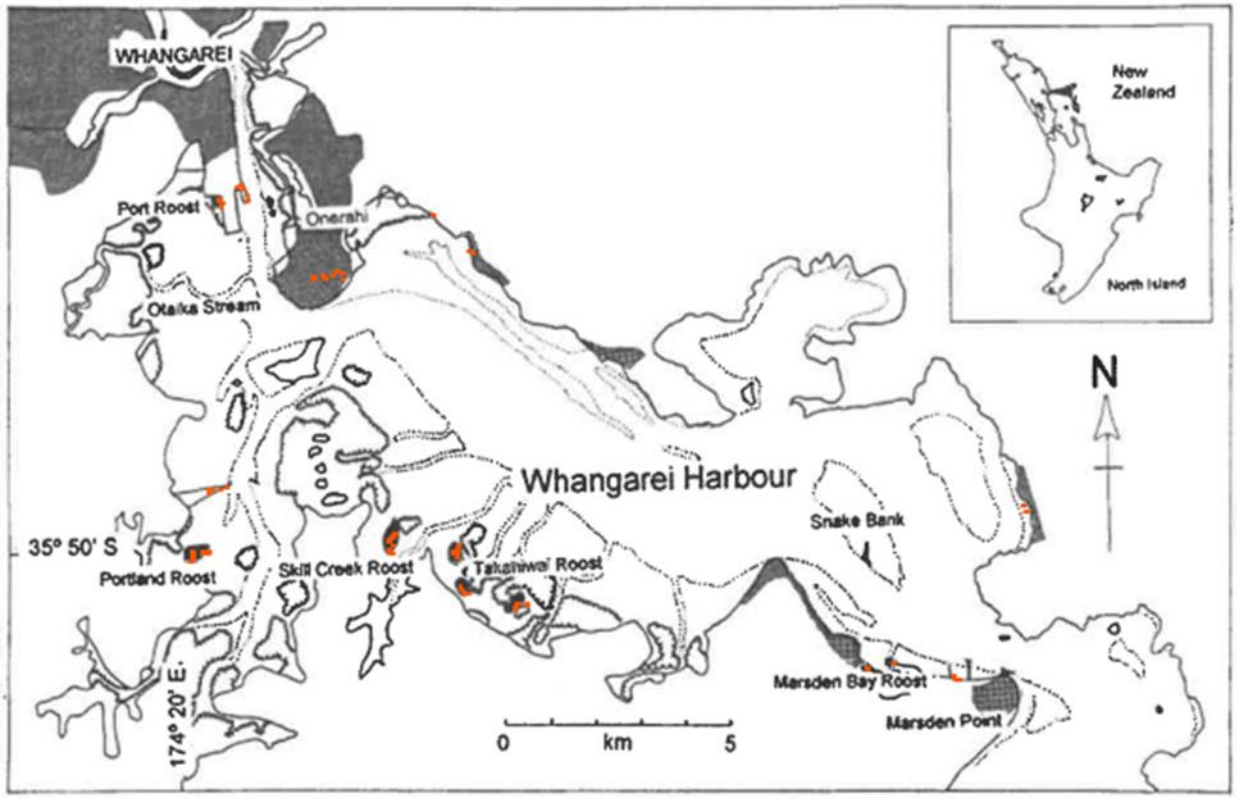

Fig 3 Location of principal high tide wader roosts in Whangarei Harbour. Red = roosts.

APPROACH BY THE APPLIANT'S EXPERTS TO DATA

Data coverage and numbers of waders

39. When considering wader data, one must be careful to select the data that most likely represents the best estimate of a population at the time of the year because the numbers of many species change seasonally.

40. There is data available for some months which has been presented as means, medians and maximums of different species over differing time frames for most of the waders in Whangarei Harbour. I have set these out in Appendix 1. However, there are no Whangarei Harbour roost data that cover all the months assessed by the applicant at Northport. The data collected by 4-Sight Consultants and assessed by Dr Bull does not include data from all the roosting areas of Whangarei Harbour, so the harbour numbers are not altered to take account of seasonal differences in populations. Also, all current roost data is limited to daytime, and we do not know how the foraging

and roost habitats are used at night.

41. The number of each species used by Dr Bull for the assessments of impacts in Whangarei Harbour was a single harbour figure generally above the mean/median of published data (Appendix 1). It is unclear whether this figure was intended to represent the maximum population using roosts or the mean (Appendix 1). The figures used for species presence at the site were the mean value of site counts in each period 2 summer and one winter survey by 4sight consulting[15].

42. As a result of this I consider that the assessments likely underestimate the magnitude of proportional impact on species.

Effects Assessment method and Zone of influence

43. Dr Bull indicates in her evidence in chief that she has taken a system-wide approach to the assessment of avifauna, referring to Policy D.2.18 (5) of the proposed Northland Regional Plan. Dr Bull and other of the applicant's experts have used the Ecological Impact Assessment New Zealand guidelines (EIANZ, Roper-Lindsay *et al*., 2018[16]) on information collected at site, and used a "whole harbour" population zone of influence.

44. The nature and level of effects on species' populations were determined as a combination of ecological value through conservation status of individual species, in conjunction with presence during tidal states.

45. The EIANZ Guidelines only apply to species with a threat status (Appendix 4), and Dr Bull used the following five-point scale[17] (Negligible to Very High) to describe the magnitude of effect as:

- *Very High: >50% Loss[18] of a very high proportion of the population or range or element/feature.*
- *High: 20-50% Loss of a high proportion of the known population or range of element*

[15] Boff Miskell 2022. Northport Eastern Expansion Additional Winter 2022 Data Analysis.

[16] Roper-Lindsay, J et al. 2018. Ecological impacts assessment (EcIA). EIANZ guidelines for New Zealand: Terrestrial and freshwater ecosystems (2nd ed.). Environment Institute of Australia and New Zealand.

[17] Bull EIC clause 23

[18] Bull EIC Appendix 1

- *Moderate: 10-20% Loss of a moderate proportion of the population or range of the element/feature*
- *Low: 1-10% Having a minor effect on the known population or range of the element/feature*
- *Negligible. Having a negligible effect on the known population or range of the element/feature*

46. However, in a system wide approach more than just loss should be considered and there is no assessment of movement of birds between zones, between foraging areas and between the eastern and western side of Northport and to and from the roost sites. There was also no assessment of breeding birds on industrial land sites outside of the proposed reclamation zone (i.e. CINZ land) to assess the magnitude of the use of the beach and intertidal habitat opposite breeding sites.

Direct permanent loss of habitat

47. The result of the applicant's assessment was that only two species (VOC and New Zealand dotterels) were considered impacted by "moderate" levels of permanent habitat loss of their population from the East 1 and East 2[19].

48. Dr Bull considers this to be adequately addressed, and in fact the effect to be avoided, by the provision of a sandbank intended for use by VOC and New Zealand dotterels as a high tide roost on the western side of Northport[20]. Dr Bull has further assessed that over 1% of the Caspian tern, lesser knot and New Zealand dotterel use the site of the proposed roost, and the placement of the roost on lesser knot and New Zealand dotterel foraging areas to be "negligible (rather than low)" because knot have better foraging habitat to the west, and because Caspian tern forage on fish and would not be affected [21].

49. I agree with Dr Bull's comment about Caspian tern foraging fish, but I disagree with the assessment of lesser knot, given there is a lack of information demonstrating how important the site is to lesser knot, and a lack of current knowledge about other foraging sites used by lesser knots in the

[19] Bull EIC Table 2.
[20] Bull EIC clause 44
[21] Bull EIC clause 72.

harbour. Without this information it is not possible to quantify the potential effect of the loss of foraging habitat.

CONSIDERATION OF DR BULL'S AND MS WEBBS EVIDENCE

Population at risk

50. Dr Bull has considered the population at risk as the whole Whangarei Harbour population. This is also supported in review by Ms Webb for the councils[22]. I consider this to be appropriate for most species, but I do not consider it appropriate for VOCs and New Zealand dotterels.

51. In my opinion the distribution data of foraging and roosting VOC throughout the harbour[23] [24] (Appendix 2), and my observed lack of any substantial variation or movement to roost sites, indicates that VOC should be considered as a local outer-harbour population. In my view the same local population consideration needs to be afforded to New Zealand dotterel.

52. This would increase the proportion of population affected by the proposal, but not alter the conclusion that these are key species to consider.

Variable oystercatcher

53. Variable oystercatchers are tactile feeders which allows them to forage during the day and night when additional food is required[25]. Overseas, oystercatchers' daily food needs, the stomach capacity, and restrictions in the length of low tides mean that they cannot get sufficient food to survive in one tidal cycle, and they need to forage in fields at high tide or sometimes feed in the next low tide at night[39]. Variable oystercatchers feed in grassland in the Marina at high tide so may not use coastal roosts. In the New Zealand marine environment, VOC feed primarily on bivalve molluscs, worms and crabs and occasionally small fish, using surface picking and deep probing. They also forage for invertebrates, especially worms on short cut paddocks. This has taken place in Marsden Bay fields since at least the 1970s (see

[22] Webb Technical Memo Avifauna
[23] Pierce, R. 2005. General patterns of bird use of Whangarei Harbour. Wildlands Consultants for Northland Regional Council.
[24] Beauchamp, A.J, Parrish, R.G. 2007. Wader (Charadriiformes) and royal Spoonbill (Platalea regia) use of roosts in Whangarei Harbour and Ruakaka Estuary, Northland, 1973-2000. Notornis 54: 83-92.
[25] van de Kam, J. et al. 2004. Shorebirds and illustrated behavioural ecology. KNNV publishers, Utrecht, The Netherlands.

clause 34) and was taking place at high tide in the Marina complex on 10 September 2023 when I last visited the area.

54. Dr Bull considers that VOC will fly to the west when displaced from the eastern beach during construction of the eastern reclamation, and that they will use the newly created roost that has been proposed. However, the current roosts in Whangarei Harbour for most VOCs, including at Marsden Bay, are on beaches, structures and short grassed coastal margins, and there is low likelihood that they will move to the tide-surrounded roost, and there is no consideration of what will happen should they move elsewhere and not move to that roost.

55. Currently the roost site to the east of Northport suffers moderate disturbance by people seeking to access the first 50 m of beach from the car park. However, when I observed the birds put to flight three times on 10 September 2023, the oystercatchers returned. None of them tried to leave to the west over Northport for Marsden Bay.

56. The proposed reclamation site is closest to a principal foraging area which is west of the CINZ wharf on the inner Mair Banks (Fig. 4). In my view that any change to the extent of the beach will push roosting birds to east, and not result in them moving their roost permanently to Marsden Bay.

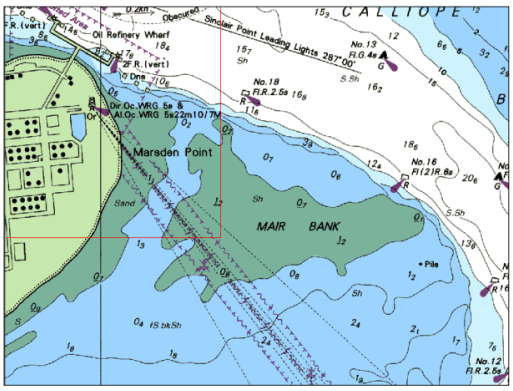

Fig. 4 – Mair Bank is located east of the CINZ wharf and variable oystercatchers use the harbour margin and inner northern Mair bank regions for foraging.

New Zealand dotterel

57. New Zealand dotterels are visual feeders so only forage during daylight. They feed on surface objects and have a relatively broad diet. When breeding in dunes, adults and young feed on amphipods and invertebrates.

They are not confined to living in the marine environment and breed and roost on land including within the tank farm in the CINZ site. In the marine environment they feed on invertebrates, crabs, and small fish.

58. Dr Bull considers that New Zealand dotterels would fly over to the western side of Northport to forage and that the impact of the permanent loss of roosting habitat would be avoided through the construction of the sandbank prior to the reclamation being undertaken. She assesses the effect of the loss of the habitat as “moderate” without the sandbank being created to the west of the port, but “low” with it in place prior to the reclamation being undertaken.

59. New Zealand dotterel have not been frequent or numerous users of Marsden Bay or harbour roosts (Appendix 4) and elsewhere in the harbour their predominant high tide roosts are in fields. There is no robust evidence that they will move to the tide isolated roost, and there is no consideration of what will happen should they move elsewhere and not use the roost. There is therefore no rationale for reducing the level of effects to “low”. The loss of foraging and roost habitat would be permanent, and the loss foraging habitat is not proposed to be addressed by the applicant.

60. New Zealand dotterel from a region flock together in late summer and autumn at specific coastal locations, and it is currently unclear where the regional flock site is that covers the birds within Whangarei Harbour. Given up to 70 birds (more than ever recorded elsewhere in the harbour - see Appendix 1) were recorded on one occasion[26] in Northport grounds during the 4Sight Consultants 2019/20 survey, it could well be within the industrial complex at Marsden Point.

Lesser knot

61. Lesser knots have a higher threat status than variable oystercatchers (Appendix 4 & 5). Lesser knot are tactile specialist small shellfish (<15 mm) feeders, with a very complicated bill structure for detecting food (Appendix 6) in water-associated habitats. This bill structure allows them to feed in areas with lower shellfish density than other waders. In Whangarei Harbour,

[26] 4sight Consulting 2020. Wading Bird survey – expanded areas December 2019 - February 2020 p 8.

knot feed around pools on sandflats at low tide and the water margin[27]. Low tide pooling occurs in Marsden Bay. Marsden Bay has been a sought-after foraging area for knot since at least the 1990s (see section 35).

62. Figure 10 in Dr Bull's evidence in chief shows that lesser knots are restricting themselves to foraging within a narrow area between Northport and the Marina canal. During 4sight data collection up to 200 lesser knots are shown to have foraged in the western 1 and 2 areas at the same time (~25% of the harbour population at that time)[28].

63. Dr Kelly has indicated in his evidence in chief that the area being used by lesser knot could be influenced by a vortex, caused by the margins of Northport and the tide, resulting in an ideal ground for settlement of the small shellfish[29], that are an important part of the diet of lesser knot[30].

64. Dr Bull indicates that the loss of habitat by the placement of the sandbank would have a negligible effect for lesser knot, because the marine ecology assessment indicated that there more diverse and abundant food to the west[31]. However, is not clear where the "west" site is, as few knot were detected west of the Marina channel.

65. There are no assessments of the impacts of both the placement of the roost site, and its ongoing erosion on the habitats present (pools) at low tide and invertebrate density changes. The region of impact could be far wider than the roost site footprint[32].

66. In my opinion, we do not know how important this small area of the harbour is to lesser knot. Recent counts have indicated the Whangarei Harbour population has declined to only 450-500 birds (compared to 3,000 15 years

[27] Parrish, R. 1985. Whangarei Harbour Wildlife Survey. New Zealand Wildlife Service, Technical Report 8
[28] 4sight consulting 2020. Wading bird survey. October 2019-February 2020.
[29] Kelly EIC clauses 20-22
[30] van de Kam, J. et al. 2004. Shorebirds and illustrated behavioural ecology. KNNV publishers, Utrecht, The Netherlands.
[31] Bull EIC clause 72.
[32] Tonkin and Tayor 2022. Vision for growth Port development Coastal Process Assessment section 2.3.6

ago), and we do not know if this decline is solely due to international[33] or local causes.

CONSTRUCTION AND OPERATIONAL EFFECTS

Injuries and mortalities

67. The surveys done for the applicant have found breeding New Zealand dotterel, VOC and pied stilt in the confines of the existing port, and Dr Bull considers that it was more likely that nesting species were at risk of injury or mortality. The other species considered to be at risk are Little-blue penguins during construction, however the impacts could be managed by pre-construction surveys and exclusion zones. Dr Bull also considers that during the operation of this part of the port that the magnitude and level of effect would be low to very low.

68. I agree that this is the stage where most birds could be injured but I also note that if the birds need to access the coastline after eggs hatch, these areas should be assessed, and measures put in place to ensure their protection.

Disturbance and displacement

69. Dr Bull has used the "flight initiation distance" of the most vulnerable species (45 m) to assess the impact of the eastern margin on bird movement. She found that 3.6% of the Harbour's New Zealand dotterels were foraging on what would be the eastern margin of the proposed reclamation. However, she considers the magnitude of construction effect would be negligible because dotterels could find more abundant food supplies west of Northport[34]. I cover my concern about these issues in clause 59 of my evidence.

70. Dr Bull also considers that human disturbance is likely to be an issue during the operational phase[35].

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[33] Studds, C.E. et al. 2017. Rapid population decline in migratory seabirds relying on Yellow Sea tidal mudflats as stopover sites. *Nature communications 8*: 14895. doi: 10.1038 / ncomms14895.
[34] Bull EIC clause 50
[35] Bull EIC clause 55

71. I agree that human disturbance could be a problem[36] due to people accessing the small amount of beach that is left between the reclamation and the CINZ wharf.

72. However, as discussed by Mr Jones[37], if the issues surrounding safety during CINZ boat unloading makes this part of the beach potentially unsafe for public taxi and tug access, and if these activities are permanently moved to another site, then the impact on birds could be lower during the operational phase. Also, any impact would be further reduced by not developing the esplanade area as a road, and leaving access as it currently is from the existing car parking.

73. Dr Bull indicates[38] that blue penguins were the most likely to be disturbed by hydraulic hammer impact (pile driving) and that the impact would be minimal because penguins are predominantly breeding in the outer harbour and would be more likely to forage out at sea. She concludes that less than 10% of the birds would be foraging within Whangarei Harbour. Dr Bull considers however that some form of noise mitigation and underwater route be considered in the Avifauna section of the Construction Environment Management Plan (CEMP).

74. I agree that the pile driving is likely to be a problem for Little blue penguins. However, I have no information on the percentage of birds using the area, their response to underwater noise, or the distance and mitigation required, and agree is needs to be considered in the CEMP.

Food supply and foraging

75. Dr Bull considers that the mobilisation of sediment and its impact on benthic biota that forms the food for birds in the east of the port to be negligible. This is not supported by the review of the Assessment of Marine Ecological Effects for council by Dr Lohrer[39],who questions the impact of the reclamation on the disruption of (pipi) propagule transport pathways and

[36] Human disturbance is already evident in a part of the beach west of Northport, which was not surveyed by 4sight Limited because they lacked birds.
[37] Application Technical memo recreation Appendix C8.
[38] Bull EIC clause 51
[39] Lohrer, Technical memo Marine Ecology Appendix C3

settlement of pipi on Mair Bank, and the impacts of sediment on intertidal habitats.

76. I have no knowledge about the possibility of dredging causing sedimentation issues for marine intertidal biota, but if there is the possibility that this may occur, my view is that this to be a serious issue for birds.

Artificial lighting

77. Dr Bull expects there to be a small cumulative effect of lighting during construction and recommends this be managed by reducing the number of lights and directing light down whenever practical. She considers the impacts to be negligible.

78. I agree with this assessment.

CUMULATIVE EFFECTS

79. Ms Webb has reviewed the Coastal Process Assessment appended to the application in her s42A assessment and considers that the impact of cumulative effects was inadequate and needed to cover:

- Identification of the key issues causing population decline (of birds) in Whangarei harbour (Zone of Influence, ZOI)
- Identification of activities and related ecological effects that contribute to key avifauna issues in Whangarei Harbour (ZOI).
- Identification of Northport eastern reclamation construction and operation activities that contribute to these effects (if any).
- Assessment of the level of cumulative effects arising from the eastern reclamation[40].

80. Dr Bull in response referred to several developments in the marine area that had taken place (Dr Bull's Table 14, evidence in chief) and extant consents. Dr Bull considers cumulative effects to comprise effects that will occur including effects that arise and build up over time and effects that arise in

[40] Webb Technical memo – Coastal avifauna, pg 5

combination with others[41]. She concluded that there were no cumulative effects on coastal avifauna identified as affected by the eastern reclamation.

81. However, in Table 12 of Dr Bull's evidence in chief, under CINZ channel optimisation, there is the comment that there will be project generated effects on shorebird habitat and that this was "high" at Mair Bank. In my experience the VOCs that feed on Mair Bank are likely to be the same birds that are to be displaced from their roost site by the construction of the eastern reclamation. In my view there is a potential cumulative effect if the birds are displaced from foraging habitat and roosting habitat, and this makes it even more important that the loss of habitat for VOCs is appropriately addressed.

82. Dr Bull considers that there were several historic projects that may have impacted coastal avifauna, however these are now part of the existing environment[42]. Dr Bull considers, bullets 1 and 2 in clause 79 above to be out of scope for this application and that she had covered bullets 3 and 4 adequately[43].

83. Ms Webb issued a S92 request for clarity the cumulative effects and increased pressure on alternative roosting and foraging sites, and whether there was space for the species displaced by the activity. Ms Webb appears to have assumed from the response given that the ~250 birds displaced could be accommodated at the various roosts in the harbour, but she still questioned whether habitat loss and disturbance were key issues for shorebirds in Whangarei Harbour, and whether there are alternative sites which are stable and secure, with adequate carrying capacity[44].

84. I address the complexity of issues of roost site stability in Appendix 3 for the main roost areas. At all roosts there is currently adequate space for ~250 birds, but there are also pressures. At Port Whangarei and Portland the roosts created by human activity are now almost lost. At Ruakaka Estuary, Marsden Bay and Waikaraka and McLoud's Bay the sites used are on or beside beaches near housing with dogs. Active human disturbance takes

[41] Dr Bull EIC clause 76.
[42] Dr Bull EIC clause 98.
[43] Dr Bull EIC clause 101.
[44] Webb Technical Memo – coastal avifauna Pg 8

place at the airport. There is potential climate change squeezing at Portland, Takahiwai/Mangawati and Skull Creek.

85. In my view none of the existing roost sites is particularly safe for waders. They are all connected to the mainland at low tide and predator control is not present on the adjoining land.

86. There is insufficient information on the reasons for declining number of waders at roost sites in Whangarei but work elsewhere points to impacts of habitat loss and predation on breeding birds and their nests. The recovery in populations of New Zealand dotterels, and variable oystercatchers apparent in threat classifications (Appendix 4) are attributed to predator control at the breeding sites including beaches, and industrial sites like CINZ.

NATIONAL POLICY STATEMENT ON INDIGENOUS BIODIVERSITY(NPS-IB)

87. The New Zealand National Policy statement for indigenous biodiversity (NPS-IB) came into effect on 4 August 2023.

88. Dr Bull has assessed the impact of the NPS-IB on the application in her evidence[45] using the species counted above MHWS in the reclamation footprint. She considers that the provision of the sandbank renourishment area meets the intent of Policy 4 ("Indigenous biodiversity is managed to promote resilience to the effects of climate change"), because it will be maintained to be above MHWS as the climate changes.

89. I agree that the proposed sandbank nourishment area is to be assessed and maintained above high tides. However, the conditions that are applied to the construction/maintenance of the sandbank and consideration of its potential abandonment apply to use by VOC and New Zealand dotterels, and not to the species that Dr Bull lists as benefiting[46].

[45] Bull EIC clauses 82-93
[46] Bull EIC Table 13 clause 92

THE SANDBANK RENOURISHMENT AREA

90. The proposed constructed sandbank renourishment area is considered by Dr Bull as a measure to avoid effects for the permanent loss of variable oystercatcher and New Zealand dotterel high tide roosting habitat[47]. The proposal is to construct this renourishment area before the construction phase of the reclamation[48] out of dredged spoil or beach sand from the proposed area from Berth five[49], and to assess the geomorphological impacts of an area within 200 m before and after construction[50]. In addition, the wider marine foraging area used by waders in Marsden Bay is to be assessed before construction begins in case there are scientifically significant impacts on marine invertebrates later (see my comments in clause 100)[51].

91. If the sand from the proposed Berth 5 is used for creation of the sandbank renourishment area it would need to be done in a way that does not displace the VOC roosting there in the meantime. Also, the sand used in maintenance would have to come from outside the Berth 5 area unless it was extracted and stored, or dredged channel sand would need to be cleaned. There is no comment on how this would be done or its potential impacts in the evidence provided by the applicant.

92. The definition of “sandbank nourishment area” makes its creation and use specific to VOCs and New Zealand dotterels paramount[52] but there is no requirement for VOC and New Zealand dotterel to be using the site when the eastern port construction begins and no monitoring of the use of the sandbank is required. In fact, post-construction monitoring regarding the use of the site which was proposed by the councils’ consultants has been rejected by the applicant (refer to track-changed conditions attached to Mr Hood’s evidence in chief[53]).

[47] Bull EIC clauses 41 and 42
[48] Draft Proposed Conditions 25/8/2023, 44
[49] Tomkin & Taylor 2022 Coastal processes section 2.3.3.2
[50] Draft Proposed Conditions 25/8/2023, 189
[51] Draft Proposed Conditions 25/8/2023, 167
[52] Draft Proposed Conditions 25/8/2023 page 3
[53] Hood Evidence Planning attachment 4 Marked-up NRC conditions.

93. The Environmental Management and Monitoring Plan[54] does not consider waders as part of its procedures so there is no assessment of what the impacts of the placement of the sandbank renourishment area or any management are. However, if for some unspecified reason the sandbank renourishment area is abandoned[55] then another area can be created but the mechanism for assessing the reasons for site abandonment is not evident.

94. Dr Bull has indicated that she assessed the impact of the placement of the proposed high tide roost by looking at the invertebrate and bird layers and assessing impacts against magnitude, which she considered was negligible based on a maximum of 50 lesser knots on site and an estimated harbour population of 800 birds (Appendix 1).

95. I have discussed the change in numbers of lesser knot in clause 66 of my evidence and consider any potential loss of habitat for lesser knot in Marsden Bay cannot be supported with existing data. The use of Marsden Bay by lesser knot shows where they prefer to forage[56].

CONDITIONS

96. As I am aware that expert conferencing has been scheduled following the exchange of submitters' expert evidence. Mindful that the proposed conditions may change because of expert conferencing, I do not propose to make specific comments on the conditions proposed by the applicant in my evidence. I do however make some general comments as below.

Sandbank renourishment area (construction)

97. **Condition 42**: there is no indication of what contaminants are being considered, or where the locations for sampling are or what the western intertidal area covers. There needs to be a requirement that the silt content must not exceed that of the Marsden Bay background.

[54] Draft Proposed Conditions 25/8/2023, 193
[55] Draft Proposed Conditions 25/8/2023, 193
[56] Condition Definitions page 3.

Avifauna

98. **Condition 61**: The condition should include the provision of an escape route for adults and chicks after the eggs hatch.

Construction and Environment Management Plan (CEMP)

99. **Condition 91**. There is no requirement for monitoring of the use of the sandbank renourishment area by VOC or New Zealand dotterel after construction takes place.

Environmental Monitoring and Management Plan

100. **Condition 167**: There are no list of actions that need to take place should a significant problem be identified in this monitoring. If significant changes are found during dredging, or 1 year after dredging is complete, then I consider that resampling needs to be done in the following year, not 2 years. Also, if significant adverse effects have been found on the intertidal invertebrates in Marsden Bay, then this should trigger an avifauna foraging assessment over the following spring summer. The data collected should be over the same period and from the same sites as those used by 4sight consulting in the 2019-2022 sampling.

101. **Condition 170**: I consider that this reporting must be after each sampling round not annually because if there are indications that there are issues then delaying 6 months is not appropriate.

Sandbank renourishment area geomorphological monitoring and maintenance

102. **Condition 190**: I do not consider that these monitoring intervals are based on adaptive management principles given the experimental nature of this activity. I consider it better to undertake the monitoring annually and use that data to modify monitoring, so the sandbank always remains above MHWS.

103. **Condition 191**: There is no requirement to report the impacts of the cessation of the activity.

104. **Conditions 193**: I do not consider it appropriate to allow for the construction of the sandbank renourishment area and cease monitoring its impacts if it is not meeting the purpose of providing roosting habitat for New Zealand dotterel and VOCs. The sandbank renourishment area will impact on the food of lesser knot, another threatened bird (Appendix 4) and if it is established then the use by this species needs to be included.

105. In addition, the conditions do not appear to deal with the impacts of a lag in the time between consent granting and the implementation of the development. There could be considerable change in the current status, and effects on avifauna.

CONCLUSION

106. Key findings in my EIC include:

a) The reclamation proposed to the east of the port will result in the loss of foraging and roosting habitat for Threatened and At risk avifauna species.

b) The applicant's proposal to create a sandbank to the west of Northport to offset the loss of roost habitat by the reclamation is inappropriate, given:

- It will result in loss of habitat for another At risk wader.
- There is no certainty that any of the displaced New Zealand dotterels and VOCs will use it as a roost.
- There are no assessments of the impacts of both the placement of the roost site, and its ongoing erosion on the habitats present (pools) at low tide. The region of impact could be far wider than the roost site footprint.

c) I consider that the assessments likely underestimate the proportion of New Zealand dotterel and VOCs impacted. The core consideration used in population assessment effect was that the proposal did not result in loss (permanent displacement) of more than 10% of the population at risk being that of the whole Whangarei Harbour population. I do not consider this appropriate for VOC and New

Zealand dotterels. The distribution data of foraging and roosting of New Zealand dotterels and VOC throughout the harbour, and the lack of any substantial variation at any roost sites, indicates to me that they represent local outer-harbour populations. This means that the number of VOC and New Zealand dotterel in the upper harbour should be removed from the population at risk estimates. This would make impacts of the reclamation on these two species greater.

d) There was no assessment of movement of birds between zones, between foraging areas and between the eastern and western side of Northport. There was also no assessment of breeding birds on industrial land sites outside of the proposed reclamation zone (e.g. CINZ land) to assess the magnitude of the loss of the beach and intertidal habitat opposite breeding sites.

e) Given the absence of data on avifauna behaviour and movement both in Marsden Bay and the wider harbour, it is not possible to quantify the effects of the proposal using a system-wide approach. Assertions that birds will move in specific ways and activities will be mitigated is not supported by evidence.

f) There is a lack of information demonstrating how important the western site is to lesser knot for foraging, and a lack of current knowledge about how other foraging sites are used by lesser knots in the harbour. Without this information it is not possible to quantify the potential effect of the loss of foraging habitat.

g) Dr Bull considers that VOCs will fly to the west when displaced from the eastern beach during construction of the eastern reclamation, and that they will use the proposed newly created roost. However, the current roosts in Whangarei Harbour for most variable oystercatchers, including at Marsden Bay, are on beaches, structures and short grassed coastal margins, and there is no guarantee that they will move to the tide-surrounded roost, and there is no consideration of what will happen should they move elsewhere and not move to that roost.

h) New Zealand dotterel have not been frequent or numerous users of Marsden Bay or harbour roosts (Appendix 4) and elsewhere in the

harbour and their predominant high tide roosts are in fields. There is no robust evidence that they will move to the tide isolated roost, and there is no consideration of what will happen should they move elsewhere and not use the roost. There is therefore no rationale for reducing the level of effects to "low", and in my opinion the effects of the reclamation would not in any event be "avoided" by the creation of the sandbank. Even if it is successfully used as a roost by the displaced birds, the loss of the foraging habitat would be permanent, and this is not addressed by the applicant.

i) The proposal will leave approximately 330 m of beach remaining to the east before the CINZ wharf. The proposed reclamation site is closest to a principal foraging area for VOC which extends from the CINZ wharf to the inner Mair Banks (Fig. 4). In my view it is possible that any change to the extent of the beach will push roosting birds to east. There is no consideration of this potential effect in the proposal.

j) Dr Bull considers that the mobilisation of sediment and its impact on benthic biota that forms the food for birds in the east of Northport to be negligible. Dr Lohrer questions the impact of the reclamation on the disruption of (pipi) propagule transport pathways, and settlement of pipi on Mair Bank, and the impacts of sediment on intertidal habitats. I have no knowledge about the possibility of dredging causing sedimentation issues for marine intertidal biota, but if possible then my view is that this is a serious issue for waders.

k) The loss of beach between Northport and CINZ may drive increased human use of Marsden Bay where the Applicant is trying to encourage displaced birds to go. The applicant has not dealt with this potential effect.

107. On the basis of the above of the above I consider the effects of the application to be significant.

Antony Julian Beauchamp

18 September 2023

APPENDIX 1 – PUBLISHED DATA ON WADER NUMBERS IN WHANGAREI HARBOUR AND THE FIGURE USED BY DR BULL IN HER ASSESSMENT OF IMPACTS.

Common name	Sagar et al 1999. period 1983-1994. (mean, SD, range)	Beauchamp & Parrish 2007. period 1973-2000. (median, range June)	Beauchamp & Parrish 2007. period 1973-2000. (median, range Nov)	Beauchamp & Parrish 2007, period 1973-2000. (median, range March)	Riegen & Sagar 2020, period 2005-2019. (mean, SD, range)	Bull EIC
Northern New Zealand dotterel	mean <25	24, 10-51	12, 4-37	30, 6-57	21,18, 0-64	80
Wrybill	136,90, 6-365	109, 2-154	0, 0-1	96, 2-160	41, 43, 0-146	150
Banded dotterel	290, 176, 5-689	346, 33-429	0, 0-9	30, 6-57	165, 188, 2-564	700
Bar-tailed godwit	3224, 1563, 1258-7245	351-217-709	3222, 2488-7253	2738, 365-6943	2738, 1108, 1000-5301	2800
Lesser knot	2582, 1159, 856-4198	7, 0-150	2097, 1294-4010	1245, 16-4100	828, 604, 19-2100	800
South Island pied oystercatcher	mean <2000	1871, 887-3048	262, 16-798	2235, 1119-2994	mean <2000	2500
Variable oystercatcher	136, 90, 6-365	114, 49-209	90, 56-254	174, 55-272	205, 95, 40-325	350

APPENDIX 2 - PROPORTION OF BIRDS USING THE ROOST AREAS IN WHANGAREI, 1973-2000. (FROM BEAUCHAMP & PARRISH 2007).

Table 6 Percentage of total recoveries (Mar; Jun; Nov) of 13 species of wading bird at each roost site in Whangarei Harbour and Ruakaka Estuary, 1991-2000 ($n = 30$ counts).

	North Shore and airport	Port Whangarei	Portland	Skull Creek	Takahiwai	Marsden Point	Ruakaka Estuary
Royal spoonbill	0	94	1	1	4	0	0
South Is oystercatcher	6	5	28	20	12	24	5
Variable oystercatcher	9	0	2	3	1	32	53
Pied stilt	6	44	25	9	9	5	2
New Zealand dotterel	29	3	1	18	12	6	33
Banded dotterel	52	0	1	16	26	5	1
Wrybill	3	23	11	53	8	0	2
Pacific golden plover	23	4	0	5	68	0	0
Spur-wing plover	23	10	5	17	15	28	2
Turnstone	0	7	4	0	0	0	89
Lesser knot	0	27	21	20	19	1	11
Asiatic whimbrel	0	0	0	32	68	0	0
Eastern bar-tailed godwit	1	20	29	22	19	6	4

APPENDIX 3 - PAST AND PRESENT STATUS OF WHANGAREI WADER ROOSTS

Roost region	Historic information	Present status
Marsden Bay	The roost sites used in Marsen Bay were previously spread along the shoreline from the CINZ wharf to Marsden Bay, and included the current eastern VOC site, and Blacksmiths Creek roost. Birds also used cut hayfields to roost and forage in at high tide[57]. Before Northport was constructed, the grassed area in front of the Northland Port Corporation (Ltd) offices was a high tide roost site for banded dotterels. Godwit and VOCs used the beach seaward of the CINZ wharf in spring tides.	The Marsden Bay roosts include upper grassed and sandy beaches either site of the marina entrance channel, a very much reduced Blacksmith Creek roost, inside of the wildlife area and the surrounding industrial and urban land. SIPO and VOC foraging in grassed areas associated with the Marina canal development and the freshwater inputs to Blacksmiths Creek. A substantial population of New Zealand dotterels breed within the tank farm of CINZ and occasionally in Northport's area. High tide roosting New Zealand dotterels are in the Northport grounds[58]. CINZ opposite assessment E3 is also the summer breeding (roost) of most the Whangarei Harbour's red-billed gull population of between 3000 and 3500 birds[59]. The Marsden Point area is an on-leash dog

[57] Munro 1970 Report on birds of Whangarei Harbour, Unpublished.

[58] 4signt Consulting 2020. Wader Bird Survey – Expanded Areas December 2019-February 2020.

[59] Frost P.G.H.; Taylor G.A. 2018. The status of the red-billed gull (Larus novaehollandiae scopulinus) in New Zealand, 2014–2016. Notornis 65: 1-13.

Roost region	Historic information	Present status
		walking area and any roosting here is open to disturbance.
North shore	The northern shore of Whangarei harbour used to have 8 important roost sites between Whangarei City and Taurikura[60]. Most of these roost sites remain unchanged except for mangrove expansion in Parua Bay until recent times.	The north shore of Whangarei Harbour is so developed with housing that most of the historic roosts are now unused. The main existing roosts are at Waikaraka (mid harbour) and McLeod's Bay (outer harbour). The McLeod's Bay roost is on the road verge beside the beach and is used by VOCs and South Island pied oystercatchers (SIPO) and red-billed gulls. The Waikaraka roost is on the beach (ex. Tropicana Holiday Park) and is used by VOCs, pied stilts (*Himantopus himantopus*) and royal spoonbills *(Platalea regia*) and is now surrounded by newly built housing. These sites have space for oystercatchers displaced by the reclamation but are not as safe and the McLeod's Bay roost is not being used continuously.
Port Whangarei (Port roost Fig 3)	The Port Whangarei Roost was created	The former sediment pond sites within 300 m of the former

[60] Parrish, R. 1985. Whangarei Harbour Wildlife Survey. New Zealand Wildlife Service, Technical Report 8.

Roost region	Historic information	Present status
	by sediment dumped during channel expansion in 1968[61]. The Port Whangarei roost was encroached by mangroves on the seaward side and partly destroyed by sediment pond development in the 1990s[62]. This resulted in the loss of red-necked stint (*Calidris ruficollis*) from the harbour. Waders then used the bare ground within the sediment ponds within 300 m of the original roost until 2010. The port sediment ponds were then used for cropping and grassed for hay and sites were lost to waders for 10 or so years.	roost site are being raised by bringing in soil and developed for use as building sites. This has led to a temporary use by bar-tail godwit, banded dotterel, New Zealand dotterel and pied stilt, but this will be lost when building begins. At high tide VOCs and SIPO use the Northport cool store building rooves in daytime. They descend to the Port Whangarei and Port Whangarei Marine Centre wharves when human activity declines after sunset. During night high tides between February and July, almost the entire Whangarei Harbour population of c.4000 red-billed gulls use the wharfs and rooves of the Northport cool stores and the Whangarei Port Marine Centre as roosts. Port Whangarei would have space for oystercatchers and New Zealand dotterels displaced by the proposed reclamation in the short term, but the roost sites will ultimately be lost unless a

[61] Munro, M. 1971. Birds of Whangarei Harbour. Notornis 18: 202-206.

[62] Beauchamp, A.J.; Parrish G.R. 1999. Bird use of the sediment settlement ponds and roost areas at Port Whangarei. Notornis 46: 470-482.

Roost region	Historic information	Present status
		purpose build roost is re-established and maintained near the location of the historic roost site.
Whangarei Airport	Whangarei Airport has been the historic daytime roost site for SIPO, banded and New Zealand dotterels, wrybill and Pacific golden Plovers (*Pulvialis fulva*). In summers 2015 to 2017 the banded dotterel roost was deserted while the grassed runway was used for sky diving. Pacific golden plovers did not return.	The airport management has instigated a vehicle-clearance of the runway of waders before each commercial flight. In the past 2 winters the airport has hosted bar-tailed godwits and this coincided with their use and disturbance from the Port Nikau Marina car park development. This is the first time the airport has hosted this species since records were collected in 1974. Any more extreme moves to clear the airport would result in the loss of this day-time roost for all wrybill (that now only number 14), most of the harbour's banded dotterels and the upper harbour New Zealand dotterels. These species desert the airport in the late evening. SIPO and some banded dotterels head to Port Whangarei and other banded dotterels and New Zealand dotterels head to an unknown site in the Skull Creek/Takahiwai area.

Roost region	Historic information	Present status
		Whangarei Airport has space for displaced dotterels displaced by the reclamation but its certainty as an airport is unknown and the land could ultimately be lost to housing. The site is not used by VOCs.
Portland	There were two roosts at Portland: a clay sediment spring tide roost and a sandflat roost at Titoki creek. The clay sediment roost was created by the wet process of cement production until the early 1970s and that built up a roost used by the species of waders listed in Appendix 1, except VOCs, and little terns () and fairy terns (*Sternula nereis davisae*). The clay sediment roost was overgrown by mangroves by 1990s and deserted. The Titoki Creek sand flat roost was an	The Portland sand flat roost is only occupied throughout the lowest high tides (2.4 to 2.6 chart datum). Birds displaced by the rising tide fly to Skull Creek or Takahiwai. Recently SIPO have used the Golden Bay Cement Roof during higher tides. The piers of the coal wharf remain a day and night time high tide roost by black-backed gulls that use Purewa Landfill near Portland. The concrete wharf extension is only used by red-billed gulls as a day roost. At low tide most of the harbours non-breeding gulls use the Portland/ Matakohe Island sandflats as roosts. Portland is now unsuitable for either VOCs or New Zealand dotterels displaced by the reclamation.

Roost region	Historic information	Present status
	important roost site for bar-tailed godwit and lesser knot but since 2008 it has been used less frequently as tide heights have increased. New Zealand fairy tern were last recorded roosting here in 2010. The deck of the Portland Coal Wharf, except the concrete wharf extension was removed in 2012, removing a surface for roosting waders and gulls during spring tides.	
Skull Creek and Takahiwai/Mangawati		Skull Creek and Takahiwai roosts are the only roosts that are surrounded by high tide waters and that are undisturbed by people during high tide. The sand-based Skull Creak and Takahiwai/Mangawati roosts are declining in size due to vegetation and mangrove encroachment due to the progressive increase in tides

Roost region	Historic information	Present status
		over the past century[63]. Waders leave the Skull Creak and Takahiwai/Mangawati roosts when tides equal or exceed 2.9 chart datum. The bar-tailed godwit and lesser knot generally fly to Ruakaka Estuary beach and others fly to the coastal margin and unknown sites. Takahiwai is used by VOCs in winter but not in spring-summer so birds displaced by the proposed reclamation would need to go to other sites. Both the Skull Creak and Takahiwai roosts could be used by New Zealand dotterels displaced by the reclamation.
Ruakaka Beach	Ruakaka Beech is regarded as the key spring tide roost for the harbour's bar-tailed godwit and lesser knot and it the roost site that was most likely used before the 1950-70s when the Portland dry process and Port	Now, the southern side of the estuary is surrounded by housing and a camp ground and has considerable recreation use is summer. The estuary is a no-dog zone, but this is often abused. The only area that has more limited disturbance is the northern shoreline. Housing has been creeping southwards along the

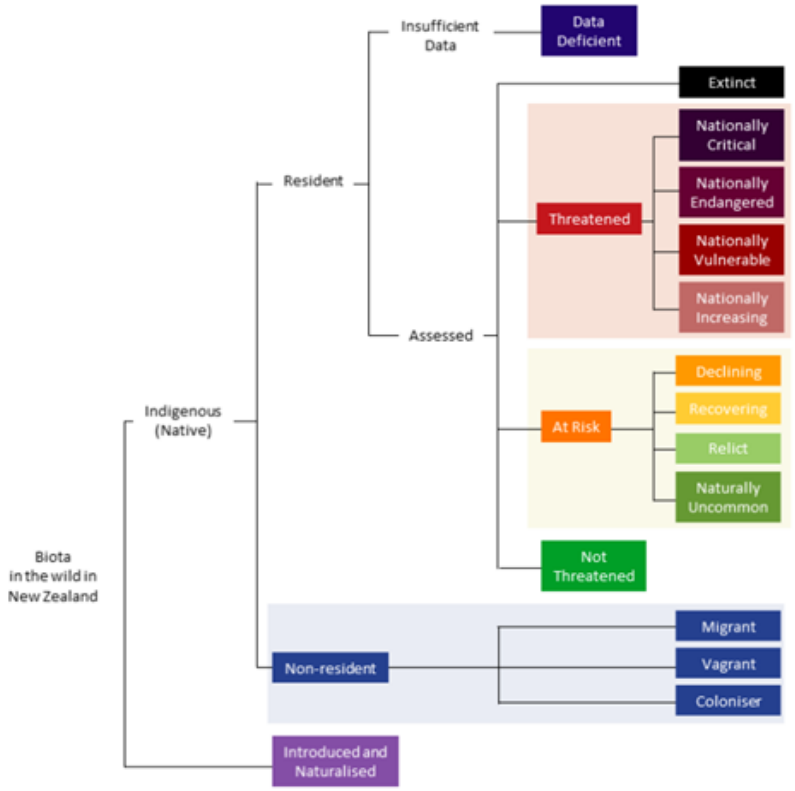
[63] The number of predicted days by Lands information New Zealand at Marsden Point with high tides ≥ 2.7m in 2003 was 61 days and in 2020 was 155 days.

Roost region	Historic information	Present status
	Whangarei sediment settlement roosts were created. The harbour waders have roosted with resident waders and seabirds on the outer spits that are sometimes connected to either the northern or southern shoreline.	Ruakaka river and there are housing areas already consented but not yet developed at the end of Tamure Place and the Ruakaka racecourse. There is no evidence that non-resident VOCs or New Zealand dotterels are using Ruakaka Estuary roost sites but there is space there if they are displaced from the reclamation.

APPENDIX 4 – THE THREAT STATUS OF BIRDS ROOSTING IN MARDEN BAY, WHANGAREI HARBOUR, AND THEIR DETECTION BETWEEN 2005 AND 2019. SEE APPENDIX 5 FOR A DIAGRAM OF THE THREAT STATUS HIERARCHY.

Common name	Name	Umbrella category	Conservation Status	Using Marsden Bay as a roost site Feb, June, Nov 2005-2019
Reef Heron	*Egretta sancra snacra*	Threatened	Nationally endangered	One adult seen 31% of the time and adult and young twice
Caspian tern	*Hydroprogne caspia*	Threatened	Nationally vulnerable	Present 60% of the time all months. Maximum 9 birds.
Northern New Zealand dotterel	*Charadrius obscurus aquilonius*	Threatened	Nationally increasing	Maximum of 7 birds counted at roost sites between 2005 and 2019
Wrybill	*Anarhychus frontalis*	Threatened	Nationally increasing	Seen on roost 2 times (1 and 2 birds respectively)
Banded dotterel	*Charadrius bicinctus bicinctus*	Threatened	Declining	Seen once (1 bird)
Bar-tailed godwit	*Limosa lapponica baueri*	At Risk	Declining	Present in 80% of November and February counts and 36% of June counts Maximum 1100 birds
Lesser knot	*Calidris canustus rogersi*	At Risk	Declining	Present in 64% of November counts and 70% of February counts, maximum 500 birds
Red-billed gull	*Chroicocephalus novaehollandiae scopulinus*	At Risk	Declining	Present in 83% of counts
South Island pied oysterc	*Haematopus finschi*	At Risk	Declining	Present in 92% of February, 82% of June and 50% of November counts, Maximum 826 birds
Variable oystercatcher	*Haematopus unicolor*	At Risk	Recovering	Present 100% of counts. Maximum 325 birds
Pied shag	*Phalacrocorax varius varius*	At Risk	Recovering	Seen 40% of the roost counts. 7 birds maximum
Black shag	*Phalacrocorax carbo novaehollandiae*	At Risk	Relict	Seen 4 times at roost sites
Little shag	*Phalacrocorax melanoleucos brevirosris*	At Risk	Relict	Seen 20% of the roost counts. 3 birds maximum

APPENDIX 5 – THE THREATENED SPECIES HIERARCHY FOR NEW ZEALAND



Updated in 2021, from the *Amendement to the NZTCS manual 2008: Revised categories 2021* (Michel 2021)

APPENDIX 6 – HOW LESSER KNOTS DETECT FOODS AND USE THE ENVIRONMENT WHERE FOODS ARE FOUND (FROM (PAGE 86 OF VAN DE KAM, J. ET AL. 2004. SHOREBIRDS AND ILLUSTRATED BEHAVIOURAL ECOLOGY. KNNV PUBLISHERS, UTRECHT, THE NETHERLANDS.

Box 2.1 How knots can detect shellfish from a distance

Red knots can distinguish between trays of wet sand that contain small stones hidden 5 cm below the surface and trays without any stones. They do this by inserting their bill tips 0.5 cm into the sand for just a few seconds.[696]

This ability to detect stones hidden in the sand centimetres away is extraordinary, as the stones do not move, are the same temperature as the sand, have no electromagnetic field and no smell. This means that the knots aren't using any of the mechanisms for prey detection known in other birds and mammals. Knots were unable to detect stones buried in dry sand or in liquid mud, which suggests that the detection mechanism is based on an interaction between water, sand grains, buried items such as stones and shells, and of course the bill itself. Increased pressure created by the probing bill causes the water between the sand grains (called the interstitial water) to try to flow away. The buried stones simply obstruct this water movement.

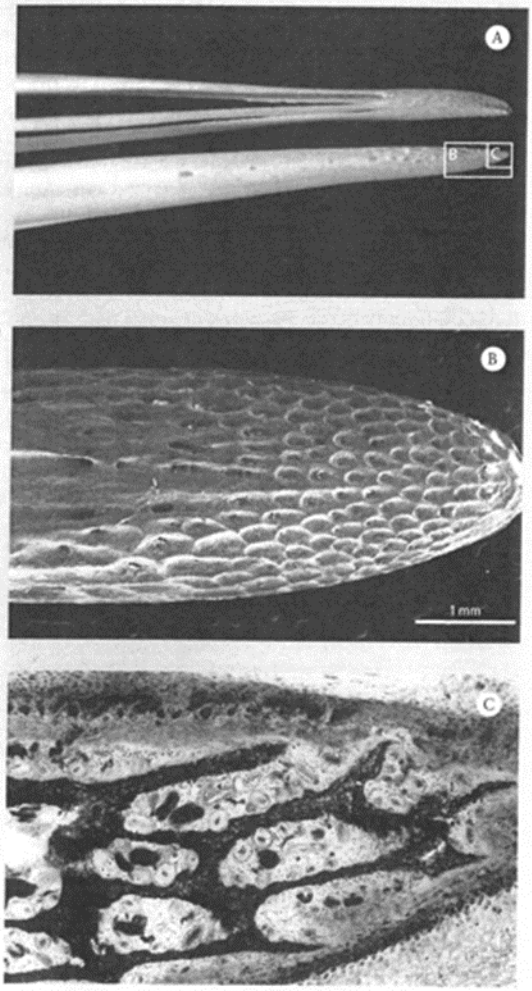


Figure B2.1.1 The red knot's sensitive bill tip. (A) The bill tip after removal of the horny layer and soft parts. (B) The Herbst corpuscles lie inside these tiny, tear-shaped pits in the bone, covered by a protective horny layer. Herbst corpuscles register subtle water pressure differences in damp sand, allowing the knots to detect buried shellfish from a few centimetres away. (C) Every tiny pit contains a group of onion-like Herbst corpuscles encircling a central nerve (coloured black).

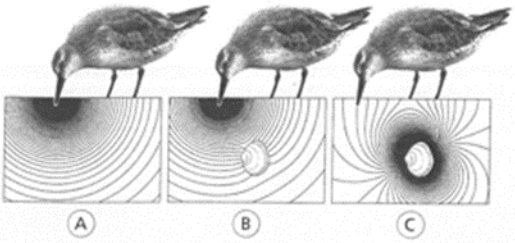


Figure B2.1.2 Hypothetical cross section through a tidal flat showing pressure fields created when a red knot probes the upper surface of the wet sediment. In (A) there are no hard objects present to disrupt the pressure field. In (B) a buried shellfish prevents the displaced interstitial water from rapidly moving away, resulting in increased water pressure around the shellfish that allows the knot to detect it from several centimetres away (C).

Beneath the protective horny layer covering the knot's bill tip are numerous rows of forward-pointing tiny pits in the bone. Each of these pits contains clusters of 10 to 20 'Herbst corpuscles', small organs able to measure pressure differences (Figure B2.1.1). When knots probe with their bills in the sediment a spherical pressure field builds up around the bill tip, due to the inertia of the interstitial water. This field is disturbed by compact buried objects such as stones or shellfish, which prevent the water in the pressure field from dispersing (Figure B2.12). The knots appear able to interpret the information this disturbed pressure field provides and even amplify it by rapidly moving their bills up and down.

This very specialised sensory organ explains why knots can detect cockles and Baltic tellins much more efficiently than oystercatchers, which have to touch their prey in order to find them.[417, 690] This also explains why knots don't mind tidal flats that have low shellfish densities and why they only forage on moderately wet sediments. In dry mudflats the pores between the sand grains are filled with air rather than water. This air is easily dispersed, so even if stones or shells are present, no discernible pressure disturbance can be created. As soon as the retreating tide causes an area to dry out, knots fly to lower-lying flats. It also explains why the knots do not like flats that are too wet. Sand grains are more buoyant and float in very wet sediments. This means that in very wet sand repeated probing will not lead to an increased pressure field and any stones or shells will remain undetected. As knots cannot distinguish between buried stones and shells, it is logical that they never forage on 'unsorted sediments' (sediments containing a mixture of different-sized sand grains and stones), even if suitable shellfish are living amongst the stones. As the knots cannot distinguish between living and inert buried objects, they would waste too much time hauling inedible items out of the sediment at such sites. They would be better off going somewhere else.