

Before Independent Hearings Commissioners
appointed by the Northland Regional Council

under: the Resource Management Act 1991

in the matter of: an application by Meridian Energy Limited for resource consents for earthworks, associated stormwater diversion and discharges and vegetation clearance for the construction of a solar farm at Ruakākā, Northland (APP.045356.01.01)

between: **Meridian Energy Limited**
Applicant

and: **Northland Regional Council**
Consent Authority

Statement of Evidence of Dr Lee Shapiro (Ecology - avifauna)

Dated: 19 July 2024

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STATEMENT OF EVIDENCE OF DR LEE SHAPIRO

INTRODUCTION

- 1 My full name is Lee Mark Shapiro.
- 2 I am a Senior Principal Ecologist and Biosecurity Consultant at Boffa Miskell Limited (*Boffa Miskell*).
- 3 I hold the qualifications of Bachelor of Science (Zoology) and Master of Science with first class honours (Ecology), both from Massey University and a Doctor of Philosophy (PhD) in Ecology from Lincoln University. I am a member of the New Zealand Biosecurity Institute and the New Zealand Ecological Society. I am a Certified Environmental Practitioner (Ecology Specialist) with the Environmental Institute of Australia and New Zealand (*EIANZ*) and am bound by its code of ethics.
- 4 I am a terrestrial ecologist with a particular specialisation in avifauna. I have over 18 years' experience in this field. My Master of Science involved research on North Island brown kiwi and my current role primarily involves undertaking assessments of ecological effects for a range of projects that seek or operate under resource consents where ecological values occur, with a particular focus on avifauna.
- 5 I have worked at Boffa Miskell for eight years. In my current role I routinely undertake monitoring for forest, wetland and coastal bird species using a range of methods to determine the presence/absence of native birds at specific sites, identify habitat use of birds, identify breeding behaviour and locate nests. I make use of all available data and relevant information to determine the potential effects of specific activities on ecological values and recommend how adverse effects can be avoided, remedied or mitigated.
- 6 Prior to my current position I was the Research and Development Manager for a New Zealand based pest control company and my key responsibilities included the research of new tools for the control and monitoring of invasive mammals in New Zealand.

CODE OF CONDUCT

- 7 Whilst this is a Council hearing, I acknowledge that I have read and agree to comply with the Environment Court's Code of Conduct for Expert Witnesses, contained in the Environment Court Practice Note 2023. My qualifications as an expert are set out above. Other than where I state that I am relying on the advice of another person, I confirm that the issues addressed in this statement of evidence are within my area of expertise. 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

- 8 I have been asked by Meridian Energy Limited (*MEL*) to provide evidence focused on avifauna effects in relation to MEL's Ruakākā solar farm project (the *Proposal*).
- 9 I visited the site on 19 June 2024 to view the wetland habitat to be removed, the wetland habitat sites to be restored and enhanced, the wetland offset site and the stormwater ponds.
- 10 I understand that there has been a specific focus on the impacts of the Proposal on matuku-hūrepo/Australasian bittern (matuku) and other Threatened and At-Risk avifauna that have been recorded within the Proposal site. My evidence is therefore in the nature of a peer review or assessment of the impacts on matuku and other Threatened and At-Risk avifauna recorded within the Proposal site, and the likely effectiveness of the proposed ecological restoration for addressing any potential impacts on these species.
- 11 Specifically, my evidence will cover:
- 11.1 the nature and breeding and feeding habits of matuku and other Threatened and At-Risk avifauna recorded within the Proposal site;
 - 11.2 impacts of the Proposal on matuku and other Threatened and At-Risk avifauna; and
 - 11.3 impacts of the proposed ecological restoration on matuku and other Threatened and At-Risk avifauna.
- 12 Other ecological matters will be covered by other Boffa Miskell experts, including **Dr Sarah Flynn, Ms Tanya Cook** and **Mr Stephen Fuller**.
- 13 I have reviewed the Ecological Review authored by Mr Jack Warden which is Appendix A to the Council's Section 42A Report and comment in my evidence on avifauna matters raised.

SUMMARY OF EVIDENCE

- 14 In my opinion, the proposed wetland recreation, enhancement and restoration, combined with a comprehensive mammalian pest control program, and measures to address other potential effects (i.e. vehicle collisions) on matuku and other Threatened and At-Risk birds present within the Proposal site is sufficient to mitigate and offset the loss of wetland habitat and potential effects on these species.
- 15 The successful recreation, enhancement and restoration of wetland habitat will provide a mosaic of good quality habitats with areas of shallow water and deeper pools, and tall, dense, reed vegetation to provide foraging, roosting, breeding, and nesting habitat for

matuku, weweia, pūweto and other wetland birds and open water birds.

AVIFAUNA SURVEYS

- 16 As well as matuku, a number of other Threatened and At-Risk species of birds have been recorded within the Proposal site, namely, spotless crane/pūweto, dabchick/weweia, brown teal/pateke, banded rail/moho pereru, pied shag/karuhiruhi, little shag/kawaupaka, little black shag/kawau tui and pipit/pihoihoi as well as South Island pied oystercatcher/torea and Northern New Zealand dotterel/tuturiwhatu. The survey locations and methods used for surveying all avifauna are explained by **Dr Flynn** in her statement of evidence, and the locations of observations of Threatened and At-Risk birds are illustrated in **Appendix 1**.

MATUKU

- 17 Matuku are considered a secretive wetland specialist species that are predominantly found in freshwater and brackish habitats including estuaries, wetlands and lakes and are restricted to New Zealand, New Caledonia and southern Australia. In New Zealand, matuku are classified as Threatened – Nationally Critical¹ which is the highest threat classification.
- 18 Matuku are known to favour wetlands that consist of a mosaic of open water with tall dense vegetation and prefer habitat consisting of beds of tall rush species (rāupo²) mixed with sedge and reed species for roosting and nesting³.
- 19 There is a limited amount of data on the breeding of matuku in New Zealand. However, the data that is available indicates that nests can be found in a wide variety of vegetation types (frequently rāupo), and it is thought that only females incubate and care for young⁴. Based on records of observed matuku nests, the ideal water depths for nesting range from 20-75 cm, while water depths of 15-25 cm on the margins of wetland vegetation cover appear optimal for feeding⁵.
- 20 Only male matuku call (referred to as booming) and the peak of their calling is during the spring breeding season from September to November. The booming is thought to function to attract females and to guard their territory from other males⁴.

¹ O'Donnell & HA Robertson, 2016. Changes in the status and distribution of Australasian bittern (Botaurus poiciloptilus) in New Zealand, 1800s– 2011. *Notornis* 63 (3-4), 152-166.

² Cheyne, J. 2015. Bittern and spotless crane survey eastern and southern wetlands Wairarapa moana, Spring 2015. In Prepared for the Wairarapa moana project. Waipukurau: Wetlands Works.

³ Marchant & Higgins, 1990. Handbook of Australian, New Zealand & Antarctic Birds: Volume 1 Part A - Ratites to Petrels. S. Marchant & P.J. Higgins (eds). Oxford University Press, Melbourne, 1990.

⁴ O'Donnell, C.F.J. 2011. Breeding of the Australasian bittern (Botaurus poiciloptilus) in New Zealand. *Emu* 111: 197- 201.

⁵ Williams 2018. Wairarapa moana bittern/matuku management strategy. Matuku Ecology. Pp 53. https://ref.coastalrestorationtrust.org.nz/site/assets/files/8673/wairarapa_moana_bittern_management_plan_draft_-_doc-5529159.pdf

- 21 Matuku are thought to be predominantly fish eaters but are also known to be opportunists, feeding on amphibians, mammals, birds, spiders and insects and most observations of foraging matuku suggest that they rely on the ability to stalk, sight and stab their prey which requires good water clarity.
- 22 Matuku are a highly mobile species and individual males that have been monitored via radio tracking were found to travel distances >100 km. It is thought that matuku rely on an extensive network of individual wetlands throughout the landscape to sustain themselves throughout their annual cycle.

THREATENED AND AT-RISK WETLAND AND OPEN WATER BIRDS

- 23 A number of Threatened and At-Risk species of wetland and open water birds have been recorded within the Proposal site including puweto and moho pereru (both classified as At-Risk – Declining), and pateke and weweia (both classified as Threatened – Nationally Increasing). These species all use freshwater bodies and/ or wetlands as their primary habitat and are all known to use wetland and open water habitats for feeding, roosting and breeding.
- 24 Karuhiruhi, kawaupaka and kawau tui (pied shag, little shag and little black shag) (all classified as At-Risk) have all been recorded using open water habitats within the Proposal site (See **Appendix 1**). All three shag species are known to use open water habitats for feeding, however, these species all nest in trees overhanging open water and suitable nesting habitat for these species is not present within the Proposal site.

THREATENED AND AT-RISK OPEN COUNTRY AND COASTAL BIRDS

- 25 Pipit/Pihoihoi (classified as At-Risk – Naturally Uncommon) are widespread in rough open habitats, around wetlands and lakes and commonly found in farmland and areas of bare ground and have been observed across the Proposal site (**Appendix 1**).
- 26 Northern New Zealand dotterel/Tuturiwhatu (classified as At-Risk – Recovering) have been observed on several occasions within the Proposal site (**Appendix 1**). Tuturiwhatu predominantly breed on sandy beaches, sandspits and shell banks and in urban areas on bare earth and recently earth worked sites. After breeding, pairs disperse to post breeding flocks often located at tidal estuaries.
- 27 South Island pied oystercatcher/Torea (classified as At-Risk – Declining) have been observed on several occasions within the Proposal site (**Appendix 1**) and are the only migratory species to have been observed within the Proposal site. Torea migrate between North Island harbours and estuaries, and South Island braided rivers where they breed.

THREATS TO MATUKU AND OTHER THREATENED AND AT-RISK WETLAND AND OPEN WATER BIRDS

- 28 In New Zealand, the main threats facing matuku and the other wetland and open water species of avifauna recorded within the Proposal site include:
- 28.1 the loss and degradation of good quality wetland habitats for feeding, breeding and roosting;
 - 28.2 fluctuating water levels and water quality and/or turbidity⁶ (for visual feeders) within their preferred wetland habitats; and
 - 28.3 threats to adults, their eggs and juvenile birds from mammalian predators.

Wetland degradation

- 29 Matuku may be limited in their ability to effectively feed in degraded wetland habitats due their lack of flexibility in relation to their foraging strategies and requirements in terms of prey size⁷. Degraded wetland habitats include those with poor water clarity that restrict the visual foraging ability of matuku and other visual feeders including weweia; water levels that are either too high or too low (causing prey to be too deep to catch or too shallow to be present); and/or little or no vegetation present resulting in matuku feeding out in the open and wetlands that lack suitable vegetation for matuku and other wetland and open water birds to roost and nest.

Mammalian predators

- 30 Mammalian predators of wetland and open water species of avifauna (including matuku), juveniles and eggs include cats, dogs, feral pigs, rats, mustelids, possums and avian predators.
- 31 In a review of risks to freshwater bird species, matuku were identified as one of six wetland specialist birds in New Zealand that are at a high risk of predation by mammalian pests, the other species listed that have also been recorded within the Proposal site include moho pereru, pateke and puweto⁸.
- 32 Matuku females face an increased risk of predation from mammalian predators during incubation and when caring for juveniles. Female matuku are smaller in size than males, and only female birds incubate eggs, rendering them vulnerable because matuku nests are a platform of reeds on the ground⁸.

⁶ O'Donnell, C.F.J. 2011. Breeding of the Australasian bittern (*Botaurus poiciloptilus*) in New Zealand. *Emu* 111: 197- 201.

⁷ Williams 2018. Wairarapa moana bittern/matuku management strategy. Matuku Ecology. Pp 53. https://ref.coastalrestorationtrust.org.nz/site/assets/files/8673/wairarapa_moana_bittern_management_plan_draft_-_doc-5529159.pdf

⁸ O'Donnell, C. F. J., Clapperton, B. K. & Monks, J. M. 2015. Impacts of introduced mammalian predators on indigenous birds of freshwater wetlands in New Zealand. *New Zealand Journal of Ecology*, 39: 19-33.

- 33 The adults, juveniles and eggs of moho pereru, pateke and puweto are also vulnerable to mammalian predators because they all nest on the ground. Weweia adults and eggs are vulnerable to mammalian predators, however, their nests are often constructed from aquatic vegetation over open water which can provide some protection from predators.

OBSERVATIONS OF THREATENED AND AT-RISK BIRDS WITHIN SITES 1, 2 AND 3 AND STORMWATER PONDS

Matuku

- 34 Between 2021 and 2024, observations (both as part of targeted surveys and made incidentally) have been made of matuku in Sites 1, 2 and 3 foraging in shallow water habitats within wetlands and drains (**Appendix 1**). Observations of matuku within Sites 1, 2 and 3 have been concentrated within three locations, namely, the exotic-dominated wetland and open water habitat in the south of Site 1, Bercich Drain (within Sites 1B and C), and within the stormwater ponds (constructed between 2008 and 2010) adjacent to Sites 2 and 3 (**Appendix 1**).
- 35 Further observations of matuku have included two observations of a single matuku foraging within an open water pond in Site 1A, and a single matuku was observed on one occasion in exotic-dominated wetland habitat within the north of Site 1B.
- 36 The observations of matuku within the stormwater ponds adjacent to Sites 2 and 3 included numerous observations of single matuku within both stormwater ponds as well as a male matuku heard booming in both September and October 2023 in wetland habitat on the edge of the northern stormwater pond during targeted acoustic surveys during the matuku breeding season⁹. Other observations included a single matuku observed in a paddock in Site 3 and another individual foraging in the unnamed drain located to the east of the southern stormwater pond (**Appendix 1**).

Other Threatened and At-Risk wetland and open water birds

- 37 Between 2021 and 2024, observations (both as part of targeted surveys and made incidentally) have been made of a range of Threatened and At-Risk wetland and open water birds in Sites 1, 2 and 3 and stormwater ponds. These observations have almost entirely been within two open water habitats, namely, the exotic-dominated wetland and open water habitat in the south of Site 1 and the stormwater ponds adjacent to Sites 2 and 3 (**Appendix 1**).
- 38 Weweia were observed on six occasions on the open water habitat within the exotic-dominated wetland in the south of Site 1 and these observations included individuals and a pair of weweia.
- 39 Further observations of Threatened and At-Risk wetland and open water birds within Site 1 have included a single weweia observed within an open water pond in Site 1C, and a single moho pereru heard calling on one occasion from an open water pond within Site 1A.

- 40 A wide variety of Threatened and At-Risk wetland and open water bird species have been observed and recorded calling during targeted acoustic surveys of the stormwater ponds adjacent to Sites 2 and 3, namely, puweto, weweia, pateke, moho pereru and Karuhiruhi /pied shag. A colony of nesting karuhiruhi and little shags/kawaupaka have been observed in pohutakawa that overhang the Ruakaka River in close proximity to where the River runs adjacent to Mccathie Rd.

Threatened and At-Risk open country and coastal birds

- 41 Between 2021 and 2024, observations (both as part of targeted surveys and made incidentally) have been made of several Threatened and At-Risk species of open country and coastal birds within Sites 1, 2 and 3 and the stormwater ponds. Pipit/pihoihoi have been observed within most areas of exotic grassland habitats within all sites. Individual Northern New Zealand dotterel/tuturiwhatu have been observed on three occasions, once each within exotic grassland habitats in Sites 1, 2 and 3. A pair of South Island pied oystercatchers/torea have also been observed on two occasions within exotic grassland habitats in Site 3 and on one occasion within the same habitat on the neighbouring site to the north of Site 3.

HABITAT FOR THREATENED AND AT-RISK BIRDS WITHIN SITES 1, 2, 3 AND STORMWATER PONDS

Matuku

- 42 Suitable habitat for matuku within Sites 1B and 1C consists of foraging habitat within the exotic-dominated wetland and open water habitat in the south of Site 1 and Bercich Drain (within Sites 1B and 1C). Bercich Drain and the wetlands within Sites 1B and 1C where matuku have been observed foraging are sparsely vegetated and provide very little cover for matuku and no suitable habitat for roosting.
- 43 Site 1A includes areas of denser vegetation, including tall reed species within indigenous dominated wetlands, that may be suitable for matuku to roost. The remainder of Site 1 (Sites 1B and 1C) lacks suitable habitat for matuku to roost. The open water habitats within Site 1A are intermittent in nature and only provide foraging habitat for matuku when standing water is present.
- 44 Overall, Site 1 lacks the mosaic of open water and beds of tall rush species including rāupo (associated with known matuku nesting sites) and is therefore not suitable for matuku nesting. No male matuku were recorded booming within Site 1 during targeted acoustic surveys during the matuku breeding season in September and October 2023⁹.
- 45 Sites 2 and 3 largely consist of grazed pasture. Observed matuku habitat use was confined to several drainage channels used by

⁹ Boffa Miskell 2023. Ruakaka Solar Park Development – Ecological Effects Assessment. Prepared for Meridian Energy Limited.

matuku for foraging. Sites 2 and 3 contain no suitable habitat for matuku to roost or nest.

- 46 Two stormwater ponds adjacent to Sites 2 and 3 contain areas of open water and beds of tall rush, sedge and reed species (including rāupo) suitable for matuku and other wetland birds to forage, roost and nest. The detection of a booming male matuku in both September and October 2023 in wetland habitat on the edge of the northern stormwater pond provides a further indication of the suitability of this habitat for matuku breeding and nesting.

Other Threatened and At-Risk wetland and open water birds

- 47 Suitable habitat for Threatened and At-Risk wetland and open water birds within Site 1 consists primarily of foraging habitat within the exotic-dominated wetland and open water habitat in the south of Site 1B and 1C. This habitat is sparsely vegetated and provides no suitable habitat for roosting for these species, however, Site 1A includes areas of denser vegetation, including tall reed species within indigenous dominated wetlands, that may be suitable for banded rail to roost.

- 48 There are open water habitats within Site 1B and 1C that are intermittent in nature and provide potential foraging habitat for weweia when standing water is present.

- 49 The two stormwater ponds adjacent to Sites 2 and 3 contain areas of open water and beds of tall rush, sedge and reed species suitable for wetland and open water birds to forage, roost and nest. A pair of weweia and a juvenile were observed on the northern of the two stormwater ponds in January 2024 providing further evidence of the suitability of this habitat for breeding. The open water habitat of these stormwater ponds provides feeding habitat for pied and little shags that roost within pohutukawa trees approximately 540 m south of the southern stormwater pond.

Threatened and At-Risk open country and coastal birds

- 50 Sites 1, 2 and 3 contain large areas of exotic grassland habitats (as does surrounding farmland within the wider area) suitable for pipit to forage, and areas of dense ungrazed exotic-dominated and indigenous wetland vegetation within Site 1A provide potential roosting and nesting habitat for pipit.

- 51 Coastal bird species are known to make opportunistic use of grazed pasture/exotic grassland in close proximity to the coast and harbours for roosting and occasionally for foraging, this occurs primarily when the high tide covers their intertidal foraging sites. Sites 1, 2 and 3 do not contain any unique or significant habitat features for coastal bird species, instead grazed pasture/exotic grassland within these sites will be used by these species opportunistically at certain times, much the same as similar sites along the Ruakākā coastline and throughout coastal areas of New Zealand.

Avifauna habitat within Sites 1, 2 and 3 and stormwater ponds

- 52 In my opinion, the open water habitat located within the south of Sites 1C and 1B and consistently used by matuku and weweia for foraging is likely an important part of a network of open water foraging habitats used by these two species within the wider area. The extent of the open water habitat fluctuates seasonally, however, the persistence of open water within this habitat throughout the year, and the likely presence of suitable prey for both species is the main reason for the continued observation of these species at this location. This is in contrast to other areas of open water within Sites 1, 2 and 3 which are intermittent in nature and only occasionally available as foraging habitat for matuku and weweia.
- 53 As **Dr Flynn** explains in her statement of evidence, the open water habitat located within the south of Sites 1C and 1B is highly degraded as a result of land clearance and stock grazing. Restoration and enhancement of this habitat will improve its value as foraging habitat for matuku and weweia, and revegetation will provide potential roosting and nesting habitat for both species that is currently absent.
- 54 Site 1A includes areas of denser vegetation, including tall reed species within indigenous dominated wetlands, that may be suitable for matuku and moho pereru to roost.
- 55 The two stormwater ponds adjacent to Sites 2 and 3 contain good quality habitat for wetland and open water birds to forage, roost and nest.

POTENTIAL PROPOSAL IMPACTS ON THREATENED AND AT-RISK AVIFAUNA

- 56 The primary impact on ecological features resulting from the proposed solar farm development and proposed effects management measures are explained by Dr Flynn in her statement of evidence.
- 57 Potential effects on Threatened and At-Risk avifauna resulting from the Proposal are as follows:
- 57.1 Disturbance and potential displacement of matuku, weweia in Site 1, Threatened and At-Risk avifauna present within the stormwater ponds, and pipit present in exotic grassland habitats across Sites 1, 2 and 3 during earthworks and construction resulting from the increase in people and vehicles moving within these sites directly adjacent to wetland habitat. Matuku, weweia, pūweto and pateke are all relatively mobile species and likely to move to other wetland/open water habitats if disturbed. However, potential effects would be most pronounced during the breeding season when adult birds are less mobile when incubating eggs and caring for nestlings before they fledge. Any potential impacts on breeding birds would be restricted to Sites 2 and 3 which

are adjacent to the two stormwater ponds that contain the only suitable breeding habitat.

- 57.2 Removal of wetland habitat within Site 1A used for foraging and potentially roosting by matuku and moho pereru. As **Ms Cook** explains in her statement of evidence, the wetlands in Site 1A are seasonal in nature. Most features lack standing water, while some contain open waterbodies during wetter periods but are covered in herbaceous vegetation for a large part of the year, and at those times do not provide foraging habitat for matuku and other roost habitat closer to foraging sites is likely to be used.
- 57.3 Removal of exotic-dominated wetland habitat within Sites 1B and 1C potentially used for opportunistic foraging by matuku when these areas are inundated.
- 57.4 Increased risk of collisions with vehicles for matuku, wetland birds and open water birds using the restored wetland proposed within Site 3.

PROPOSED ECOLOGICAL RECREATION, ENHANCEMENT AND RESTORATION

- 58 The proposed ecological recreation, enhancement and restoration in Sites 1 and 3 seeks to both mitigate and offset the potential effects on matuku and other wetland and open water birds resulting from the Proposal, and the effects management approach is as follows:
- 58.1 Recreation, enhancement and restoration of wetland and open water habitats within the south of Sites 1B and 1C.
- 58.2 Recreation of wetland habitat within Site 3.
- 58.3 Comprehensive pest mammal control across Sites 1, 2 and 3.
- 59 The approach is described in detail in **Dr Flynn's** evidence. Each of these three components are described below with a focus on avifauna aspects, with the areas shown in **Appendix 1**.

Restoration and enhancement of existing wetland habitat

- 60 Within Site 1, 2.05 ha of open water habitat will be retained and restored in the south of Site 1B and 1C and a further 7.05 ha of wetland will be recreated to provide a total of 9.10 ha of open water and wetland habitat within Sites 1B and 1C.
- 61 Restoration and enhancement works within Sites 1B and 1C will include the creation of a mosaic of habitats with areas of shallow water and deeper pools, and tall, dense, reed vegetation to provide foraging, roosting, breeding, and nesting habitat for matuku, weweia, pūweto, moho pereru and other wetland birds and open water birds.

- 62 Replacing cattle with sheep to graze Site 1 within the proposed solar panel areas, excluding livestock access to restored and created wetland habitat, and fencing the Bercich Drain with a 2.0 m setback will improve local water quality and aquatic ecosystem values and reduce inputs of sediment and nutrients. It is anticipated that this will have a positive effect on water quality within the site and will benefit visual foragers including matuku and weweia.

Wetland re-instatement

- 63 Within Site 3, 11.73 ha of wetland habitat will be recreated within an area of drained low-lying land at the southern end.
- 64 As **Mr Fuller** explains in his statement of evidence, the reinstated wetland will include areas of shallow water (and deeper pools) and tall, dense reed vegetation. This habitat will provide foraging, roosting/resting, breeding, and nesting habitat for matuku, weweia, pūweto and other wetland birds and open water birds.
- 65 The recreation of wetland habitat within Site 3 will provide additional good quality wetland habitat adjacent to the two stormwater ponds where a range of Threatened and At-Risk avifauna have been recorded. The northern stormwater pond was the only location where male matuku have been recorded during surveys of Sites 1, 2 and 3.

Disturbance and collision risk

- 66 I understand that Mr Warden (in previous correspondence and in the Ecological Review) has identified disturbance from traffic and the risk of matuku colliding with vehicles on adjacent roads as a concern regarding the location of the wetland restoration within Site 3^{10,11}.
- 67 At its closest point, the northern stormwater pond is approximately 60 m from State Highway 15, and despite the traffic noise a wide diversity of Threatened and At-Risk wetland birds continue to use this habitat as well as the southern stormwater pond.
- 68 When I visited the northern stormwater pond on 19 June 2024, I observed an adult matuku foraging on the north eastern edge of the pond approximately 80 m from the neighbouring site to the north where extensive earthworks were being undertaken to construct a new stormwater pond.
- 69 In my assessment, the Threatened and At-Risk wetland birds (including matuku) using these stormwater ponds have habituated to the human disturbance from the neighbouring subdivision and State Highway 15.

¹⁰ Rural Design (Jack Warden) 3 October 2023. Ecological Peer Review Memo on behalf of Whangarei District Council and Northland Regional Council relating to a solar energy farm development proposal by Meridian Energy Ltd at three sites between Ruakākā township and Marsden Point.

¹¹ Rural Design (Jack Warden) 11 December 2023. Ecological Peer Review Memo on behalf of Whangarei District Council and Northland Regional Council relating to a solar energy farm development proposal by Meridian Energy Ltd at three sites between Ruakākā township and Marsden Point.

- 70 I agree that roads pose a significant hazard to wetland birds, and vehicle collisions are unfortunately a common cause of death where roads intersect wetland habitat. From Boffa Miskell's observations as part of this project, it appears likely that several matuku are roosting in wetland habitat within the two stormwater ponds and flying to Site 1 to forage in the Bercich drain and open water habitat in the South of Sites 1B and 1C, and in doing so currently traverse Marsden Point Rd. The creation of wetland habitat within Site 3 will provide good quality habitat close to both stormwater ponds that has no road between these habitats.
- 71 It is likely that matuku and other wetland and open water birds will continue to move between the stormwater ponds and Site 1, particularly given the proposed restoration of wetlands in Site 1. Vehicle collision risk to matuku and other wetland birds and open water birds inhabiting the restored wetland can be effectively addressed by installation of an earth bund along the edge of Site 3 adjacent to the road corridor, and for this bund to be planted with fast-growing trees (e.g., karo, akeake, etc).
- 72 A 2.0 m earth bund and vegetation planted on top will ensure birds flying directly from the wetland will have sufficient height to avoid the road corridor as they will need to gain elevation to pass over the vegetated bund. It is my understanding that there is currently an elevated bank along the eastern boundary of Site 3 that is at least 2.0 m above the level of the proposed wetland offset site. In this area fast-growing trees planted along the boundary will be sufficient to ensure matuku and wetland and open water birds will gain sufficient elevation to pass over the adjacent road corridor.
- 73 This approach was successfully implemented by a community group in the Bay of Plenty after five matuku were killed in the space of three years by vehicle collisions on a short 1 km stretch of road as they moved between farmland drains and the Nukuhou Saltmarsh located on opposite sides of the road. Vegetation was planted along the edge of the farmland adjacent to the road and opposite the saltmarsh. No further matuku were killed at this site from vehicle collisions in the 12 years following this.

Pest mammal control

- 74 A comprehensive mammalian pest control program is proposed for Sites 1, 2 and 3 to target the main predators (particularly mustelids and feral cats) of matuku and other wetland and open water birds. Wetland birds in New Zealand are at a high risk of predation by mammalian pests¹², and targeting mammalian predators within Sites 1, 2 and 3 will provide protection for roosting, nesting and incubating adults and their eggs, and juvenile birds. In my opinion this is a positive effect of the Proposal.

¹² O'Donnell, C. F. J., Clapperton, B. K. & Monks, J. M. 2015. Impacts of introduced mammalian predators on indigenous birds of freshwater wetlands in New Zealand. *New Zealand Journal of Ecology*, 39: 19-33.

Conclusion on proposed approach

- 75 In my view, the retention and restoration of the open water habitat in the south of Site 1B and 1C and the recreation of wetland habitat in Sites 1 and 3 will avoid, mitigate and offset the potential effects on matuku and other wetland and open water birds resulting from the Proposal, such that the effects on these species will be minor, and once the improved/new habitat is established, positive in the short to medium term.

SUCCESSFUL WETLAND RESTORATION EXAMPLES

- 76 In the case of wetland and open water birds (matuku in particular), their habitat requirements and preferences are relatively well understood. Furthermore, as **Mr Fuller** explains in his evidence and as illustrated in examples I outline below, establishment of wetland environments favourable for these birds can be achieved in a relatively short timeframe.
- 77 In the following paragraphs I describe examples of successful wetland restoration, enhancement and creation that have resulted in matuku and other wetland and open water bird species inhabiting these wetland sites. **Mr Fuller** outlines examples of the work he has been involved in with successfully creating these types of wetland habitats in his evidence.

TAHI Ecosystem Restoration

- 78 The establishment of the TAHI ecosanctuary has included the creation and modification of 14 wetlands, approximately 30 ha in total with individual wetlands ranging in size from < 1 ha to 5 ha. TAHI is located on a private property at Pataua North, approximately 16 km east of Whangarei. Wetland creation methods included damming water courses to flood areas and excavating low-lying land, resulting in areas of shallow water (and deeper pools) and tall, dense wetland vegetation. Each method has been accompanied by restoration planting and comprehensive animal pest control. Matuku and mātātā (fernbird) were recorded using all of these wetland habitats within two years of construction, and pateke arrived within three years. This site is now thought to have the second largest pateke flock in Northland¹³.

Wood Valley Managed Fill

- 79 As part of the package to address the effects from the Wood Valley managed fill (Waimauku, Auckland), a 2.0 ha wetland was created in an area of low-lying pasture using an existing farm drain located within the same property. As part of compliance monitoring, matuku were observed feeding in pasture habitat and a drain within the wider Wood Valley managed fill site and known to be using this area, and the aim of the wetland creation was to provide suitable good quality habitat for matuku.

¹³ Pers. Comm. Dr John Craig Ecologist (ONZM, PhD, BSc) July 2024. Dr Craig has been actively involved in the TAHI restoration project and lives at the site, he is a past professor of Environmental Management and Deputy Dean of Science at the University of Auckland, and co-designer of Tiritiri Matangi Open Sanctuary and has been awarded The New Zealand Order of Merit for his work.

- 80 The wetland created included several areas of open water and rāupo and other native wetland plants established in and around its fringes. In early 2021 (14 months after the wetland was created) a single matuku was observed within the wetland and since this time there have been further records of a matuku observed within this wetland¹⁴.

Stormwater Pond Ruakākā

- 81 Between 2008 and 2010, two stormwater retention ponds (the northernmost is 5.4 ha and the southern 2.0 ha) were constructed immediately adjacent to the western boundary of Site 3 (east of Port Marsden Highway) to deal with the stormwater from the subdivision immediately adjacent to the west of Port Marsden Highway. It is my understanding that the design of these structures included ecological input with an aim to create suitable habitat for wetland birds and native fish and that this included the planting of wetland vegetation around parts but not all of the edge of the stormwater ponds.
- 82 Within the stormwater ponds, a continuous fringe of indigenous wetland vegetation has established on the margins of open water habitat. Surveys of both stormwater ponds by Boffa Miskell Ecologists have confirmed the presence of numerous resident species of wetland birds and waterfowl including matuku, weweia, pūweto and pateke^{15,16}. Male matuku have also been heard booming in the northern of the two ponds¹³ indicating its suitability as breeding and nesting habitat.
- 83 The straightforward creation of suitable habitat for these Threatened and At-Risk species to roost, feed and potentially breed provides further confidence that good quality wetland habitat can be recreated within Site 3 that will be suitable for matuku, weweia and other Threatened and At-Risk species wetland and open water species of birds to roost, feed and breed.

RESPONSE TO SECTION 42A REPORT

- 84 Mr Warden (Section 3.2, subsection 6) states in relation to the proposed wetland offset within Site 3 that *"In my opinion, it is unlikely that a self sustaining wetland system will be able to persist in this location due to various factors" including "...lack of ecological connectivity. This is particularly important as built structures such as roads, urban development, and other barriers can prevent wildlife from accessing offset wetlands, reducing their long-term ecological viability."* I have addressed the successful creation of good quality wetland habitat suitable for matuku and wetland and open water birds within close proximity to the proposed wetland offset within Site 3 above in paragraphs 63-65. Furthermore, the close proximity

¹⁴ Pers. Comm. Jarrod Colbert (July 2024) Projects & Consents Manager Dirt Works Ltd. Jarrod was responsible for overseeing the wetland creation at the Wood Valley Managed Fill site.

¹⁵ Boffa Miskell 2023. Ruakaka Solar Park Development – Ecological Effects Assessment. Prepared for Meridian Energy Limited.

¹⁶ Boffa Miskell 2024. Cryptic Wetland Avifauna Surveys, Ruakaka - Spring Avifauna Surveys. Prepared for Meridian Energy Limited.

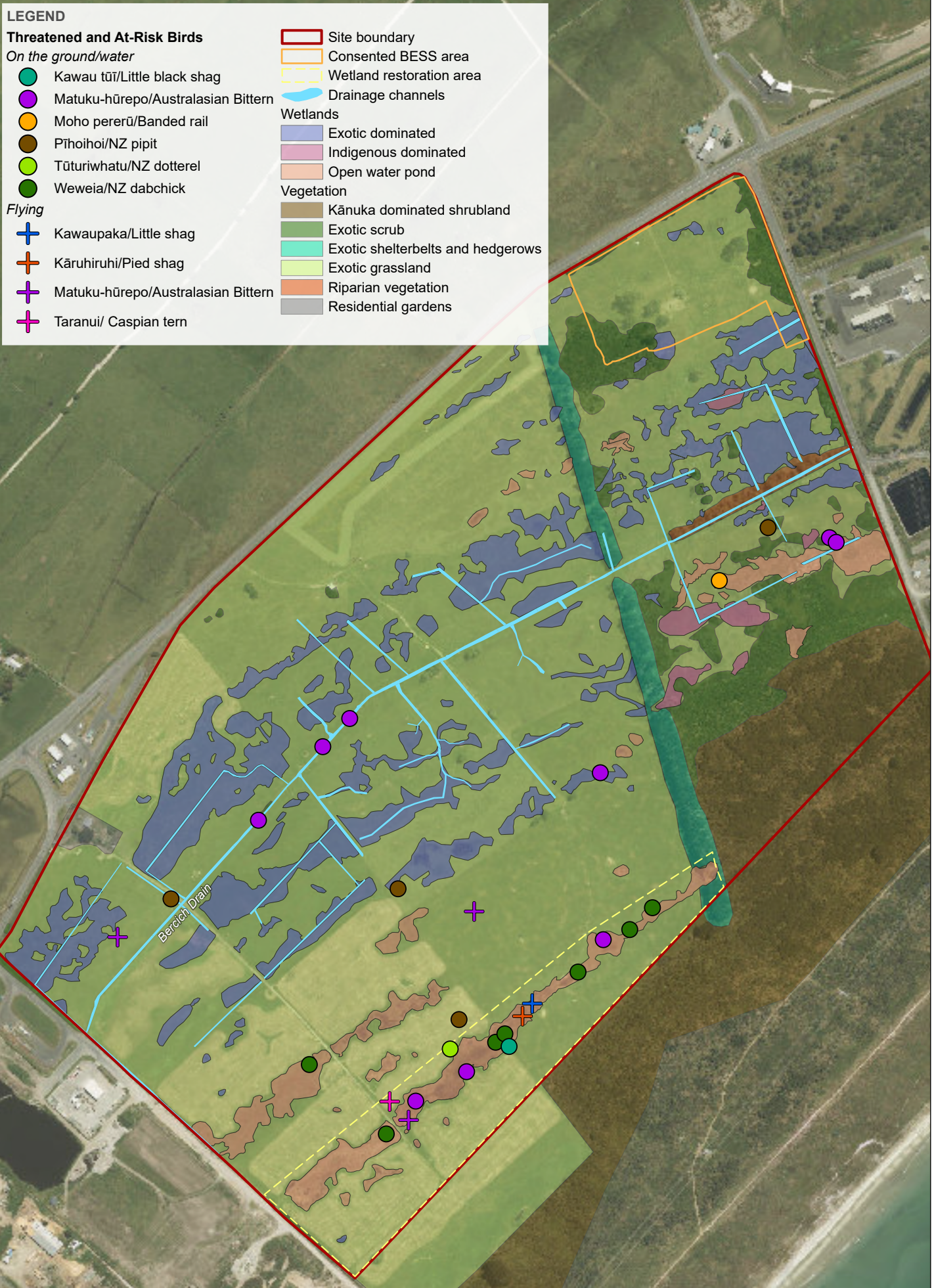
of the proposed offset wetland to both stormwater ponds will provide good connectivity between these wetland habitats.

- 85 Mr Warden (Section 3.2, subsection 8) states "*A significant lag time is expected between the loss of wetland habitat at Site 1 and the development of new artificial wetland habitat at Site 3. This lag time could have significant adverse effects on species such as the 'Threatened/Nationally Critical' matuku/Australasian bittern (Botaurus poiciloptilus)*". I note that the open water wetland within the south of Sites 1B and 1C and Bercich Drain where the majority of matuku observations have been made (within Site 1) are both being retained as part of the Proposal and matuku will continue to have access to this foraging habitat, therefore the stated lag time between wetland removal and wetland creation is incorrect. Further, the establishment of additional wetland environments favourable for matuku and other wetland and open water birds can be achieved in 3-5 years, which is an appropriate lag time in my view.
- 86 Mr Warden (Section 3.6, para 2) states that "*The proposal would result in permanent loss of foraging and breeding habitat to Australasian bittern*". The Proposal will not result in the loss of any breeding habitat for matuku as there is no suitable matuku breeding habitat within the Proposal site. The Proposal will result in the loss of areas of exotic-dominated wetlands and areas of intermittent open water habitat within Site 1 that are opportunistically used by matuku for foraging.
- 87 Mr Warden (Section 3.6, para 3) states "*The proposal will lead to permanent loss of wetland habitats used by indigenous bird species, many of which have been classified as 'At Risk'. This is especially important if the area contains nesting sites, feeding areas, or is part of a migratory route. The wetlands on Site 1 are part of the coastal ecotone environment, frequently used by migratory bird species as resting and feeding grounds during their journeys between marine and terrestrial environments. Therefore, the impact on migratory birds could be significant.*"
- 88 My response to Mr Warden's comment on the potential loss of feeding areas is covered in paragraph 85. Further, no migratory birds were observed within Site 1 during avifauna surveys between 2021-2024, the only migratory birds observed were South Island Pied Oystercatcher/torea within Site 3. This species migrates between harbours and estuaries in the North Island and braided rivers in the South Island where they breed. Sites 1, 2 and 3 do not form part of a migratory route for torea or any avifauna and the Proposal is unlikely to have any measurable effect on migratory birds.

19 July 2024

Lee Mark Shapiro

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- LEGEND**
- Threatened and At-Risk Birds**
- On the ground/water*
- Kawau tūi/Little black shag
 - Matuku-hūrepo/Australasian Bittern
 - Moho pererū/Banded rail
 - Pīhoihoi/NZ pipit
 - Tūturiwhatu/NZ dotterel
 - Weweia/NZ dabchick
- Flying*
- + Kawaupaka/Little shag
 - + Kāruhiruhi/Pied shag
 - + Matuku-hūrepo/Australasian Bittern
 - + Taranui/ Caspian tern

- Site boundary
 - Consented BESS area
 - Wetland restoration area
 - Drainage channels
- Wetlands**
- Exotic dominated
 - Indigenous dominated
 - Open water pond
- Vegetation**
- Kānuka dominated shrubland
 - Exotic scrub
 - Exotic shelterbelts and hedgerows
 - Exotic grassland
 - Riparian vegetation
 - Residential gardens

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LEGEND

- Site boundary
- Wetland restoration area

Threatened and At-Risk Birds

On the ground/water

- Kāruhiruhi/Pied shag
- Matuku-hūrepo/Australasian Bittern
- Moho pererū/Banded rail
- Pīhoihoi/NZ pipit
- Pūweto/Spotless crane
- Tōrea/South Island pied oystercatcher
- Tūturiwhatu/NZ dotterel
- Weweia/NZ dabchick
- Pāteke/Brown teal

Flying

- + Kawau tūī/Little black shag
- + Kawaupaka/Little shag
- + Kāruhiruhi/Pied shag
- + Pīhoihoi/NZ pipit
- + Tōrea/South Island pied oystercatcher

Wetlands

- Exotic dominated

Vegetation

- Dead exotic hedgerow
- Exotic shelterbelt and hedgerows
- Exotic scrub
- Native scrub
- Residential gardens
- Exotic grassland

