Before the Environment Court
At Auckland

In the matter of	the Local Government (Auckland Transitional Provisions Act 2010 (**LGATPA**) and the Resource Management Act 1991 (**RMA**)
And	
In the matter of	appeals under section 156(1) of the LGATPA
Between	**Weli Yang, Zhi Lu & Jing Ni**
	(ENV-2016-AKL-000196)
	Okura Holdings Limited
	(ENV-2016-AKL-000211)
	Appellants
And	**Auckland Council**
	Respondent
And	**Weiti Development Limited Partnership**
	Section 274 Party
And	**Long Bay-Okura Great Park Protection Society**
	Section 274 Party
And	**Royal Forest and Bird Protection Society Incorporated**
	Section 274 Party

STATEMENT OF EVIDENCE OF GRAHAM DON (COASTAL BIRDS) ON BEHALF OF THE ROYAL FOREST AND BIRD SOCIETY AND THE LONG BAY - OKURA GREAT PARK SOCIETY INCORPORATED

28 JULY 2017

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1 Qualifications and Experience

1.1 My full name is Graham Lloyd Don.

1.2 I am the Manager of Bioresearches Group Limited that was established in 1972 and specialises in Ecological Consultancy Services. I have a Bachelor of Science with Majors in both Botany and Zoology, and a Master of Science with Honours in Zoology from the University of Auckland (1975). I have been in private practice for 42 years.

1.3 During that time I have undertaken ecological assessments on behalf of regional councils, district councils, private entities and others in a wide range of habitats throughout New Zealand (Karikari Peninsula in the Far North to Tiwai near Bluff and on Chatham Island) in a variety of habitat types (intertidal areas to South Island beech forest). For the past 20 years or so my principal area of responsibility regarding field assessments has been the wildlife aspects of various development proposals, especially the avifauna, with a particular interest in coastal birds. Examples of coastal bird surveys and subsequent habitat assessments that I have completed are shown in Appendix 1.

1.4 From 2013 I also managed the terrestrial ecological baseline surveys for the Puhoi to Warkworth Road of National Significance, undertook part of the field survey, presented evidence at the Board of Inquiry and was the sole Alliance ecologist involved in the construction bid evaluation. I am currently on the Technical Advisory Group for the project.

2 Involvement with the Appeal

2.1 I was contacted on 24 February 2017 and asked to provide my expert opinion regarding effects of the proposed rezoning of land in the Okura Catchment for residential development on coastal birds. I subsequently undertook field investigations on 14 and 30 March 2017 that involved (i) high tide roost counts at Okura Spit, Karepiro Beach and the outer Weiti Estuary chenier; and (ii) 18 hourly counts using binoculars (Leupold BF-2 Cascades 10x42) and a tripod-mounted spotting scope (Kowa TSN-883; Prominar 20x60 zoom) from the intertidal area on the southern side of Okura Estuary – numbers, diversity, habitat use recorded (Figure 1). I participated in expert conferencing on 9 June 2017 with Dr John Craig (OHL) and Dr Tim Lovegrove (Auckland Council). A summary of that

conferencing is presented in Dr Lovegrove's evidence at Section 6.3. I have also reviewed the evidence of Dr Lovegrove.

3 Code of Conduct

3.1 I have read and am familiar with the Code of Conduct for Expert Witnesses in the current Environment Court Practice Note (2014), have complied with it in the preparation of this evidence, and will follow the Code when presenting evidence to the Court. I also confirm that the matters addressed in this statement of evidence are within my area of expertise, except where I rely on the opinion of other witnesses.

3.2 I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

4 Existing Marine Avifaunal Values

4.1 *Species diversity*

4.1.1 The species that have been recorded from the Long Bay-Okura-Karepiro-Weiti area are shown in Table 1 together with their latest national conservation status[1].

4.1.2 In addition to the coastal birds listed in Dr Lovegrove's evidence (Appendix 1) my list includes arctic skua, Australasian gannet and royal spoonbill recorded by Dr Michaux.

TABLE 1 – Species of Marine Birds recorded in the Long Bay – Okura – Karepiro – Weiti area (B J Michaux, PhD, pers comm; Don, 2017, this investigation

Common Name	**National conservation status**
* arctic skua	non-resident native
* australasian gannet	not threatened
banded dotterel	threatened (nationally vulnerable) ENDEMIC
* banded rail	at risk (declining)
black-backed gull	not threatened
* black-billed gull	threatened (nationally critical): ENDEMIC
* black shag	at risk (naturally uncommon)

[1] Robertson HA; Baird, K; Dowding; Elliott, GP; Hitchmough RA; Miskelly, CM; McArthur, N; O'Donnell, CFJ; Sagar, PM; Scofield; RP; Taylor, GA. 2017 Conservation Status of New Zealand birds, 2016. Dept of Conservation 23pp

caspian tern	threatened (nationally vulnerable)
eastern bar-tailed godwit	at risk (declining)
fluttering shearwater	at risk (relict): ENDEMIC
* lesser knot	threatened (nationally vulnerable)
* little black shag	at risk (naturally uncommon)
little shag	not threatened
New Zealand dotterel	at risk (recovering): ENDEMIC (CD)
pied shag	at risk (recovering)
pied stilt	not threatened
red-billed gull	at risk (declining)
* reef heron	threatened (nationally endangered)
* royal spoonbill	at risk (naturally uncommon)
* shore plover	threatened (nationally critical) ENDEMIC (CD)
South Island pied oystercatcher	at risk (declining)
spur-winged plover	not threatened
variable oystercatcher	at risk (recovering)
white-faced heron	not threatened
white-fronted tern	at risk (declining)

Notes: *: recorded by B.J. Michaux
CD: conservation dependant

4.1.3 A total of 25 species have been recorded. In my view the diversity is high for an intertidal and nearshore habitat.

4.1.4 Of the 25 species, 18 or 72.0% are either “threatened” or “at risk” on a national basis. That result is significant in the context of the New Zealand Coastal Policy Statement, (NZCPS), 2010 and also indicates a mosaic of habitats for marine birds that is of significant value.

4.1.5 The six threatened species, that are the more higher ranked nationally (i.e. are considered to be at most risk of extinction) are further summarised in Table 2.

TABLE 2 – Threatened Species	
Common Name	**National conservation status**
black-billed gull	critical (endemic)
shore plover	critical (endemic)
reef heron	endangered
banded dotterel	vulnerable (endemic)
caspian tern	vulnerable
lesser knot	vulnerable

4.1.6 The habitats are utilised by two nationally critical, one nationally endangered and three nationally vulnerable species. In my view that indicates at least a notable habitat on a national basis and clearly a significant habitat on a regional basis. Secondly, half of the threatened species are endemic (i.e. their natural range is New Zealand and nowhere else). In a resource management context, the New Zealand population of endemic species is the world population. In addition, two at risk species, New Zealand dotterel and fluttering shearwater, are endemic.

4.1.7 In summary the biodiversity of marine birds is high and the predominance of threatened (6 species) and at risk (12 species) birds, plus 5 endemic species indicates a high value habitat in its present condition.

4.2 *Notable Species*

4.2.1 I consider four species to be particularly notable as a result of (a) the values they confer to the habitats and (b) as indicators that the habitat should be afforded a very high level of protection.

4.2.2 New Zealand became a signatory to the Convention of Wetlands of International Importance (Ramsar Convention) in 1976.[2] Under this convention any area that regularly supports >1% of the individuals in a population of one species or subspecies of waterbird is considered to be of international significance.

4.2.3 A shore plover has been frequently recorded by Dr Michaux and photographed by Mr Peter Townend in the Long Bay – Okura – Karepiro – Weiti area, specifically on Karepiro Bay beach. The total wild population is estimated at 60 –

[2] Denyer, K and Robertson H. 2016. National guidelines for the assessment of potential Ramsar wetlands in New Zealand. Dept of Conservation. 58pp.

65 pairs (120 – 130 individuals)[3] of which the Karepiro Bay bird represents about 0.8% of the New Zealand and world population. While not above the Ramsar threshold, it is significant in terms of biodiversity.

4.2.4 A maximum of 22 New Zealand dotterel has been recorded in the intertidal area of Okura Estuary. I counted the 22 NZ dotterels on a series of photographs from a video provided by Mr Peter Townend that were taken on 5 February 2017. The national and world population is estimated at 2075 individuals[4] of which the Okura individuals are therefore 1.1%, which is above the Ramsar threshold.

4.2.5 Eastern bar-tailed godwit or kuaka (godwit) is rated as at risk (declining) in New Zealand with the caveat of threatened overseas (TO). Most of the population that is in New Zealand over the summer migrates north in about April, moves gradually up the East Asian coastline to arrive in Alaska in about June to breed, returning to New Zealand via a direct, nonstop flight in about September. New Zealand is a key feeding area prior to the northward migration.

4.2.6 Eastern bar-tailed godwit is identified in the Convention of the Conservation of Migratory Species of Wild Animals (Bonn Convention), an international convention that has been active in New Zealand since 2000. New Zealand is also a partner in the East Asian Australasian Flyway (EAAF) Partnership, one of nine major world waterbird flyways.

4.2.7 The godwit population in New Zealand appears to have decreased by about 25% since 1994[5]. A similar trend has occurred in Australia – "a very severe reduction in numbers" with threats being described as coastal development, habitat degradation and human disturbance.[6] Its status in Australia is vulnerable.

4.2.8 The typical summer maximum counts of godwit have ranged from 120-195 (2012-2015)[7]. Although these are relatively low numbers compared with larger estuaries and harbours, the habitat is the only area of its type between North Head and Whangaparaoa and is part of a limited east coast network of smaller habitat mosaics (eg Orewa Estuary, Waiwera Estuary, Mahurangi Harbour). On a wider

[3] www.nzbirdsonline.org.nz. Dowding, JE 2013 [updated 2016]
[4] www.nzbirdsonline.org.nz. Dowding, JE 2013 [updated 2017]
[5] Southey, I 2009 Numbers of waders in New Zealand 1994-2003. DOC R&D Series 308. 70pp www.birdsonline.org.nzz. Woodley, K 2013 [updated 2017].
[6] www.environment .gov.au/biodiversity/threatened/species/pubs/86380-conservation-advice-05052016.pdf.
[7] B.J. Michaux data

scale the habitat is within the EAAF and is relevant to the Bonn Convention with regard to the conservation of the species.

4.2.9 The Ramsar Convention is clear regarding habitat protection – "Greatest conservation value will be achieved through the selection of a network of sites providing habitat for rare, vulnerable, endangered or critically endangered species"[2]. In my view the Long Bay – Okura – Karepiro – Weiti habitats represent such a site.

4.2.10 The fourth notable species is the at risk fluttering shearwater that occurs in the nearshore area at times as a large flock of thousands of birds. The subject area is within the North Auckland Seabird Flyway between the Tasman Sea and Hauraki Gulf, and is part of a wider area considered to be a national and global centre of seabird diversity.

4.2.11 Overall the Long Bay-Okura-Karepiro-Weiti area provides a mosaic of feeding habitat types (including beach wrack (i.e. seaweed and other debris that is cast ashore)) utilised by shore plover and NZ dotterel in particular, upper intertidal roosting sites, coastal edge inland roosting sites, and is utilised for nesting by NZ dotterel and variable oystercatcher.

4.3 *Field Surveys*

4.3.1 The results of my March 2017 field surveys are shown in Appendix 2. The Okura-Karepiro-Weiti roosts (Appendix 2.1 and 2.2) in combination contained 556 and 629 individuals respectively. The entire area contains three relatively important high tide roost sites that are significant and pre-eminent in the coastal area between Orewa and Bayswater, in my view as a result of the low levels of disturbance and the nature of the coastal features.

4.3.2 The hourly counts (Appendices 2.3 and 2.4) indicated that consistent numbers were present throughout the falling tides surveyed. In the Okura Estuary (Figure 1) the average counts[8] of 14th and 30th March were similar at (rounded) 104 and 128 individuals[9]. Okura Estuary and Karepiro Bay both provide attractive feeding and resting habitat during low tide periods.

[8] Highwater + 3 hours to low water, and high water + 2.5 hours to highwater + 5.5 hours respectively.
[9] chi-squared = 2.5; not significant.

4.3.3 The habitat use records indicated that about 70% were of feeding birds and 30% of resting birds indicating an attractive feeding habitat. Feeding commenced 1.5 to 2.0 hours after high tide when birds from the Karepiro Bay roost moved around Dacre Point to feed on exposed intertidal habitat on the northern side of Okura Estuary. The next emergent habitat was on the southern side of Okura Estuary immediately adjacent to the low tide channel about 50m from the high tide level. The Okura Estuary habitats were the earliest feeding areas available after high water and would be the latest on a rising tide. Because of their relatively high tidal location, they would be susceptible to disturbance from use of the foreshore (eg public, dogs, horses) immediately after high tide.

5 Potential threats to marine birds

5.1 The following summarises threats that are probable following urbanisation. While the present probability of those factors having a permanent adverse effect may be low, in my view (a) the probability will increase significantly in the future as a result of urbanisation and (b) while the individual threats may be perceived as relatively trivial or benign in isolation, my opinion is that, considered overall the potential for a significant cumulative or additive effect represents too high a risk to the maintenance of existing habitat and avian biodiversity values.

5.2 The issues of concern regarding coastal and pelagic birds are as follows:

(i) general urbanisation

(ii) sedimentation and mangrove spread

(iii) contamination

(iv) public disturbance

(v) domestic animals

(vi) kite surfing

(vii) lighting

(viii) inland roost site loss

General urbanisation

5.2.1 The various activities associated with urbanisation are likely to impact marine wetlands by "altering their hydrological regimes, water quality, organic matter and nutrient sources, and sedimentation patterns"[10]. However much of the information has been equivocal as a result of the lack of large scale, longterm, replicated investigations with controls and/or pre-urbanisation baseline data (i.e. Before-After-Control-Impact designed studies). A different approach is presented by de Luca et al 2008[11] who have developed an Index of Waterbird Community Index (IWCI) model. The Index clearly identified that the primary stressor influencing waterbird community integrity was developed land cover. Secondly, de Luca et al 2008 concluded that "it is likely that high-density residential buildings coupled with the commercial and industrial activities of urban land cover are significant contributors to the mechanisms that are negatively impacting waterbird community integrity, resulting in a large and abrupt shift in the ecosystem".

5.2.2 Further "our findings offer compelling evidence that limits on urban development near estuarine shorelines should also be implemented". Their analysis showed that when 4.1% of the local land cover was urban, the probability of a threshold response rose to over 85%.

5.2.3 Regarding the overall marine ecology in Auckland, urbanisation effects are summarised as follows[12] – "A quick glance at the scores over a map of Auckland clearly shows the historical impact of urbanisation. Most sites near the older urban centres scored as unhealthy (scores of four to five), particularly within the Waitemata Harbour and Tamaki Estuaries. Two sites in Shoal Bay in the Waitemata are no longer monitored as they have become too muddy from sediment runoff to provide a good ongoing measure of ecological health." In my view that situation would have changed the habitat for coastal birds significantly.

[10] Lee, SY; Dunn, RJK; Young, R A; Connolly, RM; Dale, PER; Dehayr, R;. Lee, Lemckert, CJ; McKinnon, S; Powell, B; Teasdale, PR; Welsh, DJ. 2006 Impact of urbanisation on coastal wetland structure and function, Austral Ecology 31: 149-163.
[11] de Luca, WW; Studds CE; King, RS; Marra P.P. 2008. Coastal urbanisation and the integrity of estuarine waterbird communities: Threshold responses and the importance of scale. Biol.Cons 141:2669-2678.
[12] Auckland Council 2015. The health of Auckland's natural environment in 2015. Te Oranga o te taiao o Tamaki Makaurau. 216 pp

Sedimentation and mangrove spread

5.2.4 The aspect of increased sedimentation (Figures 2 and 3), especially during the earthworking and construction phases, is discussed by Mr West. With respect to coastal bird feeding, the risk is a change in substrate composition. For example bar-tailed godwits appear to prefer intermediate to sandy environments and to avoid muddy areas whereas oystercatchers prefer sandy sediments.[13].

5.2.5 Sedimentation also has the potential to increase the rate of spread of mangroves (Figure 4) and diminish the area of open intertidal habitat available for feeding and resting shorebirds. Mangrove removal in specific areas has been documented to be beneficial to coastal birds.[14] [15]

Contamination

5.2.6 The potential for contamination (heavy metals in particular) is discussed in detail by Mr West. The risks to coastal birds are (i) chronic levels of contaminants resulting in a deleterious shift in organism abundance and diversity thus affecting food availability and (ii) bioconcentration of contaminants in invertebrates resulting in chronic physiological effects on shore birds following ingestion.

5.2.7 The sediment quality guidelines (SQG's) used to rate habitats in the Auckland region, and therefore the risk to coastal birds, are based largely on the NOAA (National Oceanic and Atmospheric Administration) guidelines, the lowest of which is the ERL (effects range low). The ERL is not a no effects guideline but a concentration intended to estimate conditions in which effects would rarely be observed[16]. A concern with SQG's however is that they are not predictive of bioaccumulative effects that may affect higher trophic levels[17] eg coastal birds. Secondly, since Long et al 1995, further analysis has indicated that "rarely" means observed with a 5 – 8% frequency. The ERL's are now generally

[13] Vanermen, N; De Meulenaer, B; Stienen, E.W.N. 2006 Literature Study: Shorebirds and their abiotic environment – relationship between shoal morphology and shorebirds in the Westerschelde Estuary. Res. Inst. Nature & Forest, Brussels. 63pp.
[14] Bioresearches, 2015. 2015 Coastal Bird Survey of Pahurehure Inlet No.2. 108 pp (for Auckland Council).
[15] Bioresearches, 2016. Post-Mangrove Removal Coastal Bird Survey (For Mangawhai Harbour Restoration Society Inc.) 64 pp.
[16] Long et al 1995. Incidence of adverse biological effects within ranges of chemical concentrations in marine and estuarine sediments. Environ. Mgmt 19 (1): 81-97.
[17] Burton, GA 2002 Sediment quality criteria in use around the world. Limnology 3: 65-75

considered to correspond to a 10% probability of toxicity[18]. Therefore even at Effects Range Low concentration, metal containing sediments pose a risk to coastal birds and that risk increases with concentrations above the ERL levels.

5.2.8 Similarly, threshold effect levels (TEL's) represent concentrations below which adverse biological effects are expected to occur rarely. Although fewer than 25% of adverse effects occur below the TEL, it is not a zero effect threshold.

Public disturbance

5.2.9 In my view the increase in the local population of 2400 – 3800 people (i.e. 1200 – 1900 dwellings and 2 persons per dwelling) will inevitably increase the probability of disturbance to feeding, resting, roosting and nesting birds, even with the best management intentions. While there is also likely to be a level of habituation, there is likely to be a lower level of breeding success of species such as New Zealand dotterel[19] and variable oystercatcher. The flight initiation distances (FID; i.e. disturbance distance) of Australian species (pied oystercatcher, sooty oystercatcher, black-winged stilt and bar-tailed godwit) exposed to a walking approach have been assessed[20]. The average FID for the above four species that are similar to New Zealand species was (rounded) 44 metres with a rounded range of 25 – 92 metres. FID's have been used as a basis for the calculation of effective habitat loss as a result of disturbance from people and dogs that was considered severe enough as a cumulative factor to require offsetting.[21]

5.2.10 In my view, the risk of a similar effective loss of habitat (in the range of 25-92 metres from the coastal edge due to disturbance effects) is high.

Domestic animals

5.2.11 Shorebirds respond to dogs at greater FID's and with more intensity compared with humans alone[21]. New Zealand dotterels for example are flushed off and

[18] O'Connor, TP 2004. The Sediment Quality Guideline, ERL, is not a chemical concentration at the threshold of sediment toxicity. Mar. Pollut. Bull 49 (5-6): 383-5.
[19] Lord, A; Waas JR; Innes J; Whittingham MJ 2001. Effects of human approaches to nests of northern New Zealand dotterels. Biol. Cons 98: 233-240.
[20] Glover, HK; Weston, MA; Maguire, GS; Miller, KK; Christie BA 2011 Toward ecologically meaningful and socially acceptable buffers: Response distances of shorebirds in Victoria, Australia, to human disturbance. Landscape and Urban Planning 103 (2): 326-334.
[21] NZTA 2016 East-West Link – Ecological Impact assessment. Tech Rpt 16. 280 pp (Myers Ecology Ltd, Boffa Miskell Ltd)

remain off their nests longer as a result of a person walking with a restrained dog versus a person running or walking without a dog [20].

5.2.12 While I appreciate there are by-laws relating to dog restraint in the Marine Reserve foreshore area, there is a risk of (i) the numbers of dogs on leash increasing and (ii) the numbers let off the leash increasing. A total of 28% of New Zealand households have a dog[22]; the average number per dwelling is 1.4 dogs. If the proposed 1200 - 1900 dwelling subdivision is average, 336 - 532 homes will have dogs at 1.4 per dwelling – 470 to 745 dogs. In my opinion the probability of increased disturbance by dogs is high and represents an inappropriate risk.

5.2.13 With the increased population there is also likely to be an increase in horse riding that can be especially disruptive and damaging to upper intertidal areas in particular.

5.2.14 It is understood the proposed subdivision would include a ban on domestic cats (Dr J. Craig, pers comm).

Kite Surfing

5.2.15 Kite surfing was agreed as a potential risk for this area in expert conferencing. Birds perceive kites used for surfing as large predators and, with drones, are very disruptive to coastal birds (pers obs).

5.2.16 Long Bay Beach is promoted as an "intermediate" kite spot[23]. An evaluation of 17 studies from 5 countries[24], including New Zealand, indicated that significant effects result, for example –

- Kite surfing has a high impact with a substantial proportion of birds either taking long flights or leaving a site altogether.
- Significantly fewer birds were present with kite surfers than without.
- This also applied to tidal feeding areas where remaining birds on a rising tide were displaced.

[22] The NZ Companion Animal Council Inc, 2016 Companion Animals in NZ 2016. 93 pp.
[23] www.kiteauckland.co.nz/kite surfing - locations - 2.
[24] Kruger, T 2016 Zum Einfluss Von Kitesuffen auf Wasser-und Watvogel eine ubersicht. Niedersachsischer Landesbetrieb fur wasserwirtschaft, Kusten-und Naturschultz (English summary – on the effects of kitesurfing on waterbirds – a review.

- Kite surfing has the potential to displace all roosting and feeding birds and only a fraction returned when the activity ceased
- habituation or a diminishing response was not found
- data suggest strong evidence that unregulated kite surfing would affect the conservation status of each bird habitat, its species, and communities significantly

5.2.17 In my view unregulated kite surfing has the potential to significantly degrade the existing habitats of coastal birds as a result of continual disturbance.

Lighting

5.2.18 The proposed housing area will be "better" lit than at present. That will increase the potential for collision of seabirds, especially juveniles, and particularly during poor weather conditions. "For example, hundreds of Cook's petrel fledglings are annually rescued by Bird Rescue from the Auckland Central business district and east coast settlements between the City and Leigh where they are attracted and disorientated by night time urban lights during the fledging period[25]." (Cook's petrel is an at risk-relict-species). In context, based on the existing artificial light environment of the East Coast Bay this potential effect is likely to be minor, however, it needs to be considered in tandem with all other potential effects and on a cumulative basis regarding habitat quality.

Inland roost site loss

5.2.19 At present, at least pied stilt use riparian paddocks for roosting during spring high tide periods in particular. Inland roost sites are important alternatives when (a) "king tides" inundate coastal roosts or severely reduce the available roosting area and (b) when coastal roosts are disturbed and a nearly alternative roost is required. The inland roosting site I observed in March 2017 (Figure 1) will likely be permanently destroyed.

[25] Gaskin, CP; Rayner M J Seabirds of the Hauraki Gulf: Natural History, Research & Conservation (For Hauraki Gulf Forum) 143 pp.

6 Conclusion

6.1 In my view, there are a number of potentially adverse effects that could arise as a result of the addition of up to 1900 new dwellings immediately adjacent to a recognised high value habitat that I understand is considered by NIWA to be under stress at present.

6.2 While any one factor in isolation may not necessarily result in a significant adverse effect, I consider all the above to be potential effects arising as a result of 1200 - 1900 dwellings. In total, however, and on a cumulative basis, I consider that the overall effect on coastal birds is likely to be both significant and adverse. Although the likely cumulative effect on each individual species cannot be defined with precision, there will be a long-term and irreversible negative change to the coastal bird population in my view. In that regard, my view is that a precautionary approach is appropriate to ensure the ecological integrity of the Marine Reserve's coastal bird population is retained. Therefore, my preference is that the land in question is retained as lifestyle blocks rather than high density housing.

Graham Don
28 July 2017

Bioresearches
A Babbage Company

APPENDIX 1

GRAHAM DON (MSc. HONS)

RECENT FIELD EXPERIENCE WITH COASTAL BIRD SURVEYS

1. **Marsden Bay, Marsden Point, Northland (canal housing and marina development) (Marsden Cove Ltd)**
   - 40 ha of intertidal habitat divided into 3 main sectors;
   - 2000: May/June 20 counts and habitat use;
   - 2003: Feb/Mar 36 counts and habitat use;
   - 2005: Feb/Mar 36 counts and habitat use; habitat disturbance survey;
   - 2007: Feb/Mar 36 counts and habitat use;
   - 2008: Feb/Mar 36 counts and habitat use;
   - 2009: Feb/Mar/Apr 36 counts and habitat use;
   - 2011:-13 Feb/Mar 18 counts and habitat use.
   - 2015: Feb/Mar 18 counts and habitat use.

2. **Hobson Bay, Waitemata Harbour (coastal walkway) (Auckland City)**
   - 21 ha of mangrove/intertidal habitat;
   - 5 surveys; 36 counts and habitat use;
   - 2003: February/March.

3. **Wairoa River, Clevedon (waterway housing) (Wairoa River Canal Partnership)**
   - 5.5 km of estuarine channel plus river mouth and approaches surveyed via kayak; 11 surveys of 11 sectors; total of 60.5 survey kilometres plus habitat use; plus banded rail surveys;
   - 2003: November to March.

4. **Tamaki River (stormwater discharge option) (Landco Ltd)**
   - 2004: February/March 600 m coastline; 40 hourly counts plus habitat use in 3 sectors;
   - 2009: Feb/Mar 36 counts and habitat use over an 800 m section of coastline.

5. **Panmure Basin (stormwater discharge option) (Landco Ltd)**
   - 2005: February/March;
   - 4 surveys x 10 hourly counts each and habitat use of entire Basin.

6. **Half Moon Bay (marine terminal) (New Zealand Transport Authority)**
   - 2005: March;
   - 450 m section of Tamaki River coastline;
   - 4 surveys; 40 counts and habitat use;
   - locally significant variable oystercatcher feeding area.

7. **Waipu: Ocean Beach (wastewater treatment site) (Whangarei District Council)**
   - 2007: February – March;
   - 1 km coastline;
   - 4 surveys; 24 counts and habitat use;
   - variable oystercatcher frequent.

8. **Waipu: Ocean Beach and River Mouth (wastewater treatment site) (Whangarei District Council)**
   - 2007: May – June;
   - 1 km coastline and 900 m river mouth;
   - 3 surveys; 18 counts and habitat use;
   - locally significant habitat for NZ dotterel and variable oystercatcher.

9. **Pikes Point, Manukau Harbour (proposed heliport) (Ports of Auckland Ltd)**
   - 2007: April – May;
   - 14 ha; 4 sectors;
   - 4 surveys; 36 counts and habitat use;
   - significant wrybill feeding area.

10. **Auckland International Airport Ltd (Auckland Airport)**
    - 2007-09 bird hazard assessment and management investigations;

- all coastal bird groups plus waterfowl (ducks, black swan).
- 2016-17 bird hazard assessment – second runway

11. Whangamata Harbour (Whangamata Marina Society)

- 2007-08 marina pre-construction surveys (numbers, diversity and habitat use);
- Sept, Dec, Feb, Apr;
- 109 counts in each of ten lower Harbour sectors;
- 2008-11 marina construction and post-construction surveys (numbers, diversity and habitat use);
- Oct, Nov-Dec, Feb, Jun-Jul;
- 144 counts in each of ten lower Harbour sectors.

12. Pahurehure Inlet, Manukau Harbour (pre and post mangrove removal) (Papakura District and Auckland Council)

- 2008: Jan, Feb, Mar, Jul; 2015; summer and winter.
- 72 counts and habitat use of entire Inlet.

13. Hobsonville (marine terminal) (Hobsonville Land Co.)

- July 2009 and February 2010;
- total of 32 counts and habitat use; 2.2 km of coastline;
- banded rail survey.

14. Hatea (Harbour Bridge) Whangarei Harbour (Whangarei District Council)

- November and December 2009;
- 13 hourly counts and habitat use at proposed harbour bridge crossing.

15. Mangere Inlet (launching ramp) (Manukau City Council)

- Kiwi Esplanade; 9 counts and habitat use; 1.5 km of coastline; January 2010.

16. Panmure Basin (pylon removal) (Transpower Ltd)

- January 2010;
- 8 counts and habitat use of western area.

17. **Hobson Bay Coastal Walkway (Auckland Council)**
    - general coastal bird habitat appraisal – June 2012;
    - banded rail survey – November 2012.

18. **Motions Creek, Weona Coastal Walkway (Auckland Council)**
    - February/March 2013;
    - 28 hourly counts and habitat use; 5 days;
    - banded rail survey management.

19. **Maraetai Beach – Waiheke Island Cable (Chorus Ltd)**
    - February 2013;
    - 8 counts and habitat use.

20. **Tamaki River, Highbrook Aquatic Centre (Projenz Ltd)**
    - April 2013;
    - 7 counts and habitat use.

21. **Waterview Connection/SH 16 (Causeway Alliance)**
    - April 2013 - April 2014;
    - monthly monitoring of high tide wader roost.

22. **Monterey Park (Summerset Retirement Village)**
    - February-March 2014 to 2017; ongoing monitoring;
    - 18 hourly counts and habitat use survey annually;
    - banded rail survey;
    - Herald Island staging area surveys.

23. **Bomb Point, Hobsonville (recreation reserve)**
    - February – March 2015;
    - 1500 m coastline plus banded rail
    - 16 hourly counts and habitat use survey

24. **Marsden Point (Refining NZ: capital dredging)**

- February – March 2015
- 5 coastal sectors
- 54 hourly counts and habitat use survey
- February – March 2016
- 8 coastal sectors
- 70 hourly counts and habitat use survey

25. Marsden Point (Refining NZ: capital dredging)

- November 2015
- Outer Whangarei Harbour breeding survey
- Mair Road to Northport
- Darch Point to Home Point

26. Marsden Point (Refining NZ: capital dredging)

- November – December 2016
- little penguin surveys

27. Orion Point, Hobsonville

- February – March 2017
- hourly counts and habitat use
- 450m coastline

28. Mangawhai Harbour Restoration Society (pre and post mangrove removal)

- February-March 2012; February – July 2016; February-March 2017
- hourly counts and habitat use surveys;
- banded rail surveys.

29. Wairoa River, Clevedon (subdivision)

- February, April 2017

- re-survey part of 2003 investigation
- 16 counts + habitat use

30. Okura – Karepiro Bay

- March 2017
- 18 hourly counts and habitat use
- high tide roost surveys

APPENDIX 2. FIELD SURVEY RESULTS

Appendix 2.1 High Tide Roost Survey – 14th March 2017

C.0900 – 1000 HOURS	OKURA ESTUARY	KAREPIRO BAY	WEITI	TOTAL
Banded dotterel			1	1
Black-backed gull		8		8
Caspian tern		1		1
Eastern bar-tailed godwit		40	6	46
Little shag				
New Zealand dotterel		3	6	9
Pied Shag				
Pied Stilt	51	2	35	88
Red-billed gull				
South Island pied oystercatcher		253	117	370
Spur-winged plover	2	2	2	6
Variable oystercatcher	3	15	8	26
White-faced heron	1			1
TOTAL	**57**	**324**	**175**	**556**

Appendix 2.2 High Tide Roost Survey – 30th[h] March 2017

C.0900 – 1000 HOURS	OKURA ESTUARY	KAREPIRO BAY	WEITI	TOTAL
Black-backed gull		9		9
Caspian tern	1	2		3
Eastern bar-tailed godwit			13	13
Little shag		1		1
New Zealand dotterel	3		4	7
Pied Shag	1	1		2
Pied Stilt	59	3	25	87
Red-billed gull		2		2
South Island pied oystercatcher		188	276	464
Spur-winged plover	3	2		5
Variable oystercatcher	2	15	16	33
White-faced heron	1		2	3
TOTAL	**70**	**223**	**336**	**629**

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Appendix 2.3
14th March 2017

Number of Individuals

	KAREPIRO BAY										OKURA ESTUARY									
TIME	**1000**	**1100**	**1200**	**1230**	**1300**	**1330**	**1400**	**1430**	**1500**	**1530**	**1000**	**1100**	**1200**	**1230**	**1300**	**1330**	**1400**	**1430**	**1500**	**1530**
TIDAL STATE		**C.HW**		**C.HW**		**C.HW**		**C.HW**		**C.HW**		**C.HW**		**C.HW**		**C.HW**		**C.HW**		**C.HW**
		+1.5 hrs		**+3 hrs**		**+4 hrs**		**+5 hrs**				**+1.5 hrs**		**+3 hrs**		**+4 hrs**		**+5 hrs**		
Black-backed gull					4	6					1				1			1		
Caspian tern									1	1		1	1		1					
Eastern bar-tailed godwit						13	6	7	4	5				17	13	5	3		1	
Little shag																				1
New Zealand dotterel					3	2	3	2	2	6					1	5	9	5	5	2
Pied Shag										7										
Pied Stilt					5	5	4	5	5			1			6	5	5	7	6	3
Red-billed gull					1			1	9	5			3	1		1			1	1
S.I. Pied oystercatcher					87	104	78	53	42	54			106	157	109	47	20	73	80	68
Spur-winged plover								4	2	7				4			5	6	4	3
Variable oystercatcher					2	2	5	6	4	9		3	6	12	8	6	3	2	7	
White-faced heron		2			1	2	1	2	3	2			1	1			2			3
White-fronted tern		21																		
TOTAL	**-**	**23**	**-**	**-**	**103**	**134**	**97**	**80**	**72**	**96**	**1**	**5**	**117**	**192**	**139**	**69**	**47**	**94**	**104**	**81**

Bioresearches
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Appendix 2.4
30th March 2017

Number of Individuals

	KAREPIRO BAY								OKURA ESTUARY							
TIME	**1200**	**1230**	**1300**	**1330**	**1400**	**1430**	**1500**	**1530**	**1200**	**1230**	**1300**	**1330**	**1400**	**1430**	**1500**	**1530**
TIDAL STATE	**C.HW**		**C.HW**		**C.HW**		**C.HW**		**C.HW**		**C.HW**		**C.HW**		**C.HW**	
	+2 hrs		**+3 hrs**		**+4 hrs**		**+5 hrs**		**+2 hrs**		**+3 hrs**		**+4 hrs**		**+5 hrs**	
Black-backed gull			2	5	1	1		1	1	1	1			2	1	
Caspian tern			1				1	1	1	1	1					
Eastern bar-tailed godwit			2	3	3	3	3	1								
Kingfisher													2			
Little shag					1											
New Zealand dotterel					4	4	4	4	3	2	4	3	13	5	4	2
Pied Shag					1											
Pied Stilt			4	7	9	8	3	10	32	15	20	14	6	8	8	4
Red-billed gull			2				3							3	1	1
S.I. Pied oystercatcher			74	152	98	98	52	96		89	140	108	114	91	84	78
Spur-winged plover										2	2		7	3	4	3
Variable oystercatcher			3	5	5		3	3			4	7	8	5	2	6
White-faced heron				2	1		1			4	1	2	2	1	1	3
TOTAL	**-**	**-**	**88**	**174**	**123**	**114**	**70**	**116**	**37**	**114**	**173**	**134**	**152**	**118**	**105**	**97**

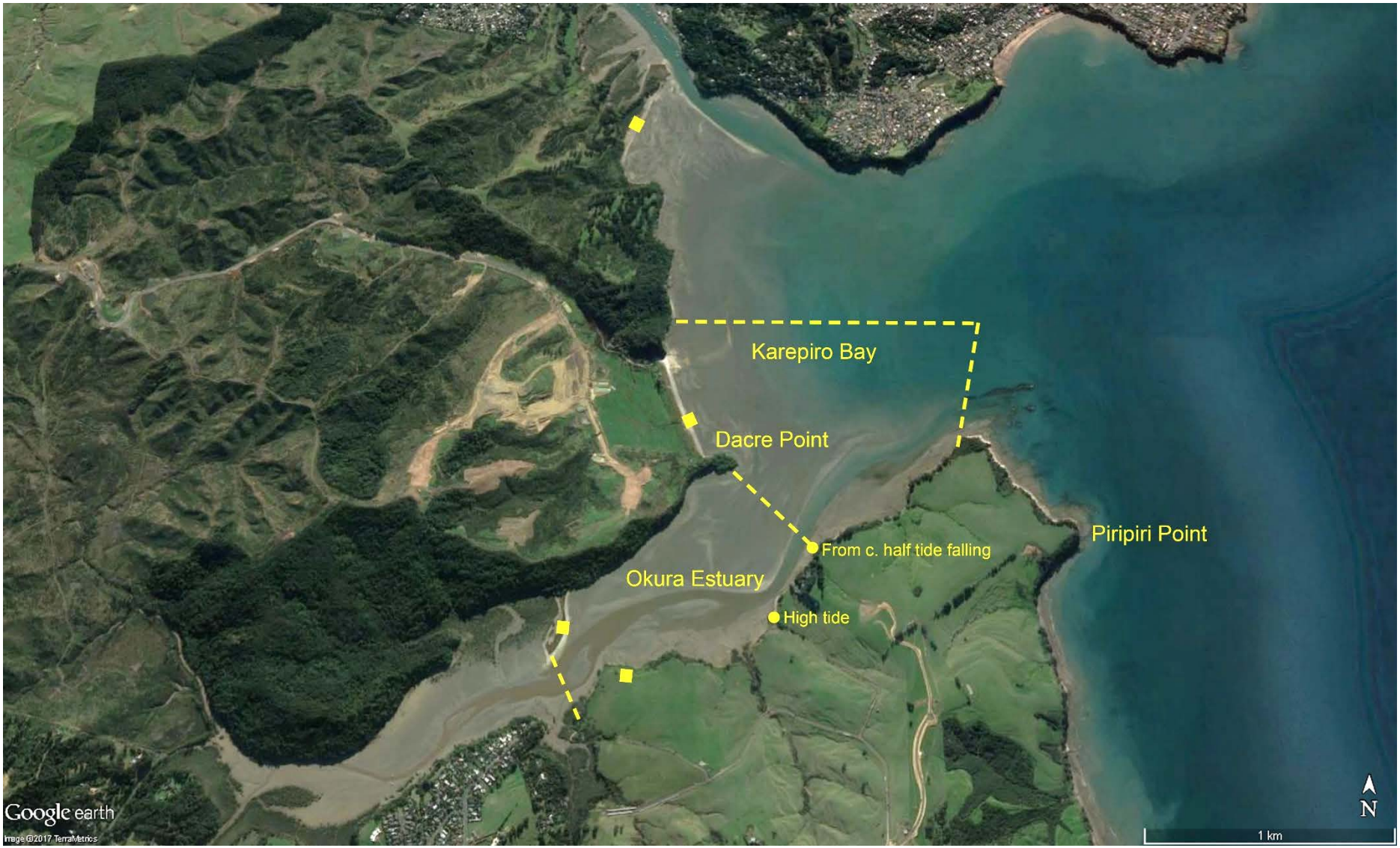

Figure 1: Survey areas, observation points (●) and high tide roosts (■).

Figure 2: Discoloured water at Long Bay. Image above taken 12/05/2014, image below taken 1/6/2017

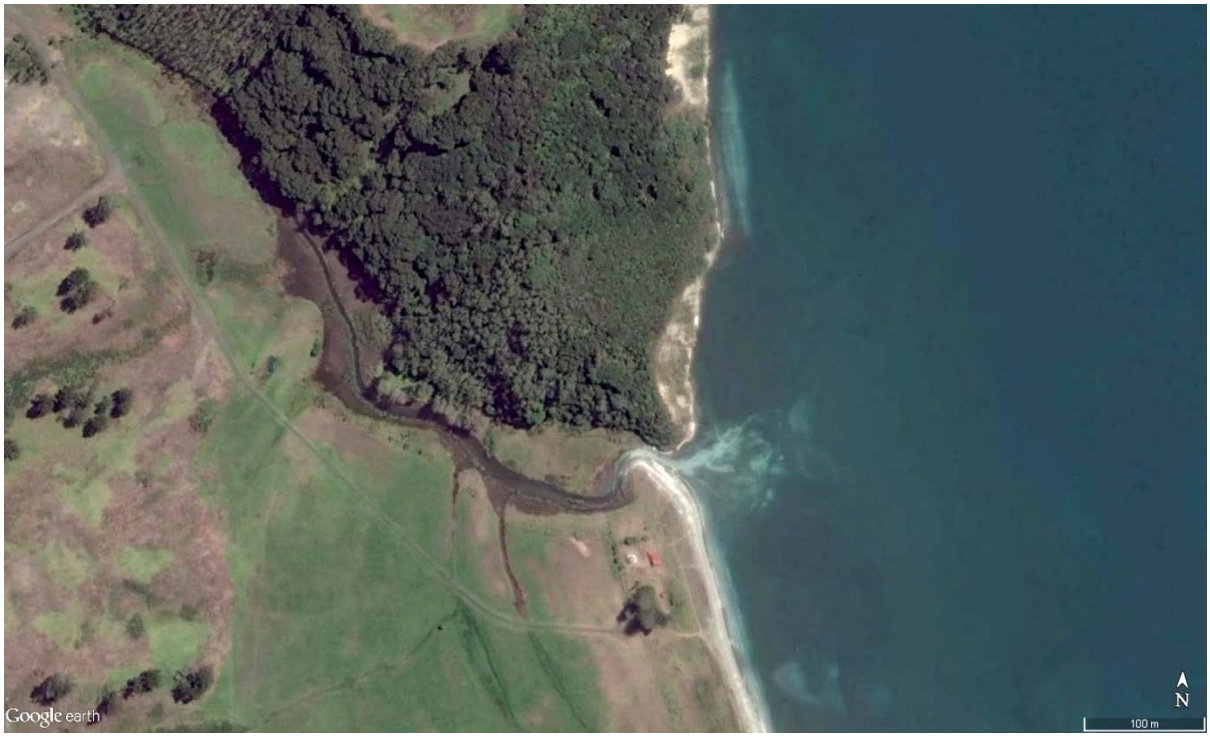

Figure 3: Discoloured water at Karepiro Bay. Image above taken 03/05/2014, image below taken 1/6/2017

Figure 4: Mangrove Spread. Image above taken 30/8/2004, image below taken 1/6/2017