

Technical Report 29

Ecological Technical Report 3: Avifauna Studies – Descriptions and Values

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Table of Contents

| | |
|---|-----------|
| 1. Introduction | 4 |
| 2. Habitat context | 5 |
| 2.1. Estuaries | 5 |
| 2.2. Wetlands | 12 |
| 2.3. Forest remnants | 13 |
| 2.4. Kanuka / Manuka habitat | 14 |
| 3. Methods and survey effort | 14 |
| 3.1. Desktop | 15 |
| 3.2. Site selection and species of interest..... | 16 |
| 3.3. 5-Minute point counts..... | 16 |
| 3.4. Waterbird counts | 17 |
| 3.5. Cryptic marshbird counts | 19 |
| 3.6. Additional non-standardised observations | 19 |
| 4. Survey constraints | 20 |
| 5. Results..... | 20 |
| 5.1. Desktop analysis | 20 |
| 5.2. Field investigations..... | 20 |
| 6. Discussion..... | 27 |
| 6.1. Species associated with the proposed Expressway Alignment..... | 27 |
| 6.2. Habitats associated with the proposed Alignment..... | 29 |
| 6.3. Coastal and estuary habitats | 30 |
| 7. Conclusions..... | 30 |
| 8. Recommendations..... | 31 |
| References | 32 |

Appendices

**Appendix 29.A - Structure and Qualifiers of the New Zealand Threat Classification
(Townsend et al. 2007)**

**Appendix 29.B - Photos of habitat occurring along the proposed Expressway Alignment at
avifauna point count survey sites**

**Appendix 29.C - Photos of habitat occurring along proposed Expressway Alignment at
avifauna waterbird survey sites**

**Appendix 29.D - Photos of habitat occurring along proposed Expressway Alignment at
avifauna playback survey sites**

**Appendix 29.E - Summary of species recorded in the OSNZ atlas data, BML survey and
DOC**

1. Introduction

This report describes the results of the avifauna field investigations undertaken along and adjacent to the proposed MacKays to Peka Peka Expressway (the "Project") from September 2010 to February 2011. This technical report is one of a series that report on ecological investigations undertaken as part of the Project. The ecological investigations associated with the Project included describing and mapping the values of ecological systems that occur along this route, as well as describing the distribution and abundance of native flora and fauna within or in close proximity to the Project footprint. From this work the potential environmental effects of both the construction and ongoing operation of the proposed Expressway Alignment will be assessed in the Ecological Impact Assessment (Technical Report 26, Volume 3), and measures to mitigate potential or actual adverse effects be developed.

In developing the methodology to investigate the avifauna associated with the Project and surrounding area, the following potential construction and operational phase effects (both direct and indirect) were considered:

- Direct loss of habitat within the Project Designation (including that used for breeding, feeding and roosting);
- Impact on food resources within the Waikanae Estuary and the Wharemauku and Waimeha Stream mouths as a result of Project earthworks within the catchment area;
- Collision with road barriers, other roading structures and vehicles; and
- Potential noise disturbance.

The results of the avifauna investigations presented here provide the baseline study which will inform the EclA for the Project. Consequently, the objectives of the avifauna survey were:

- To confirm the presence of native species of avifauna and, if present, their distribution in relation to habitat that will be affected by the proposed Alignment.
- To determine the ecological value of habitats along the proposed Alignment for indigenous avifauna, particularly Threatened and At Risk species.

While the presence of Threatened and/or At Risk animals is one of the factors taken into consideration when undertaking ecological assessments, it is important to note that all native animals, other than those outlined in Schedules 1-5, are protected under the Wildlife Act 1953.

2. Habitat context

McEwen's (1987) general description of the Foxton Ecological District in which the proposed Alignment lies, is an area which has very extensive sand-dunes, several estuaries, wetlands, dune lagoons and a few coastal swamp forest remnants containing nikau, pukatea and kahikatea.

The current landcover is highly modified, with much of the surrounding landscape comprising pasture (see Map 1). While the landscape is highly fragmented in terms of providing feeding and nesting resources for avifauna, there are areas that act as corridors for the movement of birds across the wider area. These habitat fragments comprise both protected (e.g. reserves and covenants) and unprotected (e.g. RAPs - Recommended Areas for Protection) sites. Map 2 provides an overview of important ecological sites in the wider area, including DOC conservation sites, QE2 covenants and KCDC Ecosites. Maps 3a-3d provide a more detailed view of the KCDC sites located along the proposed Expressway Alignment, many of which are also referred to in the following habitat descriptions.

2.1. Estuaries

A number of streams discharge along the coastline adjacent to the proposed Expressway Alignment (see Map 2). These estuaries vary considerably in their ecological value, particularly with regard to providing habitat for resident and visiting shorebirds.

2.1.1. Ohau River estuary

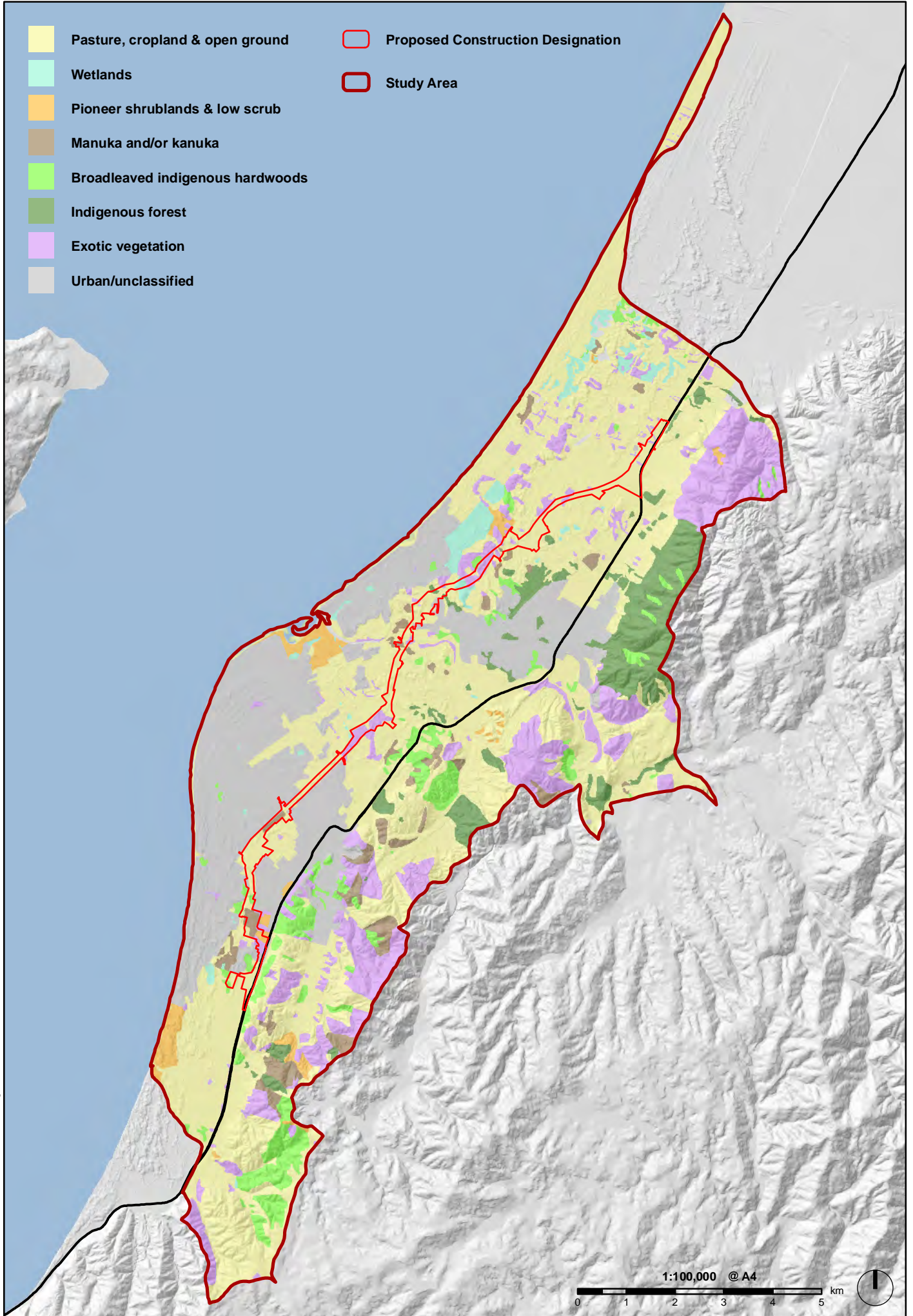
The Ohau River estuary is the last major unmodified estuary on the west coast of the Wellington Hawke's Bay Conservancy and contains a large saline lagoon with approximately 10 ha of saltmarsh in patches throughout the area (DOC 1996; Todd *et al.* unpubl.). The saltmarsh and dunes support a number of migratory (national and international) shorebirds. The estuary also contains a number of threatened and uncommon plant species (Todd *et al.* unpubl.).

These ecological values are still present despite parts of the estuary having undergone significant modifications associated with drainage and cultivation (Todd *et al.* unpubl.).

2.1.2. Waikanae River estuary

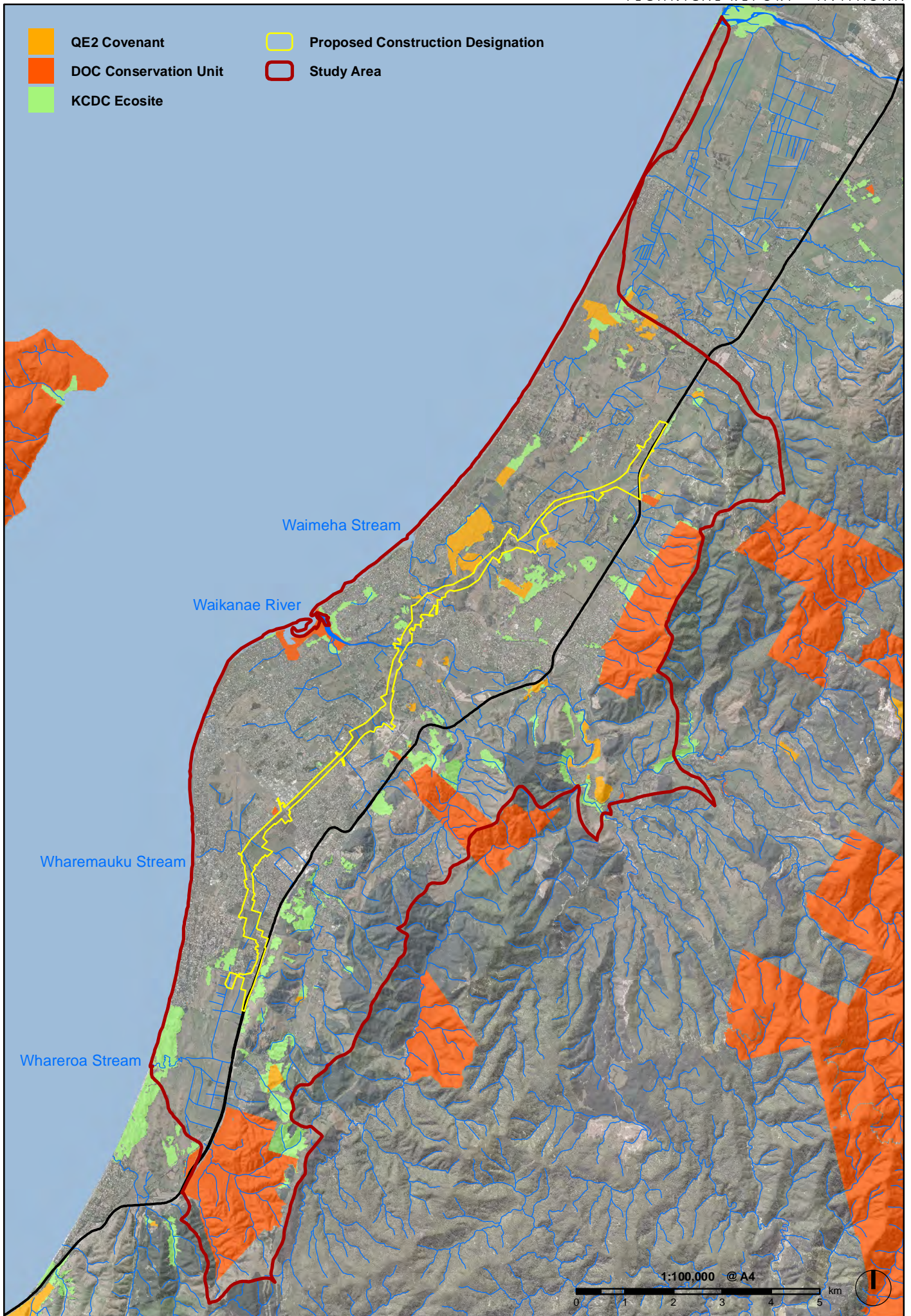
Waikanae estuary (approximately 2 km from the proposed Expressway Alignment; see Map 2) is one of the few estuary areas of any size in south-western North Island and has several classifications that recognise this value, including: a Wetland of Ecological and Regional Importance (WERI), a Site of Special Wildlife Interest (SSWI), a Recommended Area for Protection (RAP 5) and an Area of Conservation Value (Ravine 1992; DOC 1996, 2010; GWRC 2000; Todd *et al.* unpubl.) The Waikanae estuary is approximately 80 ha in area and contains a number of rare native plants and different habitat types, including examples of those which are nationally under-represented such as salt marsh, freshwater wetlands, dune lakes, and dune systems. The estuary

- Pasture, cropland & open ground
 - Wetlands
 - Pioneer shrublands & low scrub
 - Manuka and/or kanuka
 - Broadleaved indigenous hardwoods
 - Indigenous forest
 - Exotic vegetation
 - Urban/unclassified
- Proposed Construction Designation
 - Study Area



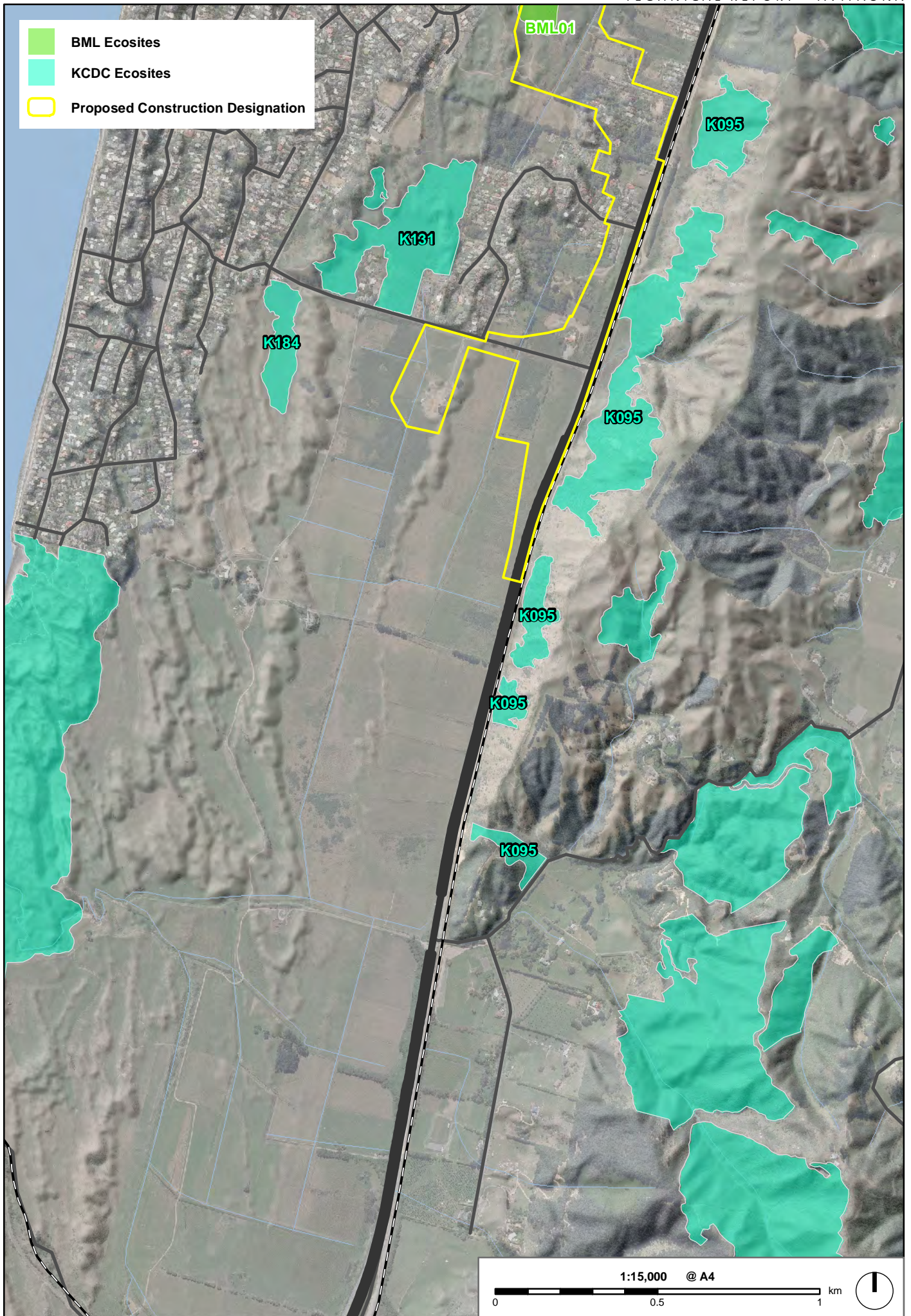
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- QE2 Covenant
- DOC Conservation Unit
- KCDC Ecosite
- Proposed Construction Designation
- Study Area



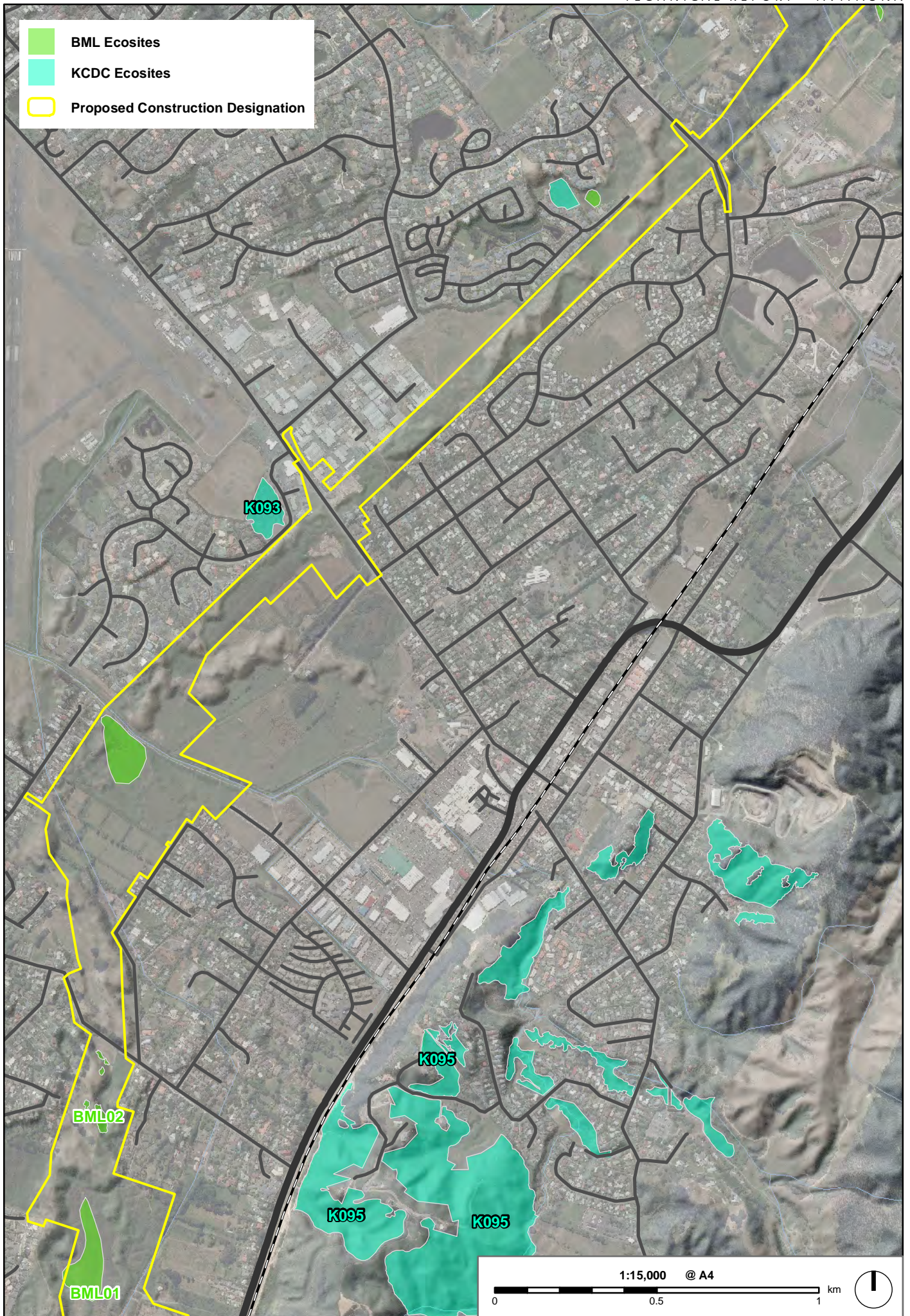
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- BML Ecosites
- KCDC Ecosites
- Proposed Construction Designation



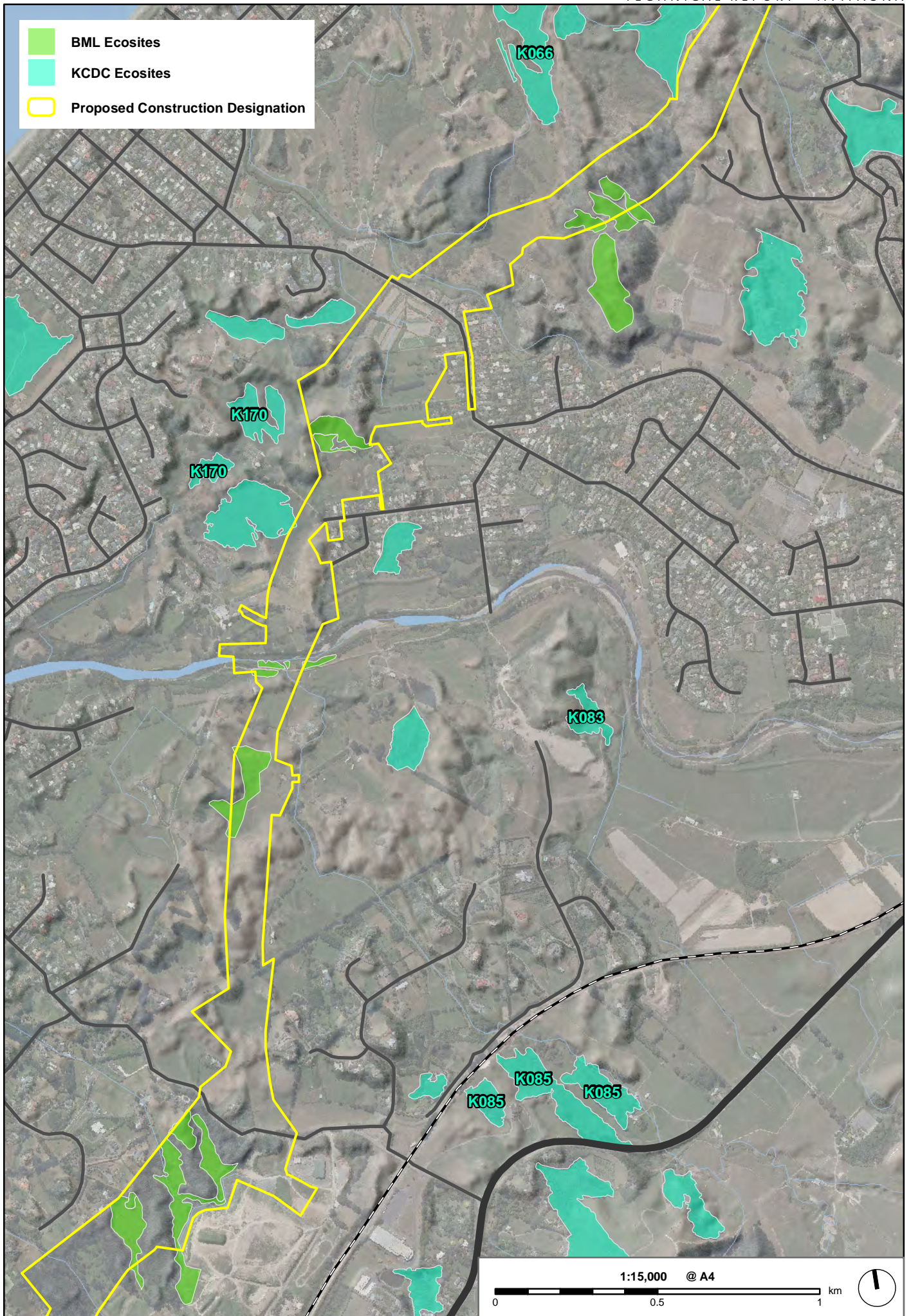
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- BML Ecosites
- KCDC Ecosites
- Proposed Construction Designation



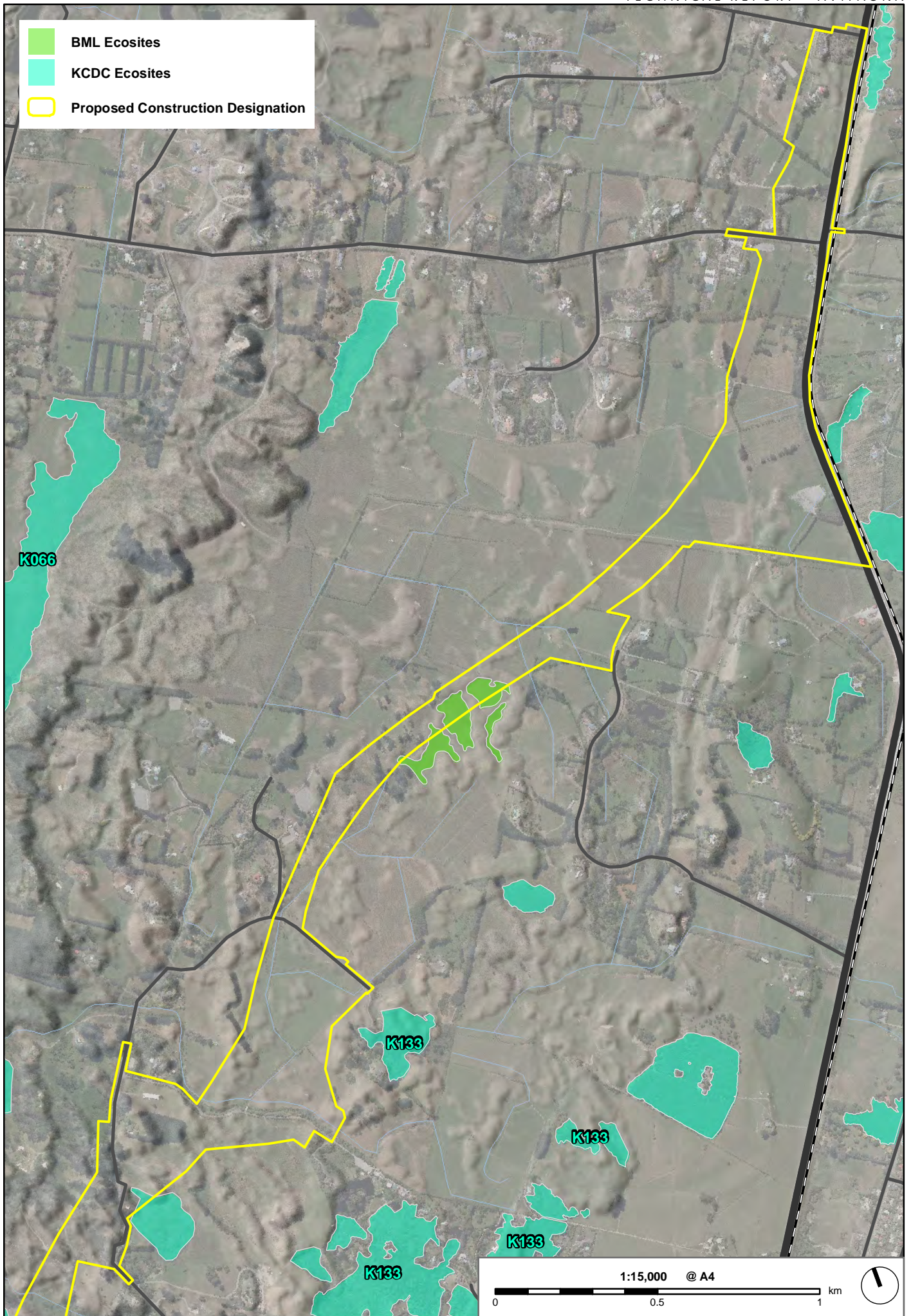
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- BML Ecosites
- KCDC Ecosites
- Proposed Construction Designation



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- BML Ecosites
- KCDC Ecosites
- Proposed Construction Designation



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2.1.3. Waimeha Stream estuary

Historically the Waimeha Stream ran parallel to the coast and discharged into the Waikanae Estuary. However, modification of the stream has resulted in it now discharging into an artificial estuary, though patches of saltmarsh vegetation are still evident (Todd *et al.* unpubl.). The three zones identified by Todd *et al.* (unpubl.) are the sandflats (at the mouth), dunes and urban (upper limit of tidal zone). Shorebirds utilise the sandflats for feeding. This estuary is located approximately 1 km downstream of the proposed Expressway Alignment (see Map 2).

2.1.4. Wharemauku Stream estuary

The discharge point of the Wharemauku Stream is highly modified: the estuary is entirely constrained by retaining walls and culverts, and the final 100 m before the beach has been artificially straightened (Todd *et al.* unpubl.). Much of the vegetation occurring there is exotic, with no attempt to retain the native vegetation of the estuary (Todd *et al.* unpubl.). The beach is visited by resident shorebirds as well as those from Kāpiti Island and Waikanae Estuary. This estuary is located approximately 1 km from the proposed Expressway Alignment (see Map 2).

2.2. Wetlands

Wetlands along the proposed Expressway Alignment range from remnant primary lowland swamp forest dominated by kahikatea through to more modified wet dune depressions dominated by *Juncus* and wet pasture species.

Lake Papaitonga within the Papaitonga Scenic Reserve (120.69 ha), approximately 25 km from the proposed Expressway location, is surrounded by wetland and coastal forest (DOC 1996). The reserve contains the only intact sequence from wetland to mature dry terrace forest in Wellington and the Horowhenua; wetland forest associations of kahikatea / pukatea, tawa, and pukatea-tawa-swamp maire are now rare (DOC 1996).

The 120 ha Kawakahia wetland (also known as Te Harakeke Swamp), located approximately 500 m to the west of the proposed Alignment, has been identified and listed by a number of agencies for its values, including as a Recommended Area for Protection (RAP 7; Ravine 1992), KCDC Ecosite 66 (Wildland 2003), GWRC Key Native Ecosystem (representing the largest interdunal swamp remnant in the Greater Wellington Region), a Wetland of Ecological and Representative Importance (ranking of 3) and as a moderate-high Site of Special Wildlife Importance (DOC). Wildland (2002) identified the following indigenous habitats as being present: raupo reedland, toetoe tussockland, flaxland, cabbage tree / *Coprosma propinqua* ± mahoe shrubland, kahikatea / pukatea swamp forest, manuka scrub and low forest. Consequently, it remains one of the largest and most diverse wetlands in the ecological district, providing diverse and plentiful habitat for birds (Ravine 1992).

Nga Manu Reserve (43.92 ha), located to the east of Te Harakeke / Kawahahia Wetland, was identified by Wildland (2003) as being of Regional importance, providing a good example of sequences between wetland, swamp and dry forests (kohekohe and tawa). The reserve is located approximately 400 m to the east of the proposed Alignment.

The El Rancho Wetland (Weggery) (KCDC Ecosite 170, Wildland 2003), located immediately to the west of the proposed Expressway Alignment, is surrounded by infestations of gorse and blackberry. This wetland is one of a number of similar manuka wetlands in this vicinity, including three of the 'El Rancho' wetlands and the Osbourne's West Wetland. The El Rancho Wetland (Weggery) has a small number of older kahikatea emerging through a canopy of almost pure manuka. There is no permanent open water in this wetland and during summer surface water disappears. On the southern edge of the wetland, there are areas of open pasture and smaller distinct areas of *Carex* sedgelands and *Baumea* rushlands.

Historically, Andrew's Pond Scientific Reserve was a small manuka wetland located amongst large areas of pasture. Andrew's Pond was thought to be one of only two such habitats remaining within the ecological district (RAP 3, Ravine 1992; KCDC Ecosite 93, Wildland 2003), however, recent development in the area has changed the hydrological conditions and consequently reduced ecological significance through the drowning of the ecological values for which it was listed (see photos in Appendix 29.C). Andrew's Pond is located approximately 50 m to the west of the proposed Alignment.

Poplar Avenue Wetlands (KCDC Ecosite K184) and the Raumati South Peatlands (KCDC Ecosite 131) are located 800m and 450 m to the west of the proposed Alignment respectively. These larger manuka scrub wetlands are dominated by manuka, *Isolepis* prolifer and rushland. The Raumati South Peatlands include areas of *Baumea* rushland and fernland. The wider area consists of two peat "fen" areas of manuka shrubland, separated by a drier hummock and Poplar Avenue road. Substantial restoration planting has been undertaken around the perimeter of the Poplar Ave wetlands and they form part of a joint community, GWRC, DOC, KCDC restoration programme. The perimeter of the Raumati South Peatlands is largely blackberry and gorse and residential properties.

2.3. Forest remnants

Hemi Matenga Memorial Park Scenic Reserve (4.31 ha) contains high value plant communities such as lowland remnant kohekohe forest which merges upslope into lowland broadleaved forest with rimu and rata emergents (DOC 1996). Wildland (2003) rank this as a site of Regional importance (KCDC Ecosite 62). The forest provides habitat for kereru (Wildland 2003) and is regularly visited by vagrant birds from Kāpiti Island (DOC 2010).

Paraparaumu Scenic Reserve (174.5 ha) forms part of a corridor of predominantly coastal (kohekohe) and lowland broadleaved (tawa-mahoe) forest extending southeast from the existing SH1 over rolling/steep hill country into the upper catchment of the Maungakotukutuku Stream (DOC 1996). The reserve contains extensive areas of regionally rare kohekohe forest (DOC 1996).

Other remnants forming part of the wider forest corridor include Tini Bush (RAP 4, Ravine 1992; KCDC Ecosite 85, Wildland 2003), Ngarara Bush (RAP 8, Ravine 1992) and Waikanae Scenic Reserve (KCDC Ecosite 61, Regional Importance).

2.4. Kanuka / Manuka habitat

Kanuka/manuka is a habitat type that is now uncommon within the Foxton Ecological District, so the few areas that remain are generally identified as having local or regional importance.

For instance, Waikanae North shrubland (KCDC Ecosite 65, Wildland 2003) is classified as being of regional importance due to it containing a relatively large (7.68 ha) area of kanuka-manuka scrub, whereas Turf Farm Bush Forest A (KCDC Ecosite 84, Wildland 2003) contains a very small narrow area of manuka scrub is classified as being locally important.

Kanuka-mahoe-gorse scrub is among the dominant habitat type occurring on the Paraparaumu Coastal Scarp (KCDC Ecosite 95, Wildland 2003). This area has been classified as regionally important, forming part of the series of fragments that provide links between Kāpiti Island and the Tararua Ranges (Wildland 2003).

At the southern end of the proposed Alignment, 11.09 ha of kanuka-gorse scrub and manuka scrub wetland occur in and around the Raumati South Peatlands (KCDC Ecosite 131, Wildland 2003). The kanuka in this area (and wider) is highly fragmented and exotic species are prevalent.

3. Methods and survey effort

A combination of desktop investigations and three field-based methods (described below) were used to assess the ecological value and composition of the avifauna communities and habitats within and adjacent to the proposed Alignment. A summary of the survey effort along the proposed Alignment and weather conditions during the survey periods are provided in Table 1. The time periods shown in this table include travel time between sites, during which incidental observations were made (refer to Section 3.6.1).

Table 1: Summary of avifauna survey effort and weather conditions

| Date | Time Period | Survey Method | | | Daily Weather Conditions |
|---------|---------------|----------------|-----------------------|----------------------|---|
| | | Playback Sites | Waterbird Count Sites | 5-minute Count Sites | |
| 20/9/10 | 06:08 – 07:10 | 4 | | | Cool (6-10°C) with moderate SW breeze. |
| | 07:19 – 09:25 | | | 7 | Cool with moderate SW breeze. |
| 21/9/10 | 05:58 – 06:45 | 2 | | | Cool with moderate SW breeze. |
| | 06:58 – 16:40 | | 9 | 15 | Mild (11-15°C) with light-moderate SW breeze. |
| | 17:08 – 18:35 | 4 | | | Cool with moderate SW breeze. |
| 22/9/10 | 06:00 – 06:55 | 3 | | | Cool with moderate SW breeze. |
| | 07:20 – 17:10 | | | 17 | Mild with light-moderate SW breeze. |
| | 17:44 – 18:35 | 3 | 6 | | Cool with moderate SW breeze. |
| 23/9/10 | 06:00 – 06:35 | 2 | | | Cool with moderate NW breeze. |
| | 06:42 – 10:20 | | 3 | 7 | Mild with light NW breeze. |
| 31/1/11 | 06:25 – 07:45 | 4 | | | Cool with moderate NW breeze. |
| | 08:30 – 16:25 | | 2 | 18 | Warm (16-22°C) with moderate NW breeze. |
| | 19:24 – 20:40 | 4 | | | Cool with moderate NW breeze. |
| 1/2/11 | 06:25 – 07:14 | 3 | | | Cool and calm conditions. |
| | 07:17 – 17:20 | | 10 | 20 | Mild – warm with a light breeze. |
| | 19:10 – 20:15 | 3 | | | Cool with moderate NW breeze. |
| 3/2/11 | 06:34 – 07:05 | 2 | | | Cool and calm conditions. |
| | 07:30 – 16:45 | | 6 | 8 | Mild – warm with a light breeze. |
| | 19:40 – 20:06 | 2 | | | Cool with moderate NW breeze. |

3.1. Desktop

Data from the recent Ornithological Society of New Zealand’s (OSNZ) atlas (Robertson *et al.* 2007) was collated from the five 10 km x 10 km grid squares (267,602; 267,603; 268,602; 268,603; 268,604) which encompass the proposed Expressway Designation and surrounding area. The primary habitat for each of the species recorded within these grid squares was obtained from Heather & Robertson (2000), along with each species’ New Zealand threat status according to Miskelly *et al.* (2008). Further explanation regarding the threat classification system (Townsend *et al.* 2007) is provided in Appendix 29.A.

The species list obtained from the OSNZ atlas served as a baseline of species previously recorded in the wider area and therefore potentially present at or near the proposed Alignment. However, this list was viewed in the context of which the data were collected: over a five year period (1999-2004) and from an area of 500 km² encompassing a number of sites and habitats that may not be represented along the proposed Expressway Alignment.

Further literature (published and unpublished) and website searches were undertaken to obtain additional information regarding bird species known to occur at the estuaries along the Kāpiti Coast (including Waikanae) and within the various reserves.

3.2. Site selection and species of interest

The avifauna survey sites selected along and adjacent to the proposed Alignment were chosen based on their providing representative avifauna habitats that occur along the length of the proposed Alignment including: wetlands; streams, rivers and wetlands; pasture; native regenerating shrublands; rural / residential gardens; exotic plantation forest. A summary of species of interest and the methodologies adopted are provided in Table 2, with further details provided in the following sections. For the purposes of this investigation, species of interest were defined as those having either Threatened or At Risk threat classifications (according to Miskelly *et al.* 2008).

Table 2: MacKays to Peka Peka proposed Expressway avifauna survey methods and key species

| Method | Key Species | Threat Classification ¹ |
|-----------------------------|----------------------|---|
| Waterbird counts | Black shag | <i>Phalacrocorax carbo novaehollandiae</i> Naturally Uncommon ^{SO Sp} |
| | Little black shag | <i>Phalacrocorax sulcirostris</i> Naturally Uncommon ^{RR} |
| | Little shag | <i>Phalacrocorax melanoleucos brevirostris</i> Naturally Uncommon ^{Inc} |
| | Dabchick | <i>Poliiocephalus rufopectus</i> Nationally Vulnerable |
| | Brown teal | <i>Anas chlorotis "North Island"</i> Recovering ^{CD RR} |
| | Grey duck | <i>Anas superciliosa superciliosa</i> Nationally Critical |
| Cryptic marshbird playbacks | Australasian bittern | <i>Botaurus poiciloptilus</i> Nationally Endangered ^{Sp TO} |
| | Marsh crake | <i>Porzana pusilla affinis</i> Relict ^{DP SO} |
| | Spotless crake | <i>Porzana tabuensis plumbea</i> Relict |
| | Fernbird | <i>Bowdleria punctata vealeae</i> Declining ^{RR St} |
| 5-minute point counts | Kereru | <i>Hemiphaga novaeseelandiae</i> Not Threatened ^{CD Inc} |
| | New Zealand pipit | <i>Anthus novaeseelandiae novaeseelandiae</i> Declining |
| | Shining cuckoo | <i>Chrysococcyx lucidus lucidus</i> Not Threatened ^{DP} |

3.3. 5-Minute point counts

The objectives of the 5-minute point count sampling were to:

- Describe the range of species utilising the site by sampling the full diversity of habitats present (eg. dune, stream, lake, bush, plantation, pasture) across the entire proposed Alignment.
- Provide a baseline against which bird activity post-construction can be compared.

Five-minute point counts, whereby all avifauna species seen and heard during the count period were recorded (Dawson & Bull 1975) were undertaken at 23 locations not less than 250 m apart along and adjacent to the proposed Alignment (see Map 4 for survey sites and Appendix 29.B for photos of representative habitats). Counts began no earlier than sunrise, and ended no later than

¹ Miskelly *et al.* (2008) with qualifiers: CD=Conservation Dependent; DP=Data Poor; Inc=Increasing; RR=Range Restricted; SO=Secure Overseas; Sp=Sparsely; TO=Threatened Overseas.

dusk. Each count lasted five minutes and was preceded by a five minute stand down period to allow activity to settle following the observer arrival. During the stand-down period the observer recorded time, visibility, temperature, wind direction, and speed, precipitation, cloud cover, and visibility.

Two survey sessions were conducted; one in spring (20-23 September 2010) and another in summer (31 January – 3 February 2011). During each session, counts were undertaken twice at each of the 23 count sites; once before midday (morning) and once after midday (afternoon). Thus, a total of 92 5-minute point counts were conducted over spring and summer survey periods (see Table 1).

3.4. Waterbird counts

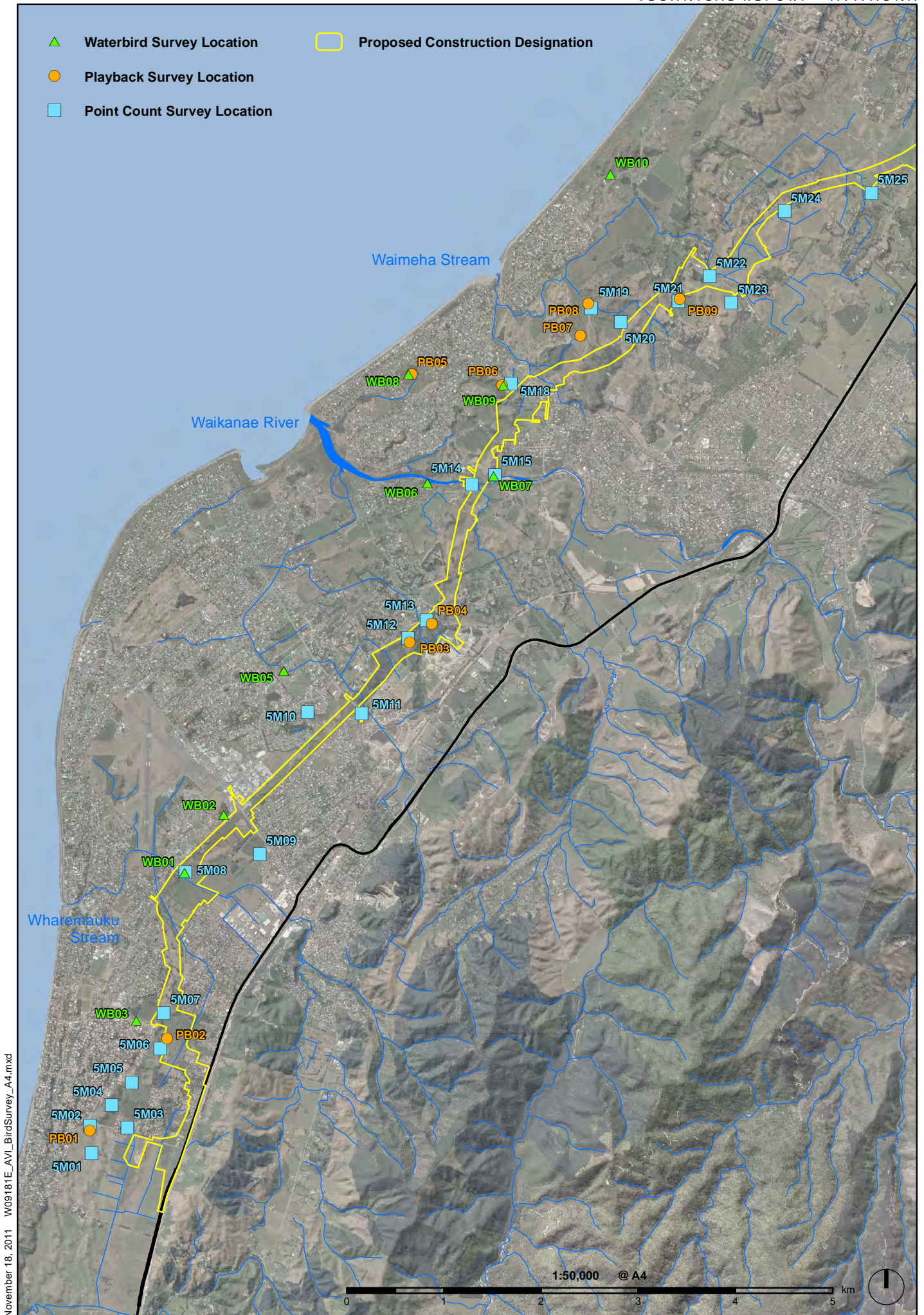
Given the close proximity of the proposed Expressway Alignment to a number of freshwater habitats (e.g. lakes, ponds, wetlands, streams) a survey of waterbird species diversity and abundance was undertaken. The objectives of the water counts were to:

- Provide an assessment of the importance of nearby waterbodies, wetlands and waterways for key non-cryptic waterbirds.
- Indicate the position and likely movement pathways of non-cryptic waterbirds around and potentially across the site.

Map 4 identifies the nine open waterbodies selected for the waterbird surveys and Appendix 29.C provides photos of representative habitats surveyed. At each location, the observer scanned the waterbodies and recorded all waterbirds seen floating on their surface. Recent New Zealand research (Kissling 2004) has shown that time of day is not a significant determinant of species number or diversity recorded during wetland counts of typical conspicuous species. However, observer elevation has also been recognised as a key determinant of these counts: higher observer elevation resulted in significantly better results in terms of number of birds seen and diversity recorded. Consequently, all counts were conducted from suitably elevated sites in which the observer had the best possible visual coverage of the waterbodies.

Each count took approximately 20 minutes and was preceded by a 5-minute stand-down period, during which the observer recorded the climatic conditions. These counts were undertaken during the spring (20-23 September 2010) and summer (31 January – 3 February 2011) survey sessions. During each session, counts were undertaken twice at each of the nine sites; once before midday (morning) and once after midday (afternoon). Thus, a total of 36 water counts were conducted over the spring and summer survey periods (see Table 1).

- ▲ Waterbird Survey Location
- Playback Survey Location
- Point Count Survey Location
- Proposed Construction Designation



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3.5. Cryptic marshbird counts

The objectives of the cryptic marshbird counts were to:

- Provide an assessment of the importance of nearby waterbodies, wetlands and waterways for key cryptic marshbirds.
- Indicate the position and likely movement pathways of key cryptic marshbirds around and potentially across the site.

Several so-called 'cryptic' marshbird species (see Table 2) are rarely recorded by water counts alone, they are difficult to survey and require rigorous species-specific techniques in order to be adequately sampled. As such, the use of playback calls was adopted to survey for bittern, fernbird, spotless crane and marsh at the nine sites identified in Map 4 (see Appendix 29.D for photos of representative habitats surveyed). The playback calls act as "lures" to entice resident birds to appear from cover or vocally respond.

Playback sites were chosen according to the presence of suitable habitat (e.g. raupo- or *Eleocharis*-dominated wetlands and manuka-edged wetlands), and the observer was positioned on the edge of the habitat to entice birds into viewing range. Calls were broadcast using an ipod and Philips SBD4000 portable speakers, aimed into the centre of the most suitable adjacent habitat. Each species' calls were played in 2 x 30 second intervals, with each call punctuated by a minute silence to listen for a response. The spotless crane calls were broadcast first because this species is more likely to respond, and additionally marsh crane also often respond to their calls.

Playback sessions were undertaken twice during each of the spring and summer survey sessions. During each session, a dawn (within four hours of sunrise) and dusk playback was conducted at each of the nine sites. Thus, cryptic marshbird playbacks were conducted on a total of 36 occasions (see Table 1).

3.6. Additional non-standardised observations

3.6.1. Incidental observations

In addition to the above mentioned counts, all incidental observations were recorded while travelling between survey stations. The objective of these observations was to record any significant observations that may have been made outside of the formally defined methods of data collection. They included observation of avifauna within or adjacent to the site, as well as unusually large numbers of a common or exotic species, or any unusual and noteworthy behaviour.

4. Survey constraints

Though a widely used and well-recognised method for surveying avifauna, one of the limitations of the 5-minute bird count method is that there is the potential to not detect species that may be present. In order to reduce the potential for this, all incidental observations made outside of the standardised survey period were recorded, as well as replicating counts at each point count site over multiple days and in different months. Furthermore, the inclusion of waterbird and playback surveys provided additional opportunities to record target species that may not otherwise have been detected through the 5-minute counts.

Because of the mobile nature of most avifauna species, a balance was achieved in terms of spatial coverage across the proposed Alignment and within the wider area.

5. Results

5.1. Desktop analysis

According to the OSNZ atlas data (Robertson *et al.* 2007), a total of 54 bird species (35 native and 19 introduced species) were recorded over the period 1999-2004 within five 10 km x 10 km grid squares that encompass the proposed Alignment and surrounding area (see Appendix 29.E for full list). The native avifauna comprised 21 Not Threatened, 9 At Risk and 5 Threatened species (Miskelly *et al.* 2008). With regards to survey technique, we note that the atlas data were collected by multiple observers over a five year period (1999-2004), from an area of 500 km², with no standardisation regarding effort or timing. Therefore this data provides only a broad indication of species presence or absence.

Todd *et al.* (unpubl.) listed a total of 50 bird species associated with the Waikanae River and Estuary, 13 of which were introduced species and 37 native (see Appendix 29.E for full list). With regard to the native species, two were migrants, 13 Not Threatened, nine At Risk and 13 Threatened (Miskelly *et al.* 2008). No details were provided regarding the level of effort or methods used to obtain this information.

These two lists provide an indication of species that could potentially be recorded along the proposed Expressway Alignment during the 2010-2011 targeted bird surveys.

5.2. Field investigations

5.2.1. All observations – standardised and non-standardised

A list of all avifauna species recorded along and adjacent to the proposed Alignment during the 5-minute point counts, waterbird counts, playbacks and incidental observations is provided in Table 3 and Appendix 29.E. Information regarding species' conservation status and habitats used is also

provided. Overall, a total of 41 species were recorded, comprising 19 introduced (exotic) and 22 native (including seven endemic species). Of the native species, 17 were Not Threatened, three At Risk and two Threatened (Miskelly *et al.* 2008).

In terms of habitat use, the primary habitats of species recorded along the proposed Expressway Alignment are represented visually in Figure 1. It should be noted that this interpretation of primary habitat has been provided in order to present the data in a meaningful way, but does not suggest that these species confine their use to a single habitat type. Information regarding the variety of habitats used by each of the species is provided in Table 3. In this report, primary habitat refers to the habitat in which a species spends most of its time. Along the proposed Alignment, the primary habitat of the majority of species that were recorded is farmland and open country (Figure 1). Furthermore, the majority of species for which this is primary habitat are introduced species. In comparison, while the forest provides primary habitat for fewer species, all of those species are native (Figure 1). The freshwater habitat is utilised by introduced, Not Threatened, Threatened and At Risk species.

5.2.2. Point counts – standardised survey

A total of 1710 birds, comprising 34 species, were recorded during the 92 point count surveys undertaken along and adjacent to the proposed Expressway Alignment (see Table 3 and Figure 2). Seventeen of the 34 species are introduced (exotic) and 17 are native (including seven endemic species) (see

Figure 3). Of the native species, 13 are classified as Not Threatened, three At Risk (pipit, fernbird and black shag) and one Threatened (pied shag).

Figure 1: Typical habitat used & conservation status of species recorded along the proposed Expressway Alignment

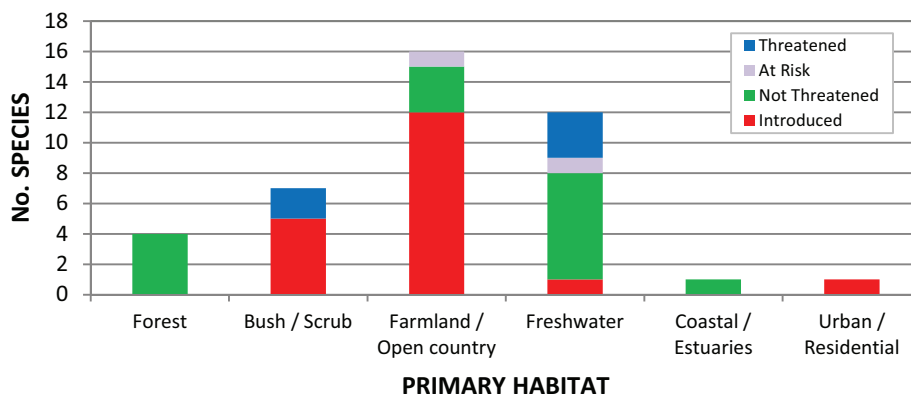


Figure 2: Number of birds and conservation status recorded during all point counts

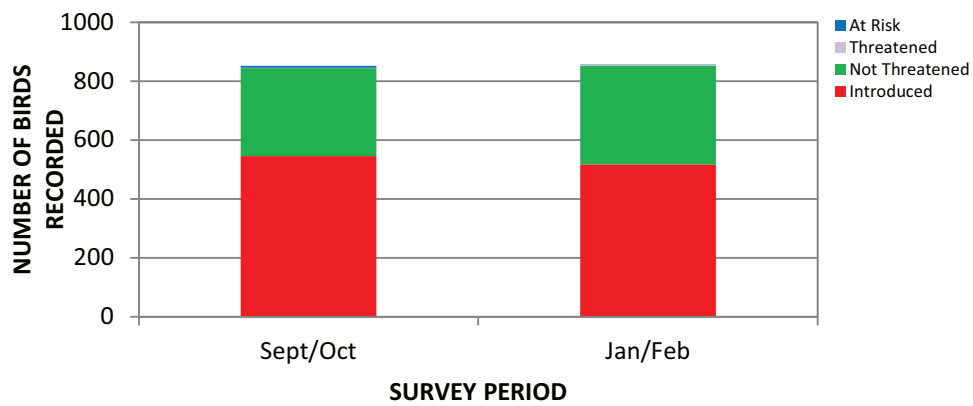


Figure 3: Number of species and conservation status recorded during all point counts.

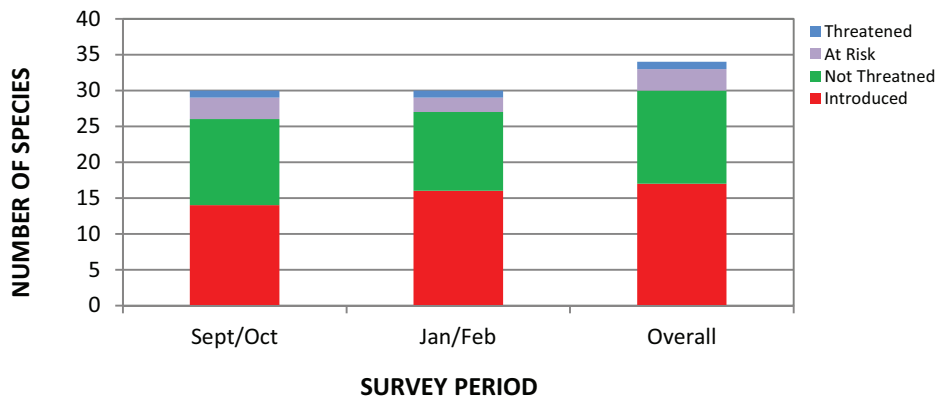


Table 3: Avifauna species recorded during 2010-11 surveys & habitat types they are known to occur in.

(Darker green cells indicate primary habitat).

| Species | Conservation Status | | Habitat | | | | | | | | | | Method | | | | | | | | | | |
|-----------------------|---------------------|---|---------------|---------------|-------|-----------|----------|--------------|------------|---------|---------|---------|--------|-------------|----------|-----------|---------|------------|---|---|---|---|---|
| | | | Native forest | Exotic Forest | Scrub | Shrubland | Farmland | Open country | Freshwater | Wetland | Coastal | Estuary | Urban | Residential | 5-minute | Waterbird | Cryptic | Incidental | | | | | |
| Fantail | Endemic | Not Threatened | | | | | | | | | | | | | | | | ✓ | | | | | |
| Kereru | Endemic | Not Threatened ^{CD Inc} | | | | | | | | | | | | | | | | | ✓ | | | | |
| Shining cuckoo | Native | Not Threatened ^{DP} | | | | | | | | | | | | | | | | | | | ✓ | | |
| Tui | Endemic | Not Threatened St | | | | | | | | | | | | | | | | | | ✓ | | | |
| Blackbird | Introduced | Introduced & Naturalised ^{SO} | | | | | | | | | | | | | | | | | | ✓ | | | |
| Californian quail | Introduced | Introduced & Naturalised ^{SO} | | | | | | | | | | | | | | | | | | ✓ | | | ✓ |
| Common pheasant | Introduced | Introduced and Naturalised ^{SO} | | | | | | | | | | | | | | | | | | | | ✓ | |
| Crimson rosella | Introduced | Introduced and Naturalised ^{SO RR} | | | | | | | | | | | | | | | | | | | | ✓ | |
| Eastern rosella | Introduced | Introduced & Naturalised ^{SO} | | | | | | | | | | | | | | | | | | ✓ | | | ✓ |
| Grey warbler | Endemic | Not Threatened | | | | | | | | | | | | | | | | | | ✓ | | | |
| Silver-eye | Native | Not Threatened ^{SO} | | | | | | | | | | | | | | | | | | ✓ | | | |
| Canada goose | Introduced | Introduced and Naturalised ^{SO} | | | | | | | | | | | | | | | | | ✓ | ✓ | | | |
| Chaffinch | Introduced | Introduced & Naturalised ^{SO} | | | | | | | | | | | | | | | | | | ✓ | | | |
| Dunnock | Introduced | Introduced & Naturalised ^{SO} | | | | | | | | | | | | | | | | | | ✓ | | | |
| Gold finch | Introduced | Introduced & Naturalised ^{SO} | | | | | | | | | | | | | | | | | | ✓ | | | |
| Green finch | Introduced | Introduced & Naturalised ^{SO} | | | | | | | | | | | | | | | | | | ✓ | | | |
| House sparrow | Introduced | Introduced & Naturalised ^{SO} | | | | | | | | | | | | | | | | | | ✓ | | | |
| Magpie | Introduced | Introduced & Naturalised ^{SO} | | | | | | | | | | | | | | | | | | ✓ | | | |
| Pipit | Endemic | Declining | | | | | | | | | | | | | | | | | | ✓ | | | |
| Redpoll | Introduced | Introduced & Naturalised ^{SO} | | | | | | | | | | | | | | | | | | ✓ | | | |
| Skylark | Introduced | Introduced & Naturalised ^{SO} | | | | | | | | | | | | | | | | | | ✓ | | | |
| Song thrush | Introduced | Introduced & Naturalised ^{SO} | | | | | | | | | | | | | | | | | | ✓ | | | |
| Spur-winged plover | Naturalised | Not Threatened ^{SO} | | | | | | | | | | | | | | | | | | ✓ | ✓ | | |
| Starling | Introduced | Introduced & Naturalised ^{SO} | | | | | | | | | | | | | | | | | | ✓ | | | |
| Swamp harrier | Native | Not Threatened ^{SO} | | | | | | | | | | | | | | | | | | ✓ | | | |
| Welcome swallow | Native | Not Threatened ^{Inc SO} | | | | | | | | | | | | | | | | | | ✓ | | | |
| Yellow hammer | Introduced | Introduced & Naturalised ^{SO} | | | | | | | | | | | | | | | | | | ✓ | | | |
| Australasian bittern | Native | Nationally Endangered ^{Sp TO} | | | | | | | | | | | | | | | | | | | | ✓ | |
| Black shag | Native | Naturally Uncommon ^{SO Sp} | | | | | | | | | | | | | | | | | | ✓ | ✓ | | ✓ |
| Black swan | Native | Not Threatened ^{SO} | | | | | | | | | | | | | | | | | | ✓ | ✓ | | |
| Grey teal | Native | Not Threatened ^{Inc SO} | | | | | | | | | | | | | | | | | | | ✓ | | |
| Kingfisher | Native | Not Threatened | | | | | | | | | | | | | | | | | | ✓ | | | |
| Mallard | Introduced | Introduced & Naturalised ^{SO} | | | | | | | | | | | | | | | | | | ✓ | ✓ | | |
| North Island fernbird | Endemic | Declining ^{RR St} | | | | | | | | | | | | | | | | | | ✓ | | | |
| NZ shoveler | Native | Not Threatened | | | | | | | | | | | | | | | | | | | ✓ | | |
| Paradise shelduck | Endemic | Not Threatened | | | | | | | | | | | | | | | | | | ✓ | ✓ | | |
| Pied shag | Native | Nationally Vulnerable | | | | | | | | | | | | | | | | | | ✓ | | | |
| Pukeko | Native | Not Threatened ^{Inc SO} | | | | | | | | | | | | | | | | | | ✓ | ✓ | | |
| Scaup | Native | Not Threatened ^{Inc} | | | | | | | | | | | | | | | | | | | ✓ | | |
| Black-backed gull | Native | Not Threatened ^{SO} | | | | | | | | | | | | | | | | | | ✓ | | | |
| Rock pigeon | Introduced | Introduced and Naturalised ^{SO} | | | | | | | | | | | | | | | | | | ✓ | | | |

Table 4 shows the total number of birds recorded (heard or seen) over the course of 92 point counts along and adjacent to the proposed Expressway Alignment, sorted from the most to least abundant. Five species (starling, chaffinch, goldfinch, silver-eye and blackbird) accounted for 48.5% of all observations, and 17 species accounted for 90% of all observations (Table 4). The most abundant native species recorded in the point counts was the silver-eye (ranked 4th overall), accounting for 8.3% of all observations.

Table 4: Individual species abundance recorded during 92 point counts.

(Conservation Classification - **Introduced**, **Native (Not Threatened)**, **At Risk**, **Threatened**)

| Species | Count | All OBS. | % OBS | Cumulative % Of OBS. | | | |
|--------------------|-------|-------------|----------------|----------------------|-----|-----|-----|
| | | | | 50% | 75% | 90% | 95% |
| Starling | 56 | 222 | 12.98% | | | | |
| Chaffinch | 74 | 188 | 10.99% | | | | |
| Gold finch | 54 | 159 | 9.30% | | | | |
| Silver-eye | 46 | 141 | 8.25% | | | | |
| Blackbird | 63 | 119 | 6.96% | | | | |
| Pukeko | 42 | 98 | 5.73% | | | | |
| Yellow hammer | 37 | 90 | 5.26% | | | | |
| Black-backed gull | 26 | 79 | 4.62% | | | | |
| Grey warbler | 42 | 65 | 3.80% | | | | |
| House sparrow | 18 | 61 | 3.57% | | | | |
| Fantail | 36 | 56 | 3.27% | | | | |
| Green finch | 31 | 53 | 3.10% | | | | |
| Tui | 32 | 50 | 2.92% | | | | |
| Song thrush | 29 | 48 | 2.81% | | | | |
| Mallard | 25 | 43 | 2.51% | | | | |
| Welcome swallow | 14 | 43 | 2.51% | | | | |
| Harrier | 28 | 35 | 2.05% | | | | |
| Paradise shelduck | 11 | 31 | 1.81% | | | | |
| Magpie | 13 | 25 | 1.46% | | | | |
| Redpoll | 18 | 19 | 1.11% | | | | |
| Skylark | 17 | 19 | 1.11% | | | | |
| Spur-winged plover | 12 | 17 | 0.99% | | | | |
| Black swan | 1 | 9 | 0.53% | | | | |
| Canada goose | 3 | 8 | 0.47% | | | | |
| Pied shag | 5 | 5 | 0.29% | | | | |
| Eastern rosella | 2 | 4 | 0.23% | | | | |
| Kingfisher | 3 | 4 | 0.23% | | | | |
| Pipit | 3 | 4 | 0.23% | | | | |
| Rock pigeon | 2 | 3 | 0.18% | | | | |
| Bellbird | 1 | 3 | 0.18% | | | | |
| Kereru | 2 | 3 | 0.18% | | | | |
| Black shag | 3 | 3 | 0.18% | | | | |
| Californian quail | 1 | 1 | 0.06% | | | | |
| Hedge sparrow | 1 | 1 | 0.06% | | | | |
| Fernbird | 1 | 1 | 0.06% | | | | |
| TOTAL | | 1710 | 100.00% | | | | |

Thus, while half the species recorded during the point counts were introduced (

Figure 3), they made up approximately 60% of all the birds that were recorded (Table 4).

Threatened and At Risk species made up 2.9% and 8.8% of all species, and the individual abundance of these birds was in such low numbers that they comprised only 0.3% and 0.5% respectively of all the birds recorded during the point counts. There was no significant difference

between the number of introduced and native birds recorded during the two survey periods ($\chi^2 = 2.63$, 1 df, $p = 0.10$). Overall, an average of 8.2 species and 18.6 individuals were recorded during each point count (Table 5).

Table 5: Summary of species diversity and bird abundance during the 2010 survey periods

| Survey Period | Mean SPP Per Count (Total per survey) | Mean Birds Per Count (Total per survey) |
|----------------|--|--|
| Sept 2010 | 8.7 (30) | 18.5 (852) |
| Jan/Feb 2011 | 7.7 (30) | 18.7 (858) |
| Overall | 8.2 (34) | 18.6 (1710) |

5.2.3. Waterbird counts - standardised survey

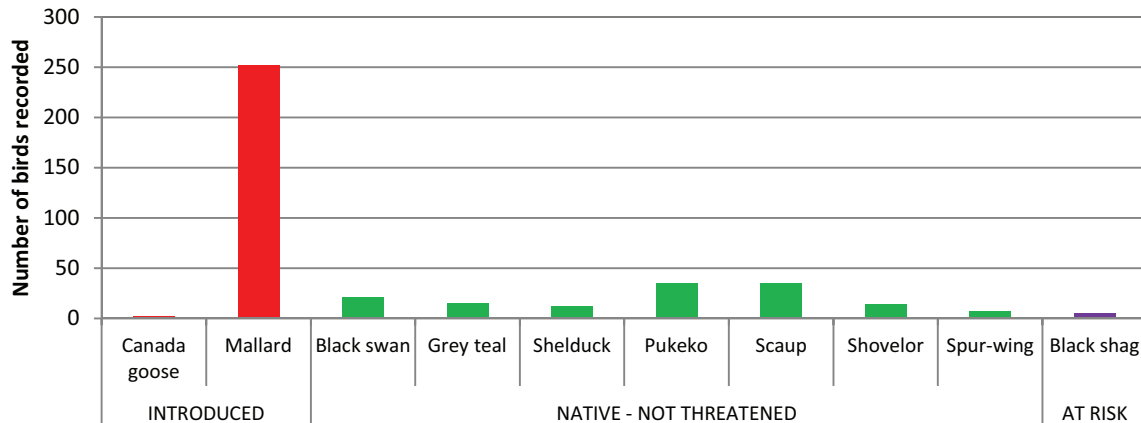
Thirty-four waterbird counts were undertaken over the two survey periods: 18 (twice at nine sites) in 2010 and 16 (twice at eight sites) in 2011. Only eight of the nine sites were surveyed in Jan-Feb 2011 session because at the time of the survey there was no water in WB01. Overall, 398 birds were recorded during the 34 counts, with the mean number of birds recorded per site ranging from 2.5 (WB10) to 46.75 (WB02) (Table 6). The two largest waterbodies surveyed had the highest mean counts.

A total of 10 waterbird species were recorded during the counts, comprising two introduced and eight native species (Table 3). The conservation status of the native species comprised seven Not Threatened and one At Risk (black shag) species. The most abundant species recorded was the introduced mallard (Figure 4).

Table 6: Mean waterbird counts

| Site | 2010 | 2011 | Overall |
|------|------|------|---------|
| WB01 | 8 | - | 8 |
| WB02 | 19 | 74.5 | 46.75 |
| WB03 | 2.5 | 3.5 | 3 |
| WB05 | 6 | 0 | 3 |
| WB06 | 1.5 | 1 | 1.25 |
| WB07 | 4 | 3 | 3.5 |
| WB08 | 28.5 | 40 | 34.25 |
| WB09 | 3.5 | 2 | 2.75 |
| WB10 | 3 | 2 | 2.5 |

Figure 4: Abundance of species recorded during waterbird counts



5.2.4. Cryptic marshbird counts

The only cryptic marshbird response that was obtained during the playback surveys was that of a single bittern at PB07 on 21/9/10. The habitat at that site is ideal for this species, with extensive areas of raupo reedland and flaxlands.

5.2.5. Non-standardised observations

Three species were recorded as incidental observations which were not picked up in the standardised surveys: crimson rosella (two seen at point count site 25), shining cuckoo (one bird heard at PB08) and ring-necked pheasant (two seen at point count site 20) (Table 3).

Another observation of note was a flock of 10 black shag traversing north to south along the coastline to the east of Pharazyn Reserve along on 21/9/10. These birds were flying approximately 30 m above the ground.

New Zealand dabchick (*Poliiocephalus rufopectus*) was recorded at WB09 by a Boffa Miskell Ecologist while undertaking vegetation surveys in the area. This Threatened species has a classification of Nationally Vulnerable (Miskelly *et al.* 2008).

6. Discussion

6.1. Species associated with the proposed Expressway Alignment

The total of 41 species recorded in the current (2010-2011) field surveys equates to approximately 76% of the species recorded in the OSNZ atlas data and 52% by Todd *et al.* (unpubl.) (Appendix 29.E). Nineteen species recorded in the OSNZ atlas data were not recorded during the current surveys. Conversely, six species were recorded here that were not in the OSNZ list. Of those six

species, North Island fernbird, Australasian bittern and pied shag are species of interest with respect to their threat classifications.

A breakdown of the number of species recorded in the three data sets according to the primary habitat used by the species is provided in Table 7. We note that Todd *et al.* (unpubl.) focussed on the coastal/estuarine habitat. The comparatively low number of coastal/estuarine species recorded in the 2010-11 avifauna surveys is a reflection of the fact that no targeted coastal/estuarine avifauna surveys were undertaken as part of these surveys because these areas (e.g. Waikanae Estuary) will not directly be affected by the proposed Expressway; consequently, information on coastal shorebirds was obtained from existing literature and databases.

Table 7: Primary habitat of species recorded in the OSNZ atlas, DOC and by Boffa Miskell.

| Primary Habitat | BML (2010-2011) | OSNZ (1999-2004) | DOC (Todd <i>et al.</i>) |
|---------------------|--------------------|---------------------|------------------------------|
| Native Forest | 4 | 8 | 1 |
| Bush / Scrub | 7 | 6 | 4 |
| Farmland / Open | 16 | 16 | 14 |
| Freshwater | 12 | 13 | 18 |
| Coastal / Estuaries | 1 | 8 | 12 |
| Urban / Residential | 1 | 1 | 0 |
| Oceanic | 0 | 2 | 1 |
| Total | 41 | 54 | 50 |

The 41 bird species (excluding dabchick) recorded in 2010-2011 comprised 19 introduced (exotic) and 22 native (including seven endemic species). Of the native species, 17 were Not Threatened, three At Risk (pipit, black shag and fernbird) and two Threatened (bittern and pied shag) (Miskelly *et al.* 2008). While Threatened and At Risk species were present along the proposed Alignment, they were recorded in very low numbers (0.8% of all observations). Overall, introduced species were found to make up the greatest proportion (62.2%) of all birds recorded during the point counts along the proposed Alignment.

In terms of species use of the site, pipit, fernbird and bittern were recorded utilising the site, whereas the records of both the black and pied shags were from birds traversing the area. Based on the species habitat requirements and the size of their territorial and home ranges, the observed pipit, fernbird and bittern would be resident in the areas they were recorded, whereas black and pied shags are unlikely to be resident along the proposed Expressway Alignment.

Fernbird are often found in areas that are viewed as being marginal habitat (i.e. wetlands, dry scrub and fernlands), as was the case for the birds recorded along the proposed Expressway Alignment in the wider Te Harekeke/Kawakahia Wetland / Nga Manu Nature Reserve area. Previous studies on

fernbird (North Island, South Island and Snares Island) have shown considerable variability in territory size (see Table 8 below, taken from Parker 2002), possible due to variation in resource availability (such as food or suitable cover/vegetation) between sites, or some other limiting factor such as predation (Parker 2002). Parker (2002) noted that fernbird may increase the size of territories at low population densities. Thus, given the low number of fernbird thought to occur in the Te Harekeke / Nga Manu area, the territory size of these birds could potentially be relative large. Furthermore, a number of studies have found that fernbird territorial boundaries often follow landscape features such as ditches, tracks and waterways (Best 1973, Andrews 1995, Parker 2002).

Table 8: Recorded territory sizes of fernbird

| Location | Median Territory Size (m ²) | Mean Territory Size ± S.E. (m ²) | n | Habitat Type | Study |
|-------------------------|---|--|----|-----------------------------------|---------------|
| Omaha | 5865 | 5220 ± 487 | 15 | Saltmarsh | Parker (2002) |
| Golden Bay | 8110 | 7987 ± 498 | 6 | Pakihi swamp | Elliot (1978) |
| Lakes Waipori (Dunedin) | 13500 | 13564 ± 1575 | 11 | Freshwater wetland | Harris (1987) |
| Invercargill | 1425 | 1376 ± 155 | 14 | Saltmarsh | Barlow (1983) |
| Snares Islands | 2560 | 3192 ± 318 | 27 | Forest and maritime tussock lands | Best (1973) |

6.2. Habitats associated with the proposed Alignment

The original (pre-human) vegetation of the Foxton Ecological District comprised forests, young dunes with shrubs and sand-binding grasses and sedges, swamps and lake edges with mosaics of scrub, flax and various reeds, and estuaries fringed with rushes and mats of succulent herbs (DOC 1997). Following human arrival, the district has had a long history of major modification and now contains mostly farmland, exotic pine plantations and urban areas. Consequently, only small fragments of ecologically valuable indigenous habitat exist today (see Maps 2 and 3).

The bird species recorded in 2010-11 are typical of the habitats that are present and were sampled. The majority of habitat along the proposed Alignment is comprised of residential development among cleared forest on and converted farming landscape on a modified dunelands coastal site. With regard to the primary habitat used by species recorded during the surveys, while the greatest diversity was recorded for species associated with farmland/open country, these species were mostly introduced. Only one At Risk species recorded during the avifauna surveys, the New Zealand pipit, utilises farmland as its primary habitat.

In comparison, a high proportion of forest and freshwater species recorded were native; thus, in terms of ecological values, the forest and freshwater habitats (particularly wetlands) are of greater value in their ability to provide feeding and nesting resources for a range of native species, including Threatened and At Risk species. Freshwater habitats are well represented along and adjacent to the proposed Alignment, as well as in the wider area, though a number of these are constructed ponds.

The Te Harakeke/Kawakahia wetland habitats and the Ngarara / Nga Manu area provide the best quality habitat for freshwater species due to the extent of the wetland and the diversity of habitat types present (i.e. extensive raupo reedlands and flaxlands). Not surprisingly, this was the area in which both the fernbird and bittern were recorded. Species of note recorded in Wildland's (2002) survey of the Te Harakeke/Kawakahia wetland included Australasian bittern, North Island fernbird, spotless crane, grey duck, pied stilt, black shag and dabchick. Thus, the wetland sequence around this area is of particular importance to Threatened and At Risk avian species in the district.

6.3. Coastal and estuary habitats

Combined, the OSNZ (Robertson *et al.* 2007) and DOC (Todd *et al.* unpubl.) species list contained a number of wader and shorebird species not recorded in the 2010-2011 surveys (Appendix 29.E). Such species include eastern bar-tailed godwit, banded dotterel, wrybill, Caspian tern, reef heron and variable oystercatchers; all species indicative of estuarine and coastal habitats. These species favour the coast and are concentrated in areas away from the proposed Alignment, as supported by the fact that they were not recorded moving around the wider area during the 2010-2011 point count surveys. The concentrations of such species around stream mouths are due to the food supply at these locations. Consequently, wader and shorebird species tend to feed at the stream mouths, and move up and down along the coast to the different stream mouths. This pattern was observed in a study undertaken by BML (2006) at the Kowhai Stream mouth, to the north of the proposed Expressway Alignment, which investigated the diversity, abundance and patterns of movement of avifauna species around stream mouth and surrounding habitats (including pasture, shrublands, dunes and beach). During that study, shorebird species were only recorded associated with the beach and dune habitat.

Pied and black shag, which may utilise the Waikanae Estuary, were recorded during the 2010-2011 survey traversing the area in varying directions, all flying at least 30 m above ground level.

7. Conclusions

- The comparison with OSNZ atlas and DOC data confirm that species recorded during the 2010-2011 avifauna fieldwork were those that were expected to be found in the habitat types surveyed (ie. those occurring along the proposed Alignment and the wider area).

- The majority of species recorded in the OSNZ atlas and DOC data (Todd et al. unpubl.) but not in the 2010-11 fieldwork were those that primarily occur in the coastal/estuarine habitats (see Table 7). While the proposed Expressway Alignment will not directly impact on the estuarine and coastal environment, the potential exists for the Project to impact indirectly downstream into such habitats, particularly the Waikanae Estuary, by way of increased stormwater runoff.
- The avifauna along and adjacent to the proposed Alignment were found to be dominated by introduced passerines; a reflection of urban and open country occurring along the route. These habitat types are considered to be of low ecological value.
- Native avifauna associated primarily with freshwater habitats (i.e. wetlands and waterways) were recorded in low numbers, though both Threatened (pied shag and bittern) and At Risk (black shag and fernbird) species were recorded along or adjacent to the proposed Alignment. With regard to the shags, birds were recorded traversing the site rather than utilising the waterbodies. However, the bittern and fernbird were associated with wetland habitats and are likely to be resident in the area. Therefore, from an avifauna perspective, a number of the wetlands occurring along the proposed Alignment and within the wider area are considered to be of high ecological value.
- The fragmented remnant native forest habitats along and adjacent to the proposed Alignment provide an important habitat for a number of native species through the provision of feeding resources and nesting sites. These fragments also provide a series of forested areas that serve as corridor to encourage the dispersal of avifauna across the wider area. Consequently, these forested areas are also considered to be of high ecological value for avifauna.

8. Recommendations

- The Ecological Impact Assessment (Technical Report 26, Volume 3) and detailed design of the proposed Expressway Project will need to consider and address all issues that could potentially impact (both directly and indirectly) upon native birds known to occur within the footprint and within the wider surrounding area. With regards to shorebirds and waders utilising the Waikanae Estuary, this would include the consideration of the indirect effects on food supply by sediment deposition arising from construction earthworks.
- A bittern was recorded in the Te Harakeke/Kawakahia Wetland and a fernbird in the wetland and kanuka habitats associated with the adjacent Nga Manu Nature Reserve. These habitats are in reasonably close proximity to each other (and the proposed Expressway Alignment) and provide ideal habitat for both species in terms of extent and vegetation communities present. Consequently these are considered to be the areas of highest ecological value for avifauna occurring along the proposed Expressway Alignment.

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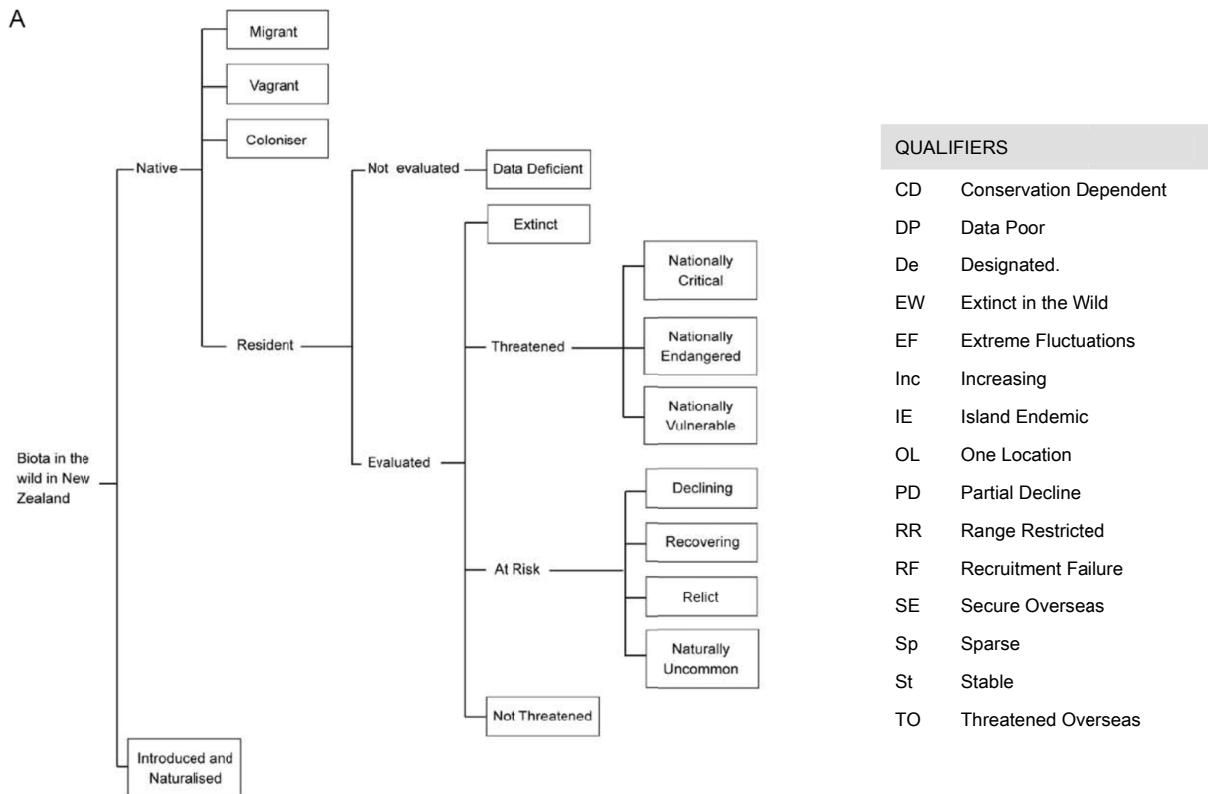
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Appendix 29.A
Structure and Qualifiers of the New Zealand Threat
Classification (Townsend et al. 2007)

Appendix 29.A: Structure and Qualifiers of the New Zealand Threat Classification (Townsend *et al.* 2007)



All avifauna species occurring in the wild in New Zealand have been assigned one of the categories (boxed text) above, depending on its origin (native vs introduced), population size and trends. Full details of classification criteria for each of these categories are provided in Townsend *et al.* (2007). In addition to these threat categories, species may receive qualifiers as part of their classification. Qualifiers are an integral part of the New Zealand threat classification system as they provide additional information about a taxon's listing, status and management. For instance, Caspian tern is classified as Nationally Vulnerable^{SO}; this category indicates that the New Zealand population is small with a high ongoing or predicted decline, however the SO (Secure Overseas) qualifier provides information regarding populations found outside of New Zealand.

Appendix 29.B

Photos of habitat occurring along the proposed
Expressway Alignment at avifauna point count
survey sites

Appendix B: Photos of habitat occurring along the Expressway Alignment at avifauna point count survey sites

Freshwater habitat survey sites:



POINT COUNT SITE 1



POINT COUNT SITE 2



POINT COUNT SITE 14

Pasture habitat survey sites:



POINT COUNT SITE 11



POINT COUNT SITE 22



POINT COUNT SITE 24

Native regenerating forest / shrub survey sites:



POINT COUNT SITE 7



POINT COUNT SITE 10



POINT COUNT SITE 20

Rural / residential habitat survey sites:



POINT COUNT SITE 11



POINT COUNT SITE 25



POINT COUNT SITE 25

Exotic forest / scrub habitat survey sites:



POINT COUNT SITE 6



POINT COUNT SITE 8



POINT COUNT SITE 12

Appendix 29.C

Photos of habitat occurring along proposed Expressway Alignment at avifauna waterbird survey sites

Appendix C: Photos of habitat occurring along Expressway Alignment at avifauna waterbird survey sites



WATERBIRD COUNT SITE 1 - September



WATERBIRD COUNT SITE 1 - January



WATERBIRD COUNT SITE 2 (Andrew's Pond)



WATERBIRD COUNT SITE 10 (Pharazyn Reserve)



WATERBIRD COUNT SITE 8

Appendix 29.D

Photos of habitat occurring along proposed
Expressway Alignment at avifauna playback survey
sites

Appendix D: Photos of habitat occurring along Expressway Alignment at avifauna playback survey sites



PLAYBACK SITE 1



PLAYBACK SITE 3



PLAYBACK SITE 5



PLAYBACK SITE 2



PLAYBACK SITE 7



PLAYBACK SITE 8

Appendix 29.E

Summary of species recorded in the OSNZ atlas data, BML survey and DOC

Appendix 29.E: Summary of species recorded in the OSNZ atlas data, BML survey and DOC.

(Darker green cells indicate primary habitat)

| Species | | Conservation Status ¹ | | Native forest | Exotic Forest | Scrub / shrubland | Panmuri / open country | Freshwater / wetlands | Coastal / Estuary | Urban/Residential | Oceanic | OSNZ | BML | DOC (Todd <i>et al.</i>) |
|--------------------------|---|----------------------------------|---|---------------|---------------|-------------------|------------------------|-----------------------|-------------------|-------------------|---------|------|-----|---------------------------|
| Bellbird | <i>Anthornis m. melanura</i> | Endemic | Not Threatened | ■ | | | | | | | | ✓ | | |
| Bush falcon | <i>Falco novaeseelandiae</i> "bush" | Endemic | Nationally Vulnerable ^{DP St} | ■ | | | | | | | | ✓ | | |
| Fantail | <i>Rhipidura fuliginosa placabilis</i> | Native | Not Threatened | ■ | | | | | | ■ | | ✓ | ✓ | ✓ |
| Kereru | <i>Hemiphaga novaeseelandiae</i> | Endemic | Not Threatened ^{CD Inc} | ■ | | | | | | | | ✓ | ✓ | |
| Morepork | <i>Ninox n. novaeseelandiae</i> | Native | Not Threatened | ■ | | | ■ | | | | | ✓ | | |
| Pied tomtit | <i>Petroica macrocephala toitoi</i> | Endemic | Not Threatened | ■ | | | | | | | | ✓ | | |
| Shining cuckoo | <i>Chrysococcyx lucidus lucidus</i> | Native | Not Threatened ^{DP} | ■ | | | | | | ■ | | | ✓ | |
| Sulphur crested cockatoo | <i>Cacatua galerita</i> | Introduced | Introduced & Naturalised ^{SO Sp} | ■ | | | | | | | | ✓ | | |
| Tui | <i>Prosthemadera n. novaeseelandiae</i> | Endemic | Not Threatened ^{OL St} | ■ | | | | | | | | ✓ | ✓ | |
| Blackbird | <i>Turdus merula</i> | Introduced | Introduced & Naturalised ^{SO} | ■ | | ■ | | | | ■ | | ✓ | ✓ | ✓ |
| California quail | <i>Callipepla californica</i> | Introduced | Introduced & Naturalised ^{SO} | | | ■ | | | | | | ✓ | ✓ | |
| Eastern rosella | <i>Platycercus eximius</i> | Introduced | Introduced & Naturalised ^{SO} | | | ■ | | | | | | ✓ | ✓ | |
| Grey warbler | <i>Gerygone igata</i> | Endemic | Not Threatened | | | ■ | | | | ■ | | ✓ | ✓ | ✓ |
| Pheasant | <i>Phasianus colchicus</i> | Introduced | Introduced & Naturalised ^{SO} | | | ■ | | | | | | ✓ | ✓ | ✓ |
| Silveryeye | <i>Zosterops lateralis lateralis</i> | Native | Not Threatened ^{SO} | ■ | | ■ | | | | ■ | | ✓ | ✓ | ✓ |
| Canada goose | <i>Branta canadensis</i> | Introduced | Introduced & Naturalised ^{SO} | | | | ■ | ■ | | | | ✓ | ✓ | |
| Chaffinch | <i>Fringilla coelebs</i> | Introduced | Introduced & Naturalised ^{SO} | | | ■ | | | | | | ✓ | ✓ | ✓ |
| Crimson rosella | <i>Platycercus elegans</i> | Introduced | Introduced & Naturalised ^{SO RR} | | | ■ | | | | | | | ✓ | |
| Dunnock | <i>Prunella modularis</i> | Introduced | Introduced & Naturalised ^{SO} | | | ■ | | | | | | ✓ | ✓ | ✓ |
| Goldfinch | <i>Carduelis carduelis</i> | Introduced | Introduced & Naturalised ^{SO} | | | ■ | | | | | | ✓ | ✓ | ✓ |
| Greenfinch | <i>Carduelis chloris</i> | Introduced | Introduced & Naturalised ^{SO} | | | ■ | | | | | | ✓ | ✓ | ✓ |
| House sparrow | <i>Passer domesticus</i> | Introduced | Introduced & Naturalised ^{SO} | | | ■ | | | | | | ✓ | ✓ | ✓ |
| Magpie | <i>Gymnorhina tibicen</i> | Introduced | Introduced & Naturalised ^{SO} | | ■ | ■ | | | | ■ | | ✓ | ✓ | ✓ |
| NZ pipit | <i>Anthus n. novaeseelandiae</i> | Native | Declining | | | ■ | | ■ | | | | ✓ | ✓ | ✓ |
| Redpoll | <i>Carduelis flammea</i> | Introduced | Introduced & Naturalised ^{SO} | | | ■ | | | | ■ | | ✓ | ✓ | |
| Skylark | <i>Alauda arvensis</i> | Introduced | Introduced & Naturalised ^{SO} | | | ■ | | | | | | ✓ | ✓ | ✓ |
| Song thrush | <i>Turdus philomelos</i> | Introduced | Introduced & Naturalised ^{SO} | | ■ | ■ | | | | ■ | | ✓ | ✓ | ✓ |
| Spur-winged plover | <i>Vanellus miles novaehollandiae</i> | Native | Not Threatened ^{SO} | | | ■ | | ■ | | | | ✓ | ✓ | ✓ |
| Starling | <i>Sturnus vulgaris</i> | Introduced | Introduced & Naturalised ^{SO} | | | ■ | | | | ■ | | ✓ | ✓ | ✓ |
| Swamp harrier | <i>Circus approximans</i> | Native | Not Threatened ^{SO} | | | ■ | | | | | | ✓ | ✓ | ✓ |
| Welcome swallow | <i>Hirundo tahitica neoxena</i> | Native | Not Threatened ^{Inc SO} | | | ■ | | ■ | | | | ✓ | ✓ | ✓ |
| Yellowhammer | <i>Emberiza citrinella</i> | Introduced | Introduced & Naturalised ^{SO} | | | ■ | | | | | | ✓ | ✓ | ✓ |

| Species | | Conservation Status ¹ | | Native forest | Exotic Forest | Scrub / shrubland Marram / open coastal | Freshwater / wetlands | Coastal / Estuary | Urban/Residential | Oceanic | OSNZ | BML | DOC (Todd <i>et al</i>) |
|------------------------|--|----------------------------------|---|---------------|---------------|---|-----------------------|-------------------|-------------------|---------|------|-----|--------------------------|
| | | | | | | | | | | | | | |
| Australasian bittern | <i>Botaurus poiciloptilus</i> | Native | Nationally Endangered ^{Sp TO} | | | | | | | | | ✓ | ✓ |
| Black shag | <i>Phalacrocorax carbo novaehollandiae</i> | Native | Naturally Uncommon ^{SO Sp} | | | | | | | | | ✓ | ✓ |
| Black swan | <i>Cygnus atratus</i> | Native | Not Threatened ^{SO} | | | | | | | | | ✓ | ✓ |
| Black-fronted tern | <i>Chlidonias albostratus</i> | Endemic | Nationally Endangered ^{DP} | | | | | | | | | | ✓ |
| Brown teal | <i>Anas chlorotis</i> "North Island" | Endemic | Recovering ^{CD RR} | | | | | | | | | | ✓ |
| Dabchick | <i>Poliiocephalus rufopectus</i> | Endemic | Nationally Vulnerable | | | | | | | | | ✓ | ✓ |
| Fernbird | <i>Bowdleria punctata vealeae</i> | Endemic | Declining ^{RR St} | | | | | | | | | ✓ | |
| Grey duck | <i>Anas s. superciliosa</i> | Native | Nationally Critical | | | | | | | | | ✓ | ✓ |
| Grey teal | <i>Anas gracilis</i> | Native | Not Threatened ^{Inc SO} | | | | | | | | | ✓ | ✓ |
| Kingfisher | <i>Todiramphus sanctus vagans</i> | Native | Not Threatened | | | | | | | | | ✓ | ✓ |
| Little black shag | <i>Phalacrocorax sulcirostris</i> | Native | Naturally Uncommon ^{RR} | | | | | | | | | ✓ | |
| Little shag | <i>Phalacrocorax melanoleucos brevirostris</i> | Native | Naturally Uncommon ^{Inc} | | | | | | | | | ✓ | ✓ |
| Mallard | <i>Anas platyrhynchos</i> | Introduced | Introduced & Naturalised ^{SO} | | | | | | | | | ✓ | ✓ |
| Paradise shelduck | <i>Tadorna variegata</i> | Endemic | Not Threatened | | | | | | | | | ✓ | ✓ |
| Pied oystercatcher | <i>Haematopus finschi</i> | Endemic | Declining | | | | | | | | | | ✓ |
| Pied shag | <i>Phalacrocorax varius varius</i> | Endemic | Nationally Vulnerable | | | | | | | | | ✓ | ✓ |
| Pied stilt | <i>Himantopus h. leucocephalus</i> | Native | Declining ^{SO} | | | | | | | | | ✓ | ✓ |
| Pukeko | <i>Porphyrio melanotus</i> | Native | Not Threatened ^{Inc SO} | | | | | | | | | ✓ | ✓ |
| Scaup | <i>Aythya novaeseelandiae</i> | Endemic | Not Threatened ^{Inc} | | | | | | | | | ✓ | |
| Shoveler | <i>Anas rhynchotis</i> | Native | Not Threatened | | | | | | | | | ✓ | ✓ |
| Spotless crane | <i>Porzana tabuensis plumbea</i> | Native | Relict | | | | | | | | | | ✓ |
| White heron | <i>Egretta alba modesta</i> | Native | Nationally Critical ^{OL SO St} | | | | | | | | | | ✓ |
| Banded dotterel | <i>Charadrius bicinctus bicinctus</i> | Endemic | Nationally Vulnerable ^{RR} | | | | | | | | | | ✓ |
| Black-backed gull | <i>Larus d. dominicanus</i> | Native | Not Threatened ^{SO} | | | | | | | | | ✓ | ✓ |
| Caspian tern | <i>Hydroprogne caspia</i> | Native | Nationally Vulnerable ^{SO} | | | | | | | | | ✓ | ✓ |
| Bar-tailed godwit | <i>Limosa lapponica baueri</i> | Native | Migrant ^{SO} | | | | | | | | | | ✓ |
| Knot | <i>Calidris</i> sp | Native | Migrant | | | | | | | | | | ✓ |
| Red-billed gull | <i>Larus novaehollandiae scopulinus</i> | Native | Nationally Vulnerable | | | | | | | | | ✓ | ✓ |
| Reef heron | <i>Egretta sacra sacra</i> | Native | Nationally Vulnerable ^{SO St} | | | | | | | | | | ✓ |
| Royal spoonbill | <i>Platalea regia</i> | Native | Naturally Uncommon ^{Inc RR SO Sp} | | | | | | | | | ✓ | ✓ |
| Shore plover | <i>Thinornis novaeseelandiae</i> | Endemic | Nationally Critical ^{CD Inc RR Sp} | | | | | | | | | ✓ | ✓ |
| Spotted shag | <i>Stictocarbo p. punctatus</i> | Endemic | Not Threatened | | | | | | | | | ✓ | |
| Variable oystercatcher | <i>Haematopus unicolor</i> | Endemic | Recovering | | | | | | | | | ✓ | ✓ |
| White-faced heron | <i>Ardea novaehollandiae</i> | Native | Not Threatened ^{SO} | | | | | | | | | ✓ | ✓ |
| White-fronted tern | <i>Sterna s. striata</i> | Native | Declining ^{DP} | | | | | | | | | ✓ | |
| Wrybill | <i>Anarhynchus frontalis</i> | Endemic | Nationally Vulnerable ^{RR} | | | | | | | | | | ✓ |

| Species | | Conservation Status ¹ | | Native forest | Exotic Forest | Scrub / shrubland farmland / open countryside | Freshwater / wetlands | Coastal / Estuary | Urban/Residential | Oceanic | OSNZ | BML | DOC (Todd <i>et al.</i>) |
|-----------------------|-----------------------------|----------------------------------|--|---------------|---------------|---|-----------------------|-------------------|-------------------|---------|-----------|-----------|---------------------------|
| | | | | | | | | | | | | | |
| Rock pigeon | <i>Columba livia</i> | Introduced | Introduced & Naturalised ^{SO} | | | | | | | | ✓ | ✓ | |
| Australasian gannet | <i>Morus serrator</i> | Native | Not Threatened ^{De Inc SO} | | | | | | | | ✓ | | |
| Fluttering shearwater | <i>Puffinus gavia</i> | Endemic | Relict ^{RR} | | | | | | | | ✓ | | |
| Yellow-eyed penguin | <i>Megadyptes antipodes</i> | Endemic | Nationally Vulnerable ^{EF} | | | | | | | | | | ✓ |
| TOTAL | | | | | | | | | | | 54 | 41 | 50 |