2021

Call count monitoring of Northland brown kiwi 2020

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Te Papa Atawhai

New Zealand Government

Cover: Young kiwi chick. *Photo: Sara Smerdon.*

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1. Introduction

1.1 Objective

The objective of this report is to provide a summary of the 2020 results for Northland brown kiwi (*Apteryx mantelli*) call count monitoring, and to provide recommendations for future monitoring.

1.2 Background

Northland populations of kiwi had declined mainly due to predation by stoats (*Mustela erminea*), ferrets (*M. furo*), dogs (*Canis familiaris*) and cats (*Felis catus*), along with increasing land development pressures throughout the region (Pierce et al. 2006). In the early 1990s, a network of kiwi call count listening stations was established nationally to determine trends (stable, increasing or decreasing) in kiwi populations over time (McLennan 1992). In 1993, 24 stations were established in four geographic areas in Northland (Northern, Eastern, Southern, Western) where kiwi were known to be present, with kiwi call count monitoring carried out annually since 1995. Call count surveys are one of the main tools used for assessing trends in kiwi populations and are used in Northland to:

- Monitor the trends in call counts (and hence population size) over time at the 24 original (1993) listening stations in the four geographic areas (Northern, Eastern, Western, Southern).
- Monitor the trends in kiwi populations at the growing number of kiwi management areas throughout Northland (currently 23 distinct clusters, with 2 additional clusters added in 2020).

1.3 Northland listening sites

The 24 original kiwi listening stations that were established in 1993 at the four geographic areas (Pierce & Westbrooke 2003) are mapped in Figure 1 and listed in Table 1. In the Northern cluster six stations were established either in or on the edge of extensive forest in the Herekino-Raetea-Puketi Forests area. In the Eastern cluster six stations were established in forest remnants and extensive exotic forestry in the Bay of Islands area spanning Purerua Peninsula-Waitangi-Russell Peninsula. In the Western cluster five stations are in extensive forest (two in Waipoua) or forest remnants (Kaitui, Trounson and Paerata). The Southern cluster comprises seven stations within 30 km of Whangarei, all northwest to northeast of the city and involving forest remnants, including two that also include exotic forests (Glenbervie 7A & 9A). Over the years since 1993 many additional listening stations have been added, predominantly in areas where community groups are working to protect kiwi. The extensive involvement of local communities in the protection of kiwi and the associated expansion of the number of kiwi listening stations provides strong information on the current distribution and density of Northland brown kiwi throughout its range. (Fig. 1). Populations now extend across both public and private land in Northland, from Whakaangi in the Far North to Ponui Island in the south.

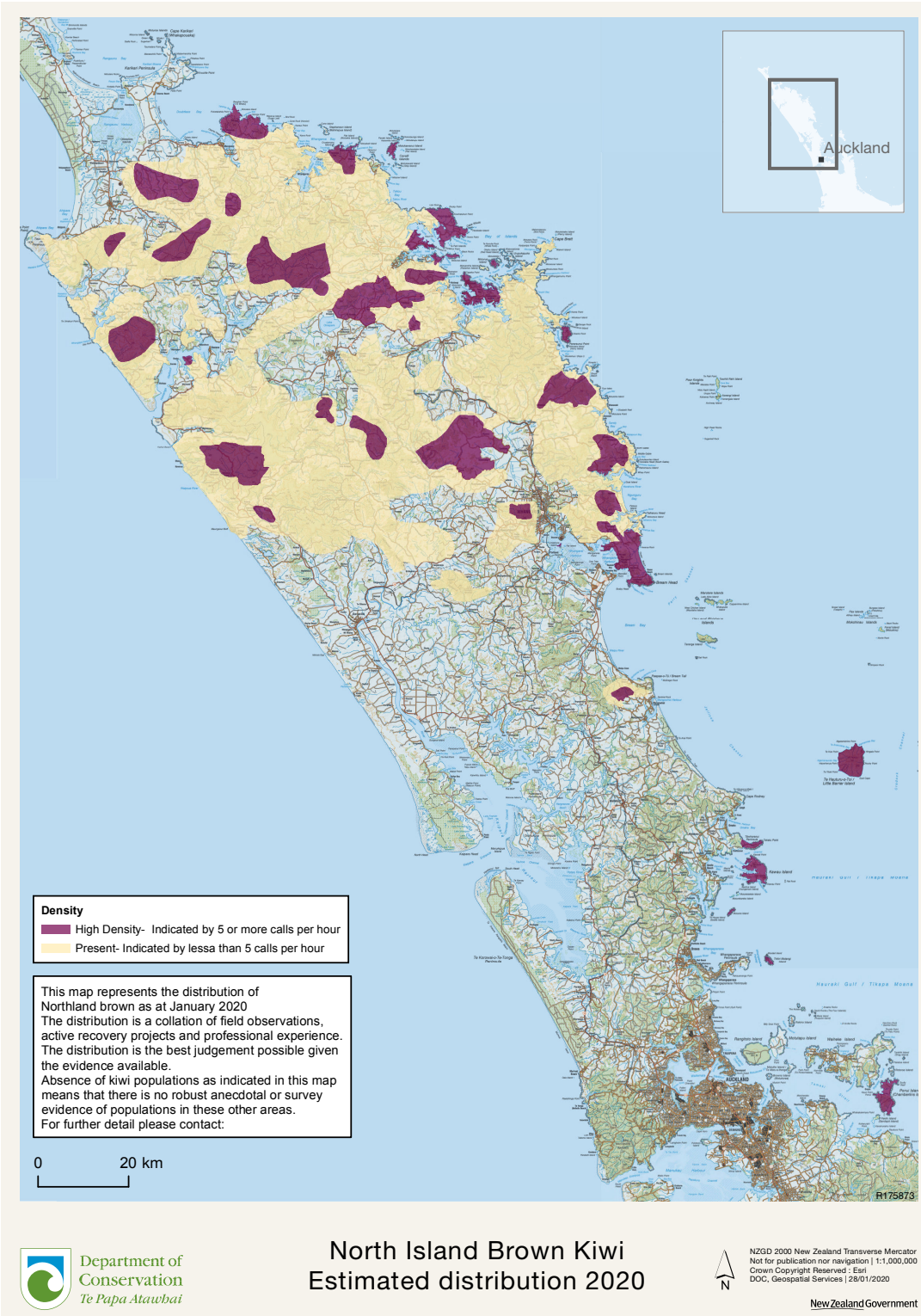

Figure 1. Northland kiwi distribution and relative abundance as known in 2020.

Table 1. The original Northland kiwi listening stations, grouped by geographic area with corresponding station numbers.

NORTHERN	EASTERN	WESTERN	SOUTHERN
1 Diggers Valley	10 Marsden Cross	16 Kaitui	21 Glenbervie 7A
2 Takahue	11 Puketotara	17 Trounson	22 Glenbervie 9A
4 Gartons	12 Rangitane	18 Cathedral	23 Marlow Road
5 Kaiaka	13 Waitangi No 12	19 Waipoua L/Out	24 Purua N
7 Puketi Forest	14 Mt Bledisloe	20 Paerata	25 Rarewarewa S
8 Puketi Scenic Reserve	15 Tikitikiore		26 Mimiwhangata
			27 Sandy Bay

2. Methods

The 2020 Northland brown kiwi call count survey followed the recommendations made by Robertson & Colbourne in the Kiwi Best Practice Manual (2003 and 2017; the relevant instructions from the latter are included in Appendix 1) and aligns with the findings of Colbourne & Digby (2016). Kiwi calls were listened for and counted during the first 2 hours of darkness, and during the dark phase of the moon, for 4 nights per station (n = 8 hours). Wherever possible, quiet conditions were favoured, with little or no wind, rain, or background noise. At times the survey conditions varied slightly from those described above. This is noted in the report when it is relevant to the results presented. Kiwi listening was carried out from 10 to 30 May 2020, with a back-up window from 9 to 28 June 2020. The combination of a relatively early listening window and a severe drought in early 2020 (and therefore a potential delay in the onset of breeding while the kiwi put on condition) gave rise to the recommendation to consider spreading the listening over the two windows. Using the second window for some or all of the listening occurred at 65% of stations. This was higher than typically observed.

2.1 2020 kiwi listening data

In addition to the original clusters, kiwi listening data for 2020 were received from the following management areas:

- Mangatete
- Honeymoon Valley
- Whaakangi
- Mahinepua
- Bay of Islands
- Russell
- Puketi Forest
- Waimate North
- Hupara
- Sandy Bay
- Tutukaka
- Manaia-The Nook
- Kauri Mountain
- Bream Head/Taurikura
- Motatau-Marlow
- Purua-Rarewarewa
- Waipoua-Trounson
- Tawharanui
- Marunui
- Mataia

Data were also received for clusters at Matapouri and Whananaki for the first time in 2020. There were no data received for Kawau Island in 2020.

3. General patterns

3.1 Northland monitoring trends since 1995

Trends in call count data collected since 1995 at the 24 original listening stations (see Table 1) in the Northern, Eastern, Southern and Western survey areas are graphed for comparison in Fig. 2 and the 2018 data for all Northland listening stations are presented and summarised in Appendices 2, 3 and 4.

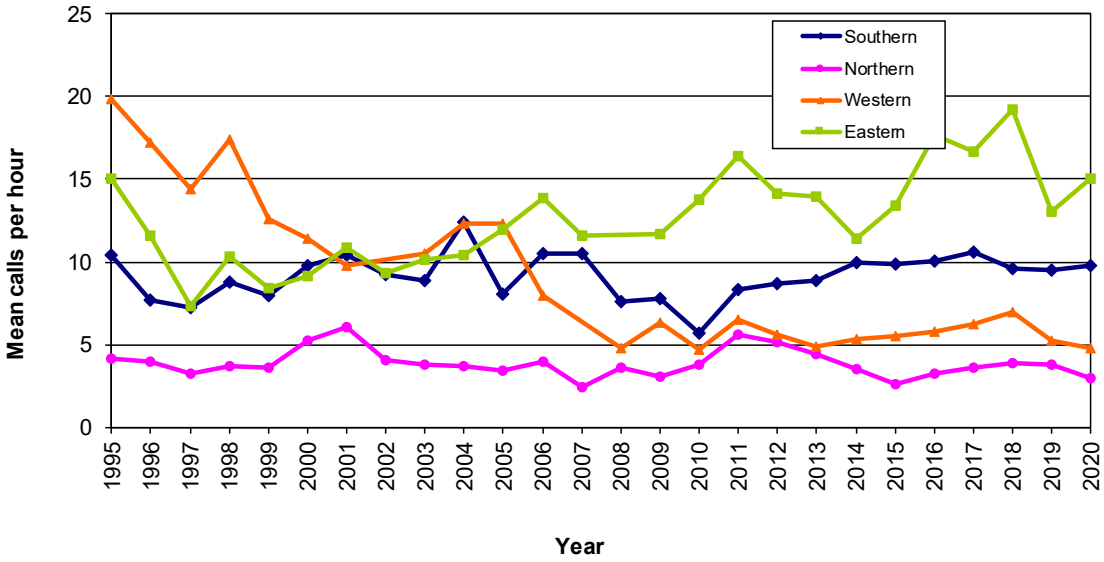

Figure 2. Mean hourly kiwi call rates per hour for each of the original four Northland monitoring areas 1995–2020. The mean for the Northern cluster was estimated using the 2016 data for two stations (Takahue and Gartons), and by using an ALD for one station (Kaiaka). The mean for the Eastern cluster was estimated using the 2019 data for two stations (Marsden Cross and Puketotara). The mean for the Western cluster was estimated using the 2014 data for one station (Paerata), the 2019 data for two stations (Trounson and Waipoua Lookout), and with only two nights completed in 2020 for the remaining two stations (Katui and Cathedral). The mean for the Southern cluster was estimated using the 2019 data for one station (Mimiwhangata), and by using an ALD for two stations (Glenbervie 7A and Glenbervie 9A).

Northern Area

The mean for the Northern cluster was 2.98 calls/hr, which was a decrease of almost one call/hr compared with 2019 (a mean of 3.79 kiwi calls/hr; Fig. 2). This was the lowest observed mean for this cluster since 2015, and the third lowest since 1995. It was a shame to see the previous upward trend start to decrease, although the 2020 result didn't suggest any change from the general pattern of stability observed at this cluster over the last 25 years. It was excellent to have data from Diggers Valley (Station 1) and Kaiaka (Station 5) received in 2020, neither of which had listening completed for several years prior. As was observed in 2019, data were not received since 2016 for Takahue or Gartons (stations 2 and 4). Of the four stations listened from in 2020, three had a decrease in the mean number of kiwi calls heard when compared with the previous listen, while only one (Kaiaka/Station 5) showed an increase (from 2 kiwi calls/hr when listening was last completed in 2015, to 3 calls/hr in 2020). The data for Kaiaka/Station 5 were collected using an ALD for the first time, so the change in methodology may have affected the results. Diggers Valley (Station 1) recorded its lowest mean in 2020 at just 0.63 kiwi calls/hr (down from 0.88 calls/hr in 2018). The only two stations that were listened from in 2019 and 2020 both had lower mean call count rates in 2020 (Puketi Forest/Station 7 decreased from 7.38 to 4 calls/hr; while Puketi Scenic Reserve/Station 8 decreased from 12.38 to 10.13 calls/hr). The 2020 means were in the ranges previously seen for these stations. All four stations had 4 full nights of listening completed.

Eastern Area

The mean number of kiwi calls heard for the Eastern area increased by exactly 2 calls/hr from 13.02 in 2019 to 15.02 in 2020 (Fig. 2). After the substantial decrease observed for this cluster in 2019 it was heartening to see some recovery in 2020. Once again, the greatest change was observed at Tikitikiore/Station 15, but this time there was an increase of almost 9 calls/hr from a mean of 7.8 in 2019 to 18.6 in 2020. The 2020 result was more aligned with what had been previously observed for this station from 2012 to 2018 inclusive, so the 2019 result was likely an anomaly rather than an indication of population change. The other three stations that were listened from in 2020 had smaller changes: Rangitane/Station 12 and Mt Bledisloe/Station 14 both increased (by 2.5 and 0.4 calls/hr, respectively. The 2020 calls were within the range typically seen for these stations), while Waitangi No. 12/Station 13 decreased by 1.75 calls/hr to a mean of 4 calls/hr, which was the second lowest mean observed for this station. These stations all had 4 nights of listening completed. Listening was not carried out for Marsden Cross/Station 10 or Puketotara/Station 11.

Southern Area

After 2 years in a row of a decreasing mean call rate it was good to see an increase in 2020 for the Southern cluster (from 9.47 calls/hr in 2019 to 9.78 in 2020, Fig. 2). These changes have all been minor though, and the results for this cluster have been effectively stable since 2014 (hovering around 10 ± 0.6 calls/hr; Fig. 2). The 2020 mean was derived from six kiwi listening stations, of which four had increased from the previous year. Once again, Rarewarewa South/Station 25 returned the highest result since records at this station began (a mean of 13.7 calls/hr, up from 12.9 in 2019); however, there were only 3 nights of listening completed at this station within the listening windows (further listening was carried out but not within the listening period so these data were not included). Glenbervie 7A/Station 21 recorded the highest mean for this station since 1998 (6.1 calls/hr cf. 3.1 in 2019). It was positive to see continued growth in this area which was once considered a stronghold for kiwi. Purua North/Station 24 had a substantial increase from a mean of 11 calls/hr to 17.5 between 2019 and 2020. These figures were both within the typical range seen at this station, albeit at either end. There was also an increase in mean call rates observed at Sandy Bay/Station 27, from 3.6 calls/hr in 2019 to 5.8 in 2020, and likewise these figures were both within the typical range seen at this station. Call rates at Marlow Road/Station 23 reduced substantially from 16.4 calls/hr in 2019 to 8.3 in 2020. The 2020 result was less than half of the observed mean call rates since 2014, and the lowest since 2010. It will be important to continue to monitor this station in 2021 to ensure the 2020 result is not indicative of a decrease in the adult population. Glenbervie 9A/Station 22 also had a decrease in the mean number of kiwi calls heard between 2019 and 2020, from 8.1 to 6 calls/hr. These results were within the usual range for this station. Glenbervie 7A/Station 21 and Glenbervie 9A/Station 22 both had the listening data collected via an ALD. No data were received for Mimiwhangata/Station 26. All other stations had 4 full nights of listening as per standard practice.

Western Area

The Western cluster showed a decrease in the mean number of kiwi calls heard for the second year in a row, decreasing 0.5 calls/hr from 5.25 in 2019 to 4.75 in 2020 (Fig. 2). However, of the five stations that were typically used to derive the mean for this cluster, only two were listened from in 2020, and each of these for only 2 nights. The remaining three stations had the data from previous years used instead (data from 2019 for Trounson/Station 17 and Waipoua Lookout/Station 19; and data from 2014 for Paerata/Station 20). Katui/Station 16 increased slightly from a mean of 1 call/hr in 2019 to 1.25 in 2020; and Cathedral Grove/Station 18 halved from 5.24 calls/hr in 2019 to 2.5 in 2020. This was the lowest mean call rate for this station since 2009, but as listening only occurred over 2 nights, the 2020 figure doesn't have the same degree of reliability as previous years. It would be helpful to have 4 nights of listening carried out at all the Western cluster stations in 2021 so the data can accurately represent the trend of what is happening for adult kiwi populations in the area.

4. Trends at managed populations

Each year, the same selection of listening stations are used to compare call rates over time to provide population trends for management areas. Only these core stations contribute data for the mean hourly call rate calculations depicted in the bar graphs for each management area provided below. It is important that kiwi coordinators prioritise kiwi listening from the core stations each year to ensure that the most accurate depictions of population trends that are occurring in management areas are obtained. The stations that are used in this analysis are listed and data summarised in Appendix 3 for each management site and should be referred to when organising kiwi listening each year.

4.1 Summary of areas

4.1.1 Mangatete

Once again there was a decrease in the mean number of kiwi calls heard in the Mangatete cluster of >4 calls/hr, falling from 13.2 in 2019 to 9.1 in 2020 (Fig. 3). The mean for this cluster was derived from two stations. The decrease between 2018 and 2019 was largely attributed to Station 256, whereas the decrease between 2019 and 2020 was due to the mean call rate at Station 3 almost halving from 16.0 calls/hr in 2019 to 8.1 in 2020. The mean call rate at Station 256 was relatively stable at 10.1 calls/hr in 2020 cf. 10.4 in 2019. Both stations were listened from for 4 full nights. The 2020 results for both stations were the lowest on record. Although the 2020 rates for these stations were still reasonably high, it was concerning that both stations had dramatic decreases in the mean call counts; that Station 256 had not recovered from the large decrease observed between 2018 and 2019; and that the overall mean for this cluster was decreasing so rapidly. It is vital to continue call count monitoring for this cluster to try to establish what is happening with the adult kiwi population.

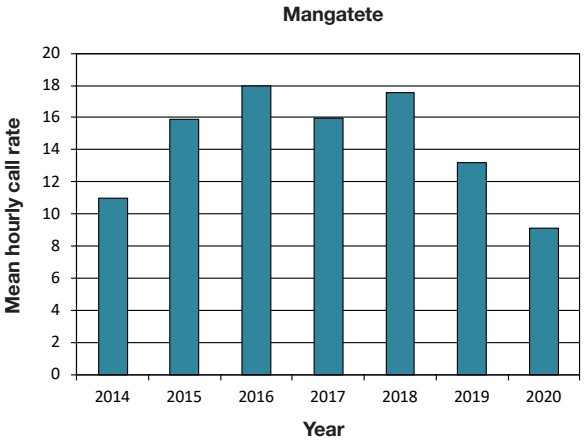

Figure 3. Trends in mean kiwi call rates (calls/hr) at Mangatete management area.

4.1.2 Honeymoon Valley

There were data received from two stations for the Honeymoon Valley cluster for 2020. It was useful to have data for this cluster once again; however, only one of these stations (Station 271) was core and had previously been used to calculate the mean. This was insufficient data to derive a 2020 mean for this cluster. If the existing core stations of 271–274 aren't going to be listened from regularly it may be worth contacting the kiwi listening coordinator to communicate which stations would be better considered 'core', and to ensure the relevant stations are listened from annually. That way accurate comparisons can be made between years. The 2020 calls heard

for this cluster were low, with a mean of 1.75 calls/hr for Station 301 (lower than previously observed); and 0.29 for Station 271 (similar to previously observed). Station 301 had 4 full nights of listening completed, and Station 271 had 3.5 nights of listening completed.

4.1.3 Whakaangi

It was very pleasing to see that the mean number of kiwi calls heard in the Whakaangi cluster bounced back somewhat in 2020, returning a similar mean call count to that observed for this cluster from 2016–2018 inclusive (the 2020 mean was 4.5 calls/hr, more than double the 2.1 calls/hr recorded in 2019; Fig. 4). The 2020 mean was derived from five kiwi listening stations, of which two were listened from in 2019. This was an improvement from 2019 when only three stations had kiwi listening carried out. It was good to have data from Station 29 included once again, as this station had not been listened from since 2011. There was a mean of 5.3 calls/hr recorded at Station 29, which was similar to the previous known results. Stations 132 and 133 were last listened from in 2018, and again in 2020. They both had similar results to previous years, and little change from 2018 (Station 132 increased slightly from a mean of 4.2 to 4.3 calls/hr, while Station 133 decreased from 5.2 to 4.5 calls/hr). Station 133 more than halved from 3.3 calls/hr in 2019 to 1.5 in 2020. In recent years, the results for this station have been variable, but generally low. Station 136 rose dramatically from a mean of 1.3 calls/hr in 2019 to 7.0 in 2020. The 2020 result was a return to what had been typically recorded there in recent years, and the 2019 result can be considered an anomaly. It appears that much of the dip observed for this cluster in 2019 can be attributed to the anomalous 2019 result for Station 136, and that the number of kiwi has likely not changed significantly for the last 5 years. Station 132 was listened from for 2 nights only, and stations 29 and 136 for 3 nights only.

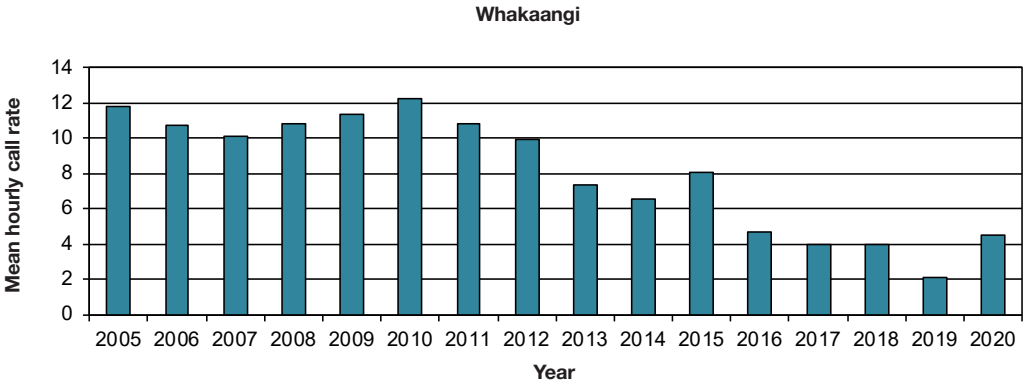

Figure 4. Trends in mean kiwi call rates (calls/hr) at Whakaangi management area.

4.1.4 Mahinepua-Radar Hill

After dropping below 5 calls/hr in 2019, the mean number of kiwi calls heard for the Mahinepua-Radar Hill cluster more than doubled to a record high of 11.4 calls/hr in 2020 (Fig. 5). It was excellent to see the call rate at this cluster not only recovering from the 2019 trough but exceeding all previous years. It was noted in the 2019 report that data weren't received for Station 99. This station was listened from in 2020 for the first time since 2017, and a record high mean of 22.5 calls/hr were heard. The cluster pattern of lower calls in 2019 and a steep recovery in 2020 would have appeared more pronounced due to the inclusion of data from Station 99 in 2020 but not in 2019. In addition to Station 99 there were four other stations used to calculate the mean for this cluster. All four of these other stations had fewer calls in 2019 than 2020, and all five stations had 4 full nights of listening completed. Station 83 recovered slightly in 2020 after quite a decrease between the 2018 and 2019 mean kiwi call rates (2018: 8.1 calls/hr; 2019: 2.1 calls/hr; 2020: 2.8 calls/hr). The 2020 result was still low compared with recent years. Station 84 doubled from a mean of 2.8 calls/hr in 2019 to 5.8 in 2020. The 2020 result was similar to that observed at this station in the past except for 2018 which was unusually high at 12.3 calls/hr. Station 85 increased from a mean of 5.8 calls/hr

in 2019 to 8.1 in 2020. Both of these figures were within the typical range for this station. Station 88 more than doubled from a mean of 8.0 calls/hr in 2019 to 17.8 calls/hr in 2020. The 2020 mean call rates for both stations 88 and 99 were the highest ever recorded, with the next highest being recorded in 2012. It was interesting to note this similar pattern at these two stations. It may be that an environmental factor is causing fluctuations in calling frequency at both stations concurrently.

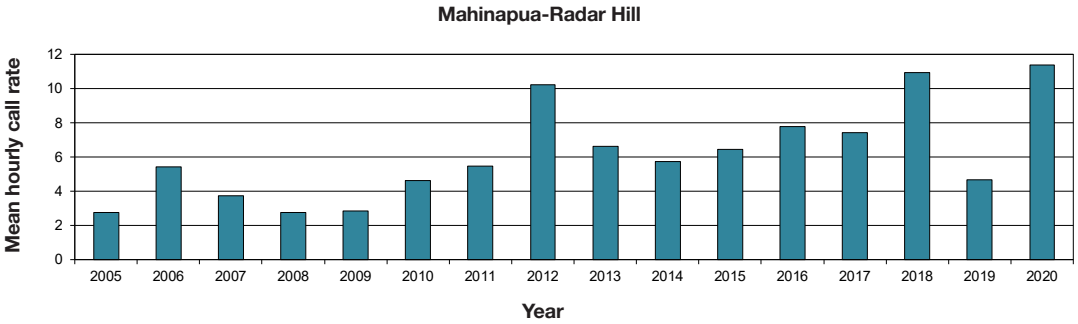

Figure 5. Trends in mean kiwi call rates (calls/hr) at Mahinepua-Radar Hill management area.

4.1.5 Russell Peninsula

The mean number of kiwi calls heard for the Russell Peninsula cluster increased substantially from 7.4 calls/hr in 2019 to 12.1 in 2020 (Fig. 6). This was a decent recovery from the relatively low result recorded in 2019. As with 2019, there were five stations used to calculate the mean for this cluster. Four of these were listened from for four nights, and one (Station 59) for two nights. All five stations had a higher mean call count in 2020 cf. 2019. The greatest difference was observed at Station 15 which decreased from a mean of 24.6 calls/hr in 2018 to 7.8 in 2019, before increasing to 18.6 in 2020. The 2019 result was a low anomaly for this station. Station 173 also increased markedly, from a mean of 1.4 calls/hr in 2019 to 5.5 in 2020. The 2020 result was the second highest mean ever recorded for this station, after 11.1 calls/hr in 2018. There was some discussion in the 2019 report about why the 2018 mean was so unusually high compared with other years. One of the potential factors discussed was changing listeners. It was recommended that the same listener be used for this station between years so that observer bias can be ruled out as a potential factor. This has now occurred, so it makes the data for this station more reliable. Station 170 increased from a mean of 5.8 calls/hr in 2019 to 9.1 in 2020. The 2019 result was very low for this station, and the 2020 result was closer to what was typically seen. Station 59 increased from a mean of 10.1 calls/hr in 2019 to 13.3 in 2020; and Station 62 increased from a mean of 11.9 calls/hr in 2019 to 13.8 in 2020. These rates were all within the ranges previously seen for these stations.

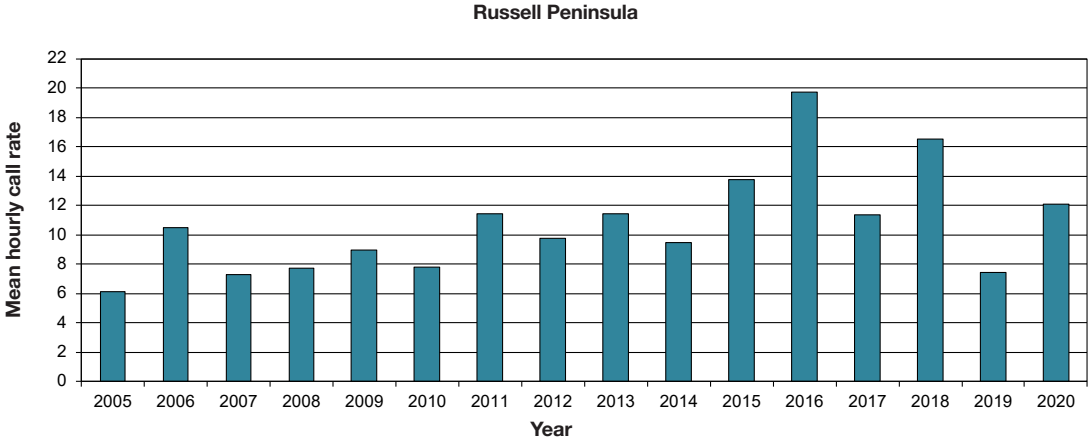

Figure 6. Trends in mean kiwi call rates (calls/hr) at Russell Peninsula management area.

4.1.6 Puketi Forest

The mean call rate for the Puketi cluster more than halved from 4.2 calls/hr in 2019 to 2.0 in 2020 (Fig. 7). This was the second year in a row of decreasing call rates for this cluster, a pattern not observed since 2011–2013. The mean was derived from four stations, each of which were listened from for 4 nights. All four stations had fewer calls/hr in 2020 than in 2019. Stations 104 and 106 both decreased but were within the ranges typically seen (from a mean of 6.1 calls/hr in 2019 to 3.8 in 2020; and from a mean of 5.4 calls/hr in 2019 to 2.3 in 2020, respectively). Stations 108 and 111 both decreased also, to a mean of around 1 call/hr in 2020 (from a mean of 5.4 calls/hr in 2019 to 1.1 in 2020; and from a mean of 3.1 in 2019 to 0.9 in 2020, respectively). The 2020 result was the lowest on record for both stations, but not unusually low for Station 108. The listening for this cluster tended to happen in the first recording window. It may be that this area was more severely affected by the drought which delayed breeding (and the associated calling) more than in other areas. The 2021 listening survey should be able to determine whether this is the case.

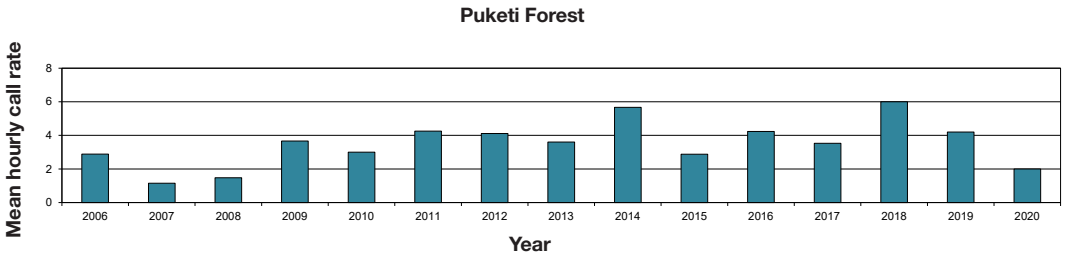

Figure 7. Trends in mean kiwi call rates (calls/hr) at Puketi Forest management area.

4.1.7 Waimate North

The Waimate North cluster had an increasing call rate, from a mean of 7.3 calls/hr in 2019 to 12.2 in 2020 (Fig. 8). It was good news to see this increase, especially given that it followed two years of a decreasing rate. The 2020 cluster mean was the second highest on record, and only marginally lower than the highest rate recorded in 2017 (12.5 calls/hr). The 2020 mean was derived from six stations, each of which were listened from for four nights. Two of the stations had a decreasing call rate when compared with the previous year (Stations 120 and 124). Station 114 had a similar result in 2019 and 2020 (a mean of 6.8 and 6.9 calls/hr, respectively). Station 118 doubled from a mean of 9.8 calls/hr in 2019 to 19.4 in 2020. This was the highest mean recorded for this station since 2004. Station 122 also increased, from a mean of 7.0 calls/hr in 2019 to 10.1 in 2020. The 2020 mean was the highest ever recorded for this station. As mentioned in the 2019 report, there were no data received for Station 113 in 2019. This station typically had a very high mean call rate, so its exclusion had a substantial influence over the cluster mean and was the predominate reason that the 2019 mean was lower than previous years. This station was listened from in 2020 (with a mean of 27.4 calls/hr, similar to the 26.6 recorded in 2018), which explains much of the perceived increase from 2019. It is likely that the population of adult kiwi in this area has had little change since approx. 2010. It will be helpful to include Station 113 consistently in the listening surveys for this cluster.

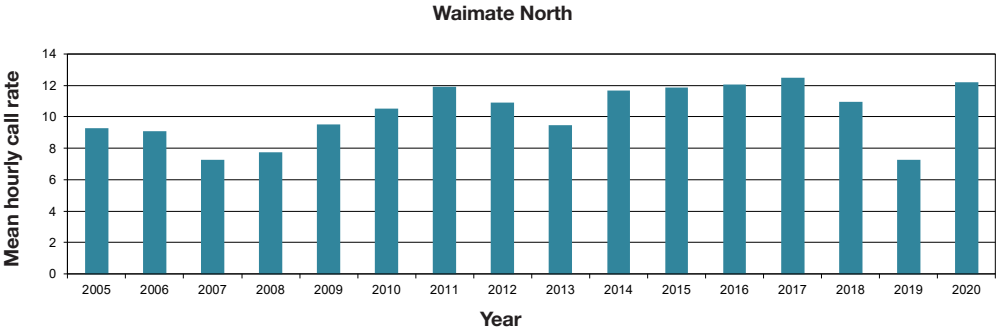

Figure 8. Trends in mean kiwi call rates (calls/hr) at Waimate North management area (excluding Station 113).

4.1.8 Hupara

There was an increase in the mean number of kiwi calls heard for the Hupara cluster, from 17.7 calls/hr in 2019 to 23.1 in 2020 (Fig. 9). The 2020 result is the highest on record for the cluster; is well above the call rate considered to represent high density (>5 calls/hr); and is a very high mean when compared with the other clusters. As per previous years, the mean was calculated from two stations, both of which had an increase in call counts between 2019 and 2020. Station 258 increased from a mean of 24.1 calls/hr in 2019 to 32.4 in 2020, the highest on record for this station. Station 257 increased from a mean of 11.3 calls/hr in 2019 to 13.9 in 2020, which was mid-range for this station. Both stations had 4 full nights of listening completed. There was one additional station listened from in this cluster (Station 294), which had a mean over 4 nights of 38.5 calls/hr. This is phenomenally high and is indicative of a healthy kiwi population in the area.

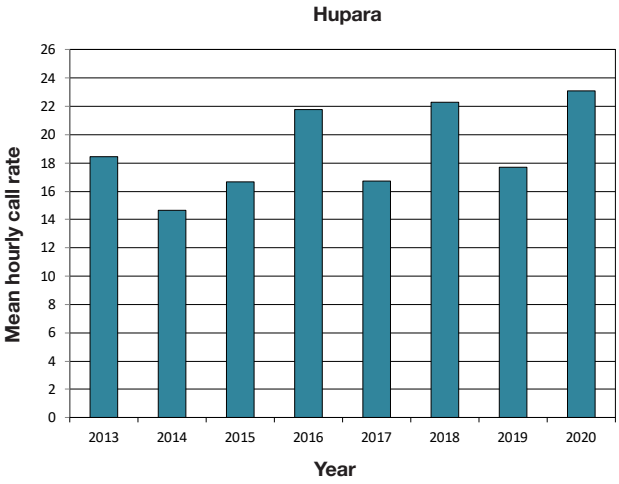

Figure 9. Trends in mean kiwi call rates (calls/hr) at Hupara management area.

4.1.9 Sandy Bay

There was some recovery observed in 2020 from the downward trend seen at the Sandy Bay cluster over 2017–2019 (Fig. 10). The mean number of kiwi calls heard in 2020 was 3.3 calls/hr, up from 2.5 in 2019. Although the 2020 result was still less than half of the rates heard in 2016 and 2017, it was good to see the call rate trending up. The 2020 result was calculated from three stations, each of which had 4 nights of listening completed. The cluster increase could be attributed to increases at two stations. Station 27 rose from a mean of 3.6 calls/hr in 2019 to 5.8 in 2020. The 2019 result for this station was low, and the 2020 result was a return to the figures typically heard there. Station 261 doubled from a mean of 1.6 calls/hr in 2019 to 3.4 in 2020. The results for this station have been variable and the 2020 rate was within the usual range. Station 260 dropped substantially from a mean of 2.4 calls/hr in 2019 to 0.8 in 2020, which was the lowest ever recorded for this station. Stations 260 and 261 were monitored using ALDs as per previous years

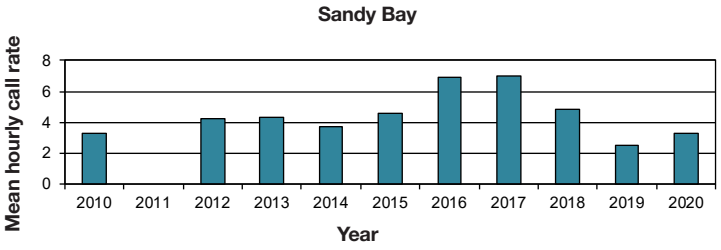

Figure 10. Trends in mean kiwi call rates (calls/hr) at Sandy Bay management area.

4.1.10 Tutukaka

There was a further decrease in call rates for the Tutukaka cluster, down from a mean of 11.0 calls/hr in 2019 to 6.4 in 2020 (Fig. 11). This was the largest decrease seen across all the clusters, and it marks 3 years in a row of decreasing rates for this cluster. This is an alarming trend; however, it is important to note that the stations used to calculate the mean rates for this cluster have been quite variable, so the fluctuating mean may be due to the presence or absence of data from particular stations rather than a change in adult kiwi call rates and associated density. An example of this is Station 28, which was included in the 2019 survey with a mean rate of 10.1 calls/hr. If this station had also been included in 2020 with a similar result, the cluster mean would have been higher (although still lower than in 2019). The 2020 cluster mean was derived from three stations, all of which were listened from for 4 nights, and all of which trended down from the last survey. Two of the stations weren't listened from in 2019, but the 2020 calls were approximately half of those heard when the stations were last listened from in 2018 (Station 126 decreased from a mean of 14.9 calls/hr in 2018 to 7.5 in 2020; and Station 142 decreased from a mean of 5.6 calls/hr to 2.9 – the lowest ever for this station). Station 125 decreased from a mean of 12.5 calls/hr in 2019 to 8.8 in 2020. The downward trend for this cluster needs to be carefully monitored to ascertain what is happening for adult kiwi in the area, and it would be useful to have the same stations listened from consistently between years to ensure the data are reliable.

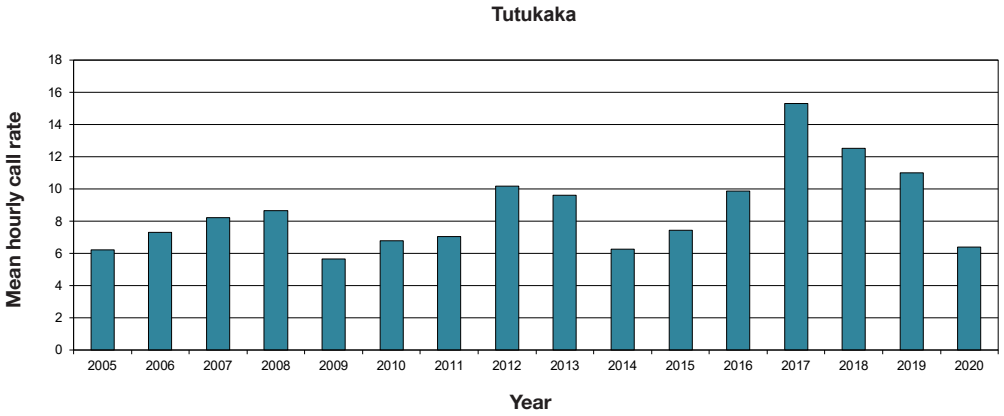

Figure 11. Trends in mean kiwi call rates (calls/hr) at Tutukaka management area.

4.1.11 Manaia-The Nook

The mean number of kiwi calls heard at Manaia-The Nook doubled between 2019 and 2020, increasing from a mean of 4.8 calls/hr in 2019 to 9.6 in 2020 (Fig. 12). The 2020 figure was the highest on record for this cluster, and a return towards the rates typically seen in the few years prior to 2019. It was good to see the increase in calls heard for this cluster, and to see the 2020 mean comfortably higher than the >5 calls/hr high density threshold. Five stations were listened from in 2020, all for 4 nights. Four of these stations were also listened from in 2019, and all had more kiwi calls heard in 2020 than in 2019. The greatest difference was seen at Station 48 which more than doubled from a mean of 8.9 calls/hr in 2019 to 21.0 in 2020. This was the highest ever mean for this station, but previous mean call rates were often approx. 15 calls/hr. The highest ever mean was also recorded for Station 71, at 6.5 calls/hr in 2020 (up substantially from 1.8 calls/hr in 2019). Station 47 doubled from a mean of 4.5 calls/hr in 2019 to 9.4 in 2020; and Station 56 had a slight increase from a mean of 4.0 calls/hr in 2019 to 4.3 in 2020. The results for both stations have typically been variable and the 2020 rates are within the usual range. Station 49 was listened from in 2020 but not 2019. The 2020 mean was the same as the last survey undertaken in 2018 (6.8 calls/hr).

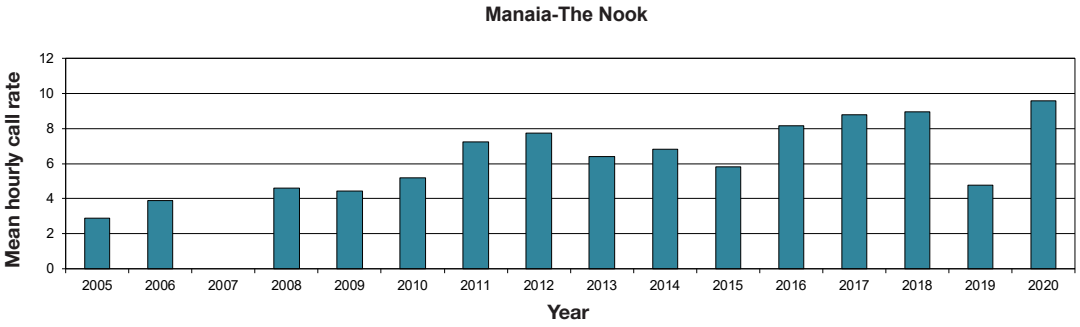

Figure 12. Trends in mean kiwi call rates (calls/hr) at Manaia-Nook management area.

4.1.12 Kauri Mountain

The mean number of kiwi calls heard at the Kauri Mountain cluster was slightly lower in 2020 than in 2019 (4.8 and 5.1 calls/hr, respectively: Fig. 13). This was the first time since 2014 that the mean number of calls heard in this cluster was lower than the high density threshold of >5 calls/hr. The mean was calculated from five stations. Four of these were listened from in 2019, and all but one had fewer calls in 2020 than 2019. The fifth station (Station 73) was listened from in 2018 and had fewer calls in 2020 than 2018. Other than the absence of Station 73 in 2019, the core stations for this cluster have generally been listened from consistently in recent years. Stations 54 and 72 both had the lowest mean number of kiwi calls heard since 2011 (3.3 and 3.9 calls/hr, respectively). Station 73 had the lowest mean since 2013 (4.4 calls/hr). Station 141 has typically had variable results, and the 2020 mean of 6.1 calls/hr was within the normal range for this station. Station 74 was the only station to have more calls heard in 2020 than 2019 (an increase from a mean of 4.5 calls/hr in 2019 to 6.3 in 2020). However, Station 74 was listened from for 2 nights only, the other stations all had 4 nights of listening completed. Having fewer nights of listening completed may have changed the mean number of calls heard for this station. Station 73 was listened from via an ALD, but also had new listeners assigned to the station. The data from these two methods overlapped, so the local coordinator opted to combine the data to best represent how many kiwi called in the area. Although it is not standard practice to use two methods concurrently, it seemed sensible to combine them in this case. Hopefully the downward trend observed for this cluster in a reaction to a factor such as the dry conditions, and is not indicative of a decrease in adult population.

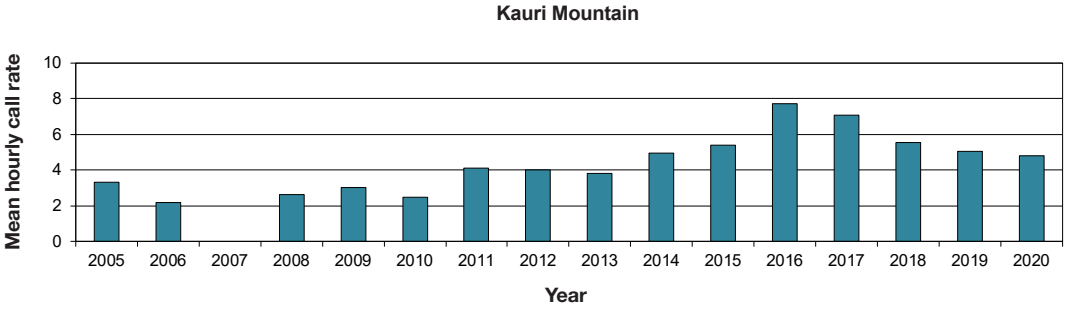

Figure 13. Trends in mean kiwi call rates (calls/hr) at Kauri Mountain management area.

4.1.13 Bream Head/Taurikura

The mean number of kiwi calls heard in the Bream Head/Taurikura cluster in 2020 increased by nearly 1 call/hr to almost equal the 2018 mean (2018: 6.9 calls/hr; 2019: 5.9 calls/hr; 2020: 6.8 calls/hr. Fig. 14). The mean for this cluster had been reasonably consistent in recent years and had varied by <2 calls/hr (range: 5.8–7.5 calls/hr), which indicated a stable adult kiwi population. As was discussed in the 2019 report, the stations used to calculate the mean for this cluster were all from Bream Head, so they did not show what was happening at Taurikura. It was positive to

see that none of the core stations had fewer calls in 2020 than in the previous survey. Station 41 had the same mean number of kiwi calls heard in 2019 and 2020 (3.0 calls/hr). Station 39 increased from a mean of 8.0 calls/hr in 2019 to 10.5 in 2020. This was within the usual observed range for this station. Station 69 was not listened from in 2019, but the 2018 mean (3.3 calls/hr) was similar to the 2020 result (3.6 calls/hr). Station 42 increased by almost 50% from 6.8 calls/hr in 2019 to 10.0 in 2020. This was the highest mean on record for this station, but it was from only 1 night of listening, so these results aren't as reliable as a complete survey over 4 nights of listening. Only one of these stations was listened from for 4 nights (Station 69). The other stations were listened from for 2 (Station 39), or 3 nights (Station 41) only. To enable an accurate comparison between years, it would be useful to have all stations listened from for 4 nights.

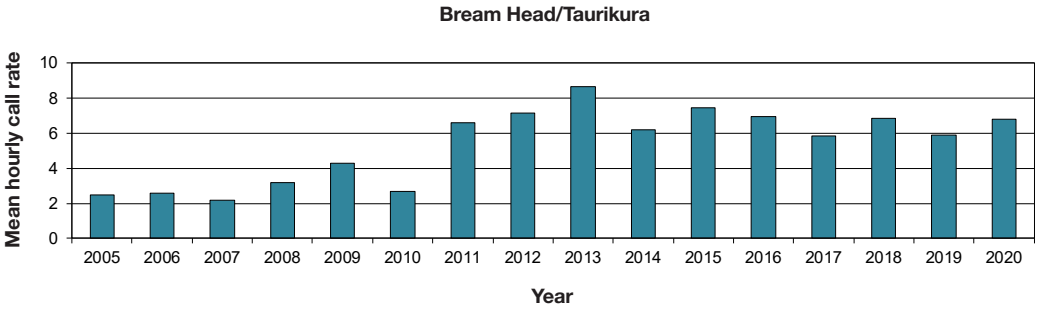

Figure 14. Trends in mean kiwi call rates (calls/hr) at Bream Head/Taurikura management area.

4.1.14 Motatau-Marlow

The Motatau-Marlow cluster had a slight decrease between 2019 and 2020, from a mean of 10.9 calls/hr in 2019 to 10.2 in 2020 (Fig. 15). The mean rates for this cluster have been consistently high and comfortably higher than the >5 calls/hr threshold to be considered high density for 10 years. The mean for this cluster was derived from three stations. Station 129 doubled from a mean of 5.9 calls/hr in 2019 to 12.0 in 2020, the highest mean on record for this station. The opposite pattern was observed at Station 23 where the mean number of kiwi calls heard halved from 16.4 calls/hr in 2019 to 8.3 in 2020. This result was very low for this station, and the lowest since 2010. It is not known why these two stations had such markedly different results, but continuing to monitor them in 2021 and beyond will help to decipher what is happening with the adult kiwi in the area. Station 68 was stable with a mean of 10.5 calls/hr in 2019 and 10.3 in 2020. Stations 129 and 68 were monitored for 4 nights while Station 23 was monitored for 3 nights.

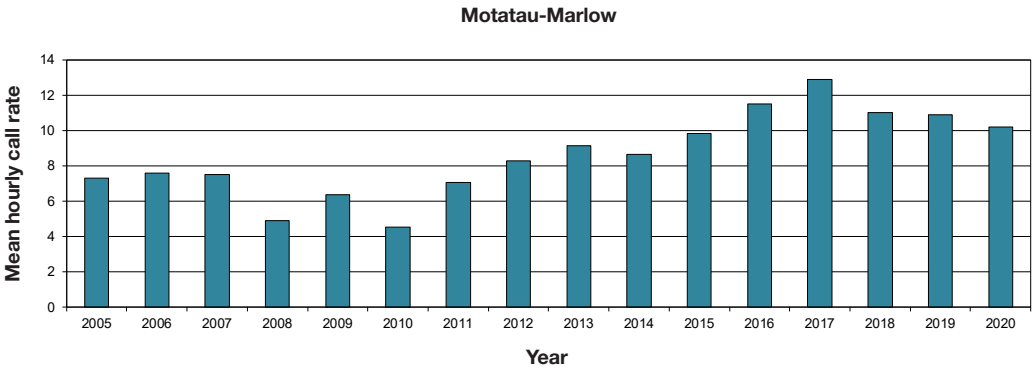

Figure 15. Trends in mean kiwi call rates (calls/hr) at Motatau-Marlow management area.

4.1.15 Purua-Rarewarewa

Once again there was a very high mean kiwi call count recorded for the Purua-Rarewarewa cluster (14.8 calls/hr in 2020 cf. 13.9 in 2019. Fig. 16). The 2020 mean was the second highest on record for this cluster, and only slightly less than the 15.4 calls/hr recorded in 2018. It was positive to see such a high count recorded. The mean from this cluster was calculated using data from five stations. Station 25 had some data collected outside the listening windows, but only that from within the windows were used to ensure the data were valid. Station 25 had 3 nights of recording within the correct dates. All other stations had 4 nights of listening carried out. It would be useful to ensure that all listening is carried out within the correct dates for future surveys. The biggest change between 2019 and 2020 was observed at Station 24 where the mean call rate increased by more than 50% from 11 calls/hr in 2019 to 17.5 in 2020 (the third highest on record). Stations 81 and 25 also increased between 2019 and 2020 (Station 81 from 19.5 to 20.0 calls/hr; Station 25 from 12.9 to 13.7 calls/hr – the highest ever recorded for this station). Stations 82 and 139 had lower mean call rates in 2020 than in 2019 (Station 82 declined from 13.4 calls/hr in 2019 to 11.9 in 2020; Station 139 from 12.8 calls/hr to 10.8). These changes are all likely to be natural fluctuation and there is nothing to suggest any change in population density in this cluster which record typically high and relatively stable call counts.

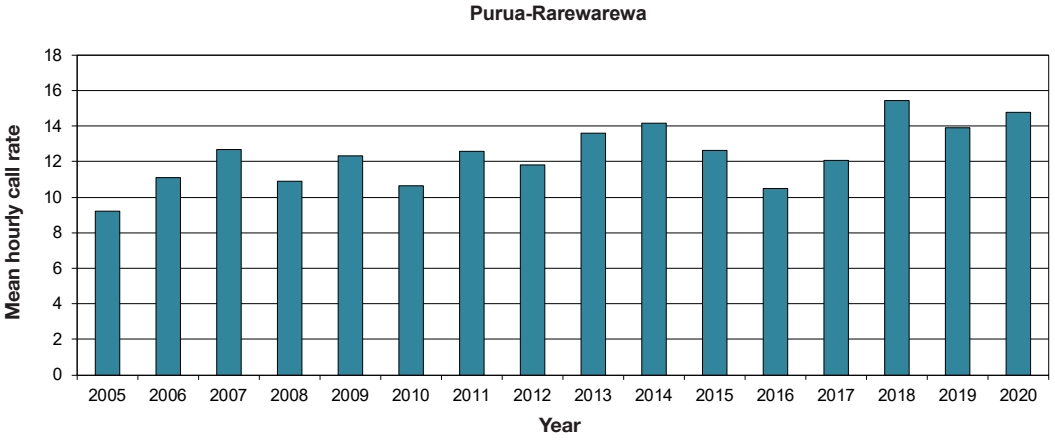

Figure 16. Trends in mean kiwi call rates (calls/hr) at Purua-Rarewarewa management area.

4.1.16 Waipoua-Trounson

There was a substantial change in the mean kiwi call rate recorded for the Waipoua-Trounson cluster between 2019 and 2020, which decreased from 7.6 calls/hr in 2019 to 4.6 in 2020 (Fig. 17). This marked the second year in a row of a lower mean call rate and was the first time since 2010 that the mean rate for this cluster dropped below >5 calls/hr (the threshold for high kiwi population density). Some of this perceived decrease may have been due to the methodology used, as only three core stations were listened from, and each of these for only 2 nights. Station 16 increased from a mean call rate of 1.0 calls/hr in 2019 to 1.3 in 2020. It was positive to see calls continuing to be heard at this station as no calls were detected there for several years in the past. The mean call rate at Station 18 halved from 5.2 calls/hr in 2019 to 2.5 in 2020. This was the lowest mean recorded since 2009. Station 33 reduced from 12.5 calls/hr in 2019 to 10.0 in 2020, which is within the typical range for this station. Data were not received from stations 17 and 19, both of which had mean call rates of more than double the 2020 cluster mean when they were last surveyed in 2019 (9.4 and 10.0 calls/hr respectively), and neither of which have ever had mean call rates as low as 4.6 calls/hr. The omission of data from these stations likely artificially reduced the cluster mean. For future surveys it will be important to listen from all five core stations, and for the recommended 4 nights so the data can be considered reliable

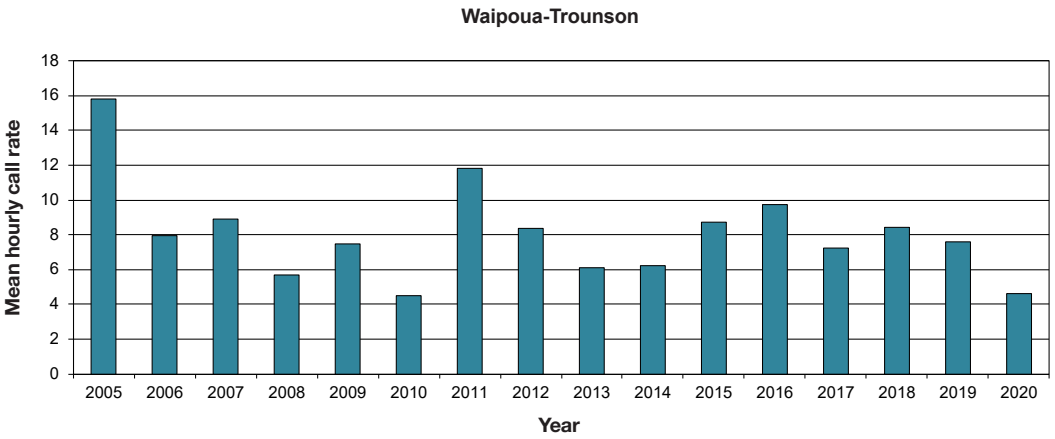

Figure 17. Trends in mean kiwi call rates (calls/hr) at Waipoua-Trounson management area.

4.1.17 Tawharanui

The mean kiwi call rate recorded at the Tawharanui cluster trended down for the second year in a row (from 6.1 calls/hr in 2019 to 5.4 in 2020. Fig. 18). This was the first time this cluster had downward trending call rates for more than a single year. The 2020 mean is still above the high kiwi population density threshold of >5 calls/hr, as it was in 2016, 2018 and 2019. It may be that the number of calls/hr for this cluster is starting to stabilise, in which case the mean will fluctuate up and down slightly between years. As with previous surveys, the 2020 mean was derived from six stations. All stations were listened from for 4 nights. Three stations trended up from the previous year, and three trended down. The biggest difference was observed at Station 163 where call rates halved from a mean of 4.9 calls/hr in 2019 to 2.5 in 2020. The 2020 result was approximately half of the calls heard from this station from 2014 to 2019. The mean number of kiwi calls heard at stations 164 and 165 also trended down (by 0.8 and 1.4 calls/hr, respectively), but they stayed within the usual observed range. Station 166 had 0.5 more calls/hr heard in 2020 compared with 2019 (from a mean of 11.6 to 12.1 calls/hr), and the 2020 result was the second highest recorded mean for this cluster following 12.6 calls/hr recorded in 2018. Stations 161 and 162 both decreased very slightly by 0.1 calls/hr between 2019 and 2020 (from 0.9 to 1.0 for Station 161; and from 7.9 to 8.0 for Station 162). The results for Station 161 have remained low compared with the years prior to 2019, so may indicatate that there has been a change in the number of adult kiwi living in the vicinity of this station.

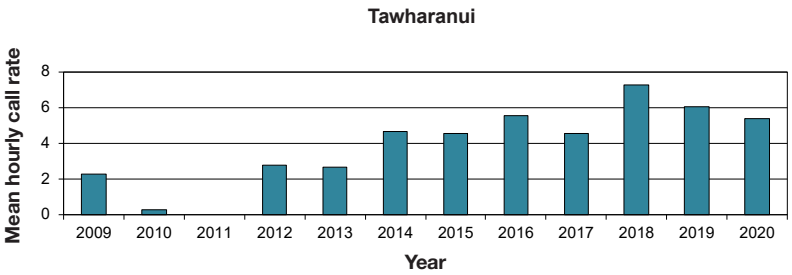

Figure 18. Trends in mean kiwi call rates (calls/hr) at Tawharanui Open Sanctuary management area.

4.1.18 Marunui

As with the 2019 report, there were insufficient 2020 kiwi listening data received to create a cluster mean and graph for the Marunui cluster. There were data received from one station (253). The mean number of kiwi calls recorded was 4.0 calls/hr, a slight increase from 3.6 in 2019. Listening occurred over 4 nights. This station has recorded a trend of generally increasing call rates, which is a positive sign for the kiwi population in the area. It would be useful to reinstate listening from Station 275, which was surveyed from 2015 to 2018; and to consider adding further stations to make the mean for this cluster more robust.

4.1.19 Mataia

As with 2019, data were received from four stations in the Mataia cluster in 2020, and two of these were the regular stations used to calculate the annual mean kiwi call rate. The mean for this cluster increased by 50% between 2019 and 2020, from 3.6 calls/hr to 5.4 calls/hr. This was the first time the mean for this cluster had been above the >5 calls/hr high kiwi population density threshold. This was a significant achievement for this burgeoning population, and something all those involved in re-establishing kiwi in the area can be proud of. Station 254 increased by 70% from a mean of 4.6 calls/hr in 2019 to 7.8 in 2020. Station 255 had a smaller increase from a mean of 2.6 calls/hr in 2019 to 3.0 in 2020. The 2020 mean for both of these stations was the highest on record. Both stations were listened from via an ALD, and for 4 nights. The other two stations that were listened from in the Mataia cluster had lower mean call rates of 2.1 calls/hr for Station 280, and 2.0 calls/hr for Station 281 (only 3 hours of survey were completed).

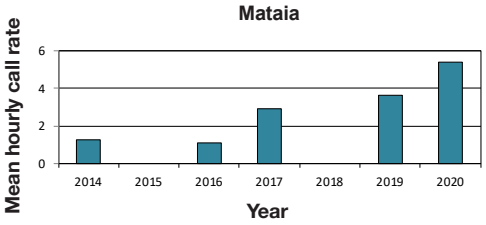

Figure 19. Trends in mean kiwi call rates (calls/hr) at Mataia management area.

4.1.20 Kawau Island

There were no kiwi listening data received for the Kawau Island cluster for 2020. Hopefully kiwi listening will be reinstated in 2021.

4.1.21 Pukenui

Kiwi listening was carried out at Pukenui for the second year in a row in 2020. Nine stations that were listened from, for either four (*n*=3), three (*n*=1), two (*n*=2), or one (*n*=3) nights. The mean number of kiwi calls heard ranged between 0 and 3.3 calls/hr for each station, with a maximum of 6 calls heard in a single hour. Five of the stations were also listened from in 2019. The combined mean from these five stations was 0.6 calls/hr in 2019 and 1.2 calls/hr in 2020. It was positive to see this burgeoning population showing an increase in the number of calls heard. It would be more valuable to listen from fewer stations, but for 4 nights each, as this would ensure the data were more reliable and comparable between years.

4.1.22 Piroa

Piroa Data were received from one station from Piroa in 2020 – Station 290 with a mean of 1.6 calls/hr recorded over 4 nights of monitoring. This is a slight increase from the 1.5 calls/hr recorded there in 2019. It was good to see some consistency in the number of kiwi calls heard in this area. It will be useful to continue to monitor stations 290 and 291 in future years, and to consider adding more listening stations to the cluster to ensure a robust mean is able to be calculated.

4.1.23 Matapouri

Kiwi listening data were received from Matapouri for the first time in 2020. Two stations were listened from, each for 3 nights. No calls were heard. It is great to see kiwi listening expanding into new areas, and given the proximity to known kiwi populations and territories it would be expected that kiwi calls would be heard in this area in the near future (or potentially currently, but not within the survey window). To ensure the data are valid, reliable, and comparable it is recommended the same stations are used for each survey, and that 4 nights of listening are carried out.

4.1.24 Whananaki

Data were received from Whananaki for the first time in 2020. Four stations were listened from, one for 4 nights and three for 3 nights. The mean number of calls heard for these four stations combined was 2.6 calls/hr (range for stations: 0.8–4.3 calls/hr). The minimum number of calls heard in a single hour was 0, and the maximum was 10. It was great to receive data from this new area, and it will be useful for this listening to continue for 2021 and beyond; ideally using the same stations and listening for 4 nights at each station.

5. Discussion and general recommendations

It was positive to see that the pronounced pattern of decreasing kiwi call rates observed between 2018 and 2019 did not continue into 2020 for many of the clusters. The four original clusters that have been monitored since 1995 had increasing mean call rates in two clusters (Southern and Eastern), and a minor decrease across the other two clusters (Northern and Western). This was an improvement on the previous year when mean call rates at all four clusters trended down. Of the other 23 clusters, seven trended down between 2019 and 2020, but none by more than 5 calls/hr, and five by ≤3 calls/hr. These were modest decreases compared with what was noted in the 2019 report. Eleven clusters trended up between 2019 and 2020, two by 5–7 calls/hr, three by 4–5 calls/hr, and six by < 3 calls/hr. These results were excellent in comparison with the previous year when no clusters demonstrated an upward trend in mean kiwi calls recorded. The remaining five clusters could not be analysed either because they weren't monitored in 2019 or 2020; or because there were insufficient data collected to create a cluster mean.

The two clusters which were added in 2019 were both surveyed for the second time, and an additional two clusters were added in 2020 (Matapouri and Whananaki). This means that at the time of writing there were the four original clusters listened from since 1995, and 25 additional clusters. There are now 26 years of data related to this study, and more stations added every year which increases the scope of the research. These data continue to be a useful tool for monitoring the relative abundance of kiwi across Northland; and in areas of high kiwi density, the data may offer an insight to absolute abundance (Robertson & Colbourne 2017).

The relatively positive results observed for 2020 were unexpected given the climatic events of the previous year. The downward mean call rate trend observed in the 2019 report was largely due to a particularly dry period during early 2019 into autumn (https://www.nrc.govt.nz/environment/river-and-rainfall-data/hydrology-climate-report/2019/april/april-climate-report-2019/. This weather was thought to affect kiwi through factors such as dehydration, heat exhaustion and a reduction in food availability, leading to lower fat stores so a delay in the onset of breeding. A precursor to breeding is increased courtship calling, so a delay in breeding would likely mean a delay in the increased calling typically heard from May to August. A more extreme version of this phenomenon also occurred in early 2020 when Northland was plunged into one of the most prolonged and severe summer droughts on record (e.g. https://www.nrc.govt.nz/news/2020/may/drought-firmly-locked-in-in-northland/). It was interesting that the 2019 weather appeared to

reduce the number of kiwi calls heard, whereas the more extreme 2020 drought did not appear to. At the time of writing (December 2020) there were anecdotal reports that the onset of breeding in 2020 was delayed in at least some areas of Northland, with breeding starting substantially later than previous years in some cases. This was not what the results of the call count survey would suggest, but it may be that territorial and courtship calling were evident for a period of time before mating and nesting began. It may also be that the recommendation to split the listening across both the May and June windows to counter a delay in peak calling (65% of stations used the second window for at least some of the survey nights) resulted in enough of the survey nights happening during peak calling even if it was delayed. It is logical to assume that a delayed breeding season may result in fewer pairs having second (and third) clutches, so will likely result in an overall shorter breeding season. The effect that this will have on the 2021 breeding season and related peak calling is not known, but it may be that a shorter 2020 breeding season means that the adult kiwi retain sufficient condition to resume breeding at the normal time in 2021, in which case the 2021 peak calling would also occur at the normal time. The effect of at least 2 years in a row of conditions which very likely reduced the breeding output of kiwi may be picked up in kiwi listening surveys in 3–4 years time, due to lower recruitment and therefore fewer individuals reaching adulthood and starting to breed.

In some areas the effects of the drought were known to be so severe that there was likely an increase in kiwi mortality (e.g. on Motuora Island, where an emergency translocation was undertaken to both give the translocated individuals a greater chance of survival, and to reduce the drain on the limited island food resources for the remaining population). The most vulnerable individuals in circumstances such as these are often younger birds who are not yet calling, so again there may be a lag until the results of the drought become evident in kiwi call surveys.

For the first time in 2020 there was the option of entering kiwi listening data via a Kiwi Coast created mobile app in the field. This reduced workload and the potential for transcription errors as there was no double-handling of data required, and the app was designed to ensure data were entered in the correct format, so no time was lost having to clean data before it could be analysed. Further advantages included no delay in the coordinators receiving data as it uploaded as soon as the listener submitted it, and it made it easier for the listener to know they were listening from the correct spot, as the app was pre-loaded with GPS coordinates, as well as date and time stamps. You can find out more and download the app from the Kiwi Coast website (https://kiwicoast.org.nz/kiwi-listening-app). It is encouraged but not essential to use the app, but if the app is not used it is very important that the 2018 version of the kiwi listening spreadsheet template is used to store and collate the data. Paper field sheets are still required if this method is used. If listeners have any trouble with accessing or using the Kiwi Coast app or the correct template, they can contact the local kiwi listening co-ordinator or the Whangarei DOC Office.

It is important that coordinators ensure that all core stations are listened from, and that listeners include all the relevant data. Please note that regardless of which method is used to collect and store kiwi listening data it should include the following:

- The station is identifiable to those who enter and analyse the data for this report, and to future listeners who will repeat listening at the same station. This means that every kiwi listening card must include the individual station number (see Appendix 1), and this number must not be changed. If it is a new station that will be listened from consistently, please add the comment 'station number required' or similar in the comments field, and a number will be assigned in the subsequent report. Each card must also include an up-todate GPS reference for the site. Both the station's number and GPS reference need to be written on every card, every night.
- There is consistency in kiwi listeners. Ideally, this will mean the same person will listen from the same station for each of the 4 nights, and in subsequent years. If this is not practical, aim for at least having the same person covering the same stations for all 4 nights. The exception to this would be if the listener is no longer able to adequately detect kiwi calls, in which case a permanent replacement should be sought.

- Each station needs to be covered for 4 nights if possible. If this can't be finished in the first kiwi listening window it is possible to use the second window. It is more important that fewer stations are listened from for 4 nights than more stations for only 1–2 nights. This will produce more robust data and will give a more accurate measure of kiwi in your area.
- Kiwi call cards need to be filled out in full, including all the fields, each night.
- Reduced capacity in the Whangarei Kiwi Sanctuary team means that groups are now required to enter their kiwi listening data into the spreadsheet themselves. This needs to be sent to Ayla Wiles at the DOC Whangarei Area Office, no later than the 31st of August in the year in which it was collected. If it is not submitted by the 31st of August it will not be included in the report.
- Please ensure the data are accurate. If you notice any errors or inconsistencies in the data used for this report, please advise Ayla Wiles immediately.

5.1 Other recommendations

- Provide new listeners with adequate training. This not only includes how to identify the difference between male/female kiwi calls; other species' calls that may be mistaken as kiwi; compass use and judging distances but also how to fill out the forms fully, correctly, and legibly. The updated Kiwi Best Practice Manual (Robertson & Colbourne 2017) is a useful tool.
- Try to map the location of calling birds during the four nights of listening. This will help to identify the minimum number of individuals and pairs heard from each station. As discussed above, these data are not used in this report at present, but it may be in the future. In the meantime, those groups who are analysing these data themselves are finding some interesting results.
- If you add a new listening station in your area, please identify it very clearly as a new station so that it can be allocated a consistent station number. Please make sure you also provide GPS co-ordinates for the station, a name that will make sense to everyone, and any other identifying or necessary information about the station.
- Please check the station numbers listed in Appendix 1. If any of these numbers are not accurate, please let Ayla Wiles (awiles@doc.govt.nz) know as soon as possible.

5.1.1 Kiwi listening 2021

Kiwi listening for 2021 should preferably be carried out from 29 May to 18 June, with a back-up window from 28 June to 17 July. The May window is later than in 2020, and the region does not have the same level of drought forecast for 2021 as was experienced in early 2020, so there is less concern that kiwi will not have begun courtship calling when kiwi listening is being carried out. Unlike 2020, the aim should be to complete listening during the first window, with the second window only used if weather and/or other variables prevent all 4 nights from being completed during the first window.

Information about kiwi listening can be found on the Kiwis for kiwi website http://www.kiwisforkiwi.org/resources/call-count-monitoring/.

6. Acknowledgements

Thank you to all the people who carried out kiwi listening in 2020, which was undoubtedly a trying year. Your commitment and contribution were invaluable, and your time and effort in obtaining information about kiwi in your area is very much appreciated. Thanks to the Kiwi Coast team and others who were involved in the development and trial of the app. The purpose of this was to make kiwi listening more straightforward, and for it to be easier to draw meaningful conclusions from the data, so this should be celebrated. Thanks also to local kiwi listening co-ordinators and to those who took the time to enter the data into the spreadsheets again this year, and to guide listeners through the use of the app.

7. References

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Appendix 1

Kiwi call survey methods (from the Kiwi Best Practice Manual, Robertson & Colbourne 2017)

1. Go through the Kiwi Call Scheme card methods and fields before you go out. You may also wish to practice or refresh your skills by listening to the calls of kiwi at: http://nzbirdsonline.org.nz/
2. Choose listening sites that cover a wide listening area, preferably on a prominent knob, spur, hilltop, ridgeline or riverflat, away from loud river, stream, sea, traffic or hut noise. However, do not be put off listening from a campsite in thick bush if that is the most practical way of conducting a count.
3. Neighbouring listening sites should preferably be at least 1 km apart to increase the overall coverage.
4. On a topographical map, or GIS map system, estimate the listening range from each listening site – at many places, a ridge or spur will cut out distant calls from certain directions or the habitat in some directions may be unsuitable for kiwi, and so the listening range may be far from circular.
5. Before departing to the listening sites, remember to synchronise your watch with others who are listening in the same general area, so that you can better determine if a bird was heard at multiple sites.
6. Arrive at the listening site with enough time to get ready for recording. Remember that if your listening site is on a hill, you will require some time to cool off and to then pile some clothing on and prepare your forms before you will be ready to listen. Have all of your clothing and gear handy, so that you do not make unnecessary noise during the survey.
7. Start your listening period no earlier than 30 minutes after local sunset. Sunset times are available from http://www.linz.govt.nz/hydro/nautical-info/astronomical-info and on many GPS units.
8. Preferably do your listening in the first 2 hours of darkness (from 30 minutes after local sunset). Listening conditions are often best on a dark night, with little or no wind, rain or other noise, but counts in any conditions will still be valuable. Try to listen for a 2-hour period, because call rates will tend to average out, but listening periods of different durations are acceptable. Avoid doing a short listen simply to include a call that you heard when you were not otherwise intending to do a survey – in this situation, you are better off filling out a Kiwi Reporting Scheme card. Record any birds that called outside your planned listening period in the 'Notes' section, rather than, for example, adding onto the count the pair that called when you were packing up your gear!
9. At the end of each hour of listening, total up the number of calls heard and estimate the number of individual males and females you heard calling (allowing for movement of birds during your listening period) in the 'Notes' section.
10. Do not solicit calls from kiwi by using tapes or shepherd's whistles in the first hour of listening, and only do so later in the night if it is important to determine if kiwi are present at the site. In this case, make sure that this is clear in your notes, along with the times that the calls were broadcast.
11. If you hear other teams broadcasting calls from another site, record this information on your card, along with the time, estimated distance and direction – it may be that you have heard a bird responding to their broadcast rather than the broadcast itself.

12. At the end of the second hour, summarise your data in the field (while information is fresh in your mind):
    - Total up the number of calls heard in the second hour and estimate the number of individual kiwi you heard calling.
    - Add the two counts together and estimate the total number of birds heard during the 2-hour period, again allowing for movement of birds over the whole 2-hour period. Note that one male calling four times is a quite different biological result from four males which each called once.
13. Describe the listening site well (e.g. at cairn on terrace 5 m south of where the track drops down the true right (eastern) bank of the large stony creek, 1200 m west of Cameron's Hut, North Hurunui Valley) so that the exact same listening spot can be used.in future surveys.
14. Photocopy or scan the card for you own records, and then send the original card or the scanned copy to the Kiwi Call Scheme Coordinator.

How to complete the Kiwi Call Scheme card:

CARD NUMBER Leave the top right-hand space blank. If you wish to link the card to the number of a listening station in the area surveyed, use the 'Notes' section on the card.

OBSERVER If more than one person listened from a listening station, give the name of the most experienced observer first. For each new observer, provide the address and affiliation on the first card only. This information is not required on subsequent cards unless addresses or affiliations change.

LOCALITY NAME Provide, in order, the province, the offshore island name (if applicable), the forest or reserve name and the nearest named locality or feature (such as river, stream, trig, etc.), followed by a brief description of the exact location of the listening station (use the 'Notes' section if you run out of space). For example, Southland, Stewart Island/Rakiura, Rakiura National Park, Mason Bay, sand hill 100 m east of Island Hill Homestead. This location will be further verified by the grid reference. This enables all records from Southland or Stewart Island/Rakiura to be sorted. If possible, include a photocopy of a map of the area with the listening stations marked on it, and the estimated listening extent over suitable habitat, even if you did not hear any birds calling throughout the marked area.

GRID REFERENCE Wherever possible, use the Topo50 map series, which is the official topographical map series used by the New Zealand emergency services. These maps cover the entire country. If you are using a GPS system, you should change the settings on your GPS receiver to 'NZGD2000', the datum used by Topo50, or to the 'New Zealand TM' (Transverse Mercator) position format and 'WGS 84' map datum, which is coincident with NZGD2000. If you do not have access to these maps or have a lot of data in the older grid reference, you can still use the metric NZMS 260 series maps and keep your GPS unit set to the 'New Zealand' position and the map datum set as 'NZGD49' or 'NZGD1949'. However, the grid references will need to be converted later from the NZ Map Grid to the NZ Transverse Mercator projection (NZGD2000) using a conversion programme such as that available at http://apps.linz.govt.nz/coordinate-conversion. For the section labelled 'Series', either put T50 to indicate Topo50, or 260 to indicate that you have used the NZMS260 map series. Ignore the N S X on old versions of the card and enter the Sheet Name for NZMS 260 maps. You should use grid references rather than the alternative decimal latitude/longitude system. Grid references are easy to interpret on maps and it is straightforward to work out how far each point is from adjacent points – something that cannot be done with latitudes/longitudes. The grid reference should be given to 7 places for the easting (horizontal) and 7 places for the northing (vertical), i.e. to the nearest metre, even though old versions of the Kiwi Call Scheme card have only 5 spaces available. You can download maps as image files (TIFF and GeoTIFF formats) and data files (Shape and IFF formats), or you can purchase paper maps from local retailers.

NOTES If kiwi are heard in the area but do not call during the listening period, please note this fact. This information is important for distribution analyses. If more space is required for notes, continue writing under the entry of the last call heard on the back of the card (upon completion of the listening period).

WIND This is a subjective score of the average influence of wind on your count. In general, calm and light winds will not reduce the ability to hear birds calling, moderate winds may result in the loss of distant calls, and strong winds will make distant calls very difficult to detect, especially if there is a lot of noise from the wind in trees nearby. If the weather or noise conditions change markedly during a count, fill in separate cards for the different parts of the count.

RAIN This is a subjective score of the average influence of rain during your count. Noise from rainfall can reduce the listening range, and so moderate rain should be scored when you feel that the results have been affected by the noise of rainfall.

TEMPERATURE This is a subjective score of the average temperature during your count. Note accurate readings if you have them available.

CLOUD COVER This is a subjective score of the average cloud cover during your count.

GROUND CONDITIONS This is a subjective score of the average ground conditions during your count.

NOISE This is a subjective score of interference to listening caused by other types of noise, such as river, waterfall, traffic or sea noise, talking by non-listening members of the party, or noise from other animals, e.g. petrels calling, cows mooing or frogs croaking. Avoid noisy conditions wherever possible.

MOONLIGHT This is a subjective score of how bright the moonlight was, averaged over the listening period. Some early studies on brown kiwi, in particular, showed that they called noticeably less often on bright, moonlit nights. Interim results of more recent work indicate that this may not always be the case; however, until these data are fully analysed, it is best to continue to plan surveys on dark nights wherever possible.

LISTENING COVERAGE When listening from a ridge on a calm night, choose 'wide' as the descriptive term. When listening from a campsite in a gully, underline 'narrow'. When listening in a gully with a noisy creek and pouring rain … head back to your tent!

MAJOR HABITAT TYPES Mark a maximum of three categories of vegetation types found within the listening zone. If the types of vegetation present are not listed, circle 17 and explain in the notes. Developed farmland is typical New Zealand pasture, and is well fenced, intensively grazed and has few trees. Undeveloped farmland has rank grasses interspersed with mānuka, gorse and other scrub throughout, and may include extensively grazed river flats or frost flats.

MINUTES LISTENED Give the total time that calls were listened for, in minutes. The number of calls will eventually be expressed as a number of calls per hour. As a general rule of thumb, 1 hour per station is a good continuous period for listening for kiwi calls. Do not listen for more than 3 consecutive hours in a single night, as your concentration will rapidly diminish beyond this. Do not be tempted to 'start' listening as soon as you hear a kiwi calling or to 'finish' a count as soon as a bird has called.

CALLS Record calls according to the species calling, sex (M/F), time, compass bearing that the kiwi called from and the estimated distance (metres). If you are not confident of estimating distance, then write 'near', 'moderate' or 'distant'. A call is made up of a series of notes, ranging from just 1–2 to about 25. Because it is the call rate that is important, if two calls from the same individual are more than a minute apart, record these calls on separate lines. If a pair duet (male or female responds during or shortly after the call of its partner), indicate that these calls are linked. In some species, a duet will comprise alternating calls, with a number of notes from one bird followed by a number of notes from its partner, and then a number from the original bird,

and so on; regard this series of calls as being just one call from each member of the pair, unless one of the calls is obviously from a third bird. At the completion of listening, estimate the number of individuals you heard during the listening period, taking into account the possibility that birds may have moved around during this time.

OTHER ANIMALS HEARD Record other animal species that you heard calling during the listening period, and make an estimate of their abundance using the following criteria:
Few = 1–2 individuals, Moderate = 3–6 individuals, Many = 6+ individuals.

Appendix 2

Mean call count data (calls/hr) for all Northland stations 1995–2020

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Northern																								
1	Diggers Valley	1.1	2.4	4.1	2.50	2.1	3.3	4.1	3.8	3.0	3.9	3.9	2.7	1.3	2.0	1.7	–	2.5	–	–	–	–	2.8	0.9
2	Takahue	4.3	3.5	5.5	5.40	6.3	8.4	7.9	4.5	3.3	4.8	5.3	5.0	3.6	4.9	3.1	4.8	11.4	6.9	5.3	2.4	0.1	0.0	–
4	Gartons	5.6	5.0	1.2	–	0.8	2.0	8.6	–	1.5	4.1	4.9	7.1	1.5	1.3	0	0.1	0.3	0.8	0.3	0.3	0.0	0.1	–
5	Kaiaka	1.7	1.3	2.4	3.40	1.6	3.5	3.0	2.1	1.9	3.8	2.8	1.5	0.0	0.8	–	1.6	1.1	0.3	1.6	1.6	2.0	–	–
7	Puketi	6.6	5.4	2.1	3.00	6.0	7.6	6.4	3.5	5.0	3.4	1.5	2.3	0.8	3.9	4.0	6.9	9.4	6.3	6.3	5.9	5.6	5.6	9.8
8	Puketi SR	5.4	6.5	4.4	4.00	5.1	6.5	6.1	6.4	8.3	9.4	2.3	5.1	7.4	8.9	9.0	7.9	9.0	11.8	9.8	7.6	5.4	9.3	9.0

STN NO.	STATION NAME	2018	2019	2020
Northern				
1	Diggers Valley	–	–	0.6
2	Takahue	–	–	–
4	Gartons	–	–	–
5	Kaiaka	–	–	3.0
7	Puketi	8.3	7.4	4.0
8	Puketi SR	12.1	12.4	10.1

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Mangatete																								
3	Lightning Hill	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	15.5	13.5	10.0	17.6	20.5	17.1
256	Baigents home drive	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	12.0	14.1	15.4	14.8

STN NO.	STATION NAME	2018	2019	2020
Mangatete				
3	Lightning Hill	17.6	16.0	8.1
256	Baigents home drive	17.5	10.4	10.1

Continued on next page

Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Honeymoon Valley																								
271	H-moon Valley Green Bach	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.4	0.5	–
272	H-moon Valley Lost Valley track	–	–	–	–	–	–	–	–	–	–	–	–	-	-	–	–	–	–	–	–	0.6	–	–
273	H-moon Valley Central Ridge of Beth's	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4.6	–	–
274	H-moon Valley Greg's driveway	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.3	–	–
	NZFRT reserve, campsite	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.6	5.1
	Toa Toa Ridge	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019	2020
Honeymoon Valley				
271	H-moon Valley Green Bach	0.0	–	0.3
272	H-moon Valley Lost Valley track	–	–	–
273	H-moon Valley Central Ridge of Beth's	–	–	–
274	H-moon Valley Greg's driveway		–	–
	NZFRT reserve, campsite	4.4	–	1.8
	Toa Toa Ridge	0.5	–	–

Continued on next page

Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Whakaangi																								
130	Whakaangi 1	–	–	–	–	–	–	–	–	–	–	9.0	10.4	4.6	7.6	6.3	–	–	–	–	–	–	–	–
131	Whakaangi 2	–	–	–	–	–	–	–	–	–	–	14.9	25.0	15.3	20.8	17.1	16.1	9.4	8.0	4.8	3.1	14.1	4.9	–
132	Whakaangi 3	–	–	–	–	–	–	–	–	–	–	13.5	14.6	9.0	10.8	12.2	12.2	5.5	3.1	6.8	3.9	4.4	5.9	–
29	Whakaangi 4	–	–	4.5	–	2.9	1.9	6.3	3.8	4.9	6.6	2.3	6.8	6.3	4.9	5.8	9.8	5.0	–	–	–	–	–	–
133	Whakaangi 5	–	–	–	–	–	–	–	–	–	–	9.8	13.8	10.1	–	8.3	–	7.9	4.1	–	3.5	7.1	6.8	–
134	Whakaangi 6	–	–	–	–	–	–	–	–	–	–	6.0	7.3	3.9	–	9.5	7.0	–	–	4.5	–	–	–	–
135	Whakaangi 7	–	–	–	–	–	–	–	–	–	–	21.9	28.0	24.5	27.0	25.9	21.9	23.4	19.1	11.9	13.6	9.0	5.3	0.5
136	Whakaangi 8	–	–	–	–	–	–	–	–	–	–	14.1	29.0	11.8	18.8	15.3	10.5	20.0	15.3	12.8	13.0	10.9	4.5	6.8
137	Whakaangi 9	–	–	–	–	–	–	–	–	–	–	4.8	8.4	5.6	6.5	4.9	8.1	5.0	–	–	2.6	3.0	0.8	4.8
138	Whakaangi 10	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8.8	4.0	5.8	4.3	3.8	2.9	0.5	–	–
140	Whakaangi 11	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	16.6	7.6	3.9	7.1	7.3	7.6	7.6
247	Whakaangi 12	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
248	Whakaangi 13	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
250	Seon's Gate 17	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019	2020
Whakaangi				
130	Whakaangi 1	–	–	–
131	Whakaangi 2	2.8	–	–
132	Whakaangi 3	4.2	–	4.3
29	Whakaangi 4	–	–	5.3
133	Whakaangi 5	5.2	–	4.5
134	Whakaangi 6	–	–	–
135	Whakaangi 7	2.6	3.3	1.5
136	Whakaangi 8	7.3	1.3	7.0
137	Whakaangi 9	1.8	1.8	–
138	Whakaangi 10	–	–	–
140	Whakaangi 11	8.9	2.8	–
247	Whakaangi 12	12.0	–	5.3
248	Whakaangi 13	–	–	2.8
250	Seon's Gate 17	–	–	5.7

Continued on next page

Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Mahinepua-Radar Hill																								
90	Mahinepua 0	–	–	–	–	–	–	–	–	–	–	–	–	2.9	2.9	3.4	3.6	4.0	7.1	4.4	3.3	4.9	5.6	5.4
83	Mahinepua 1	–	–	–	–	–	–	–	–	3.5		2.6	4.1	3.5	2.6	2.4	2.3	3.1	7.5	6.8	4.3	4.8	4.3	7.9
84	Mahinepua 2	–	–	–	–	–	–	–	–	4.2	0.8	2.3	4.8	4.3	2.8	3.3	3.3	4.3	6.8	4.8	3.6	4.3	7.3	6.3
85	Mahinepua 3	–	–	–	–	–	–	–	–	5.6	4.8	4.0	5.5	5.4	3.3	5.9	5.3	5.3	10.3	5.0	5.9	5.4	7.3	6.4
88	Mahinepua 4	–	–	–	–	–	–	–	–	6.1	4.1	3.0	7.8	4.7	4.1	9.5	4.8	5.4	10.6	7.1	8.0	6.9	9.3	7.5
87	Mahinepua 5	–	–	–	–	–	–	–	–	–	–	–	–	2.4	0.9	2.0	–	–	–	–	–	–	–	–
86	Mahinepua 6	–	–	–	–	–	–	–	–	1.0	2.5	2.3	–	0.4	0.8	1.3	–	–	–	–	–	–	–	–
89	Mahinepua 7	–	–	–	–	–	–	–	–	0.9	5.9	1.8	4.8	1.9	0.4	–	–	–	–	–	–	–	–	–
181	Mahinepua 8	–	–	–	–	–	–	–	–	–	–	–	–	0.8	0.4	–	–	–	–	–	–	–	–	–
182	Mahinepua 9	–	–	–	–	–	–	–	–	–	–	–	–	0.1	0.1	–	–	–	–	–	–	–	–	–
183	Mahinepua 10	–	–	–	–	–	–	–	–	–	–	–	–	1.6	1.3	–	–	–	–	–	–	–	–	–
184	Mahinepua 11	–	–	–	–	–	–	–	–	–	–	–	–	2.9	1.3	1.3	–	–	–	–	–	–	–	–
98	Mahinepua 12	–	–	–	–	–	–	–	–	–	3.5	2.3	3.8	2.5	3.4	2.9	–	–	–	–	–	–	–	–
99	Mahinepua 13	–	–	–	–	–	–	–	–	–	3.9	3.8	7.4	7.3	5.0	9.4	7.8	9.5	16.0	9.6	6.9	11.0	10.9	9.3

STN NO.	STATION NAME	2018	2019	2020
Mahinepua-Radar Hill				
90	Mahinepua 0	6.1	2.0	1.9
83	Mahinepua 1	8.1	2.1	2.8
84	Mahinepua 2	12.3	2.8	5.8
85	Mahinepua 3	12.5	5.8	8.1
88	Mahinepua 4	–	8.0	17.8
87	Mahinepua 5	–	–	–
86	Mahinepua 6	–	–	–
89	Mahinepua 7	–	–	–
181	Mahinepua 8	–	–	–
182	Mahinepua 9	–	–	–
183	Mahinepua 10	–	–	–
184	Mahinepua 11	–	–	–
98	Mahinepua 12	–	–	–
99	Mahinepua 13	–	–	22.5

Continued on next page

Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Mahinepua-Radar Hill																								
92	Mahinepua 14	–	–	–	–	–	–	–	–	–	–	–	–	0.6	1.3	1.1	1.4	0.8	–	–	–	–	–	–
91	Mahinepua 15	–	–	–	–	–	–	–	–	–	–	–	–	1.0	1.1	1.6	1.8	3.1	–	–	–	–	–	–
93	Mahinepua 16	–	–	–	–	–	–	–	–	–	–	–	–	1.3	6.0	2.0	2.6	5.3	–	–	–	–	–	–
94	Mahinepua 17	–	–	–	–	–	–	–	–	–	–	–	–	2.5	4.9	5.0	3.4	6.9	–	–	–	–	–	–
95	Mahinepua 18	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.8	-	-	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019	2020
Mahinepua-Radar Hill				
92	Mahinepua 14	–	–	–
91	Mahinepua 15	–	–	–
93	Mahinepua 16	–	–	–
94	Mahinepua 17	–	–	–
95	Mahinepua 18	–	–	–

Continued on next page

Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Eastern																								
10	Marsden Cross	20.9	18.3	9.6	16.7	14.5	19.9	21.9	17.9	18.5	22.0	19.3	30.6	23.0	-	20.3	24.5	34.9	30.9	30.3	19.3	30.4	38.6	38.8
11	Puketotara	10.0	13.8	8.1	11.6	9.7	8.0	–	2.5	7.5	3.6	–	7.1	13.7	10.6	6.2	9.5	9.3	9.1	9.8	14.0	12.75	–	11.0
12	Rangitane	14.0	5.6	8.4	10.5	7.5	8.4	11.5	10.5	8.6	8.0	8.0	11.5	9.1	15.9	15.3	11.4	10.8	12.8	11.3	12.8	9.5	10.9	10.1
13	Waitangi No 12	7.6	7.6	6.3	8.9	5.3	7.1	11.5	15.1	18.4	13.8	11.5	15.5	6.3	–	–	–	–	6.8	7.4	3.0	4.8	7.5	11.5
14	Mt Bledisloe	27.1	10.9	5.5	7.9	8.8	5.1	6.4	6.8	4.9	8.9	9.1	5.5	9.6	11.3	8.3	11.4	13.7	7.4	10.8	6.8	7.9	10.9	8.3
15	Tikitikiore	10.8	13.5	6.1	6.1	4.5	6.5	2.9	3.3	3.1 (12.3)	6.1 (7.1)	3.4	13.0	7.9	11.0	12.3 (5.3)	12.3	13.5	17.8	14.5	12.4	15.1	25.5	20.4

STN NO.	STATION NAME	2018	2019	2020
Eastern				
10	Marsden Cross	39.6	30.8	-
11	Puketotara	14.0	16.1	-
12	Rangitane	18.1	10.1	12.6
13	Waitangi No 12	6.0	5.8	4.0
14	Mt Bledisloe	12.8	7.6	8.0
15	Tikitikiore	24.6	7.8	18.6

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Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Russell Peninsula																								
59	Opito Farms	–	–	–	–	–	5.7	–	9.9	–	–	4.6	13.1	6.1	9.13	6.75	4.3	5.3	8.1	6.9	11.5	10.1	–	13.5
60	Flagstaff/Te Maiki	–	–	–	–	–	3.7	1.3	1.3	–	–	–	4.3	–	6.4	–	2.5	4.3	3.9	3.3	3.3	3.9	3.4	5.8
61	Milne Ct	–	–	–	–	–	–	–	–	–	–	–	6.3	5.8	–	–	–	–	–	–	–	–	–	–
62	Uruti Rd	–	–	–	–	–	10.8	7.6	10.5	–	–	7.7	14.4	7.9	5.0	12.8	12.3	12.8	11.5	13.9	6.9	15.0	21.6	11.1
156	Russell Heights	–	–	–	–	–	–	–	–	–	–	–	9.8	4.8	5.0	2.5	5.0	–	–	–	–	–	–	–
170	Nikau Block	–	–	–	–	–	–	–	–	–	–	12.9	10.0	12.0	12.0	12.0	8.9	14.3	9.1	20.8	14.6	14.9	12.0	10.4
171	Mace/Farmer	–	–	–	–	–	–	–	–	–	–	–	–	–	6.6	4.75	17.6	10.4	6.3	4.0	4.0	14.3	12.8	21.6
172	Pipiroa Bay	–	–	–	–	–	–	–	–	–	–	–	–	–	0.0	3.0	2.0	2.8	6.0	5.4	5.6	3.0	3.3	3.6
173	Shortlands	–	–	–	–	–	–	–	–	–	–	–	2.0	2.5	1.4	1.1	1.3	–	2.3	1.1	2.0	–	–	1.3
174	Johnsons	–	–	–	–	–	–	–	–	–	–	–	10.0	9.8	12.8	10.0	10.0	11.4	8.5	10.1	10.3	11.3	12.8	12.3
176	Jarvis	–	–	–	–	–	–	–	–	–	–	5.4	4.3	–	–	–	–	–	–	–	–	–	–	–
177	Soloman's Gate	–	–	–	–	–	–	–	–	–	–	11.5	6.4	–	–	–	–	5.4	6.3	4.9	14.0	9.5	–	9.3
210	Paroa Bay, Russell	–	–	–	–	–	–	–	–	–	–	–	–	4.3	–	–	–	–	–	–	–	–	–	–
211	Eagles Nest	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4.5	–	–	–	–	–	–	–
	Ngaiotonga	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019	2020
Russell Peninsula				
59	Opito Farms	13.5	10.1	13.3
60	Flagstaff/Te Maiki	5.0	4.9	15.4
61	Milne Ct	–	-	-
62	Uruti Rd	17.1	11.9	13.8
156	Russell Heights	–	-	-
170	Nikau Block	16.1	5.8	9.1
171	Mace/Farmer	32.2	19.4	20.5
172	Pipiroa Bay	4.8	7.0	5.4
173	Shortlands	11.1	1.4	5.5
174	Johnsons	11.9	5.6	12.0
176	Jarvis	–	-	-
177	Soloman's Gate	–	5.5	7.0
210	Paroa Bay, Russell	–	–	–
211	Eagles Nest	–	-	–
	Ngaiotonga	–	3.9	–

Continued on next page

Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Bay of Islands																								
146	Kauri Cliffs 1 (Pink Beach)	–	–	–	–	–	–	–	–	9.0	–	–	4.0	4.3	1.8	5.0	6.5	–	–	–	–	–	3.3	–
147	Kauri Cliffs 2 (Puriri)	–	–	–	–	–	–	–	–	–	–	–	1.5	3.0	2.8	1.0	–	–	–	–	–	–	–	–
148	Wiwiki Beach	–	–	–	–	–	–	–	–	–	–	–	32.1	–	–	–	–	–	–	–	–	–	–	–
149	Mataka Stn Gate, Purerua	–	–	–	–	–	–	–	–	–	–	–	4.0	4.1	8.3	6.8	18.5	3.3	10.0	6.9	–	–	–	–
150	McKenzie Rd, Purerua	–	–	–	–	–	–	–	–	–	–	–	9.5	12.1	10.3	5.0	7.5	–	2.5	–	–	–	–	–
151	Mtn Landing (Lot 30) Purerua	–	–	–	–	–	–	–	–	–	–	–	12.3	10.2	18.8	12.6	25.0	22.8	20.3	–	–	–	–	–
152	Waitoto Block	–	–	–	–	–	–	–	–	–	–	–	4.0	–	–	–	–	–	–	–	–	–	–	–
153	Aroha Island	–	–	–	–	–	–	–	–	6.9	–	–	12.6	–	–	–	–	–	–	–	–	–	–	–
154	Napia Bay	–	–	–	–	–	–	–	–	–	8.7	5.50	4.6	4.0	4.5	3.3	5.6	7.5	3.6	4.0	–	–	–	–
155	Stirlings Quarry	–	–	–	–	–	–	–	–	7.3	9.8	13.00	12.4	10.2	8.3	4.0	8.5	–	–	–	–	–	–	–
97	Kurapari Rd	–	–	–	–	7.1	–	–	–	12.7	8.8	9.25	10.4	5.5	6.0	6.8	4.8	2.3	5.5	7.0	–	–	–	–
138	Hupara	–	–	–	–	–	–	–	–	–	25.6	19.30	27.8	–	–	–	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019	2020
Bay of Islands				
146	Kauri Cliffs 1 (Pink Beach)	–	–	–
147	Kauri Cliffs 2 (Puriri)	–	–	–
148	Wiwiki Beach	–	–	–
149	Mataka Stn Gate, Purerua	–	–	–
150	McKenzie Rd, Purerua	–	–	–
151	Mtn Landing (Lot 30) Purerua	–	–	–
152	Waitoto Block	–	–	–
153	Aroha Island	–	–	–
154	Napia Bay	–	–	–
155	Stirlings Quarry	–	–	–
97	Kurapari Rd	–	–	–
138	Hupara	–	–	–

Continued on next page

Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Bay of Islands																								
185	Akeake Reserve, Kerikeri	–	–	–	–	–	–	–	–	–	–	–	–	–	2.8	0.5	–	6.0	–	–	–	–	–	–
186	Cunningham Gardens, Aroha Island	–	–	–	–	–	–	–	10.8	8.6	–	–	–	–	–	–	–	8.2	–	–	–	–	–	–
187	Gaitens, Rangitane Rd, Kerikeri	–	–	–	–	10.0	–	12.8	6.3	6.9	10.0	12.0	12.6	14.7	10.5	8.0	7.3	7.5	4.8	–	–	–	–	–
188	Blacksmiths Bay (east), Kerikeri (Lex Rennes)	–	–	–	–	–	–	–	10.3	10.3	7.7	8.3	6.2	6.0	8.0	4.5	6.9	8.8	6.40	0.0	–	–	–	–
189	Doves Bay, Kerikeri (Lockyer)	–	–	–	–	4.2	–	–	2.0	–	3.8	2.5	–	–	4.5	7.5	15.3	18.3	–	–	–	–	–	–
190	Rangitu, Opito Bay Road, Kerikeri	–	–	–	–	–	–	–	–	–	–	–	–	9.1	16.0	15.5	15.5	–	–	–	–	–	–	–
191	Tikorangi Road, Opito Bay, Kerikeri	–	–	–	–	–	–	–	–	–	–	–	–	–	4.5	4.5	4.0	–	–	–	–	–	–	–
192	Kraus, Hansen Rd, Purerua	–	–	–	–	–	–	–	–	–	3.3	–	–	–	–	11.0		–	–	–	–	–	–	–
193	Mataka Beach, Mataka Station, Purerua	–	–	–	–	–	–	–	41.5	–	30.0	39.0	32.7	24.5	41.8	30.0	41.3	–	30.83	30.9	–	–	–	–

STN NO.	STATION NAME	2018	2019	2020
Bay of Islands				
185	Akeake Reserve, Kerikeri	–	–	–
186	Cunningham Gardens, Aroha Island	–	4.8	–
187	Gaitens, Rangitane Rd, Kerikeri	–	-	–
188	Blacksmiths Bay (east), Kerikeri (Lex Rennes)	–	–	–
189	Doves Bay, Kerikeri (Lockyer)	–	–	–
190	Rangitu, Opito Bay Road, Kerikeri	–	–	–
191	Tikorangi Road, Opito Bay, Kerikeri	–	–	–
192	Kraus, Hansen Rd, Purerua	–	–	–
193	Mataka Beach, Mataka Station, Purerua	–	–	–

Continued on next page

Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Bay of Islands																								
194	Mataka Station, Ninepin Track, Pureua	–	–	–	–	–	–	–	–	–	30.0	–	–	–	50.8	43.5	–	18.0	–	24.0	–	–	–	–
195	Mountain Landing (Lot 30) Wharengaere, Pureua	–	–	–	–	–	–	–	–	–	–	–	12.3	10.2	18.8	12.6	25.0	22.8	20.25	13.3	–	–	–	–
196	Mountain Landing, Mataka Ridgeline, Pureua	–	–	–	–	–	–	–	–	–	–	–	7.5	10.1	18.0	25.5	14.3	22.0	–	–	–	–	–	–
197	Mountain Landing, Paddle (Entrance), Pureua	–	–	–	–	–	–	–	–	–	–	–	8.5	10.2	12.5	14.3	17.0	–	–	–	–	–	–	–
198	Mountain Landing, Poraenui Point	–	–	–	–	–	–	–	–	–	–	–	–	7.3	14.5	16.0	13.8	–	–	–	–	–	–	–
	Top Vineyard Villa	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Twin tanks	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
199	Paoneone	–	–	–	–	–	–	–	16.7	–	–	–	–	–	–	–	–	37.6	–	11.3	–	–	–	–

STN NO.	STATION NAME	2018	2019	2020
Bay of Islands				
194	Mataka Station, Ninepin Track, Pureua	–	–	–
195	Mountain Landing (Lot 30) Wharengaere, Pureua	–	–	–
196	Mountain Landing, Mataka Ridgeline, Pureua	–	–	–
197	Mountain Landing, Paddle (Entrance), Pureua	–	–	–
198	Mountain Landing, Poraenui Point	–	–	–
	Top Vineyard Villa	36.9	28.9	–
	Twin tanks	42.6	32.9	–
199	Paoneone	–	–	–

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Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Bay of Islands																								
200	Pattersons Big Hill	–	–	–	–	–	–	–	9.0	–	–	30.5	–	4.0	20.5	70.3	33.0	35.5	–	–	–	–	–	–
201	Pattersons, Rocky Bay	–	–	–	–	–	–	–	–	–	–	–	–	–	16.5	19.5	17.7	11.7	–	–	–	–	–	–
202	Tapuaetahi	–	–	–	–	–	–	–	–	–	–	–	5.0	–	3.0	3.3	16.5		-	7.4	–	–	–	–
203	Wharengaere Bay	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	14.5	15.5	–	–	–	–	–	–
204	Wiroa Station	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4.5	6.7	–	–	–	–	–	–
205	Wiroa Station Hill 11	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.5	–	–	–	–	–	–	–
206	Maintenance Facility, Kauri Cliffs	–	–	–	–	–	–	–	–	–	–	–	–	–	6.5	5.0	13.1	–	–	–	–	–	6.9	–
207	Waiaua Bay, Matauri X	–	–	–	–	–	–	–	–	2.3	–	–	0.5	0.5	–	–	–	–	–	–	–	–	–	–
208	Waterfall, Kauri Cliffs, Takou Bay	–	–	–	–	–	–	–	–	6.0	–	–	5.5	2.3	4.5	3.5	–	–	–	–	–	–	–	–
209	Hikurua Rd (end)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.0	–	–	–	–	–	–	–
212	Drivers Whitehills farm	–	–	–	–	–	–	–	–	–	–	–	–	–	7.5	2.0	8.0	8.0	7.9	–	–	–	–	–
213	Landcorp Takou Kiwi covenant	–	–	–	–	–	–	–	–	–	–	–	–	–	8.5	0.8	3.0	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019	2020
Bay of Islands				
200	Pattersons Big Hill	–	–	–
201	Pattersons, Rocky Bay	–	–	–
202	Tapuaetahi	–	–	–
203	Wharengaere Bay	–	–	–
204	Wiroa Station	–	–	–
205	Wiroa Station Hill 11	–	–	–
206	Maintenance Facility, Kauri Cliffs	–	–	–
207	Waiaua Bay, Matauri X	–	–	–
208	Waterfall, Kauri Cliffs, Takou Bay	–	–	2.2
209	Hikurua Rd (end)	–	–	–
212	Drivers Whitehills farm	–	–	–
213	Landcorp Takou Kiwi covenant	–	–	–

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Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Bay of Islands																								
214	Maori Block	–	–	–	–	–	–	–	–	–	–	–	–	1.5	–	–	3.5	–	–	–	–	–	–	–
215	Otaha Station (south end)	–	–	–	–	–	–	–	–	–	–	–	–	3.0	–	–	3.0	–	–	–	–	–	–	–
216	Just past Clinton's	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.0	–	–	–	–	–	–	–
217	End of Te Ra Rd	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.3	–	–	–	–	–	–	–
219	Achtzhener, Bulls Gorge, Kerikeri	–	–	–	–	–	–	–	–	–	–	–	7.0	–	6.0	11.8	5.8	2.8	–	1.9	–	–	–	–
220	Airstrip Rd (Baigent-Mercer)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.0	–	3.3	–	–	–	–	–
221	Airstrip Rd (Sharp)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.0	–	–	–	–	–	–	–
222	Candy Bush, Puketi Road, middle ridge	–	–	–	–	–	–	–	–	–	–	–	–	–	0.8	6.0	–	–	–	–	–	–	–	–
223	Candy Bush, Puketi Road, red cliffs	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8.5	–	-	5.8	–	–	–	–	–
224	Candy Bush, Puketi Road, white/yellow path	–	–	–	–	–	–	–	–	–	–	–	–	–	–	11.0	–	-	11.0	–	–	–	–	–

STN NO.	STATION NAME	2018	2019	2020
Bay of Islands				
214	Maori Block	3.3	–	–
215	Otaha Station (south end)	–	–	–
216	Just past Clinton's	–	–	–
217	End of Te Ra Rd	–	–	–
219	Achtzhener, Bulls Gorge, Kerikeri	1.0	0.9	–
220	Airstrip Rd (Baigent-Mercer)	–	–	–
221	Airstrip Rd (Sharp)	–	–	–
222	Candy Bush, Puketi Road, middle ridge	–	–	–
223	Candy Bush, Puketi Road, red cliffs	–	–	–
224	Candy Bush, Puketi Road, white/yellow path	–	–	–

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Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Bay of Islands																								
225	Kauri Hills, Totara North	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.0	6.3	–	–	–	–	–
226	Poultons, Kerikeri River, Mangaparerua Rd	–	–	–	–	–	–	–	–	–	–	–	–	–	9.0	–	6.5	–	5.4	4.6	–	–	–	–
227	Puketotara Rd = 709	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	10.0	–	–	–	–	–	–	13.8
228	Puketotara Rd = Kearney	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.5	–	–	–	–	12.9	–	–
229	Waipapa Rd West, Kerikeri (Anne C.)	–	–	–	–	–	–	–	–	–	–	–	–	–	0.0	–	–	–	–	–	–	–	–	–
230	Waipapa Rd West, Kerikeri (Isabella C.)	–	–	–	–	–	–	–	–	–	–	–	–	–	0.6	0.5	–	–	–	–	–	–	–	–
231	Waitoto, 500m west of Rhyolitic dome, Mangaparerua	–	–	–	–	–	–	–	–	–	–	–	4.0	–	–	–	–	–	–	–	–	–	–	–
232	Waitoto, Rhyolitic dome, Mangaparerua Road	–	–	–	–	–	–	–	–	–	–	–	4.5	4.6	8.0	5.0	–	–	–	–	–	–	–	–
233	Wharau Rd, Kerikeri (Manning)	–	–	–	–	–	–	–	–	–	–	–	–	3.6	2.5	–	5.5	3.5	4.5	–	–	–	–	–

STN NO.	STATION NAME	2018	2019	2020
Bay of Islands				
225	Kauri Hills, Totara North	–	–	–
226	Poultons, Kerikeri River, Mangaparerua Rd	12.3	9.0	–
227	Puketotara Rd = 709	–	11.5	–
228	Puketotara Rd = Kearney	–	–	–
229	Waipapa Rd West, Kerikeri (Anne C.)	–	–	–
230	Waipapa Rd West, Kerikeri (Isabella C.)	–	–	–
231	Waitoto, 500m west of Rhyolitic dome, Mangaparerua	2.8	0.6	–
232	Waitoto, Rhyolitic dome, Mangaparerua Road	2.6	0.3	–
233	Wharau Rd, Kerikeri (Manning)	–	–	–

Continued on next page

Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Bay of Islands																								
234	Wharau Rd, Kerikeri (Starr)	–	–	–	–	–	–	–	–	–	–	–	–	6.3	7.0	–	–	–	–	–	–	–	–	–
	Lodore Rd	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6.9
	Paddock 35	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Rangihoura	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
282	Palm Drive	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
303	Te Puke	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
304	Blue Penguin Drive	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
305	Rangitane River Park	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019	2020
Bay of Islands				
234	Wharau Rd, Kerikeri (Starr)	–	–	–
	Lodore Rd	–	12.0	–
	Paddock 35	12.1	9.1	–
	Rangihoura	–	34.4	–
282	Palm Drive	–	0.9	–
303	Te Puke	–	0.6	9.6
304	Blue Penguin Drive	–	–	12.1
305	Rangitane River Park	–	–	15.3

Continued on next page

Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Puketi Forest																								
102	Bramley's Rd	–	–	–	–	–	–	–	–	–	–	–	2.5	0.5	2.0	2.0	2.8	2.8	2.5	2.0	–	3.4	2.4	2.3
103	Pirau Ridge	–	–	–	–	–	–	–	–	–	–	–	0.0	–	0.0	1.0	0.5	1.3	1.3	1.4	0.5	1.6	0.9	1.0
104	Pond	–	–	–	–	–	–	–	–	–	–	–	4.5	1.0	3.8	5.0	3.5	8.0	6.9	4.6	5.9	3.3	4.9	2.9
105	Pudding Bowl Hill	–	–	–	–	–	–	–	–	–	–	–	0.3	0.8	1.1	2.0	2.0	1.0	–	3.0	–	–	–	–
106	Takapau Track	–	–	–	–	–	–	–	–	–	–	–	0.0	1.0	0.0	2.5	3.3	2.4	2.6	1.4	–	1.1	1.9	4.9
107	Takapau/Pirau Rd Junction	–	–	–	–	–	–	–	–	–	–	–	0.5	–	1.0	2.8	1.4	3.5	1.5	1.1	0.9	1.6	1.5	1.4
108	Totara Ridge	–	–	–	–	–	–	–	–	–	–	–	5.8	–	0.8	7.1	3.5	6.1	4.6	5.9	5.0	1.8	4.1	2.4
109	Waihoanga Gorge	–	–	–	–	–	–	–	–	–	–	–	2.0	–	3.8	5.4	3.3	6.3	4.5	4.3	–	5.8	5.5	4.4
110	Waihoanga Gorge 2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.5	2.5	1.5	–	4.5	–	–	–	–
111	Walnut	–	–	–	–	–	–	–	–	–	–	–	4.3	2.5	1.3	3.3	3.0	5.3	4.0	4.8	6.1	4.9	7.9	5.3
112	Stoat line 9 - Puketi	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.1	4.0	3.6	1.4	4.0	1.0	3.6
259	Puketi Nature Trail	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3.1	–	3.3	–	–	–	–

STN NO.	STATION NAME	2018	2019	2020
Puketi Forest				
102	Bramley's Rd	3.9	1.0	–
103	Pirau Ridge	–	2.3	–
104	Pond	9.5	6.1	3.8
105	Pudding Bowl Hill	–	–	-
106	Takapau Track	4.5	5.4	2.3
107	Takapau/Pirau Rd Junction	3.6	1.6	2.6
108	Totara Ridge	6.8	5.4	1.1
109	Waihoanga Gorge	8.1	7.1	4.4
110	Waihoanga Gorge 2	–	–	–
111	Walnut	5.4	3.1	0.9
112	Stoat line 9 - Puketi	3.4	4.0	0.3
259	Puketi Nature Trail	–	3.3	3.8

Continued on next page

Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Waimate North																								
113	W1	–	–	–	–	–	–	–	–	–	23.5	15.8	24.8	–	–	25.5	25.8	23.6	23.1	23.8	27.1	30.8	34.5	31.4
114	W2	–	–	–	–	–	–	–	–	–	12.3	7.0	9.5	7.9	11.5	5.8	14.5	11.6	12.5	7.1	5.1	8.6	4.8	8.8
115	W3	–	–	–	–	–	–	–	–	–	14.9	–	–	–	–	–	–	1.0	0.0	1.0	1.4	2.0	1.3	1.1
116	W4	–	–	–	–	–	–	–	–	–	9.4	10.5	6.0	–	8.0	–	8.5	13.5	10.5	10.9	8.5	8.0	7.0	12.1
117	W5	–	–	–	–	–	–	–	–	–	5.9	1.8	3.0	–	–	–	–	–	–	–	–	–	–	–
118	W6	–	–	–	–	–	–	–	–	–	22.3	11.0	5.7	8.5	7.3	9.1	5.6	10.6	8.0	7.5	10.4	11.0	13.3	10.9
119	W7	–	–	–	–	–	–	–	–	–	–	5.3	6.5	–	3.1	–	–	–	–	–	–	–	–	–
120	W8	–	–	–	–	–	–	–	–	–	13.8	2.8	1.0	8.1	8.0	5.5	8.1	9.1	11.9	9.1	11.3	8.1	7.1	5.3
121	W9	–	–	–	–	–	–	–	–	–	5.2	3.5	2.1	2.3	3.5	–	–	–	–	1.0	5.5	2.9	7.3	2.6
122	W10	–	–	–	–	–	–	–	–	–	–	–	7.3	8.3	5.9	5.3	4.1	7.3	5.1	4.1	8.0	4.4	5.3	–
123	W11	–	–	–	–	–	–	–	–	–	7.1	7.8	2.0	–	–	–	–	–	–	–	–	–	–	–
124	W12	–	–	–	–	–	–	–	–	–	18.9	9.8	6.1	3.6	5.9	6.0	7.9	6.3	4.6	5.1	8.0	8.1	7.4	6.1
178	W13	–	–	–	–	–	–	–	–	–	–	–	–	–	4.5	2.8	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019	2020
Waimate North				
113	W1	26.6	–	27.4
114	W2	7.6	6.8	6.9
115	W3	–	–	–
116	W4	9.4	7.6	13.9
117	W5	–	–	–
118	W6	15.9	9.8	19.4
119	W7	–	–	–
120	W8	5.6	5.1	3.9
121	W9	–	–	4.3
122	W10	4.4	7.0	10.1
123	W11	–	–	–
124	W12	5.5	7.8	5.8
178	W13	–	–	–

Continued on next page

Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Waimate North																								
127	W14	–	–	–	–	–	–	–	–	–	–	–	–	–	1.0	0.9	0.5	0.0	–	–	–	–	–	–
128	W16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.9	2.2	–	–	–	–	–	–	
	Sacro Bosco	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.9

STN NO.	STATION NAME	2018	2019	2020
Waimate North				
127	W14	–	–	1.4
128	W16	–	–	–
	Sacro Bosco	0.9	–	–

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Hupara																								
258	Hupara Land Care 1 (Bill's Plateau)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	31.3	15.1	21.4	25.0	26.4	21.4
245	Hupara Land Care 2 (Mike Sullivan's)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	20.9	11.0	16.0	–	–
246	Hupara Land Care 3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	19.4	–	–	–	–
257	Hupara Land Care 4 (Home Orange Tree)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	11.6	9.0	17.1	12.1
294	Hupara Land Care Harrison's Property	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	35.3	–

STN NO.	STATION NAME	2018	2019	2020
Hupara				
258	Hupara Land Care 1 (Bill's Plateau)	24.8	24.1	32.4
245	Hupara Land Care 2 (Mike Sullivan's)	–	–	–
246	Hupara Land Care 3	–	–	–
257	Hupara Land Care 4 (Home Orange Tree)	19.9	11.3	13.9
294	Hupara Land Care Harrison's Property	–	–	38.5

Continued on next page

Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Tutukaka & Sandy Bay																								
125	TLC 1	–	–	–	–	–	–	–	–	9.8	5.9	7.1	8.8	10.9	11.6	8.1	8.6	12.4	12.0	12.1	9.6	7.4	11.5	13.8
126	TLC 2	–	–	–	–	–	–	–	–	–	8.4	7.8	9.8	10.3	6.5	–	7.4	2.8	10.0	–	6.8	10.9	9.5	16.9
142	TLC 3	–	–	–	–	–	–	–	–	–	–	3.0	4.6	3.6	3.0	–	–	9.3	8.5	7.1	5.4	4.1	8.6	–
28	TLC 4	-	7.3	–	–	8.0	4.4	-	-	10.7	7.3	4.4	10.0	–	–	8.2	4.5	–	–	–	6.50	–	–	–
143	TLC 5	–	–	–	–	–	–	–	–	–	–	4.1	6.0	3.3	7.1	4.0	2.3	3.8	–	–	3.5	–	–	–
144	TLC 6	–	–	–	–	–	–	–	–	–	–	9.2	–	13.0	15.2	6.5	8.8	–	–	–	–	–	–	–
160	TLC 7	–	–	–	–	–	–	–	–	–	–	–	4.4	–	–	4.8	4.9	–	5.5	2.1	3.0	–	–	–
100	Kaiatea 1	–	–	–	–	–	–	–	–	–	1.6	–	–	–	–	–	–	–	–	–	–	–	–	–
101	Kaiatea 2	–	–	–	–	–	–	1.2	2.0	1.3	2.1	–	–	–	–	–	–	–	–	–	–	–	–	–
27	Sandy Bay 1	3.6	3.4	2.8	8.0	6.1	3.3	3.5	–	3.0	–	2.5	–	–	6.8	–	5.3	–	4.2	5.5	4.3	3.9	5.8	6.3
260	Sandy Bay 2	–	–	–	–	–	–	–	–	–	–	–	4.5	–	–	3.8	3.5	2.5	4.5	–	3.0	5.9	6.4	9.3
261	Sandy Bay 3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.0	–	4.0	7.5	3.9	3.9	8.5	5.5
	Rayonnier Forest	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.1
292	Sandy Bay Farms	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019	2020
Tutukaka & Sandy Bay				
125	TLC 1	17.6	12.5	8.8
126	TLC 2	14.9	–	7.5
142	TLC 3	5.6	–	2.9
28	TLC 4	–	10.1	–
143	TLC 5	–	–	–
144	TLC 6	–	–	–
160	TLC 7	–	–	–
100	Kaiatea 1	–	–	–
101	Kaiatea 2	–	–	–
27	Sandy Bay 1	6.0	3.6	5.8
260	Sandy Bay 2	3.6	2.4	0.8
261	Sandy Bay 3	4.8	1.6	3.4
	Rayonnier Forest	–	–	–
292	Sandy Bay Farms	4.8	6.1	–

Continued on next page

Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Tutukaka & Sandy Bay																								
293	Te Toiroa	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Pukenui Rd	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
295	Ngahere Pines	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
306	Gunther	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
308	Otito N Reserve Matapouri	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
309	Morrison Ridge Track Matapouri	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
310	North Onekainga Whananaki	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
311	Harman Farms Lookout Whananaki	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
312	Dawson's Property Whananaki	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
313	Hailes Road Whananaki	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019	2020
Tutukaka & Sandy Bay				
293	Te Toiroa	14.0	5.1	–
	Pukenui Rd	6.1	–	–
295	Ngahere Pines	15.0	–	13.6
306	Gunther	–	–	10.8
308	Otito N Reserve Matapouri	–	–	0.0
309	Morrison Ridge Track Matapouri	–	–	0.0
310	North Onekainga Whananaki	–	–	0.8
311	Harman Farms Lookout Whananaki	–	–	1.7
312	Dawson's Property Whananaki	–	–	3.5
313	Hailes Road Whananaki	–	–	4.3

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Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Whangarei Heads																								
39	Bream Hd 1	–	–	–	–	–	–	5.0	3.1	5.8	3.1	4.7	5.1	3.5	5.0	6.0	3.0	7.1	9.5	9.6	9.6	10.0	12.1	7.4
40	Bream Hd 2	–	–	–	–	–	–	1.2	2.0	1.3	2.1	2.4	2.0	2.8	2.0	–	–	1.3	–	–	–	–	–	–
41	Bream Hd 3	–	–	–	–	–	–	–	–	–	–	1.5	2.0	1.3	1.6	–	–	–	8.4	8.6	8.6	6.1	6.9	6.0
42	Bream Hd 4	–	–	–	–	–	–	1.2	2.0	1.3	2.1	2.4	2.0	1.5	3.1	2.0	2.0	5.4	5.3	7.6	2.1	6.3	3.8	6.8
42	Bream Hd 4	–	–	–	–	–	–	1.2	2.0	1.3	2.1	2.4	2.0	1.5	3.1	2.0	2.0	5.4	5.3	7.6	2.1	6.3	3.8	6.8
69	Bream Hd 6	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.9	6.8	4.4	–	5.0	3.3
44	Taurikura 1	–	–	–	–	–	–	–	–	–	–	1.5	2.0	–	4.4	4.9	3.1	12.6	9.6	10.8	–	–	–	–
45	Taurikura 2	-	-	-	-	-	-	-	-	-	-	-	-	-	9.0	8.5	10.9	10.3	5.5	10.4	11.9	8.6	11.3	10.3
46	Taurikura 3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.5	1.9	5.9	4.6	4.0	7.5	4.8	6.0	–
47	Manaia 1	–	–	–	–	–	–	3.5	2.5	4.3	4.0	3.3	3.9	2.1	5.1	3.9	3.3	10.3	2.9	2.8	3.6	1.5	9.4	8.8
48	Manaia 2	–	–	–	–	–	–	4.0	4.5	4.9	5.8	4.0	5.3	7.4	7.6	8.8	10.8	8.4	16.6	13.3	15.9	15.1	15.6	13.5
49	Manaia 3	–	–	–	–	–	–	3.3	3.9	2.9	–	2.1	3.0	–	4.0	3.1	3.5	6.3	3.1	5.1	3.6	7.5	7.1	9.3
71	Manaia 8	–	–	–	–	–	–	–	1.5	0.3	1.0	1.2	2.0	1.5	1.4	1.9	0.8	2.1	–	4.6	–	3.3	4.8	3.9
262	Manaia 9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	7.8	3.6	6.9	9.1	6.0	–	10.0

STN NO.	STATION NAME	2018	2019	2020
Whangarei Heads				
39	Bream Hd 1	11.3	8.0	10.5
40	Bream Hd 2	–	–	–
41	Bream Hd 3	4.5	3.0	3.0
42	Bream Hd 4	8.5	6.8	10.0
42	Bream Hd 4	8.5	–	3.6
69	Bream Hd 6	3.3	–	–
44	Taurikura 1	–	8.4	9.1
45	Taurikura 1	9.8	8.4	9.1
46	Taurikura 3	4.8	4.5	4.1
47	Manaia 1	13.5	8.9	9.4
48	Manaia 2	15.3	–	21.0
49	Manaia 3	6.8	1.8	6.8
71	Manaia 8	3.1	–	6.5
262	Manaia 9	–	4.5	–

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Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Whangarei Heads																								
54	Kauri Mtn 1	–	–	–	–	–	–	4.5	1.5	–	3.1	7.4	1.3	–	1.4	3.0	2.1	2.5	3.6	4.6	4.4	3.8	7.4	6.5
72	Kauri Mtn 2	–	–	–	–	–	–	–	5.1	3.2	4.3	2.7	2.3	0.4	2.3	3.6	2.4	3.4	5.3	5.0	6.3	6.8	9.6	7.1
73	Kauri Mtn 3	–	–	–	–	–	–	–	2.0	1.0	1.0	1.3	2.5	–	5.0	3.4	1.1	6.0	3.3	3.2	5.1	6.9	7.0	6.8
74	Kauri Mtn 4	–	–	–	–	–	–	–	4.8	5.9	2.6	3.0	2.9	–	2.0	2.0	3.4	3.9	3.8	3.3	4.1	4.8	5.6	6.1
141	Kauri Mtn 5	–	–	–	–	–	–	–	–	–	–	2.3	1.9	1.3	2.5	3.1	3.3	4.8	4.1	3.0	4.9	4.8	8.9	8.9
127	The Nook 1	–	–	–	–	–	–	–	–	–	1.8	1.5	0.9	–	0.7	1.4	1.3	2.3	–	0.9	–	–	–	–
56	The Nook 2	–	–	–	–	–	–	6.0	2.1	3.3	3.8	4.0	5.3	–	5.0	4.5	7.8	9.3	8.4	6.4	4.1	1.6	3.9	8.5
58	Nook Rd	–	–	–	–	–	–	–	–	–	–	–	–	–	3.8	–	3.7	4.6	1.5	–	–	–	–	–
263	Craig Road	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6.0	14.1	12.3	9.3	13.5	12.3	10.6
75	McCleod Bay	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	9.6	5.9	8.8	7.4
	Maungatika Scenic Reserve 1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.0	0.9	0.4	0.8
302	Owhiwa Road Kauri Villas	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019	2020
Whangarei Heads				
54	Kauri Mtn 1	5.1	4.5	3.3
72	Kauri Mtn 2	5.6	–	3.9
73	Kauri Mtn 3	4.8	4.5	4.4
74	Kauri Mtn 4	5.8	6.4	6.3
141	Kauri Mtn 5	6.3	3.0	6.1
127	The Nook 1	–	4.0	-
56	The Nook 2	6.1	–	4.3
128	The Nook 3	–	–	–
58	Nook Rd	–	7.0	–
263	Craig Road	14.3	3.0	–
75	McCleod Bay	7.3	–	–
	Maungatika Scenic Reserve 1	0.1	–	–
302	Owhiwa Road Kauri Villas	0.4	–	–

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Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Southern																								
21	Glenbervie 7A	5.0	6.4	7.1	7.5	5.0	0.5	1.0	2.4	1.0	–	1.3	–	2.4	2.5	1.9	1.8	2.6	1.1	4.3	–	–	–	1.9
22	Glenbervie 9A	11.2	3.8	4.3	7.3	5.9	12.6	6.8	5.3	4.5	6.5	–	1.8	2.8	2.9	1.4	2.9	1.6	6.8	6.9	2.8	2.0	–	5.3
283	Glenbervie 10	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
284	Glenbervie 11	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
296	Glenbervie 14	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
23	Marlow Road	22.4	13.9	14.0	17.8	19.8	21.3	22.9	–	19.8	17.6	12.1	10.0	13.3	11.1	10.3	7.3	13.1	15.4	14.0	18.4	20.1	18.8	21.1
24	Purua North	12.1	13.0	10.3	10.5	10.6	15.0	12.8	12.5	13.3	10.9	12.6	13.6	18.3	9.9	13.5	10.0	16.1	16.0	17.6	14.9	16.3	13.8	13.5
25	Rarewarewa – early listen	–	–	–	8.0	10.4	4.6	7.0	6.5	4.6	5.9	5.6	4.8	6.0	–	–	–	–	–	–	–	–	–	–
25	Rarewarewa South	7.5	8.0	8.5	6.6	8.3	6.6	7.0	5.8	6.5	6.6	5.3	6.3	6.6	6.4	8.9	4.0	7.9	6.5	4.6	7.5	7.5	9.1	11.3
26	Mimiwhangata	11.0	5.6	3.5	3.6	0.3	9.4	19.1	20.3	13.8	20.3	14.3	21.0	19.5	12.9	11.0	8.4	–	11.0	9.0	12.1	9.6	10.8	14.6
34	Motatau 1	–	–	–	–	8.8	–	10.0	15.0	6.8	7.5	5.6	6.5	7.5	8.8	6.0	–	4.9	2.5	–	–	4.9	–	–
35	Motatau 2	–	–	–	–	–	–	–	2.7	–	–	1.5	3.0	2.5	–	–	–	4.3	–	5.5	–	–	–	–
36	Motatau 3	–	–	–	–	–	–	4.8	1.5	2.8	5.5	3.5	4.6	4.0	0.9	–	–	5.5	–	–	–	–	–	–
38	Motatau 5	–	–	–	–	–	–	1.5	1.3	0.9	1.0	–	–	–	–	–	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019	2020
Southern				
21	Glenbervie 7A	3.9	3.1	6.1
22	Glenbervie 9A	–	8.1	6.0
283	Glenbervie 10	–	2.5	4.0
284	Glenbervie 11	–	2.4	2.9
296	Glenbervie 14	–	–	1.0
23	Marlow Road	18.4	16.4	1.0
24	Purua North	–	11.0	8.3
25	Rarewarewa – early listen	–	–	17.5
25	Rarewarewa South	10.3	12.9	-
26	Mimiwhangata	9.8	11.1	13.7
34	Motatau 1	–	–	–
35	Motatau 2	–	–	–
36	Motatau 3	–	10.5	–
38	Motatau 5	–	19.5	–

Continued on next page

Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Southern																								
68	Motatatu 9 / Marlow 1	–	–	–	–	–	–	–	11.7	11.8	17.6	13.5	10.5	9.3	2.9	7.1	3.0	9.8	9.9	9.3	5.4	–	11.9	11.8
81	Purua South	–	–	–	–	–	–	–	–	14.8	15.9	14.4	14.1	14.6	10.5	12.5	11.1	17.5	10.8	7.3	18.6	9.5	7.3	11.5
82	Rarewarewa North	–	–	–	–	–	–	–	–	9.8	6.6	4.0	8.5	7.9	10.4	11.8	11.4	11.9	12.1	10.0	7.9	6.9	–	8.1
129	Motatau 10 / Marlow 2	–	–	–	–	–	–	–	–	–	7.1	7.5	10.9	9.0	5.8	2.2	3.4	5.0	5.4	7.8	2.3	4.5	3.9	5.9
139	Hodges Bush	–	–	–	–	–	–	–	–	–	–	9.8	13.0	16.1	17.8	15.5	16.6	9.5	13.8	28.6	22.0	23.1	11.8	16.0
145	Whangaruru	–	–	–	–	–	–	–	–	–	–	–	6.0	6.0	10.3	13.4	10.8	24.3	13.5	9.4	7.8	4.4	10.0	5.4
167	Kaikanui Rd	–	–	–	–	–	–	–	–	–	–	–	–	8.5	11.6	15.0	8.4	7.3	3.8	2.9	–	–	–	–
168	Worsp Rd	–	–	–	–	–	–	–	–	–	–	–	–	1.8	2.4	2.0	5.8	1.4	–	–	–	0.1	2.0	–
264	Whau Valley Dam	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.0	–	–	–	–	–	–
	Tanekaha 1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3.0
	Tanekaha 2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.1
	Hay Rd	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019	2020
Southern				
68	Motatatu 9 / Marlow 1	9.5	13.4	-
81	Purua South	29.8	19.5	20.0
82	Rarewarewa North	6.3	13.4	11.9
129	Motatau 10 / Marlow 2	5.2	5.9	12.0
139	Hodges Bush	15.5	12.8	10.8
145	Whangaruru	3.5	6.0	6.1
167	Kaikanui Rd	–	–	–
168	Worsp Rd	–	–	–
264	Whau Valley Dam	–	–	–
	Tanekaha 1	–	–	–
	Tanekaha 2	–	–	–
	Hay Rd	1.7	–	–

Continued on next page

Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Pukenui																								
285	Pukenui Loop Track	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
286	Whau Valley Dam	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
287	Pukenui Loop by B Line	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
288	Steps on Loop Line (between N and O)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
289	Forest Edge Smithville	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
297	Woods Road Quarry	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
298	Stonelea Way	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
299	Clements Quarry Trig	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
300	Pukenui	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019	2020
Pukenui				
285	Pukenui Loop Track	–	0.5	1.3
286	Whau Valley Dam	–	0.3	0.0
287	Pukenui Loop by B Line	–	0.0	3.3
288	Steps on Loop Line (between N and O)	–	0.3	0.3
289	Forest Edge Smithville	–	1.8	1.0
297	Woods Road Quarry	–	–	0.5
298	Stonelea Way	–	–	0.0
299	Clements Quarry Trig	–	–	0.9
300	Pukenui	–	–	2.1

Continued on next page

Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Western																								
16	Katui	47.6	39.4	20.4	28.2	17.5	16.1	14.4	–	14.9	13.9	–	4.0	–	0.0	–	0.3	–	–	0.0	0.0	–	–	1.5
17	Trounson North	8.5	17.3	12.5	19.0	16.0	14.3	16.1	–	15.3	19.9	22.2	15.4	–	13.8	22.3	5.8	15.1	12.0	10.0	5.3	7.6	9.4	11.1
18	Cathedral	2.3	3.8	5.1	5.5	5.1	1.8	2.8	5.9	5.3	4.9	4.0	4.6	4.4	3.0	1.6	2.8	4.1	2.6	4.4	5.8	7.1	7.1	6.1
19	Waipoua L/Out	30.9	24.4	30.8	27.7	21.4	21.8	14.6	8.4	16.9	22.8	23.0	7.9	11.8	6.0	6.0	9.3	15.6	8.9	10.0	12.5	12.4	12.0	11.6
20	Paerata	9.9	1.3	3.1	6.5	2.8	3.1	1.3	–	0.0	–	–	–	0.9	1.1	1.6	0.3	0.4	1.1	0.3	0.6	–	–	–
31	Te Matua Ngahere	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3.3	4.1	–	–	–	–	1.2	–	3.4
33	Trounson South	–	–	–	–	–	–	12.3	–	23.8	19.1	–	–	8.2	8.9	–	11.1	12.3	10.0	6.0	7.8	7.8	10.5	5.9
79	Toronui Track	–	–	–	–	–	–	–	–	1.8	2.4	–	–	–	–	–	–	–	–	–	–	–	–	–
96	Kawerau Rd Cr	–	–	–	–	–	–	–	–	3.4	2.0	0.3	0.4	1.0	–	–	–	–	–	–	–	–	–	–
157	Opouteke CHH	–	–	–	–	–	–	–	–	–	–	–	6.6	6.1	2.8	11.3	–	–	–	–	–	–	–	–
158	Pipiwai CHH	–	–	–	–	–	–	–	–	–	–	–	7.3	0.5	1.5	–	–	–	–	–	–	–	–	–
179	Marlborough 13	–	–	–	–	–	–	–	–	–	–	–	–	–	6.5	–	–	–	–	–	–	–	–	–
244	Maunganui Bluff	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.0	–	–	–	–
265	River Road	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.0	–	–	–	2.6	–	5.0

STN NO.	STATION NAME	2018	2019	2020
Western				
16	Katui	5.0	1.0	1.3
17	Trounson North	13.5	9.4	–
18	Cathedral	6.0	5.2	2.5
19	Waipoua L/Out	9.6	10.0	–
20	Paerata	–	–	–
31	Te Matua Ngahere	2.0	2.5	2.3
33	Trounson South	7.9	12.5	10.0
79	Toronui Track	–	–	–
96	Kawerau Rd Cr	–	–	–
157	Opouteke CHH	–	–	–
158	Pipiwai CHH	–	–	–
179	Marlborough 13	–	–	–
244	Maunganui Bluff	–	–	–
265	River Road	3.1	–	2.0

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Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Western																								
266	Wekaweka LC 1 (Alf's Cottage)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.2	–	–	–	–	–	–
267	Wekaweka LC 2 (Rob's Place)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.7	–	0.1
268	Wekaweka LC 3 (Libby's track)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.3	–	1.3
	Wekaweka (The drop)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
	Wekaweka (1052 Wekaweka Road)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
13b	Site 13	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.1	–	–	–	–	–	–	–	–
14b	Site 14	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.0	–	–	–	–	–	–	–	–
16b	Marlborough Rd Site 16	–	–	–	–	–	–	–	–	–	–	–	–	–	–	4.4	2.1	1.5	1.4	0.6	2.0	0.4	0.5	1.0
18b	Site 18	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.5	–	–	–	–	–	–	–	–
28b	Site 28 SH12	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6.3	8.9	3.6	4.1	5.1	–	7.6	4.5	8.4
30b	Site 30 SH12	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.0	3.0	0.9	–	–	–	1.5	–	–

STN NO.	STATION NAME	2018	2019	2020
Western				
266	Wekaweka LC 1 (Alf's Cottage)	–	–	–
267	Wekaweka LC 2 (Rob's Place)	–	–	–
268	Wekaweka LC 3 (Libby's track)	–	–	–
	Wekaweka (The drop)	–	–	–
	Wekaweka (1052 Wekaweka Road)	–	0.6	–
13b	Site 13	–	–	–
14b	Site 14	–	–	–
16b	Marlborough Rd Site 16	0.0	1.0	–
18b	Site 18	–	–	–
28b	Site 28 SH12	5.1	6.5	7.2
30b	Site 30 SH12	0.4	–	–

Continued on next page

Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Western																								
31b	Site 31	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.5	–	–	–	–	–	–	–	–
32b	Site 32	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.9	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019	2020
Western				
31b	Site 31	–	–	–
32b	Site 32	–	–	–

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Tawharanui																								
161	TWN 1 Marine triangle	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8.2	0.5	–	1.3	2.3	2.9	2.6	4.0	4.4
162	TWN 2 Trig triangle	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.2	0.7	–	3.9	1.9	1.3	2.9	6.6	5.9
163	TWN 3 Top ecology track	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.5	0.3	–	1.6	2.0	4.6	6.0	5.0	4.5
164	TWN 4 Possum gully	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.0	0.0	–	2.8	1.4	8.0	2.8	4.6	2.4
165	TWN 5 Twin hills	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.2	0.0	–	2.3	1.9	3.3	3.5	6.8	7.3
166	TWN 6 South coast water tank	–	–	–	–	–	–	–	–	–	–	–	–	–	–	0.8	0.3	–	4.9	6.5	8.0	9.5	6.4	3.0

STN NO.	STATION NAME	2018	2019	2020
Tawharanui				
161	TWN 1 Marine triangle	4.1	0.9	1.0
162	TWN 2 Trig triangle	10.8	7.9	8.0
163	TWN 3 Top ecology track	4.4	4.9	2.5
164	TWN 4 Possum gully	7.0	4.8	4.0
165	TWN 5 Twin hills	4.8	6.4	5.0
166	TWN 6 South coast water tank	12.6	11.6	12.1

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Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Kawau Island																								
269	Bostaquet Bay	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	5.57	–	–	–	–	–
270	South Cove	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.40	–	–	–	–	–
277	Skid 1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.8	1.1	2.3
278	Skid 2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.7	1.5	2.8
279	Harris Bay	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	2.1	3.1	3.5

STN NO.	STATION NAME	2018	2019	2020
Kawau Island				
269	Bostaquet Bay	–	–	–
270	South Cove	–	–	–
277	Skid 1	2.4	3.5	–
278	Skid 2	2.8	2.2	–
279	Harris Bay	2.8	2.3	–

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Piroa																								
290	1 PBL Trig	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
291	2 Cullen	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019	2020
Piroa				
290	1 PBL Trig	–	1.5	1.6
291	2 Cullen	–	1.8	–

Continued on next page

Appendix 2 continued

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Maranui																								
253	Marunui 1 (House 17 deck)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.1	2.6	4.3	3.3
275	Marunui 2 (Pebblebrook Rd)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.7	3.0	6.9

STN NO.	STATION NAME	2018	2019	2020
Maranui				
253	Marunui 1 (House 17 deck)	5.6	3.6	4.0
275	Marunui 2 (Pebblebrook Rd)	3.5	–	–

STN NO.	STATION NAME	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Mataia																								
254	Mataia 1 KLD (Top of fishing track)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.0	–	–	4.0
255	Mataia 2 KLD (Mid pa track)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.5	–	0.5	1.9
	Mataia 3 KLD (Cliffs)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1.8	–
280	Mataia 4 (Quarry)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
281	Mataia 5 (Hooper's Bush)	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

STN NO.	STATION NAME	2018	2019	2020
Mataia				
254	Mataia 1 KLD (Top of fishing track)	–	–	7.8
255	Mataia 2 KLD (Mid pa track)	–	–	3.0
	Mataia 3 KLD (Cliffs)	–	–	–
280	Mataia 4 (Quarry)	–	–	2.1
281	Mataia 5 (Hooper's Bush)	–	2.3	2.0

Appendix 3

Summary of Northland kiwi listening data (calls/hr) for stations listened from in 2020

STN NO.	STATION NAME	LISTENER	1		2		3		4		TOTAL	MEAN
			1	*2*	*1*	*2*	*1*	*2*	*1*	*2*		
Northern												
1	Digger's Valley	R Renwick	1	0	0	0	0	2	1	1	5	0.63
5	Kaiaka	ALD	6	10	2	3	0	1	0	2	24	3.00
7	Puketi	D O'Halloran	3	1	9	8	2	5	2	2	32	4.00
8	Puketi SR	R&B Hall	16	13	9	13	7	12	4	7	81	10.13
Mangatete												
3	Lightning Hill	L Baigent	5	5	14	7	4	5	17	8	65	8.13
256	Home drive	A&L Baigent	5	6	14	6	12	13	11	14	81	10.13
Honeymoon Valley												
301	NZFRT reserve, campsite	ALD	0	1	2	0	1	0	5	5	14	1.75
271	Green Bach	ALD	1	1	0	0	0	0	0	-	2	0.29
Whakaangi												
132	Wha 3	Aldrich/Vujcich	3	5	6	3	–	–	–	–	17	4.25
29	Wha 4	G Seon	1	6	15	5	2	3	–	–	32	5.33
133	Wha 5	D Bell	5	9	1	2	1	6	8	4	36	4.50
135	Wha 7	B Jarvis	1	4	3	1	1	1	1	0	12	1.50
136	Wha 8	P&P Johnston	2	12	7	8	4	9	-	-	42	7.00
247	Wha 12	I Palmer	5	1	9	12	5	1	2	7	42	5.25
248	Wha 13	J Prince	0	3	5	4	3	2	–	–	17	2.83
250	Seon's gate 17	T Seon	0	3	12	12	3	4	–	–	34	5.67
Mahinepua												
90	Site 0	N&M Cox/N Redmond/ L Lucas	0	5	2	0	2	0	5	1	15	1.88
83	Site 1	W Ferrell/Gilhespy	0	4	4	0	2	1	6	5	22	2.75
84	Site 2	S Moore/M Wilson	14	2	4	5	3	2	12	4	46	5.75
85	Site 3	F&L Barnes/K Herewini	8	7	4	7	9	12	7	11	65	8.13
88	Site 4	S Wright/M Cox/L Lucas	13	17	15	17	19	22	17	22	142	17.75
99	Site 13	M Schmid	24	22	18	15	29	23	23	26	180	22.50
Eastern												
12	Rangitane	D Wright	14	21	13	5	9	16	11	12	101	12.63
13	Waitangi No. 12	D Lawson	2	1	4	2	14	5	3	1	32	4.00
14	Mt Bledisloe	Madeleine P/Laura M	2	6	9	8	3	17	9	10	64	8.00
15	Tikitikikiore	L Gordon	14	21	17	19	11	10	38	19	149	18.63
Bay of Islands												
303	Waitangi Forest/ Te Puke	M Schmid	7	10	4	5	20	8	17	6	77	9.63
304	Blue Penguin Drive	G Boocock	13	19	14	9	13	13	11	5	97	12.13
305	Rangitane River Park	R Holman	17	13	19	18	17	8	–	–	92	15.33
208	Takou Bay	M Phillips	3	5	4	1	0	0	–	–	13	2.17
Russell												
59	Opito Farms	L Gordon	24	5	12	12	-	-	-	-	53	13.25
60	Te Maiki / Flagstaff	K Lawton	23	10	21	14	17	10	20	8	123	15.38
62	Uruti Road	C Richmond	15	10	8	19	19	9	17	13	110	13.75
170	Nikau Block	L Gordon	8	16	7	5	11	6	11	9	73	9.13

Continued on next page

Appendix 3 continued

STN NO.	STATION NAME	LISTENER	1		2		3		4		TOTAL	MEAN
			1	*2*	*1*	*2*	*1*	*2*	*1*	*2*		
171	Mace/Farmer	L Gordon	35	11	21	15	–	–	–	–	82	20.50
172	Pipiroa	M Pasco	3	2	8	1	5	8	9	7	43	5.38
173	Shortlands	M Cadogan	6	5	4	7	4	9	3	6	44	5.50
174	Johnsons	M Frankum	12	9	17	8	15	12	14	9	96	12.00
177	Solomons Gate	S Sharpe	3	3	16	6	5	3	11	9	56	7.00
Puketi Forest												
104	Pond	P Magon/I Wilson et al.	4	8	5	5	2	2	2	2	30	3.75
106	Takapau Track	P Hodgson	2	2	2	0	5	3	2	2	18	2.25
107	Takapau / Pirau Rd Jn	A Blackmore/I Wilson	0	0	6	5	2	2	3	3	21	2.63
108	Totara Ridge	T Adcock/A Blackmore/ I Wilson	1	1	2	0	0	2	2	1	9	1.13
109	Waihoanga Gorge	C&R Robinson	4	4	6	3	4	5	5	4	35	4.38
111	Walnut	G Adams/K Whittaker	0	2	0	0	2	1	1	1	7	0.88
112	Stoat line 9 – Puketi	C Beaver/B Sutton	0	1	0	0	–	–	–	–	1	0.25
259	Nature Trail	N&E Walker	1	10	2	5	3	5	0	4	30	3.75
Hupara												
258	HLC 1	S. Brown	46	27	47	48	22	29	19	21	259	32.38
257	HLC 4	S. Brown	13	12	19	16	16	16	10	9	111	13.88
294	HLC Harrison's Property	D Harrison	26	38	49	39	50	38	44	24	308	38.50
Waimate North												
113	W1	N&S Brown	28	25	39	21	40	17	36	13	219	27.38
114	W2	John D	5	9	5	6	10	4	8	8	55	6.88
116	W4	H Horrobin	15	12	10	27	15	13	9	10	111	13.88
118	W6	T Upperton	28	25	18	24	23	8	16	13	155	19.38
120	W8	Anne C	4	4	4	5	3	3	5	3	31	3.88
121	W9	D Way/P Saunders	10	5	4	3	4	2	4	2	34	4.25
122	W10	Phillip S	17	7	9	12	9	9	15	3	81	10.13
124	W12	Daryl W	8	2	5	7	7	3	10	4	46	5.75
127	W14	A Jones/A Brindle	2	3	1	1	0	0	2	2	11	1.38
Sandy Bay												
27	Sandy Bay 1	N Pullman	10	8	6	3	6	4	0	9	46	5.75
260	Sandy Bay 2	ALD	0	2	0	1	0	1	2	0	6	0.75
261	Sandy Bay 3	ALD	5	2	3	6	3	1	7	0	27	3.38
292	Sandy Bay farms	ALD	2	4	3	1	5	4	8	1	28	3.50
293	Te Toiroa	ALD	13	3	3	6	5	4	2	10	46	5.75
Tutukaka												
125	TLC 1	M Camm	7	4	11	11	9	6	15	7	70	8.75
126	TLC 2	N Davies	4	9	5	2	16	5	8	11	60	7.50
142	TLC 3	Wendy A	4	2	11	2	3	1	0	0	23	2.88
295	TLC Ngahere Pines	ALD	17	15	22	12	13	11	12	7	109	13.63
306	Gunther	ALD	14	10	6	13	12	8	11	12	86	10.75
Matapouri												
308	Otito N Reserve	K Raines	0	0	0	0	0	0	–	–	0	0.00
309	Morrison Ridge Track	M Houba	0	0	0	0	0	0	–	–	0	0.00
Whananaki												
310	North Onekainga	S&A McCusker	2	1	0	0	0	2	–	–	5	0.83
311	Harman Farms Lookout	S&A McCusker	3	3	0	2	0	2	–	–	10	1.67
312	Dawson's Property	S&A McCusker	10	4	0	4	1	4	2	3	28	3.50
313	Hailes Road	S&A McCusker	1	5	8	6	5	1	–	–	26	4.33

Continued on next page

Appendix 3 continued

STN NO.	STATION NAME	LISTENER	1		2		3		4		TOTAL	MEAN
			1	*2*	*1*	*2*	*1*	*2*	*1*	*2*		
Whangarei Heads												
39	Bream Head 1	W Newbold	24	6	7	5	–	–	–	–	42	10.50
41	Bream Head 3	A Petel/A Van Poldren Petel	3	1	1	6	2	5	–	–	18	3.00
42	Bream Head 4	A Willetts	17	3	–	–	–	–	–	–	20	10.00
69	Bream Head 6	C Cook	7	3	4	3	4	1	4	3	29	3.63
54	Kauri Mt 1	M Barteldres	2	3	8	2	2	2	6	1	26	3.25
72	Kauri Mt 2	J Nairn	4	3	5	3	5	3	2	6	31	3.88
73	Kauri Mt 3	P Olsen/ALD	6	3	1	7	4	7	4	3	35	4.38
74	Kauri Mt 4	G&R Faber	1	11	11	2	–	–	–	–	25	6.25
141	Kauri Mt 5	L Brown	6	6	6	7	8	2	6	8	49	6.13
47	Manaia 1	L Ogle	7	9	5	10	9	4	11	20	75	9.38
48	Manaia 2	F Clayton	7	13	22	19	21	19	25	42	168	21.00
49	Manaia 3	P Richards	3	6	9	11	4	4	6	11	54	6.75
71	Manaia 8	W Fieldhouse/L Penney	4	2	10	6	13	9	8	0	52	6.50
56	Nook 2	C Brown	7	1	5	9	4	2	4	2	34	4.25
45	Taurikura 2	G Pike/R Dean	13	8	4	12	11	4	7	14	73	9.13
46	Taurikura 3	K Lange	1	3	1	6	9	1	6	6	33	4.13
263	Craig Rd	C&J McNamara	12	13	6	15	3	17	15	13	94	11.75
75	McLeod Bay	W&V Biddle	9	6	2	2	9	1	12	8	49	6.13
302	Owhiwa Rd Kauri Villas	Pauline G	0	0	0	0	0	0	0	0	0	0.00
Southern												
21	Glenbervie 7A	ALD	12	5	4	7	6	0	11	4	49	6.13
22	Glenbervie 9A	ALD	3	3	5	7	10	5	7	8	48	6.00
283	Glenbervie 10	ALD	7	3	5	0	7	3	3	4	32	4.00
284	Glenbervie 11	ALD	0	7	2	1	3	4	5	1	23	2.88
296	Glenbervie 14 (new)	ALD	0	1	0	1	0	1	3	2	8	1.00
24	Purua N	Julia B	34	8	20	14	16	22	16	10	140	17.50
81	Purua S	Ayla W	30	10	20	22	24	19	17	18	160	20.00
25	Rarewarewa N	C Robles	10	14	20	9	17	12	–	–	82	13.67
82	Rarewarewa S	C Robles	10	10	15	10	22	8	18	2	95	11.88
139	Hodges	G Lovell	3	12	16	1	20	4	23	7	86	10.75
23	Marlow Road	Julia B	9	13	6	8	2	12	–	–	50	8.33
145	Whangaruru	R&D Hughes	5	5	4	9	5	8	6	7	49	6.13
129	Motatau 10	I&A King	2	14	13	18	13	18	5	13	96	12.00
68	Motatau 9	I King	16	7	18	7	8	6	8	12	82	10.25
Pukenui												
297	Woods Rd Quarry (new)	S Morgan	1	0	–	–	–	–	–	–	1	0.50
285	Pukenui Loop Track	Julia B/B Cramp	5	0	2	0	3	0	0	0	10	1.25
287	Pukenui Loop – B line	B Cramp/B Lovell	3	2	6	2	–	–	–	–	13	3.25
298	Stonelea Way (new)	S Milner/S Hughes	0	0	0	0	0	0	–	–	0	0.00
288	1st steps N&O lines	T Thompson	0	0	0	1	–	–	–	–	1	0.25
289	Forest edge Smithville	F Douglas	0	2	–	–	–	–	–	–	2	1.00
286	Whau Valley Dam	B Cramp	0	0	–	–	–	–	–	–	0	0.00
299	Clements Quarry trig (new)	B Lovell	3	1	1	0	0	1	1	0	7	0.88
300	Pukenui (new)	Fiona D	4	2	3	2	2	2	1	1	17	2.13
Piroa												
290	1 PBL Trig	A Neill	1	1	3	1	2	1	3	1	13	1.63

Continued on next page

Appendix 3 continued

STN NO.	STATION NAME	LISTENER	1		2		3		4		TOTAL	MEAN
			1	*2*	*1*	*2*	*1*	*2*	*1*	*2*		
Western												
16	Katui	A Meduna	1	0	0	4	–	–	–	–	5	1.25
18	Cathedral	J McLaughlin	1	3	4	2	–	–	–	–	10	2.50
31	Te Matua Ngahere	K Donovan	6	0	3	0	–	–	–	–	9	2.25
33	Trounson Sth	R Booth	13	6	19	2	–	–	–	–	40	10.00
265	River Road	A McLeod	3	0	1	4	–	–	–	–	8	2.00
28b	Site 28 SH12	M Topia	10	5	6	12	3	7	–	–	43	7.17
Tawharanui												
161	TWN 1 Marine triangle	C Wards/C Crosby et al.	2	1	1	0	2	1	0	1	8	1.00
162	TWN 2 Trig triangle	S Halliwell/N Wallen et al.	1	1	8	14	9	15	7	9	64	8.00
163	TWN 3 Top ecology track	D&H Denee et al.	0	4	3	1	4	4	2	2	20	2.50
164	TWN 4 Possum gully	Vandervolk/Gregorie et al.	7	1	1	5	8	4	4	2	32	4.00
165	TWN 5 Twin hills	R Blackburn/Maggie et al.	6	11	5	5	6	6	0	1	40	5.00
166	TWN 6 South coast water tank	R&P Williams	13	9	16	7	12	19	8	13	97	12.13
Marunui												
253	House 17 Deck	J. Hawley	2	5	1	8	0	8	4	4	32	4.00
Mataia												
254	Mataia 1	ALD	9	3	14	4	12	3	11	6	62	7.75
255	Mataia 2	ALD	4	1	3	2	4	4	2	4	24	3.00
280	Mataia 4 (Quarry)	ALD	3	1	2	1	3	3	4	0	17	2.13
281	Mataia 5 (Hooper's)	ALD	1	–	3	–	2	–	–	–	6	2.00

Appendix 4

Trends in mean kiwi call rates (calls/hr) from annual monitoring at selected stations of managed Northland kiwi populations

AREA	NO. STNs	STATION NUMBERS	2019 STATION NUMBERS	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Mangatete	2	3, 256	3, 256	–	–	–	–	–	–	–	–	–	–	–	11.0	15.9	17.9	15.9	17.6	13.2	9.1
Honeymoon Valley	4	271–274	insufficient data	–	–	–	–	–	–	–	–	–	–	–	–	1.5	–	–	–	–	–
Whakaangi	7–9	29, 130–137	29, 132, 133, 135, 136	–	–	11.8	10.7	10.1	10.8	11.7	12.2	10.9	9.9	7.3	6.5	8.1	4.7	4.0	4.0	2.1	4.5
Mahinepua-Radar Hill	8	83–85, 87–89, 98, 99	83, 84, 85, 88, 99	–	3.6	2.8	4.9	2.7	1.9	2.5	4.7	5.5	10.2	6.7	5.7	6.5	7.8	7.5	11.0	4.7	11.4
Russell Peninsula	5	15, 59, 62, 170, 173	15, 59, 62, 170, 173	–	–	4.5	4.0	7.0	5.4	4.6	5.5	11.5	9.8	11.4	12.8	13.8	19.7	11.3	16.5	7.4	12.1
Puketi Forest	6	102, 104–106, 108, 111	104, 106, 108, 111	–	–	–	2.9	1.2	1.5	3.7	3.0	4.3	4.1	3.6	5.7	2.9	4.2	3.5	6.0	4.2	2.0
Hupara	3–4	245, 246, 257, 258	257, 258	–	–	–	–	–	–	–	–	–	–	18.5	14.7	16.7	21.8	16.8	22.3	17.7	23.1
Waimate North	6	113, 114, 118, 120, 122, 124	113, 114, 118, 120, 122, 124	–	10.5	4.3	–	6.8	6.5	4.7	8.1	9.0	8.4	6.6	8.6	8.1	7.6	7.8	10.9	7.3	12.2
Sandy Bay	3	27, 260, 261	27, 260, 261	–	–	–	–	–	–	–	3.3	–	4.2	4.3	3.7	4.5	6.9	7.0	4.9	2.5	3.3
Tutukaka	6	125, 126, 142, 143, 144, 28	125, 126, 142	–	–	6.2	7.3	8.2	8.7	5.7	6.8	7.0	10.2	9.6	6.3	7.5	9.9	15.3	12.5	11.0	6.4
Manaia-Nook	5	47–49, 56, 71	47–49, 56, 71	3.1	3.5	2.9	3.9	–	4.6	4.4	6.3	7.3	7.8	6.4	6.8	5.8	8.2	8.8	9.0	4.8	9.6
Kauri Mountain	5	54, 72–74,141	54, 72–74, 141	–	–	3.3	2.2	–	2.6	3.0	2.5	4.1	4.0	3.8	5.0	5.4	7.7	7.1	5.5	5.1	4.8
Bream Head-Taurikura	5	39, 41, 42, 44, 69	39, 41, 42, 69	–	–	2.5	2.6	2.2	3.2	4.3	2.7	6.6	7.1	8.7	6.2	7.5	6.9	5.8	6.9	5.9	6.8
Motatau-Marlow	6	23, 34–36, 68, 129	23, 68, 129	–	–	7.3	7.6	7.5	4.9	6.4	4.5	7.1	8.3	9.1	8.7	9.8	11.5	12.9	11.0	10.9	10.2
Purua-Rarewarewa	5	24, 25, 81, 82, 139	24, 25, 81, 82, 139	–	–	9.2	11.1	12.7	10.9	12.4	10.6	12.6	11.8	13.6	14.2	12.7	10.5	12.1	15.4	13.9	14.8
Waipoua	5	16–19, 33	16–19, 33	13.1	15.4	15.8	8.0	8.9	5.7	7.5	4.5	11.8	8.4	6.1	5.6	8.7	9.8	7.3	8.4	7.6	4.6
Tawharanui	6	161–166	161–166	–	–	–	–	–	–	2.3	0.3	–	2.8	2.65	4.7	4.5	5.6	4.6	7.3	6.1	5.4
Maranui	2	253, 275	Insufficient data	–	–	–	–	–	–	–	–	–	–	–	1.1	2.2	3.6	5.1	4.6	–	–
Mataia	2	254, 255	254, 255	–	–	–	–	–	–	–	–	–	–	–	1.3	–	1.1	2.9	–	3.6	5.4
Kawau	3	277, 278, 279	No data for 2020	–	–	–	–	–	–	–	–	–	–	–	–	1.9	1.9	2.9	2.7	2.7	–

Note: In previous reports up to 2009: where a single station was not covered, the previous year's results were used. However, some of the stations had not been listened from for several years, so the mean call count rates for the data from 2010 and beyond were calculated only from the relevant stations listened from for that year. If only one station is listened from, no mean is given for that cluster.