Boffa Miskell

Memorandum

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Attention:	Damien Barr
Company:	WMS Group
Date:	30/11/2023
From:	Karin Sievwright and Scott Hooson – Boffa Miskell Ecologists
Message Ref:	Mananui Sand Mining - Forest and Wetland Bird Survey Memorandum
Project No:	BM230754

Introduction

Westland Mineral Sands (WMS Group) is seeking approval to mine sand at a farm 7 km south of Hokitika on the West Coast. Mining will predominantly occur in pasture as well as in some small forest fragments that will be cleared on site. The eastern component of the site includes a bush escarpment and part of the Māhinuapua Creek Wetland; the southern boundary of the site is Lake Māhinapua Scenic Reserve (Figure 1). Mining will not occur in these areas however a spring wetland and forest bird survey was required to assess light and noise effects on bird species using these areas adjacent to the site. This memorandum summarises the methods and results of the surveys.

The scope of work for these surveys was to:

- Conduct presence / absence wetland bird surveys in the wetland adjacent to the site.
- Conduct forest bird surveys in the Lake Māhinapua Scenic Reserve (public conservation land) that borders the southern boundary of the site and in the forest fragments that are proposed to be cleared on site.
- Prepare a memorandum summarising the methods and results of the bird surveys[1].

Methods

Between 7 and 9 November 2023, Karin Sievwright and Jake Ball (Ornithologists, Boffa Miskell) conducted surveys for forest and wetland birds at the Mananui sand mining site and surrounds (Figure 1). Three survey methods were employed as described below. Incidental observations of bird species observed were also recorded as described below. Survey dates, times and weather conditions are summarised in Appendix 1.

Bioacoustic monitoring was not conducted as we were informed by Dr. Vaughan Keesing that this was not required as the other survey methods would provide a sufficient level of effort for what is required at this stage.

Five-Minute Bird Counts

Five-minute bird counts (5MBCs) were conducted at 11 locations in the forest fragments on the site that are proposed to be cleared. The counts were conducted at ~200 m spacings along two transects (Figure 1). Birds seen and heard in the surrounding pasture were also recorded.

Five-minute bird counts were also conducted at eight locations in the Lake Māhinapua Scenic Reserve (public conservation land) that borders the southern boundary of the site. The counts were conducted along two transects, one 50 m from the boundary of the site and one 250 m from the boundary of the site, at ~200 m spacings (Figure 1).

[1] Preparation of an ecological impact assessment or detailed survey report are outside the scope of the work.

Each survey location was surveyed twice, once in the morning and once in the afternoon, to account for temporal variation in bird activity. The surveys followed the standard 5MBC methodology (Dawson & Bull, 1975).

Point Counts (Dawn)

Two dawn point count surveys were conducted at ten locations on the margins of Māhinapua Creek Wetland that partially lies within the eastern margin of the site. The counts were conducted at ~200 m spacings and spanned ten minutes (Figure 1). The purpose of the counts was to determine presence / absence of Australasian bittern (*Botaurus poiciloptilus*) and marsh crake (*Porzana pusilla affinis*). Marsh crake calls were played through a UE boom speaker at each count location to elicit a potential response. Bittern calls were not played. The counts were conducted approximately 1.5 hours before and after sunrise and the methods were based on the Department of Conservation's (DOC) protocols for monitoring these species and slightly adapted to suit monitoring both species at once (Department of Conservation, 2009a, 2009c). Any bittern or marsh crake seen or heard were recorded and their approximate location mapped. Although the dawn surveys were not specifically targeting South Island fernbird or spotless crake, records were made if these species were seen or heard.

Point Counts (Daytime)

Two daytime point count surveys were conducted at the same ten locations as the dawn point counts (Figure 1); each count spanned ten minutes. The purpose of the daytime point counts was to determine presence / absence of South Island fernbird (*Poodytes punctatus punctatus*) and spotless crake (*Porzana tabuensis tabuensis*). Spotless crake calls were played through a UE boom speaker at each count location to elicit a potential response. Fernbird calls were not played. The survey method was based on the DOC protocols for monitoring these species and slightly adapted to suit monitoring both species at once (Department of Conservation, 2009b, 2009d). Any fernbird or spotless crake seen or heard were recorded and their approximate location mapped. Although the daytime surveys were not specifically targeting bittern or marsh crake, these species were recorded if they were seen or heard.

Incidental Observations

Records were also kept of any bird species incidentally observed outside of the formal survey periods either on site, in the Māhinapua Creek Wetland or in the Lake Māhinapua Scenic Reserve.

Mananui

Mahinapua Creek/Tūwharewhare

Conservation Area - Mahināpua Creek/Tūwharewhare

Ruatapu Rd

Conservation Area - Mananui Bush

Lake Mahinapua Scenic Reserve

Lake Mahinapua Reserve

Grebe Bay

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Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

- Site
- DOC Reserve 5-MBC Transect
- Forest Fragment 5-MBC Transect
- Wetland Point Count
- Conservation Area
- Reserve
- Wetland (WCRC)
- Proposed Mining Area

MANANUI BIRD SURVEY

Bird Survey Locations

Date: 30 November 2023 | Revision: C

Plan prepared for WMS Group by Boffa Miskell Limited

Project Manager: Karin.Sievwright@boffamiskell.co.nz | Drawn: JWa | Checked: KSi

Figure 1

Results

Five-Minute Bird Counts

Twenty-five bird species were recorded during the 5MBCs conducted in the forest fragments on site, including 14 indigenous species and 11 introduced species. One Threatened species was recorded, Australasian bittern. The bittern was heard in the adjacent Māhinapua Creek Wetland. All other indigenous species recorded are Not Threatened. The most common species observed were chaffinch, bellbird and paradise shelduck (Table 1). The raw data is provided in Appendix 2.

Table 1. Forest fragment 5MBC results summary (sorted by total number of observations).

Species		**Conservation Status**	**Seen**	**Heard**	**Total Obs.**
Chaffinch	*Fringilla coelebs*	Introduced	8	48	56
Bellbird / Korimako	*Anthornis melanura*	Not Threatened	2	32	34
Paradise shelduck / Pūtangitangi	*Tadorna variegata*	Not Threatened	10	20	30
Grey warbler / Riroriro	*Gerygone igata*	Not Threatened	0	23	23
Pukeko	*Porphyrio melanotus*	Not Threatened	9	13	22
Silvereye / Tauhou	*Zosterops lateralis*	Not Threatened	0	21	21
South Island fantail / Pīwakawaka	*Rhipidura f. fuliginosa*	Not Threatened	5	11	16
Song thrush	*Turdus philomelos*	Introduced	3	12	15
Goldfinch	*Carduelis carduelis*	Introduced	7	7	14
Blackbird	*Turdus merula*	Introduced	1	9	10
Harrier hawk / Kahu	*Circus approximans*	Not Threatened	8	0	8
Mallard duck	*Anas platyrhynchos*	Introduced	4	2	6
New Zealand pigeon / Kereru	*Hemiphaga novaeseelandiae*	Not Threatened	5	1	6
Starling	*Sturnus vulgaris*	Introduced	5	0	5
Spur-winged plover	*Vanellus miles novaehollandiae*	Not Threatened	0	4	4
Greenfinch	*Carduelis chloris*	Introduced	0	4	4
Redpoll	*Carduelis flammea*	Introduced	2	2	4
Tui	*Prosthemadera novaeseelandiae*	Not Threatened	1	3	4
Welcome swallow / Warou	*Hirundo neoxena*	Not Threatened	3	0	3
Skylark	*Alauda arvensis*	Introduced	0	2	2
Canada goose	*Branta canadensis*	Introduced	0	1	1
Black-backed gull / Karoro	*Larus dominicanus*	Not Threatened	0	1	1
South Island tomtit / Miromiro	*Petroica macrocephala macrocephala*	Not Threatened	0	1	1
Australasian bittern / Matuku hūrepo	*Botaurus poiciloptilus*	Threatened – Nationally Critical	0	1	1
Australian magpie	*Gymnorhina tibicen*	Introduced	1	0	1
Total			**74**	**218**	**292**

Sixteen species were recorded during the 5MBCs conducted in the Māhinapua Scenic Reserve, including 11 indigenous species and five introduced species. One At Risk species was recorded, South Island pied oystercatcher (SIPO). The SIPO was heard flying overhead. All other indigenous species recorded are Not Threatened. The most common species observed were bellbird, chaffinch and grey warbler (Table 2). The raw data is provided in Appendix 3.

Table 2. Māhinapua Scenic Reserve 5MBC results summary.

Species		Conservation Status	Seen	Heard	Total Obs.
Bellbird / Korimako	*Anthornis melanura*	Not Threatened	0	26	26
Chaffinch	*Fringilla coelebs*	Introduced	1	20	21
Grey warbler / Riroriro	*Gerygone igata*	Not Threatened	0	18	18
South Island fantail / Pīwakawaka	*Rhipidura f. fuliginosa*	Not Threatened	2	14	16
Silvereye / Tauhou	*Zosterops lateralis*	Not Threatened	0	12	12
Song thrush	*Turdus philomelos*	Introduced	0	12	12
Blackbird	*Turdus merula*	Introduced	1	8	9
Pukeko	*Porphyrio melanotus*	Not Threatened	0	6	6
Paradise shelduck / Pūtangitangi	*Tadorna variegata*	Not Threatened	0	4	4
New Zealand pigeon / Kereru	*Hemiphaga novaeseelandiae*	Not Threatened	1	3	4
Goldfinch	*Carduelis carduelis*	Introduced	0	2	2
Tui	*Prosthemadera novaeseelandiae*	Not Threatened	0	1	1
Kingfisher / Kotare	*Todiramphus sanctus vagans*	Not Threatened	0	1	1
South Island pied oystercatcher / Tōrea pango	*Haematopus finschi*	At Risk – Declining	0	1	1
Canada goose	*Branta canadensis*	Introduced	0	1	1
South Island tomtit / Miromiro	*Petroica macrocephala macrocephala*	Not Threatened	0	1	1

Point Counts – Dawn and Daytime

During the wetland point count surveys Australasian bittern and South Island fernbird were detected. Bittern were heard at six point count locations (Table 3, Figure 2) and based on the direction and volume of the calls it is likely that this represented two individuals, one that was repeatedly heard at the southern extent of the survey transect in rushland, and one near the northern extent of the survey transect in an area of open water bordered by flaxland (Table 3). Fernbird were both heard and seen in rushland in the southern extent of the survey transect at point count locations 1, 2 and 3 (Table 3, Figure 2); the surveyors considered that the observations were likely of two individuals.

Over the point count survey duration, four incidental bittern observations (calls heard) were made while walking between point count locations 1, 2, 3 and 4. All calls were heard to the south and are assumed to be the same individual heard during the point counts.

Table 3. Wetland bird survey results summary. PC stands for Point Count.

PC Site	Daytime – survey 1	Daytime – survey 2	Dawn – survey 1	Dawn – survey 2
1	1 bittern heard	-	1 bittern & 1 fernbird heard	1 fernbird heard then seen
2	-	1 bittern heard & 1 fernbird heard then seen	1 bittern heard	1 fernbird heard
3	1 bittern heard	-	1 bittern & 1 fernbird heard	1 bittern heard
4	-	1 bittern heard	1 bittern heard	1 bittern heard
5	-	1 bittern heard	-	1 bittern heard
6	-	-	-	-
7	-	-	-	-
8	-	-	-	1 bittern heard
9	-	-	-	-
10	-	-	-	-

File Ref: U:\2023\BM230754_KSi_Mananui_bird_survey\GIS\BM230754.aprx BM230754_WetlandBirdSurveyResults_A3P 2:45 pm

Mananui

Mahinapua Creek/Tūwharewhare

Conservation Area - Mahināpua Creek/Tūwharewhare

Ruatapu Rd

Conservation Area - Mananui Bush

Lake Mahinapua Scenic Reserve

Lake Mahinapua Reserve

Grebe Bay

1 2 3 4 5 6 7 8 9 10

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Projection: NZGD 2000 New Zealand Transverse Mercator

DRAFT

LEGEND

- Site
- Wetland Bird Survey Location
- None
- Bittern Only
- Bittern and Fernbird
- Incidental Bittern Observation
- Conservation Area
- Reserve
- Wetland (WCRC)
- Proposed Mining Area

MANANUI BIRD SURVEY

Wetland Bird Survey Results

Date: 30 November 2023 | Revision: C

Plan prepared for WMS Group by Boffa Miskell Limited

Project Manager: Karin.Sievwright@boffamiskell.co.nz | Drawn: JWa | Checked: KSi

Figure 2

Incidental Observations

Eight species not recorded during the formal surveys were incidentally observed (seen and or heard) as summarised in Table 4. All incidental observations were of indigenous species, including one Threatened species, two At Risk species and five Not Threatened species.

Table 4. Incidental observations.

Species		Conservation Status	Location
White heron / Kōtuku	*Ardea modesta*	Threatened – Nationally Critical	Māhinapua Creek Wetland and overflying the site
Black shag / Kawau pū	*Phalacrocorax carbo novaehollandiae*	At Risk – Relict	Māhinapua Creek Wetland
Little shag / Kawau paka	*Phalacrocorax melanoleucos brevirostris*	At Risk – Relict	Māhinapua Creek Wetland
Pied stilt / Poaka	*Himantopus leucocephalus*	Not Threatened	Pond in pasture on site
Australasian shoveler / Kuruwhengi	*Ana rhynchotis*	Not Threatened	Pond in pasture on site
Grey teal / Tētē-moroiti	*Anas gracilis*	Not Threatened	Pond in pasture on site
Morepork / Ruru	*Ninox novaeseelandiae*	Not Threatened	Wetland / forest edge
Black swan / Kakīānau	*Cygnus atratus*	Not Threatened	Wetland

Yours sincerely,

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References

Dawson, D. G., & Bull, P. C. (1975). Counting birds in New Zealand forests. *Notornis*, *22*(2), 101–109.

Department of Conservation. (2009a). *Australasian bittern: Draft protocols for index counts*. Department of Conservation.

Department of Conservation. (2009b). *Fernbird: Draft protocol for index counts* (DOCDM-487723). Department of Conservation.

Department of Conservation. (2009c). *Marsh crake: Draft protocol for index counts, Ashburton Lakes*. Department of Conservation.

Department of Conservation. (2009d). *Spotless crake: Draft protocols for index counts* (pp. 1–2). Department of Conservation.

Photos

Photo 1. The southern extent of the forest fragments looking north.

Photo 2. Looking towards a forest fragment on site with the Māhinapua Scenic Reserve boundary on the right.

Photo 3. Contextual photo showing one of the forest fragments on site.

Photo 4. Contextual photo showing the farmland on site with the forest fragments to the east.

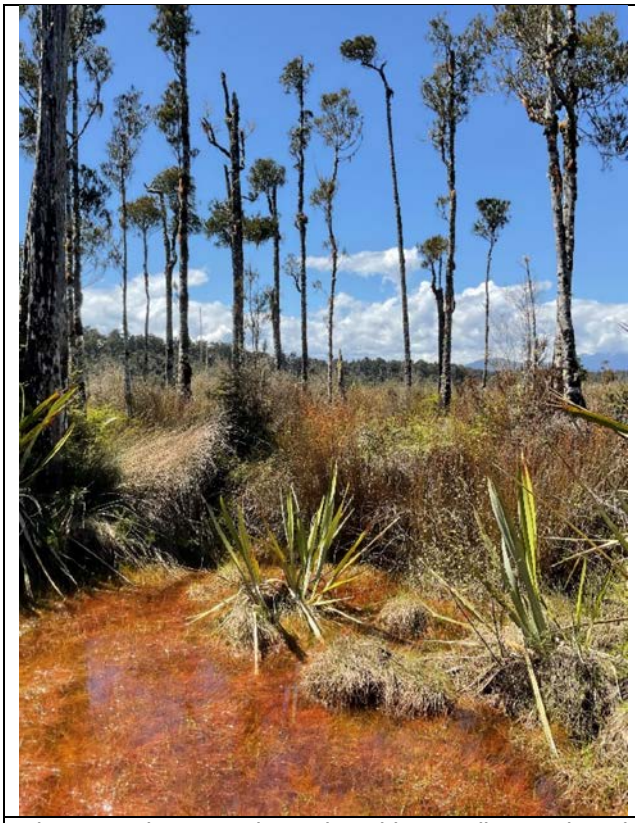

Photo 5. Point count site 1 where bittern calls were heard and fernbird were seen and heard.

Photo 6. Point count site 4 where bittern calls were heard to the south.

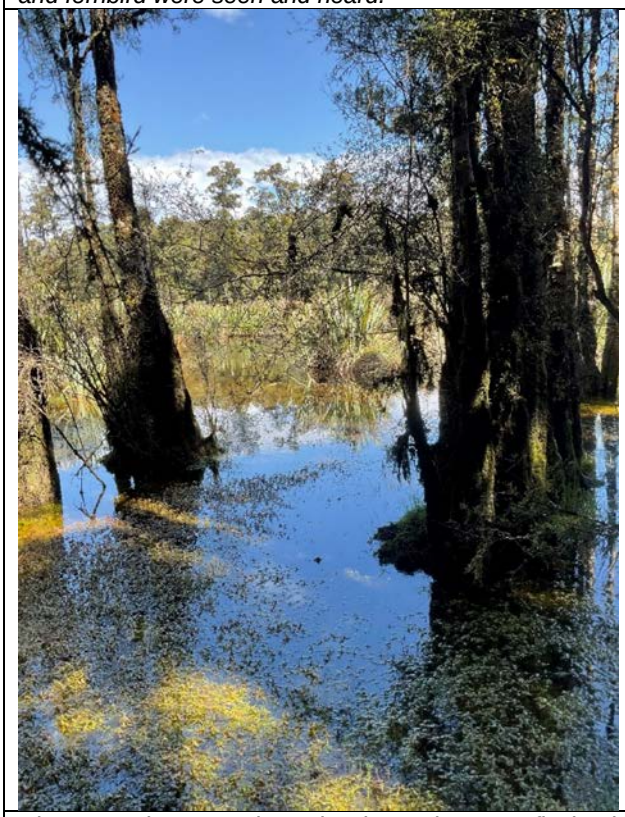

Photo 7. Point count site 6 showing a change to flaxland, a wider channel and more open water.

Photo 8. Point count site 8 where a bittern was heard.

Photo 9. Point count site 10 looking south.

Photo 10. Māhinapua Scenic Reserve 5MBC location 1.

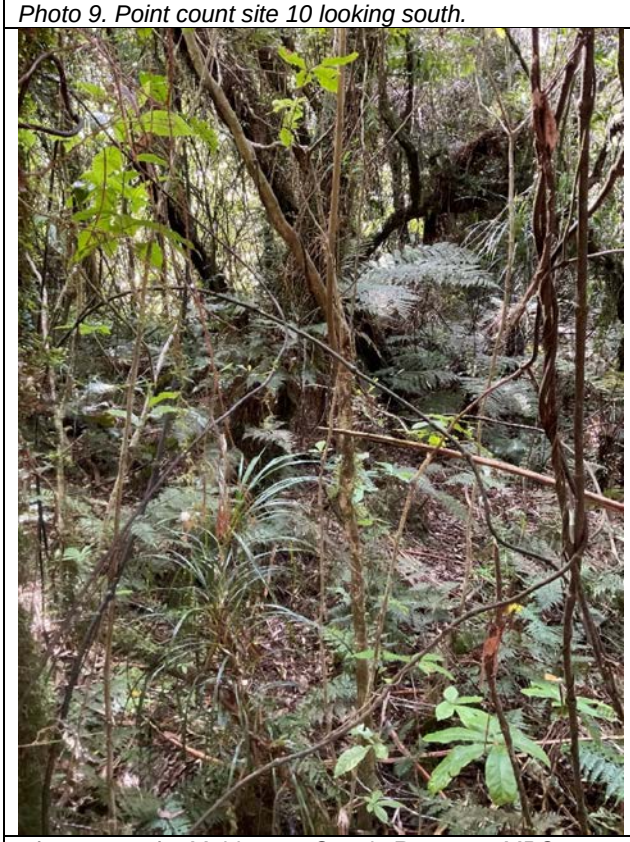

Photo 11. Lake Māhinapua Scenic Reserve 5MBC location 6.

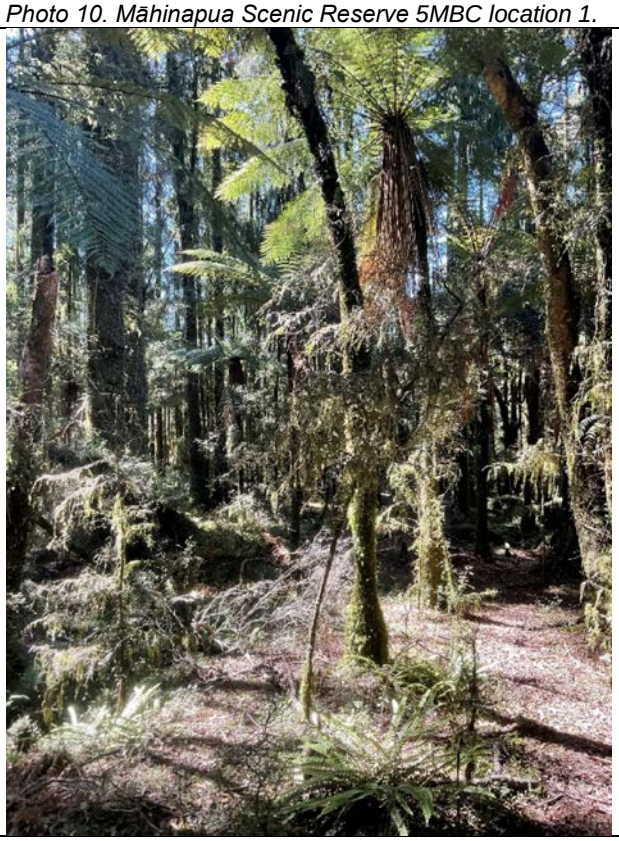

Photo 12. Forest fragment 5MBC location 5.

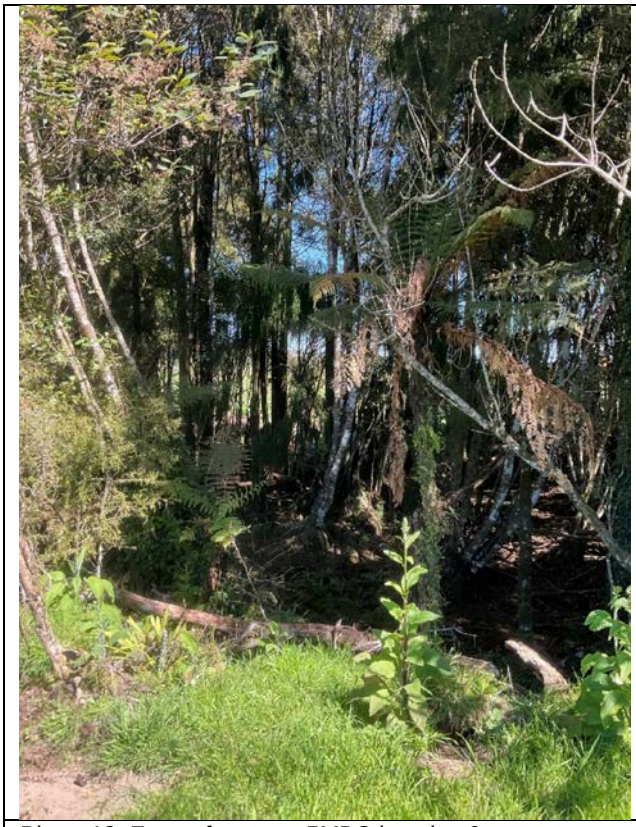	
Photo 13. Forest fragment 5MBC location 9.	*Photo 14. Forest fragment 5MBC location 11.*

Appendix 1. Survey Dates, Times and Weather Conditions

Five-Minute Bird Counts:

Location	Site	Date	Time	TOD	Weather
Fragment	1	9/11/2023	0818-0823	am	Drizzle, mild, calm, 0 mins sun, no other noise
Fragment	2	7/11/2023	1147-1157	am	Drizzle, mild, calm, 0 mins sun, no other noise
Fragment	3	7/11/2023	1130-1140	am	Mild, calm, no other noise, 5 mins sun, no rain
Fragment	4	7/11/2023	1107-1117	am	Mild, calm, no other noise, 5 mins sun, no rain
Fragment	5	7/11/2023	1049-1054	am	Mild, calm, no other noise, 5 mins sun, no rain
Fragment	6	7/11/2023	1036-1041	am	Mild, calm, no other noise, 5 mins sun, no rain
Fragment	7	7/11/2023	1025-1030	am	Mild, calm, no other noise, 5 mins sun, no rain
Fragment	8	7/11/2023	1141-1146	am	Mild, calm, no other noise, 5 mins sun, no rain
Fragment	9	7/11/2023	1129-1134	am	Mild, calm, no other noise, 5 mins sun, no rain
Fragment	10	7/11/2023	1116-1121	am	Mild, calm, no other noise, 5 mins sun, no rain
Fragment	11	7/11/2023	1104-1109	am	Mild, calm, no other noise, 5 mins sun, no rain
Fragment	1	7/11/2023	1201-1211	pm	Mild, calm, no other noise, 5 mins sun, no rain
Fragment	2	8/11/2023	1306-1311	pm	Mild, calm, no other noise, 5 mins sun, no rain
Fragment	3	8/11/2023	1321-1326	pm	Mild, calm, no other noise, 5 mins sun, no rain
Fragment	4	8/11/2023	1335-1340	pm	Mild, calm, no other noise, 5 mins sun, no rain
Fragment	5	8/11/2023	1353-1358	pm	Mild, calm, no other noise, 5 mins sun, no rain
Fragment	6	8/11/2023	1412-1417	pm	Mild, no wind, no other noise, 3 mins sun, no rain
Fragment	7	8/11/2023	1411-1421	pm	Mild, calm, no noise, 5 mins sun, no rain
Fragment	8	8/11/2023	1301-1311	pm	Mild, calm, no noise, 3 mins sun, no rain
Fragment	9	8/11/2023	1316-1326	pm	Mild, calm, no noise, 5 mins sun, no rain
Fragment	10	8/11/2023	1333-1343	pm	Mild, calm, no noise, 5 mins sun, no rain
Fragment	11	8/11/2023	1347-1357	pm	Mild, calm, no noise, 5 mins sun, no rain
DOC	1	8/11/2023	1105-1110	am	Mild, calm, some traffic noise, 5 mins sun, no rain
DOC	2	8/11/2023	1123-1128	am	Mild, calm, no noise, 5 mins sun, no rain
DOC	3	8/11/2023	1142-1147	am	Mild, calm, no noise, 3 mins sun, no rain
DOC	4	9/11/2023	1120-1130	am	Mild, calm, some noise, 5 min sun, no rain
DOC	5	8/11/2023	1106-1116	am	Mild, calm, some noise, 5 min sun, no rain
DOC	6	8/11/2023	1127-1137	am	Mild, calm, some noise, 5 min sun, no rain
DOC	7	8/11/2023	1148-1158	am	Mild, calm, no noise, 5 mins sun, no rain
DOC	8	9/11/2023	1133-1138	am	Raining, warm, calm, no other noise, 0 mins sun
DOC	1	9/11/2023	1240-1250	pm	Mild, calm, no noise, 2 min sun, No rain
DOC	2	9/11/2023	1219-1229	pm	Mild, calm, no noise, 0 min sun, dripping foliage
DOC	3	9/11/2023	1200-1210	pm	Mild, calm, no noise, 0 min sun, steady drizzle
DOC	4	8/11/2023	1210-1215	pm	Mild, calm, no other noise, 2 mins sun, no rain
DOC	5	9/11/2023	1243-1248	pm	Dripping foliage (but rain stopped), mild, calm, no other noise, 0 mins sun
DOC	6	9/11/2023	1224-1229	pm	Dripping foliage (but rain stopped), mild, calm, no other noise, 0 mins sun
DOC	7	9/11/2023	1202-1207	pm	Steady drizzle, warm, calm, no other noise, 0 mins sun
DOC	8	8/11/2023	1301-1311	pm	Warm, calm, no other noise, 5 min sun

Point Counts:

Site	TOD	Date	Time	Weather
PC-1	Daytime	7/11/2023	1253-1303	Sunny, light breeze, warm, 25% cloud cover
PC-2	Daytime	7/11/2023	1312-1322	Sunny, light breeze, warm, 25% cloud cover
PC-3	Daytime	7/11/2023	1332-1342	Sunny, light breeze, warm, 25% cloud cover
PC-4	Daytime	7/11/2023	1354-1402	Sunny, light breeze, warm, 25% cloud cover
PC-5	Daytime	7/11/2023	1415-1425	Sunny, light breeze, warm, 25% cloud cover
PC-6	Daytime	7/11/2023	1437-1447	Sunny, light breeze, warm, 25% cloud cover
PC-7	Daytime	7/11/2023	1459-1509	Sunny, light breeze, warm, 25% cloud cover
PC-8	Daytime	7/11/2023	1520-1530	Sunny, light breeze, warm, 25% cloud cover
PC-9	Daytime	7/11/2023	1537-1547	Sunny, moderate breeze, warm, 25% cloud cover
PC-10	Daytime	7/11/2023	1610-1620	Sunny, moderate breeze, warm, 25% cloud cover
PC-1	Dawn	8/11/2023	0827-0837	Fine, calm, 11 degrees, 100% cloud cover
PC-2	Dawn	8/11/2023	0811-0821	Fine, calm, 11 degrees, 100% cloud cover
PC-3	Dawn	8/11/2023	0754-0804	Fine, calm, 11 degrees, 100% cloud cover
PC-4	Dawn	8/11/2023	0733-0743	Fine, calm, 11 degrees, 100% cloud cover
PC-5	Dawn	8/11/2023	0712-0722	Fine, calm, 11 degrees, 100% cloud cover
PC-6	Dawn	8/11/2023	0653-0703	Fine, calm, 11 degrees, 100% cloud cover
PC-7	Dawn	8/11/2023	0630-0640	Fine, calm, 11 degrees, 100% cloud cover
PC-8	Dawn	8/11/2023	0610-0620	Fine, calm, 11 degrees, 100% cloud cover
PC-9	Dawn	8/11/2023	0552-0602	Fine, calm, 11 degrees, 100% cloud cover
PC-10	Dawn	8/11/2023	0534-0544	Fine, calm, 11 degrees, 100% cloud cover
PC-1	Dawn	9/11/2023	0757-0807	Calm, light drizzle, cool-mild, 100% cloud cover
PC-2	Dawn	9/11/2023	0735-0745	Calm, light drizzle, cool-mild, 100% cloud cover
PC-3	Dawn	9/11/2023	0718-0728	Calm, light drizzle, cool-mild, 100% cloud cover
PC-4	Dawn	9/11/2023	0700-0710	Calm, light drizzle, cool-mild, 100% cloud cover
PC-5	Dawn	9/11/2023	0637-0647	Calm, light drizzle, cool-mild, 100% cloud cover
PC-6	Dawn	9/11/2023	0617-0627	Calm, fine, cool-mild, 100% cloud cover
PC-7	Dawn	9/11/2023	0556-0606	Calm, fine, cool-mild, 100% cloud cover
PC-8	Dawn	9/11/2023	0536-0546	Calm, fine, cool-mild, 100% cloud cover
PC-9	Dawn	9/11/2023	0519-1529	Calm, fine, cool-mild, 100% cloud cover
PC-10	Dawn	9/11/2023	0500-0510	Calm, fine, cool-mild, 100% cloud cover
PC-1	Daytime	9/11/2023	1337-1347	Light drizzle, calm, mild, 100% cloud cover
PC-2	Daytime	9/11/2023	1354-1404	Dry, calm, mild, 100% cloud cover
PC-3	Daytime	9/11/2023	1410-1420	Dry, calm, mild, 100% cloud cover
PC-4	Daytime	9/11/2023	1428-1438	Dry, calm, mild, 100% cloud cover
PC-5	Daytime	9/11/2023	1459-1509	Dry, calm, mild, 100% cloud cover
PC-6	Daytime	8/11/2023	1605-1615	Warm, light breeze, dry, 50% cloud cover
PC-7	Daytime	8/11/2023	1545-1555	Warm, light breeze, dry, 50% cloud cover
PC-8	Daytime	8/11/2023	1527-1537	Warm, light breeze, dry, 50% cloud cover
PC-9	Daytime	8/11/2023	1510-1520	Warm, light breeze, dry, 50% cloud cover
PC-10	Daytime	8/11/2023	1453-1503	Warm, light breeze, dry, 50% cloud cover

Appendix 2. Five-Minute Bird Count Compiled Raw Data – Forest Fragments (am and pm)

Species	1 - 9/11/23 am		2 - 7/11/23 am		3 - 7/11/23 am		4 - 7/11/23 am		5 - 7/11/23 am		6 - 7/11/23 am		7 - 7/11/23 am		8 - 7/11/23 am		9 - 7/11/23 am		10 - 7/11/23 am		11 - 7/11/23 am	
	Seen	Heard	Seen	Heard	Seen	Heard	Seen	Heard	Seen	Heard	Seen	Heard	Seen	Heard	Seen	Heard	Seen	Heard	Seen	Heard	Seen	Heard
Bellbird		2		3		1		1		2				1		1		1				2
Goldfinch		2									1			1	1		1				4	1
Grey warbler		2		1		1		1		1				1				2		2		1
Chaffinch		1		1		1		1		3		2		1		4		3		3	4	2
Pukeko		1		1				1						2	6		2				1	
Paradise shelduck		1		1		3		1		2	1	1			2	3	5	1	2	1		
Song thrush						1		1						1				1			3	1
Canada goose														1								
Mallard duck													3									
Black-backed gull														1								
Silvereye				6						2				2				2				
Starling											1		1								3	
Welcome swallow													3									
Harrier hawk											2						2				2	
Spur-winged plover												2				1						
Greenfinch												1										2
Blackbird				1				1		1	1		1					1				1
Redpoll						1					2											
Kereru				1	2				1												1	
Tui				1												1	1	1				
Tomtit						1																
Bittern				1																		
Skylark																						
Fantail				1		1	2		1										1			
Magpie															1							

Species	1 - 8/11/23 pm		2 - 8/11/23 pm		3 - 8/11/23 pm		4 - 8/11/23 pm		5 - 8/11/23 pm		6 - 8/11/23 pm		7 - 8/11/23 pm		8 - 8/11/23 pm		9 - 8/11/23 pm		10 - 8/11/23 pm		11 - 8/11/23 pm	
	Seen	Heard	Seen	Heard	Seen	Heard	Seen	Heard	Seen	Heard	Seen	Heard	Seen	Heard	Seen	Heard	Seen	Heard	Seen	Heard	Seen	Heard
Bellbird		2		2	1	2		1		3		2		2	1	1		2		1		
Goldfinch														1		1				1		
Grey warbler		1		1		1				2		1		1		1		2		1		
Chaffinch		3		3		3	2	3	2	4		4		1		2		1				2
Pukeko				2								2		2		1				1		
Paradise shelduck								2												2		2
Song thrush		1		1								2				1		1		1		
Canada goose																						
Mallard duck									1					1								1
Black-backed gull																						
Silvereye						1		1		1		3								1		2
Starling																						
Welcome swallow																						
Harrier hawk							1														1	
Spur-winged plover																						1
Greenfinch		1																				
Blackbird						1												1		1		
Redpoll														1								
Kereru																		1				
Tui																						
Tomtit																						
Bittern																						
Skylark														2								
Fantail		1		2		1		1		1	1	1				1				1		
Magpie																						

Appendix 3. Five-Minute Bird Count Compiled Raw Data – Lake Māhinapua Scenic Reserve (am and pm)

	1 - 8/11/23, am		2 - 8/11/23, am		3 - 8/11/23, am		4 - 9/11/23, am		5 - 8/11/23, am		6 - 8/11/23, am		7 - 8/11/23, am		8 - 9/11/23, am	
Species	**Seen**	**Heard**	**Seen**	**Heard**	**Seen**	**Heard**	**Seen**	**Heard**	**Seen**	**Heard**	**Seen**	**Heard**	**Seen**	**Heard**	**Seen**	**Heard**
Bellbird		1		2		2		1		2		3		2		1
Chaffinch		2		4		3		1		1		1	1	1		1
Fantail	1			1		2		1						2		1
Silvereye		1				3				1		2		1		1
Paradise shelduck								1								1
Song thrush		3		1						1						
Grey warbler		1		1				1		2		1		1		
Kereru												1				
Blackbird								1				1	1	1		
Goldfinch												1				
Pukeko						2										
Tui																
Kingfisher												1				
SIPO										1						
Canada Goose								1								
Tomtit				1												

Species	1 - 9/11/23, pm		2 - 9/11/23, pm		3 - 9/11/23, pm		4 - 8/11/23, pm		5 - 9/11/23, pm		6 - 9/11/23, pm		7 - 9/11/23, pm		8 - 8/11/23, pm	
	Seen	Heard	Seen	Heard	Seen	Heard	Seen	Heard	Seen	Heard	Seen	Heard	Seen	Heard	Seen	Heard
Bellbird		1				1		4		2		1		2		1
Chaffinch		1				1		2		1						1
Fantail			1	2		1		3						1		
Silvereye								1						2		
Paradise shelduck								1				1				
Song thrush		1		1		1						2		2		
Grey warbler		1		1		1		1		2		2		1		2
Kereru						1			1					1		
Blackbird				1				1		1		1				1
Goldfinch										1						
Pukeko		1		1		1		1								
Tui								1								
Kingfisher																
SIPO																
Canada Goose																
Tomtit																