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Native Bat Assessment

Mahinerangi Wind Farm

June 2025

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1 Executive Summary

Background

This report has been prepared by Habitat NZ at the request of Tararua Wind Power Limited (TWP) and provides an assessment of the presence of native bats at the Mahinerangi Wind Farm.

TWP holds a land use consent for the development of the Mahinerangi Wind Farm up to 200MW installed capacity and up to 100 wind turbines, with a maximum tip height of 145m. Stage 1 of the wind farm was completed in 2011 and involved the commissioning of 12 Vestas V90 turbines with a tip height of 125m.

Stage 2 is proposed to be the final stage and will consist of 44 additional 4.3MW turbines which will have a maximum tip height of 165m. To retain some flexibility for the detailed design, TWP proposes to construct the 44 wind turbines amongst 54 potential locations. The remaining 34 of the approved 100 wind turbine locations would be removed from the consent.

Stage 2 of the Mahinerangi Wind Farm project is a Schedule 2 of the Fast-track Approvals Act 2024 (FTAA) Listed Project.

The wind farm site is approximately 1723 ha and is located on the eastern foothills of Lammermoor Range, situated approximately 5km north of Lake Mahinerangi and approximately 50km west of Dunedin. The west and north-western boundary of the wind farm is bounded by the Te Papanui Conservation Park and Black Rock Scientific Reserve.

Survey Purpose

Habitat NZ was engaged to assess the presence of native bats within the Wind Farm Site to determine if the proposed wind farm expansion poses any risk to long-tailed bats (*Chalinolobus tuberculatus*) or lesser short-tailed bats (*Mystacina tuberculata*). This precautionary approach was implemented despite the National Bat Database showing no recent bat records within a night's flying distance of the site.

Survey Methodology

Acoustic monitoring was conducted using Automatic Bat Monitors (ABMs) across three survey periods during the bat activity season (November 2024 - March 2025):

- Round 1: November 7 - December 26, 2024
- Round 2: January 4 - January 25, 2025
- Round 3: March 11 - March 28, 2025

A total of 31 ABM locations were established throughout the Wind Farm Site, targeting potential turbine locations, and also habitats likely to be used by bats, including streams, gullies, and vegetation edges. The survey achieved 1,480 valid monitor nights, with valid conditions being defined as nights with temperatures above 7°C, minimal precipitation, and wind speeds below 38 km/hr in the first four hours after sunset.

Key Findings

- **Habitat assessment**: The project area consists primarily of grazed pasture and snow tussock with limited suitable bat habitat, particularly for lesser short-tailed bats, which depend on indigenous forest and intact old-growth habitat.

- **No bat activity detected**: The surveys found no evidence of long-tailed or lesser short-tailed bats using the Mahinerangi Wind Farm Site for resting, foraging, or commuting during any of the three survey periods.
- **Database review supports findings**: The National Bat Database showed no recent bat records within 69km of the site, with the closest recorded instance being an unidentified bat species sighting at Taieri Gorge in 1988, approximately 25km east of the site.

Conclusion

Comprehensive monitoring detected no bat passes, habitat quality is low, and no bat observations exist within 50km on the National Bat Database. This evidence conclusively demonstrates the Mahinerangi Wind Farm area is not utilised by long-tailed or lesser short-tailed bats.

Therefore, no further consideration of bat populations is warranted in the consent process.

2 Background

The Mahinerangi Wind Farm was consented in 2009 and provides for the construction, commissioning, operation and maintenance of up to 100 wind turbines with a maximum tip height of 145 m at finished ground level and an overall maximum generation capacity of 200MW. At the time, the applications were advanced the applications on the basis of 100 x 2 MW turbines or 67 x 3MW turbines as realistic options, although flexibility was retained as to the particular type of turbine to be installed.

The consents were given effect to with the construction of Stage 1, comprising 12 x 3MW wind turbines 125m high, which have been operational since 2011. TWP now wishes to complete the wind farm (Stage 2) and seeks changes to the conditions of consent to enable it to use larger and more efficient wind turbines now available. It also seeks regional consents, in part to replace those that have expired, and new land use consents for transmission infrastructure to connect with the National Grid and a Battery Energy Storage System.

The consented layout plan for the wind farm is shown in Figure 1 below. This layout plan shows the 100 consented turbine location and contingency zones. TWP seeks to retain approximately 54 of the 100 consented turbine locations and contingency zones as part of Stage 2.

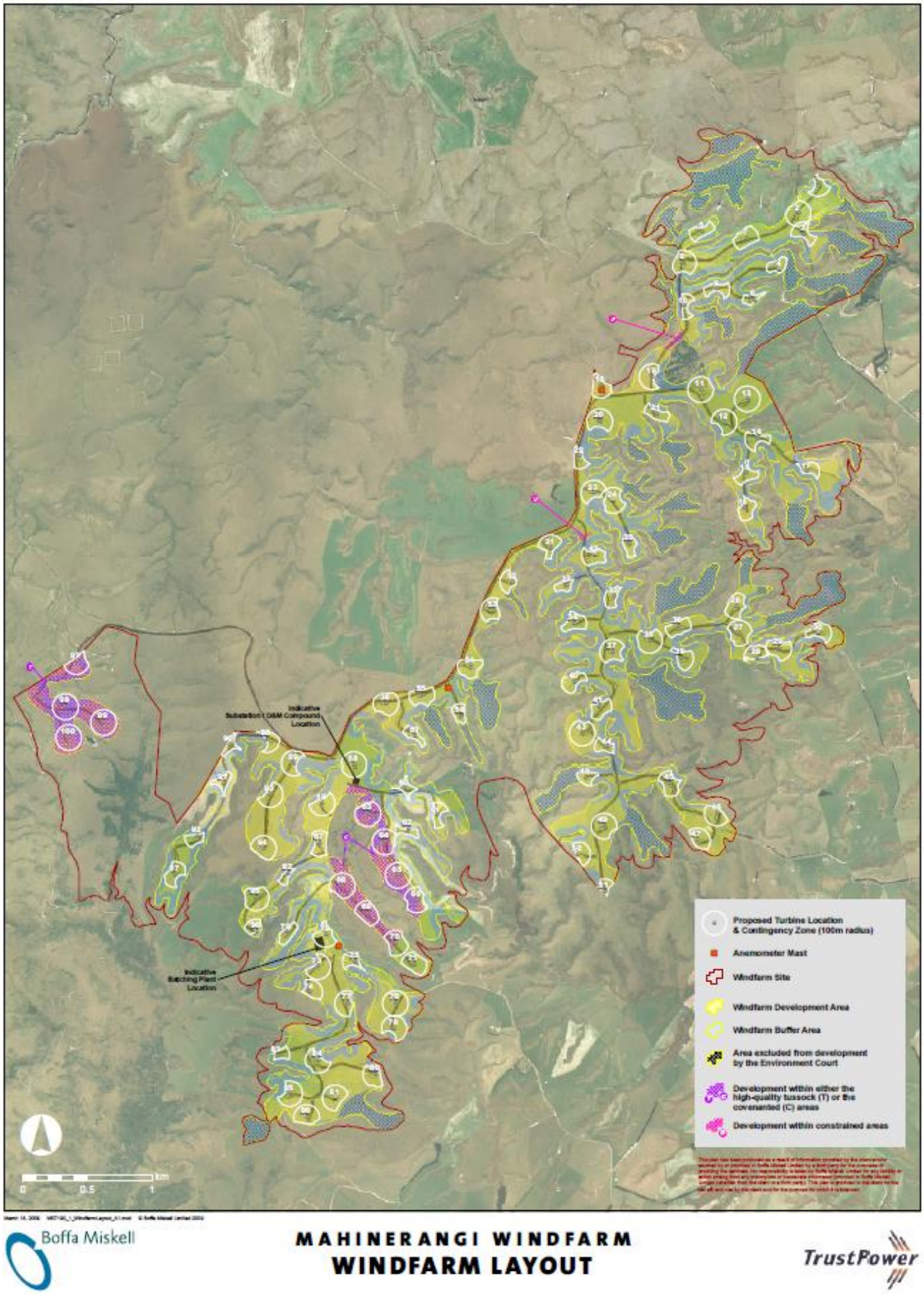

Figure 1. Mahinerangi Wind Farm Layout.

2.1 Project area description

Situated on the eastern foothills of the Lammermoor Range, the Mahinerangi Wind Farm is located approximately 5km north of Lake Mahinerangi and approximately 50 km west of Dunedin (Figure 2).

The wind farm is located within the jurisdiction of the Clutha District Council and Otago Regional Council. To the west, the wind farm shares part of its boundary with Te Papanui Conservation Park and Black Rock Scientific Reserve, which the Department of Conservation administers.

The project area consists of rolling terrain, typically at or about 600m elevation, ranging to a high point of 730m above sea level. Schist tors and rocky outcrops occur on ridgelines and valley sides across the site, most commonly around gully systems. In total, these gully systems cover approximately 359 ha. The site is dissected by a network of numerous small watercourses and ephemeral stream gullies. The lower reaches of all the main watercourses are deeply incised, with moderate to steep gradients, while small headwater streams are characterised by gentle to moderate grades with wide (>20-50 m) valley floors. Wetlands are present on the site, the condition and composition of which vary depending on their catchment size (i.e. degree of wetness), history of modification, and current land use.

Most of the wind farm area is grazed pasture and snow tussock. Shrublands are almost absent from the site apart from sparse, scattered fragments in gully systems and around rocky outcrops. The Wind Farm Development Area contains areas within which development may occur with other areas in the Wind farm Site excluded from development.

Figure 2. Location of consented Mahinerangi Wind Farm

2.2 Purpose and scope

Habitat NZ was engaged to assess the presence of native bats within the Mahinerangi Wind Farm Site. This was completed to better understand whether native bats are using the area to any extent, and if the proposed changes to the Mahinerangi Wind Farm pose any risk to long-tailed bats (*Chalinolobus tuberculatus*) or the lesser short-tailed bat (*Mystacina tuberculata*).

Habitat NZ has adopted a precautionary approach by conducting acoustic monitoring to confirm whether bats are present or absent from the project area. This was done despite the National Bat Database (Department of Conservation, 2024a) showing no recent bat records within a night's flying distance of the site (detailed in section 3.1).

This report describes the results of investigations to detect bat presence within the Mahinerangi Wind Farm Site. It includes details of a desktop review of the National Bat Database to identify records of bat presence in the wider landscape, and results of three acoustic monitoring surveys undertaken between November 2024 – March 2025 at the Mahinerangi Wind Farm.

3 Ecological context

3.1 Bat ecology and behaviour

There are two species of native bat in the South Island: the long-tailed bat (*Chalinolobus tuberculatus*) and the lesser short-tailed bat (*Mystacina tuberculata*).

Long-tailed bats utilise linear landscape features such as forest edges, creek lines, and valleys as flyways between roosting and foraging areas (O'Donnell, 2000). These nocturnal feeders maintain a generalist diet of airborne, terrestrial and aquatic invertebrates caught mid-flight (Gurau, 2014). They primarily forage along vegetation edge lines, in open gaps, and just above the forest canopy. They commonly fly 10 to 25km between roosting and feeding sites, with individuals capable of travelling over 50km in a single night. During daylight hours, they roost in mature native and exotic trees that provide adequate shelter (O'Donnel and Sedgeley, 1999; Sedgeley and O'Donnell, 2004). Their colonies can establish extensive home ranges exceeding 10,000 hectares (100 square kilometres) (O'Donnell, 2001).

Lesser short-tailed bats are also nocturnal feeders but display distinctive behaviours, consuming a diet of insects, nectar, pollen, and fruit (Lloyd 2001). In contrast to long-tailed bats, they forage both terrestrially and aerially. Their flight pattern is rapid and direct, typically occurring among trees and close to the ground beneath forest canopies. While lesser short-tailed bats have been documented in diverse environments (logged forest, scrubland, pine plantations and farmland), they remain dependent on indigenous forest and intact old-growth habitat (Lloyd 2001). The open habitat characteristics of the Mahinerangi Wind Farm Site are considered unsuitable to support a lesser short-tailed bat population. Nevertheless, the acoustic monitoring equipment would detect either bat species if present on site.

3.2 Bat conservation status and threats

Both bat species face pressure from habitat loss and degradation (Borkin *et al.,* 2011; O'Donnel *et al.,* 2023) and predation by invasive animals (O'Donnel *et al.,* 2023). Long-tailed bats hold New Zealand's highest threat classification: "Threatened – Nationally Critical" (O'Donnell *et al.,* 2023). Their populations are declining at an estimated rate of 5-9% annually in areas without effective predator control (Pryde *et al*., 2005; Pryde *et al.,* 2006). The southern subspecies of lesser short-tailed bat (*Mystacina tuberculata tuberculata*) is classified as "Threatened – Nationally Increasing," with only three known populations remaining in the South Island. These populations are localised and vulnerable, with the closest to the Mahinerangi Wind Farm project being approximately 170km away in Eglinton Valley.

The 2023 regional threat assessment for bats in the Otago region (Jarvie *et al.*, 2023) determined:

- Long-tailed bat (*Chalinolobus tuberculatus*) as 'Regionally Critical', the highest threat status, with confirmed records in or within a night's flying distance of the Clutha District.
- Lesser short-tailed bat (*Mystacina tuberculata tuberculata*) as 'Regionally Data Deficient', due to insufficient data being available.

4 Methodology

4.1 Database and literature review

The National Bat Database, administered by the Department of Conservation (DOC), contains GIS records of bat sightings and monitoring activities across New Zealand, both historic and recent (Department of Conservation 2024a). It is updated regularly with new data as monitoring is conducted, although there can be a time lag between data collection and published updates. Organisations or individuals can submit and access monitoring activity records with positive and nil bat recordings to learn about bat species distribution and how that changes over time.

A database review was conducted to identify where previous monitoring has been carried out near the Mahinerangi Wind Farm Site and establish whether any positive bat records exist in the vicinity. Literature relating to long-tailed bats habitat use and behaviour was also reviewed and used to inform the design of an appropriate survey programme for the area.

There are no recent bat records in the National Bat Database found within 69km of the site (accurate as of 24 August 2024). The closest recorded instance of bat activity in the database is a sighting of an unidentified bat species at Taieri Gorge in 1988, approximately 25 km to the East of the site (Figure 3). The next nearest entries on the National Bat Database are long-tailed bat recordings approximately 69 km to the west at Piano Flat, and 73 km to the South near the Catlins.

It is possible for long-tailed bat populations to exist in areas without prior detection, as many parts of the South Island have never been surveyed for bats (Department of Conservation, 2023).

For lesser short-tailed bats, the nearest documented records are approximately 120km South near Haldane Bay, though these date back to the early 1900s. The closest current populations of lesser short-tailed bats are known to exist 170km away in Eglinton Valley and on Codfish Island/Whenua Hou, which is over 200km from the project area.

Figure 3: Mahinerangi Wind Farm project area showing a 25km buffer zone and bat monitoring results recorded in the National Bat Database (August 2024)

4.2 Acoustic monitoring

As bats are highly mobile, have patchy distributions and are only active at night they can be difficult to detect (Sedgeley, 2012). ABMs are the preferred method for presence surveys as they allow for:

- Multiple devices being deployed for long periods, providing effective coverage of large areas
- Sampling for full nights from dusk to dawn
- Fewer labour resources and reduced safety risks of night-time work for line transects
- Detection of either bat species
- Automatic storage and permanent records with standardised analysis (Sedgeley, 2012).

The months for monitoring bats are between October – April (inclusive) under Department of Conservation protocols (Department of Conservation, 2024b). This aligns with the times of year when bats are most active (Sedgeley and O'Donnell, 2012). Monitoring for bat presence was conducted across three periods of likely high activity and mobility. These were:

- Round 1 – 7 November 2024 to 26 December 2024
- Round 2 – 4 January 2025 to 25 January 2025
- Round 3 – 11 March 2025 to 28 March 2025.

ABMs[1] used in the surveys passively record ultrasonic sounds and store them as spectrograms of sound wave frequencies alongside the date and time of occurrence. The ABMs were programmed to record full spectrum files of bat passes from one hour before sunset until one hour after sunrise each night. Each ABM automatically identifies sunset and sunrise times through the built-in function to correlate GPS position to local sunrise/sunset time.

4.3 Survey area

Acoustic monitoring covered the Mahinerangi Wind Farm Site, with ABMs placed at potential turbine locations and possible bat habitats and flyway locations. The survey design ensured comprehensive coverage of the Wind Farm Development Area, optimising detection potential at both proposed turbine locations and within the surrounding landscape.

ABMs were deployed at the same 31 locations across the Mahinerangi Wind Farm project area for each of the three surveys (Figure 4). Because bat activity can vary between habitats (O'Donell 2000), ABM locations were chosen to thoroughly cover a range of habitats across the Wind Farm Site. They were positioned to detect bat passes near streams, valleys, vegetation edges and other flyways that could be utilised by bats. Typically, ABMs were deployed at approximately 1.2 – 5m above the ground, with minimal obstructions from surrounding vegetation (e.g. Figure 5).

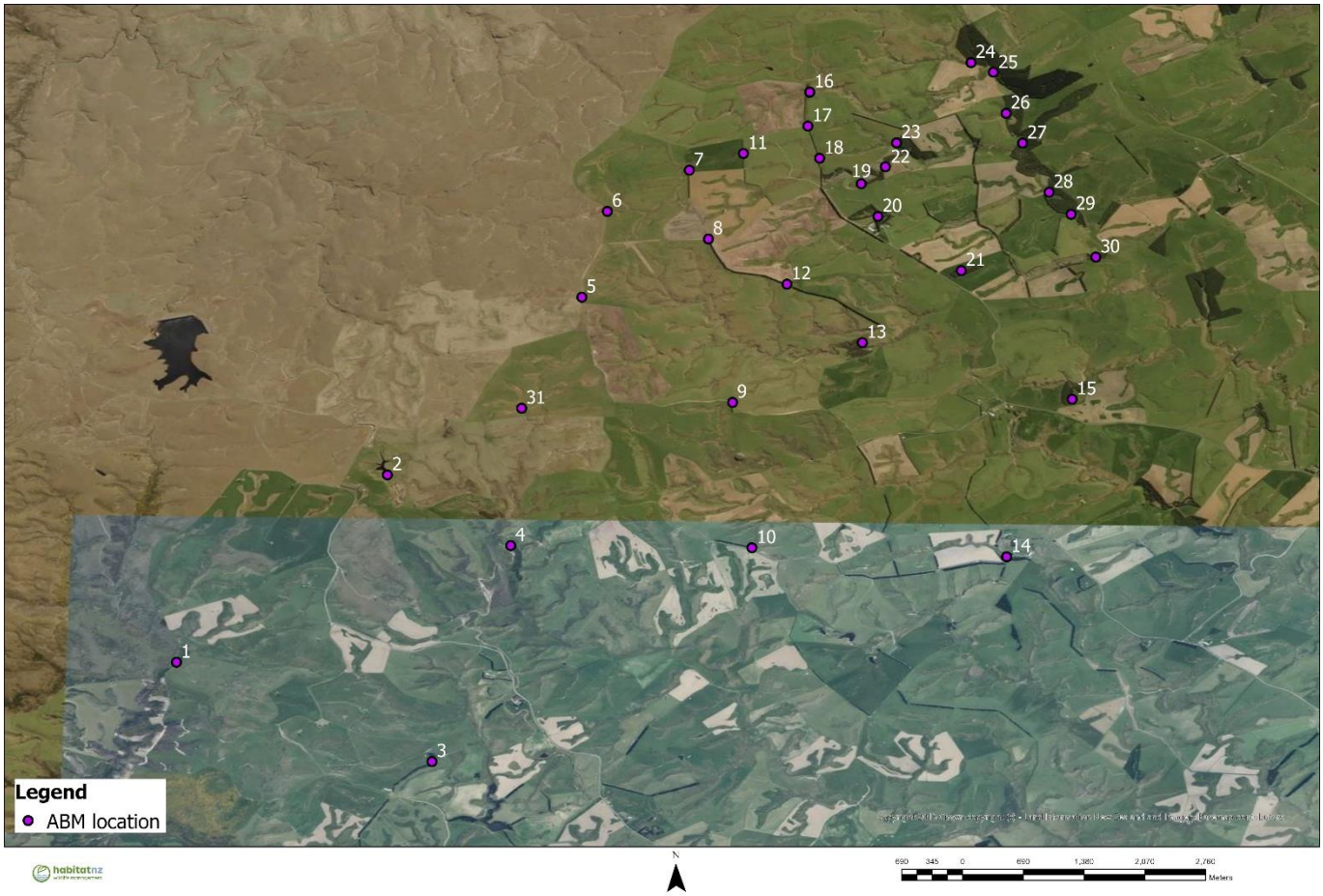

Figure 4. Automatic Bat Monitor (ABM) deployment locations across the Mahinerangi Wind Farm project area

[1] Song Meter Mini Bat 2, Wildlife Acoustics.

Figure 5. Typical deployment of Automatic Bat Monitor (ABM) in pine tree with the ABM number highlighting exact location.

4.4 Data processing

All acoustic recordings obtained during the survey period was analysed using Anabat Insight software (Titley Scientific) to filter positive bat calls (passes) from other recordings in similar frequency ranges not attributable to bats (e.g. rat, insect, and bird calls). The process involves reviewing each acoustic recording and comparing it to known characteristics of long-tailed bat echolocations.

It is important to note that ABMs indicate bat activity levels rather than species abundance. As the movement of an individual bat can generate multiple passes, there is no way to correlate ABM data with actual bat population levels (Sedgeley, 2012).

The ABMs used for the survey detect echolocations of all New Zealand native bat species, however, short-tailed bat calls were not expected due to the absence of old-growth indigenous forest habitat within the project area. Although there are regional differences in long-tailed bat echolocation calls throughout New Zealand, calls from all areas of the country have broadly similar characteristics (Parsons, 1997). Typical long-tailed bat echolocations can be seen as spectrograms of the sound wave frequencies in Figure 6 below.

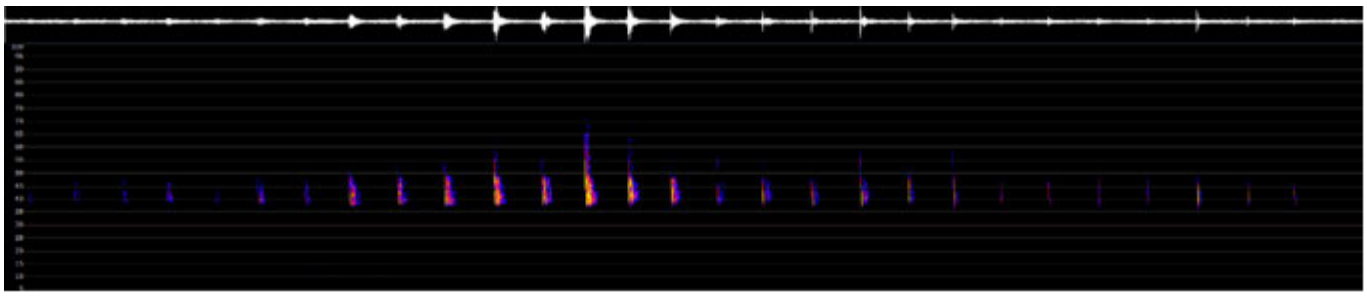

Figure 6. Typical long-tailed bat echolocation search calls as viewed in Anabat Insight. The frequency range of echolocations is provided on the left axis, and the amplitude of each call is shown at the top of the image.

Long-tailed bats can create a 'terminal-buzz' echolocation, also known as a 'feeding-buzz', thought to aid the identification of moving targets from their surrounding environment (Parsons, 1997), as shown in Figure 7 below. Therefore, terminal buzzes on ABM recordings indicate bat foraging behaviour and provide information about a site's importance as a feeding ground.

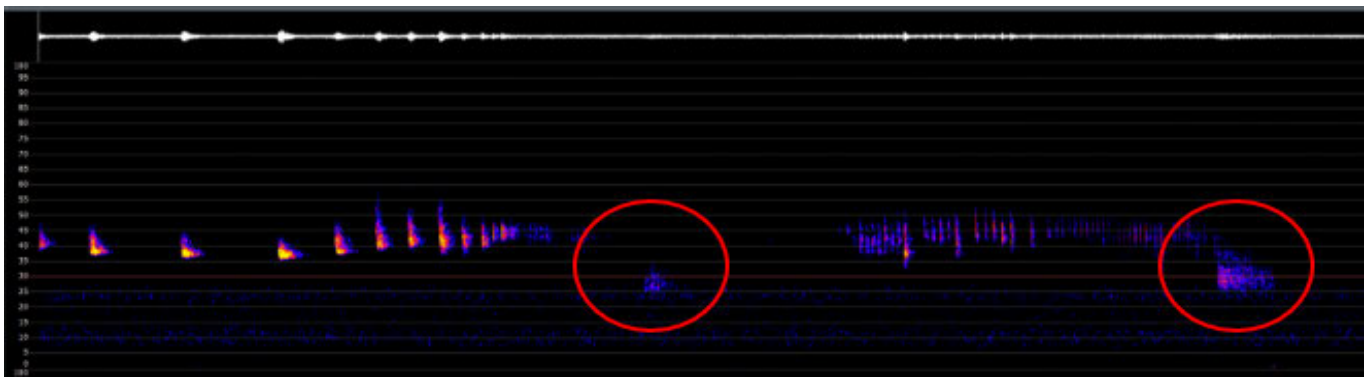

Figure 7. Typical long-tailed bat echolocation terminal-buzz as viewed in Anabat Insight. Terminal-buzz calls are indicated in red circles.

4.5 Valid survey nights

Weather conditions and daylight hours strongly influence bat activity (Borkin *et al.* 2023). The DOC protocol for surveying bat roosting activity specifies the criteria for a valid survey night (Department of Conservation, 2024b). These are the parameters within which bats are more likely to be active, ensuring optimal conditions for their detection in acoustic surveys. A high proportion of valid survey nights increase confidence that a lack of detections reflects absence, rather than temporary inactivity within an area.

A valid survey night is a night where:

- Monitoring begins one hour before official sunset and end one hour after official sunrise
- Temperature 7°C or greater for the first four hours after official sunset time (South Island)
- Ideally no to very little precipitation within the first 4 hours after official sunset, although a light mist or occasional drizzle may be acceptable as assessed by a bat ecologist accredited with Competency 3.1
- No to light wind within the first four hours after official sunset.

A 2024 update of the Bat Roost Protocols (Department of Conservation 2024b) removed prescriptive measures for rainfall limits. Previously, this required less than 2.5mm in the first two hours after official sunset and less than 5mm total in the first four hours after official sunset. While this prescriptive rainfall definition for a valid survey night has been removed, Habitat NZ considers these thresholds are still largely appropriate unless a study area presents with climatic conditions that produce rainfall patterns where strict compliance would render surveying results impractical.

Habitat NZ has set an upper threshold for average wind speed in the four hours after sunset to guide valid monitoring nights at the Mahinerangi Wind Farm, cognisant of representative climatic conditions at the site. This threshold aligns with a 'fresh breeze' (29-38km/hr) on the Beaufort scale, ensuring survey parameters reflect typical wind patterns at the location.

Overnight weather data was acquired from an on-site weather station for temperature and wind, and data from the Manawa Energy hydrology station was used for precipitation.

5 Results and conclusions

Acoustic monitoring surveys were undertaken during valid periods of likely high bat activity and in locations that included major habitat features expected to be used by bats if they were present in the Mahinerangi Wind Farm Site.

A total of 1480 valid monitor nights were obtained throughout all survey periods. These nights were within the required parameters of device monitoring times, minimum overnight temperature criteria, maximum rainfall and wind criteria presented in section 4.5.

These surveys found no evidence of long-tailed or lesser short-tailed bats using the Mahinerangi Wind Farm Site for any purpose, including resting, foraging, or commuting, during any of the three survey periods. Table 1 provides an overview of the findings from each of the three surveys, including that ABMs returned negative results for bat passes on all survey nights.

Complete results of ABM data, technical issues, survey dates, and bat activity levels are provided in Appendix 1. Overnight temperature and rainfall conditions for each night in the survey periods are provided in Appendix 2.

Table 1: Acoustic monitoring survey results for the Mahinerangi Wind Farm project area

Survey period	No. active monitor locations	Valid survey nights	Valid monitor nights	Total no. nights with bat activity	Total no. passes	Mean no. passes per night	Total no. feeding buzz
Round 1	30[2]	23	674	0	0	0	0
Round 2	31	15	465	0	0	0	0
Round 3	31	11	341	0	0	0	0
Total	**31**	**49**	**1,480**	**0**	**0**	**0**	**0**

In conclusion, our comprehensive monitoring yielded zero bat passes, the site represents low quality bat habitat, and there are no recorded bat observations within a 50km radius of the site. These findings, taken together, provide overwhelming evidence that the Mahinerangi Wind Farm project area is not utilised by long-tailed bats or lesser short-tailed bats for roosting, foraging, or commuting purposes. The complete absence of any bat-related indicators strongly supports this assessment. Therefore, further consideration of potential effects on bat populations is not warranted in subsequent stages of the consent process for the Mahinerangi Wind Farm.

[2] Data was unrecoverable from one monitor when the tree it was in fell and damaged the memory card. One monitor ceased operating after 7 days.

Appendix 1 Acoustic survey results

The following tables summarise findings from the acoustic surveys for each monitoring round in the Mahinerangi Wind Farm project area.

The number of valid survey nights is determined from the number of nights ABMs successfully operated during the study (excluding any technical issues), less the number of nights invalidated by exceedance of temperature, rainfall, and wind criteria (refer Appendix 2 for valid weather night data).

Table 2. First round of automatic bat monitoring (ABM) survey data from Mahinerangi Wind Farm, November – December 2024. The asterix (*) indicates the last complete date of records for ABMs with technical issues

Site ID	Technical issues	Survey start date	Survey end date*	No. valid survey nights	No. of files	Total no. passes	Mean no. passes per night	Total no. feeding buzzes
1		7/11/2024	16/12/2024	23	8,189	0	0	0
2		7/11/2024	16/12/2024	23	451	0	0	0
3		7/11/2024	16/12/2024	23	992	0	0	0
4		7/11/2024	16/12/2024	23	2,547	0	0	0
5		7/11/2024	16/12/2024	23	43,669	0	0	0
6		7/11/2024	16/12/2024	23	1,043	0	0	0
7		7/11/2024	16/12/2024	23	596	0	0	0
8		7/11/2024	16/12/2024	23	9,786	0	0	0
9		7/11/2024	16/12/2024	23	1,633	0	0	0
10		7/11/2024	16/12/2024	23	1,242	0	0	0
11		7/11/2024	16/12/2024	23	2,029	0	0	0
12		7/11/2024	16/12/2024	23	4,353	0	0	0
13		7/11/2024	16/12/2024	23	964	0	0	0
14		7/11/2024	16/12/2024	23	47	0	0	0
15		7/11/2024	16/12/2024	23	1,926	0	0	0
16		7/11/2024	16/12/2024	23	297	0	0	0
17		7/11/2024	16/12/2024	23	764	0	0	0
18		7/11/2024	16/12/2024	23	3,745	0	0	0
19		7/11/2024	16/12/2024	23	103	0	0	0
20		7/11/2024	16/12/2024	23	366	0	0	0
21		7/11/2024	16/12/2024	23	296	0	0	0
22		7/11/2024	16/12/2024	23	1,544	0	0	0
23	Stopped recording	7/11/2024	20/11/2024*	7	264	0	0	0
24		7/11/2024	16/12/2024	23	374	0	0	0
25		7/11/2024	16/12/2024	23	1,018	0	0	0
26		7/11/2024	16/12/2024	23	1,491	0	0	0
27		7/11/2024	16/12/2024	23	3,730	0	0	0
28		7/11/2024	16/12/2024	23	179	0	0	0
29	Tree fell during survey	7/11/2024	N/A	0	N/A	0	0	0
30		7/11/2024	16/12/2024	23	274	0	0	0
31		7/11/2024	16/12/2024	23	3,626	0	0	0

Table 3. Second round of automatic bat monitoring (ABM) survey data from Mahinerangi Wind Farm, January 2025

Site ID	Technical issues	Survey start date	Survey end date	No. valid survey nights	No. of files	Total no. passes	Mean no. passes per night	Total no. feeding buzzes
1		4/01/2025	25/01/2025	15	3,811	0	0	0
2		4/01/2025	25/01/2025	15	109	0	0	0
3		4/01/2025	25/01/2025	15	1,166	0	0	0
4		4/01/2025	25/01/2025	15	1,994	0	0	0
5		4/01/2025	25/01/2025	15	462	0	0	0
6		4/01/2025	25/01/2025	15	337	0	0	0
7		4/01/2025	25/01/2025	15	154	0	0	0
8		4/01/2025	25/01/2025	15	3,499	0	0	0
9		4/01/2025	25/01/2025	15	1,697	0	0	0
10		4/01/2025	25/01/2025	15	5,035	0	0	0
11		4/01/2025	25/01/2025	15	141	0	0	0
12		4/01/2025	25/01/2025	15	10,768	0	0	0
13		4/01/2025	25/01/2025	15	66	0	0	0
14		4/01/2025	25/01/2025	15	1,878	0	0	0
15		4/01/2025	25/01/2025	15	5,226	0	0	0
16		4/01/2025	25/01/2025	15	317	0	0	0
17		4/01/2025	25/01/2025	15	337	0	0	0
18		4/01/2025	25/01/2025	15	751	0	0	0
19		4/01/2025	25/01/2025	15	713	0	0	0
20		4/01/2025	25/01/2025	15	64	0	0	0
21		4/01/2025	25/01/2025	15	73	0	0	0
22		4/01/2025	25/01/2025	15	170	0	0	0
23		4/01/2025	25/01/2025	15	530	0	0	0
24		4/01/2025	25/01/2025	15	206	0	0	0
25		4/01/2025	25/01/2025	15	320	0	0	0
26		4/01/2025	25/01/2025	15	229	0	0	0
27		4/01/2025	25/01/2025	15	7	0	0	0
28		4/01/2025	25/01/2025	15	254	0	0	0
29		4/01/2025	25/01/2025	15	67	0	0	0
30		4/01/2025	25/01/2025	15	491	0	0	0
31		4/01/2025	25/01/2025	15	2,687	0	0	0

Table 4. Third round of automatic bat monitoring (ABM) survey data from Mahinerangi Wind Farm, March 2025

Site ID	Technical issues	Survey start date	Survey end date	No. valid survey nights	No. of files	Total no. passes	Mean no. passes per night	Total no. feeding buzzes
1		11/03/2025	28/03/2025	11	4,211	0	0	0
2		11/03/2025	28/03/2025	11	8,105	0	0	0
3		11/03/2025	28/03/2025	11	5,261	0	0	0
4		11/03/2025	28/03/2025	11	675	0	0	0
5		11/03/2025	28/03/2025	11	4,211	0	0	0
6		11/03/2025	28/03/2025	11	1,964	0	0	0
7		11/03/2025	28/03/2025	11	1,003	0	0	0
8		11/03/2025	28/03/2025	11	1,589	0	0	0
9		11/03/2025	28/03/2025	11	1,659	0	0	0
10		11/03/2025	28/03/2025	11	653	0	0	0
11		11/03/2025	28/03/2025	11	65	0	0	0
12		11/03/2025	28/03/2025	11	7,293	0	0	0
13		11/03/2025	28/03/2025	11	1,298	0	0	0
14		11/03/2025	28/03/2025	11	208	0	0	0
15		11/03/2025	28/03/2025	11	5,064	0	0	0
16		11/03/2025	28/03/2025	11	659	0	0	0
17		11/03/2025	28/03/2025	11	1,114	0	0	0
18		11/03/2025	28/03/2025	11	10,023	0	0	0
19		11/03/2025	28/03/2025	11	93	0	0	0
20		11/03/2025	28/03/2025	11	121	0	0	0
21		11/03/2025	28/03/2025	11	767	0	0	0
22		11/03/2025	28/03/2025	11	2,310	0	0	0
23		11/03/2025	28/03/2025	11	95	0	0	0
24		11/03/2025	28/03/2025	11	184	0	0	0
25		11/03/2025	28/03/2025	11	1,762	0	0	0
26		11/03/2025	28/03/2025	11	17	0	0	0
27		11/03/2025	28/03/2025	11	1,348	0	0	0
28		11/03/2025	28/03/2025	11	208	0	0	0
29		11/03/2025	28/03/2025	11	3,898	0	0	0
30		11/03/2025	28/03/2025	11	48	0	0	0
31		11/03/2025	28/03/2025	11	5,370	0	0	0

Appendix 2 Weather data

The following tables summarise the weather data related to automatic bat monitor (ABM) surveys including overnight temperature, rainfall, and wind speed. Overnight weather data was acquired from an on-site weather station for temperature and wind, and data from the Manawa Energy hydrology station was used for precipitation.

Table 5. First round weather data for automatic bat monitor (ABM) survey at Mahinerangi Wind Farm, November – December 2024. Highlighted rows indicate survey nights that did not meet temperature, rainfall, or wind criteria and are therefore not valid survey nights – the criteria that was not met is bolded.

Date	Official sunset time	Minimum temperature first four hours after sunset (°C)	Rainfall 2 hr after sunset (mm)	Rainfall 4 hr after sunset (mm)	Wind speed (km/h)	Valid weather night
7/11/2024	20:39:00	15.9	0.0	0.0	**42.8**	No
8/11/2024	20:40:00	12.4	0.0	0.0	28.3	Yes
9/11/2024	20:42:00	7.3	0.0	0.0	24.2	Yes
10/11/2024	20:43:00	7.3	0.0	0.0	26.3	Yes
11/11/2024	20:45:00	**4.9**	0.0	0.0	6.0	No
12/11/2024	20:46:00	**5.8**	0.0	0.0	21.5	No
13/11/2024	20:47:00	9.8	0.0	0.0	15.7	Yes
14/11/2024	20:49:00	10.4	0.6	0.6	8.1	Yes
15/11/2024	20:50:00	**3.8**	1.0	1.2	**41.4**	No
16/11/2024	20:52:00	**2.1**	0.0	0.0	8.3	No
17/11/2024	20:53:00	**6.1**	0.0	0.0	27.0	No
18/11/2024	20:54:00	11.8	0.0	0.0	33.4	Yes
19/11/2024	20:56:00	9.5	0.0	0.0	25.2	Yes
20/11/2024	20:57:00	**3.3**	0.2	**6.4**	**30.7**	No
21/11/2024	20:58:00	**3.5**	0.4	0.6	**31.2**	No
22/11/2024	21:00:00	**5.3**	0.0	0.0	21.9	No
23/11/2024	21:01:00	**5.3**	0.0	0.0	11.2	No
24/11/2024	21:02:00	9.1	0.0	0.0	20.2	Yes
25/11/2024	21:04:00	8.9	0.0	0.0	15.0	Yes
26/11/2024	21:05:00	9.4	1.2	5.0*	9.1	Yes
27/11/2024	21:06:00	16.7	0.0	0.0	32.5	Yes
28/11/2024	21:07:00	**6.2**	2.2	2.2	28.7	No
29/11/2024	21:09:00	**5.5**	0.0	0.0	23.4	No
30/11/2024	21:10:00	7.6	0.0	0.0	12.0	Yes
1/12/2024	21:11:00	9.2	0.0	0.0	6.4	Yes
2/12/2024	21:12:00	13.2	0.0	0.0	26.1	Yes
3/12/2024	21:13:00	17.8	0.0	0.0	31.2	Yes
4/12/2024	21:14:00	16.9	0.0	0.2	37.1	Yes
5/12/2024	21:16:00	10.1	0.4	0.6	**68.2**	No
6/12/2024	21:17:00	11.3	0.0	0.0	21.6	Yes
7/12/2024	21:18:00	10.5	0.0	0.0	27.2	Yes
8/12/2024	21:19:00	9.8	0.0	0.0	**44.3**	No
9/12/2024	21:20:00	**6.1**	0.0	0.0	**29.2**	No

Date	Official sunset time	Minimum temperature first four hours after sunset (°C)	Rainfall 2 hr after sunset (mm)	Rainfall 4 hr after sunset (mm)	Wind speed (km/h)	Valid weather night
10/12/2024	21:20:00	8.3	0.0	0.0	26.1	Yes
11/12/2024	21:21:00	**4.9**	0.0	0.0	25.4	No
12/12/2024	21:22:00	12.6	0.0	0.0	22.3	Yes
13/12/2024	21:23:00	9.5	0.0	0.0	34.7	Yes
14/12/2024	21:24:00	8.6	0.0	0.0	15.1	Yes
15/12/2024	21:25:00	10.0	0.0	0.0	9.9	Yes

* Reading is at the maximum threshold for rainfall in the first 4 hours, however has been included as a valid night given the exceedance is marginal (0.1mm).

Table 6. Second round weather data for automatic bat monitor (ABM) survey at Mahinerangi Wind Farm, January 2025. Highlighted rows indicate survey nights that did not meet temperature, rainfall, or wind criteria and are therefore not valid survey nights – the criteria that was not met is bolded.

Date	Official sunset time	Minimum temperature first four hours after sunset (Degrees C)	Rainfall 2 hr after sunset	Rainfall 4 hr after sunset	Wind speed (km/h)	Valid weather night
4/01/2025	21:31:00	**5.9**	0.0	0.2	34.5	No
5/01/2025	21:31:00	**4.7**	0.0	0.0	12.1	No
6/01/2025	21:31:00	8.3	0.0	0.0	26.8	Yes
7/01/2025	21:30:00	**6.4**	0.0	0.0	**39.8**	No
8/01/2025	21:30:00	9.4	0.0	0.0	25.3	Yes
9/01/2025	21:30:00	8.0	0.0	0.0	12.5	Yes
10/01/2025	21:30:00	9.5	0.0	0.2	8.6	Yes
11/01/2025	21:29:00	**5.3**	0.2	0.2	20.8	No
12/01/2025	21:29:00	**6.1**	0.2	0.2	23.8	No
13/01/2025	21:28:00	**6.6**	0.0	0.0	20.2	No
14/01/2025	21:28:00	7.3	0.0	0.0	19.3	Yes
15/01/2025	21:27:00	8.0	0.0	0.0	31.2	Yes
16/01/2025	21:26:00	8.2	0.0	0.0	20.1	Yes
17/01/2025	21:26:00	9.4	0.0	0.0	19.4	Yes
18/01/2025	21:25:00	9.1	0.0	0.0	19.5	Yes
19/01/2025	21:24:00	7.3	0.0	0.0	7.7	Yes
20/01/2025	21:24:00	11.2	0.0	0.0	12.1	Yes
21/01/2025	21:23:00	11.8	0.0	0.0	15.0	Yes
22/01/2025	21:22:00	11.1	0.0	0.0	12.0	Yes
23/01/2025	21:21:00	7.3	0.2	0.2	16.8	Yes
24/01/2025	21:20:00	8.7	0.0	0.0	21.6	Yes

Table 7. Third round weather data for automatic bat monitor (ABM) survey at Mahinerangi Wind Farm, March 2025. Highlighted rows indicate survey nights that did not meet temperature, rainfall, or wind criteria and are therefore not valid survey nights – the criteria that was not met is bolded.

Date	Official sunset time	Minimum temperature first four hours after sunset (Degrees C)	Rainfall 2 hr after sunset	Rainfall 4 hr after sunset	Wind speed (km/h)	Valid weather night
11/03/2025	20:10:00	**6.3**	0.0	0.0	**35.4**	No
12/03/2025	20:08:00	**3.9**	0.0	0.0	8.1	No
13/03/2025	20:06:00	7.0	0.0	0.0	4.5	Yes
14/03/2025	20:05:00	8.3	0.0	0.0	34.7	Yes
15/03/2025	20:03:00	10.6	0.0	0.0	18.5	Yes
16/03/2025	20:01:00	16.3	0.0	0.0	**50.6**	No
17/03/2025	19:59:00	9.7	0.0	0.2	24.5	Yes
18/03/2025	19:57:00	**4.9**	0.0	0.0	27.6	No
19/03/2025	19:55:00	7.5	0.0	0.0	13.5	Yes
20/03/2025	19:53:00	10.6	0.0	0.0	22.6	Yes
21/03/2025	19:51:00	15.3	0.0	0.0	9.8	Yes
22/03/2025	19:50:00	14.5	0.2	0.2	32.8	Yes
23/03/2025	19:48:00	7.2	0.6	0.8	25.4	Yes
24/03/2025	19:46:00	8.0	0.0	0.0	19.9	Yes
25/03/2025	19:44:00	**5.6**	0.0	0.0	17.8	No
26/03/2025	19:42:00	7.0	0.0	0.0	11.9	Yes
27/03/2025	19:40:00	**6.4**	0.0	0.0	16.2	No

Appendix 3 Authors qualification and experience

Name and Role	Qualifications	Experience
Keith Barber Principal Ecologist / Wildlife Manager	MSc. (Hons.) Wildlife Management & Ecology, Lincoln University (2003) Making Good Decisions Certificate Holder – Accredited RMA Commissioner (2024) Competent Bat Handler (BHC 0117) (competencies 1.2.2, 1.2.2, 1.2.3., 1.3.1, 1.3.2, 1.3.3, 2.1.1, 2.1.2, 2.2.1, 2.2.2, 2.4.1, 2.4.2, 2.4.3 (trainee), 2.4.5., 3.1, 3.2, 3.3) NPCA Designer NPCA Field Operative	Keith brings 26 years of experience in terrestrial ecology, invertebrate ecology and wildlife management, and 19 years of experience in bat ecology. Keith is recognised as a Competent Bat Ecologist by the National Bat Recovery Group, fully certified to design and implement bat monitoring, radio tracking and potential roost felling programmes. Keith's bat ecology project portfolio spans nearly two decades of diverse assignments, from significant infrastructure developments and fast-track applications from Northland to Otago. His expertise encompasses assessment of effects on bats, supervising complex dayworks operations on large-scale infrastructure projects, designing and implementing sophisticated monitoring programmes with radio tracking aspects and designing effects management packages for NZ bats.
Therese Barber Ecologist	B.PRTM, Lincoln University (1999) Competent Bat Handler (BHC 0140) (competencies: 1.2.3, 1.3.2, 1.3.3, 2.4.5, 3.3)	Therese is recognised as a Competent Bat Ecologist by the National Bat Recovery Group with certification for competencies including high-risk habitat assessment, trapping and animal welfare for long-tailed bats. Over her two years' of experience working with bats, Therese has assisted Competent Bat Ecologists to undertake acoustic monitoring surveys in Canterbury, Otago, greater Auckland and Waikato. Therese continues to work toward full competencies in long-tail bat tracking and trapping, roost watching, handling and banding.
Ashley Walsh Junior Ecologist	BSc., Ecology & Zoology, University of Otago (2022) Bat Handling Competencies (BHC 0149) (competencies 1.2.1, 1.2.3, 1.3.2, 1.3.3, 2.1.1, 2.4.1, 2.4.5, 3.3)	Ashley is a recognised Competent Bat Ecologist by the National Bat Recovery Group with certification for competencies that include assessing high-risk bat habitats, trapping and handling long-tailed bats.

Name and Role	Qualifications	Experience
		Ashley has two years of experience assisting Competent Bat Ecologists in undertaking acoustic monitoring surveys, including assisting ABM field deployments, data collection and analysis, while working towards full certification. This experience includes bat surveys conducted across various habitat types in Otago, Southland, Auckland, and Waikato.

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