WAITAHA HYDRO SCHEME
ASSESSMENT OF EFFECTS ON
TERRESTRIAL FAUNA: BATS, AVIFAUNA AND *POWELLIPHANTA* LAND SNAILS

July 2025

Report prepared for: Westpower Ltd

Report prepared by: Rhys Buckingham

Report reviewed by: Dr Brian Lloyd

Statement confirming compliance with the Environment Court's Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2023

As an expert witness or peer reviewer, I have read, and I am familiar with the Environment Court's Code of Conduct for expert witnesses contained in the Environment Court Practice Note 2023.

I have prepared my, or provided input into, an assessment of effects for the Waitaha Hydro Scheme in compliance with the Code of Conduct and will continue to comply with it in this Fast-track Approvals Act process. In particular:

- my overriding duty is to assist the decision-maker impartially on matters within my expertise;
- unless I state otherwise, my assessment is within my area of expertise, and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express; and
- I have not, and will not behave as, an advocate for the Applicants.

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Cover photos:

Long-tailed bat: D'Urville Island 2015 (Brian Lloyd photo)

Kea on southern rata (*Metrosideros umbellate*) above Morgan Gorge (author photo)

Western weka, Waiuta, 2016 (author photo)

1. Introduction

Westpower Ltd (**Westpower**) proposes a run-of-the-river hydro-electric power scheme (**The Scheme**) for the Waitaha River, approximately 60km south of Hokitika[1] on the West Coast of the South Island, New Zealand (**Figure 1**).

The proposed Headworks include a low weir and intake structure situated at the top of Morgan Gorge that will divert water into a pressurised desander and tunnel. A pressurised tunnel will convey the diverted water down to a Power Station below Morgan Gorge. Having passed through the turbines the diverted water will be returned via tailrace discharging to the Waitaha mainstem in the vicinity of the confluence with Alpha Creek. The Scheme will divert up to a proposed maximum of 23 m³/s ('cumecs'), whilst maintaining a minimum residual river flow of 3.5 m³/s immediately downstream of the intake. The hydro design includes a 10 m3/s bypass valve to maintain water flow following Power Station outages. The abstraction reach would include approximately 2.5 km of the Waitaha River, including Morgan Gorge. Construction access to the Headworks above Morgan Gorge would initially be via helicopter and/or on foot and then via the access tunnel (once completed). A short access road will provide temporary access between the access tunnel portal and Construction Staging Area 1 (Headworks) during the construction phase. An access road and transmission line corridor would be required from Anderson Road to the Power Station. The access road and transmission line from Anderson Road to Macgregor Creek will be 10m wide during both construction and operation. The transmission line from Macgregor Creek to the Power Station mainly runs parallel to the access road and this combined corridor would be on average 15m in width with each corridor diverging at a small section on the true left of Macgregor Creek.

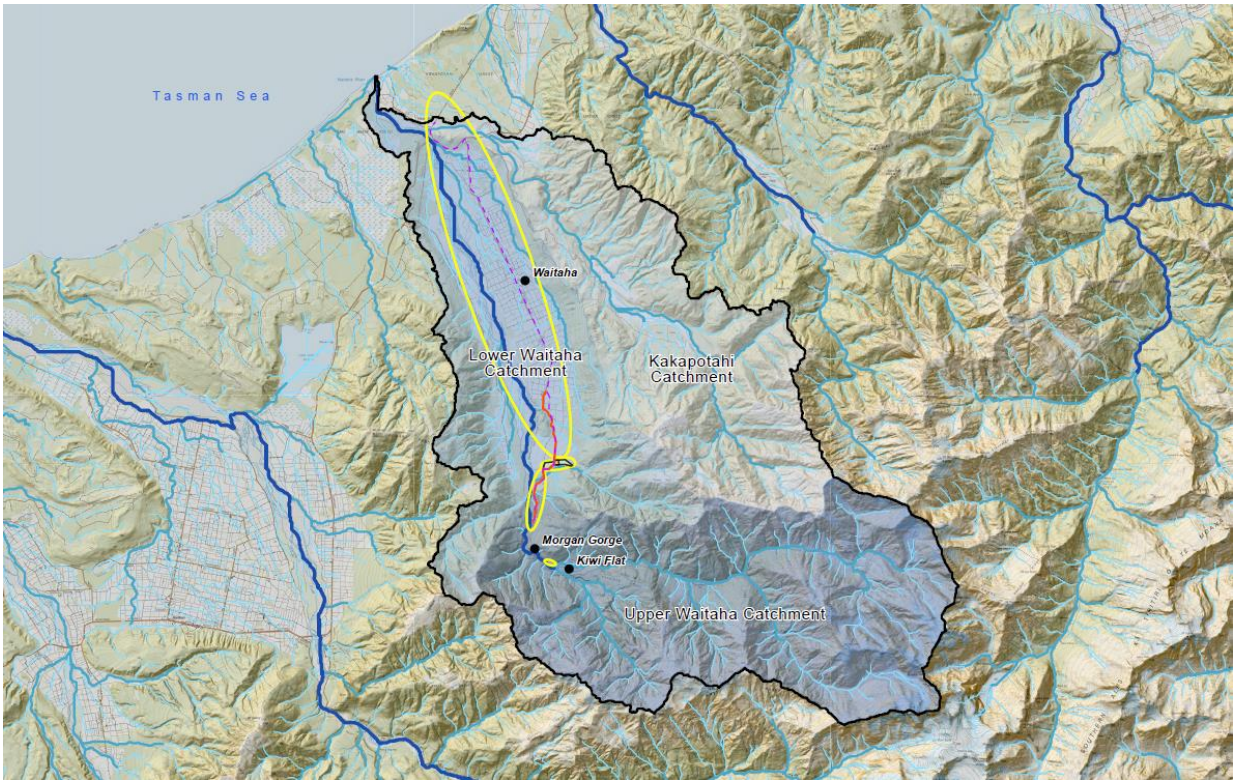


Figure 1 Project location

As part of this work, the existing transmission corridor extending from State Highway 6 (SH6) and the Waitaha Bridge to the southern part of Waitaha Road would be upgraded. No works along the proposed

[1] Measured using local roads and tracks to the Power Station

upgrading of this transmission line will occur within an existing Scenic Reserve. The Scheme footprint upriver of the Macgregor Creek's confluence with the Waitaha River lies within Department of Conservation (**DOC**) administered land.

The main construction activity will take about 3-4 years, followed by a low level of activity during routine operation and maintenance. The overall footprint area between the farm boundary on the true right of Macgregor Creek and the Power Station Site, and at the Headworks (excluding underground areas) is an estimated 7.4 ha during construction, reducing to approximately 5 ha during operation. An additional approximately 21 ha footprint includes the access road across the farm, the transmission line from Construction Staging Area 3 to SH6, along SH6, Beach Road and Bold Head Road to the Waitaha Substation, temporary construction areas on the farm, Spoil Disposal Areas, Construction Staging Area 3 and the Gravel Screening Area north of the Doughboy Hill. Gravel extraction will also occur from the bed of the Waitaha River. The transmission line footprint mostly follows the existing network. The line will be upgraded along Bold Head Road, SH6 and along the fill length of Waitaha Road: from the end of Waitaha Road, there will be a new 66 kV line built all the way to the Power Station.

Further detail on the project design and project background information as it relates to terrestrial fauna is set out in **Appendix A.** This information, as well as a description of the **Project Site** is set out in the **Project Overview Report**.

Wildlife Surveys has been commissioned by Westpower to assess the potential effects of the Scheme on terrestrial fauna, specifically endemic bats, indigenous birds excluding whio (blue duck) and endemic *Powelliphanta* land snails. Whio are covered independently by Fred Overmars (refer Sustainability Solutions, 2025. Waitaha Hydro Scheme: Assessment of Environmental Effects – Whio Blue Duck (the **Whio Report)**).

The qualifications and experience of the report author relevant to this Scheme are set out in **Appendix B**.

This report considers and assesses:

- the values and their significance within the Project Site, and the potential effects of the Scheme, in relation to terrestrial fauna as defined in Sections 4 & 5 below, and
- how these potential effects are proposed to be managed (Section 6).

Detail on the scope and approach of this report is set out in **Appendix C.**

2. Investigations of Terrestrial Fauna

Four separate surveys for terrestrial fauna (bats, birds and *Powelliphanta* snails) have been undertaken:

- a general baseline survey: October 2006;
- a targeted survey for threatened species: January 2007;
- a survey focusing on bats, fernbirds and *Powelliphanta* snails in November & December 2012 (three separate trips); and
- an acoustic survey for birds in August 2024.

The surveys were designed to cover the Scheme's footprint area as well as outside this area to ensure all habitat types were covered. Standard survey methods were used to evaluate presence/absence, broad distributions and relative abundance of terrestrial fauna. These methods included five-minute counts and grid-based distribution counts for birds, specialized playback surveys for fernbirds, and acoustic surveys for bats and birds. Focused walk-through surveys were undertaken for *Powelliphanta* snails.

An additional bat survey was not undertaken in August 2024 alongside the bird survey because bats are largely inactive at the time of the bird survey and it was assumed long-tailed bats, pekapeka (*Chalinolobus tuberculatus*) would still be present in the Waitaha Valley. Given this assumption, there was no requirement for further bat surveys to address the main mitigation recommendation for bats (i.e. given the guidelines in DOC's protocols for minimising effects on bat roosts during construction would be followed). There have not been any detectable broad changes in avifauna distributions and relative abundance since

2006, so there is no particular reason that there would be broad changes in the bat population. Further detail of these investigations is provided in **Appendix E**.

3. Existing Environment

The Scheme is located on the east (true right) side of the Waitaha River (**Figure 1**). Below Macgregor Creek, the proposed Scheme footprint lies within private land and existing road reserve. The Scheme's proposed footprint south of Macgregor Creek lies within largely unmodified indigenous vegetation of the Waitaha Forest Conservation Unit, being Stewardship Land administered by DOC.

The Scheme lies within the Wilberg Ecological District (**Wilberg ED**) and Harihari Ecological District (**Harihari ED**) of the Whataroa Ecological Region. The boundary of the two EDs is just north of Macgregor Creek. The Wilberg ED spans 84,114 hectares and is almost entirely conservation land. Of this total area, 62,655 ha is vegetated (indigenous vegetation of some type). The proposed footprint area is 7.4 ha during construction (reducing to approximately 5 ha during operation), being approximately 0.008% of the Wilberg ED. The Harihari ED (93,071 ha) comprises a mixture of conservation, reserve and private land. Within the Harihari ED, the Scheme lies entirely within private land and road reserve with minimal forest/shrub cover and no public conservation land. The footprint here includes the transmission line corridor, some access roads, Construction Staging Area 3 and spoil disposal areas.

Public conservation land on the West Coast occupies 1.912 million hectares (85% of the West Coast). The Waitaha Catchment is 31,561 hectares, being 1.65% of the West Coast public conservation land. The proposed footprint area is 7.4 ha during construction, that is 0.0004% of the total public conservation land on the West Coast.

The Scheme's proposed footprint includes grassland, broadleaved shrub and podocarp/hardwood, hardwood/tree fern shrub, kamahi forest and seral forest below Morgan Gorge (TACCRA Ltd, 2025 Waitaha Hydro Scheme: Terrestrial Flora (the **Terrestrial Flora Report)**). Above Morgan Gorge there is mature podocarp/hardwood hill forest and successional hardwood shrub. These types of vegetation are sometimes clearly demarcated by different topography such as above and below terraces, or between alluvial river flats and forest margins. However, it is common to have various degrees of intergradation between types.

A regionally significant population of long-tailed bats has been identified in the lower/mid Waitaha Valley. This determination was based on DOC bat database records **(Figure 2)** as well as widespread bat surveys carried out by DOC and Rhys Buckingham for Timberlands West Coast Ltd throughout their West Coast estate between 1994 and 2002 using similar methods as undertaken in the Waitaha Valley (Buckingham 1998, 1999 & 2002). While long-tailed bat records are widespread throughout South Westland **(Figure 2)**, in general they appear to be present in very small isolated populations (Molloy 1995, local DOC information, pers. obs.).

Surveys for Westpower found highest long-tailed bat encounter rates at Kiwi Flat compared to other areas surveyed on the true right of the Waitaha River to about 500m north of Macgregor Creek (Wildlife Surveys 2013). Highest rates were detected in the lower Kiwi Flat area where the Headworks will be located and in the upper Kiwi Flat area which is outside the Scheme's footprint. Bat activity was also detected on the river terraces below Morgan Gorge, particularly below the Macgregor Creek confluence, indicating that this is an important foraging area for bats. This area is outside the Scheme's footprint (other than for possible gravel extraction which will have no effects on bats). Bats were also recorded in low pass rates between Morgan Gorge and Macgregor Creek within the Scheme's footprint. It is possible that bats roost and breed in tall forest within the Scheme footprint in the vicinity of Morgan Gorge and at Kiwi Flat. Bats were rarely detected within the proposed access road/transmission line corridor between Macgregor Creek and the Power Station with small numbers of passes being recorded at riparian margins that are largely avoided during construction.

An accumulated total of over 40 species of birds have been recorded in the Waitaha Valley from the end of Waitaha Road to Kiwi Flat between 2006 and 2024. Six threatened species (whio, grey duck, bush falcon, kea, South Island kākā, long-tailed cuckoo and six at risk species (black shag, South Island pied oystercatcher, yellow-crowned kakariki, South Island robin, South Island fernbird and NZ pipit) have been

identified as being present (some seasonally)[2]. Colin O'Donnell (DOC Officer's report (2016) for the DOC concession application hearing) also identified two further species (banded dotterel: 'Nationally Vulnerable' and variable oystercatcher: 'At Risk: Recovering') outside the Scheme's footprint along the braided river above the Waitaha Bridge. Most of these species appear to be localised and uncommon in this area, although kea and long-tailed cuckoo have been relatively frequently recorded (seasonally for long-tailed cuckoo). Western weka (previously 'At Risk' but now 'Not Threatened') is an isolated Waitaha Valley population that might be genetically distinct.

The proportion of indigenous species to introduced species increases in the less-modified forested habitats further up-river. Some 'Threatened' and 'At Risk' birds (e.g. kākā and kākāriki) appear to be primarily present higher up the Waitaha Valley in in the vicinity of Morgan Gorge and Kiwi Flat, while others (e.g. bush falcon and kea) are widely but thinly distributed throughout the footprint. Western weka and robins appear to be relatively small and patchy male-biased populations, indicating small mammal predation pressure.

During the most recent 2024 survey, two threatened species (kea and South Island kākā) and three at-risk species (kākāriki, South Island robin and black shag) were detected. Of these species, kea was the most frequently encountered (5%) and the most widespread. The most frequently encountered and most widely distributed indigenous birds recorded were tomtit (78.3%), silvereye (70%), bellbird (63.8%), grey warbler (50.8%) and fantail (22.9%) all of which are non-threatened. Kiwi, short-tailed bats (pekapeka: *Mystacina tuberculata*) and *Powelliphanta* land snails have not been recorded in the Waitaha Valley.

The effects of browsing introduced mammals on vegetation within the surveyed parts of the Waitaha Valley appears very low (the **Terrestrial Flora Report**). However, predation by introduced mammalian predators appears to be a serious threat to the indigenous bird and bats populations in the area, despite

[2] See Appendix J for scientific and Māori names of birds

intermittent ground and aerial control of possums carried out by OSPRI (formerly the Animal Health

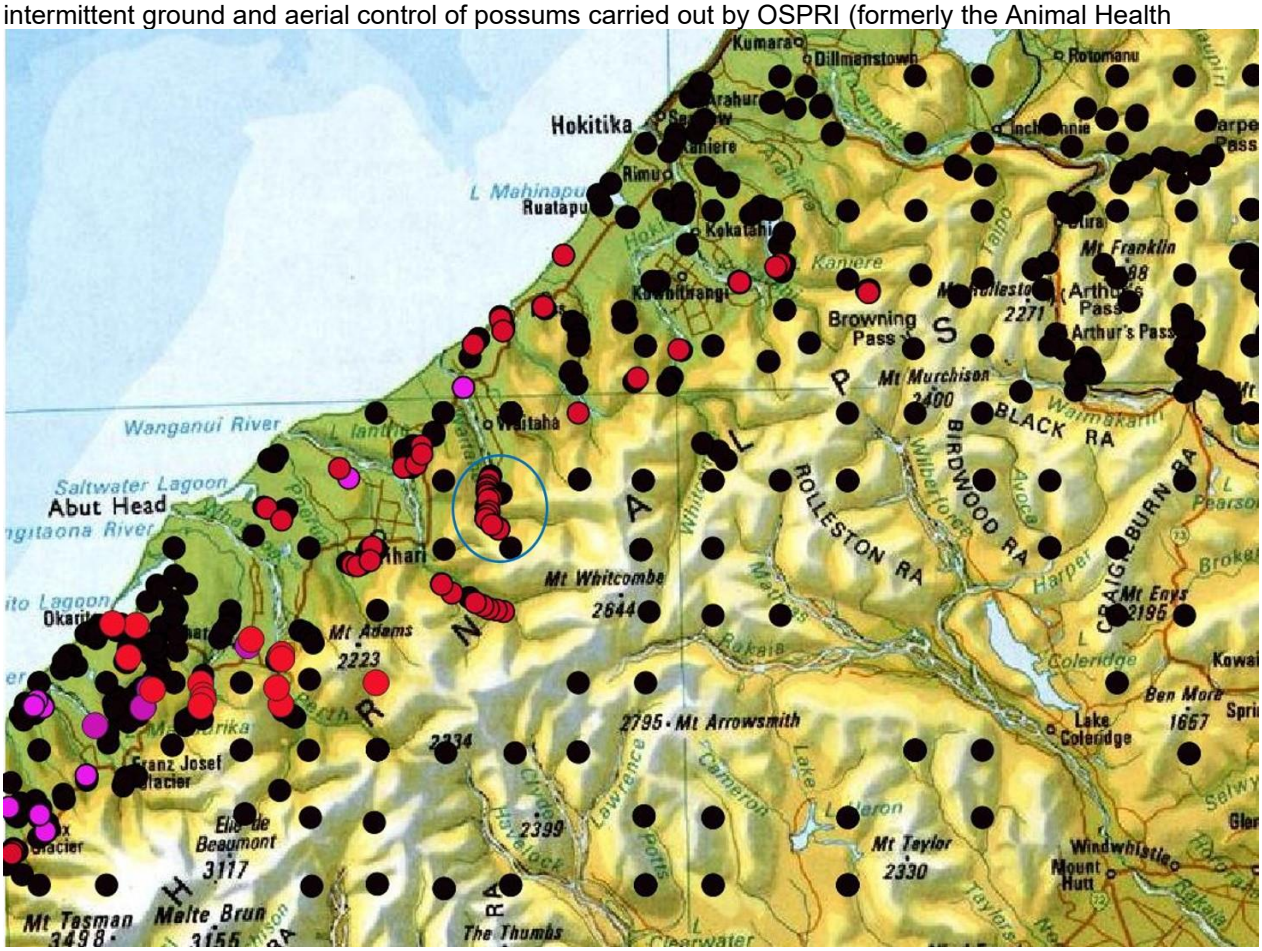


Figure 2 Bat database records (historical to 2025) Hokitika to Franz Josef (from DOC: map prepared by Brian Lloyd)

Red symbols: Long-tailed bat records; purple symbols: unknown bat species (presumably long-tailed bat); black symbols: bats not detected by ABMs. Blue polygon: Waitaha Valley. Caution should be taken in interpreting this map, as survey methods and effort are not consistent throughout the area covered.

Board). Signs of these predator effects include lower than expected numbers of some threatened or vulnerable species (e.g. kākā, kākāriki, robin, rifleman) and as stated above, observed male-biased populations (e.g. weka, robin).

Although, the distribution and conspicuousness of many species of birds, including some threatened birds, appear not to have changed materially between 2006 and 2024, the very low encounters of kākā, kākāriki and robin is noteworthy, as were the relatively few kea detected in 2024 (usually of single birds that might be the same individual flying up and down the valley) and apparent male-biased weka population (few pairs heard and single male calls generally not answered by other weka). The abundant presence of small mammal predators (mice, ship rats, stoats and possums) found in 2007 (McLennan 2007a & b) are the likely reason for the relative paucity of birds in the Valley, particularly threatened species. While surveys between 2006 and 2024 have not shown any particular decline of birds in general, the baseline surveys were not designed to show population trends. It is possible that the intermittent and patchy predator control carried out by OSPRI has helped arrest any significant declines of birds in the Waitaha Valley.

Further effects on indigenous biodiversity and ecosystem functioning are predicted with the growing influence of climate change, the immediate threat of invasive species and possible arrival of diseases, such as the highly infectious avian influenza (HPAI H5N1 bird flu) that is currently rapidly spreading in other parts of the globe (recently the strain H5N1 has spread to Antarctica and an equally infectious subtype H7N6 was discovered in New Zealand in December 2024). Mostly, these effects are likely to be gradual, though if the bird flu reaches the West Coast, its effects could be very rapid. Similarly, rapid impacts on fauna could be inflicted by major weather events or severe earthquakes. The alpine fault rupture when it occurs would have serious to devastating effects on terrestrial fauna and their habitats.

On the West Coast and elsewhere, the effects of climate change may already be impacting terrestrial fauna by influencing an increase in the frequency of seed mast events, with the flow-on effect of increasing the frequency of predator population irruptions (e.g. Christie 2014; Keegan et al. 2021; McGlone 2001; McGlone et al. 1998; Schauber et al. 2008). An increased frequency of these events would give less time for indigenous birds and bats to recover between predator irruptions (Robertson et al 2021). While there are currently not many New Zealand examples of climate change affecting indigenous fauna (review in Keegan et al. 2021), Pryde et al. (2005) have linked declines of long-tailed bats to climate change in the Eglinton Valley, Fiordland.

Climate change poses a significant threat that will exacerbate the decline in biodiversity, including indigenous ecosystems and fauna in the Waitaha Valley. Assessing the conservation status of New Zealand's birds now factors in the effects of climate change as one of the qualifiers to determine threat status (Robertson et al 2021; Rolfe et al. 2022).

Further information on the existing environment is found in **Appendices C and D**.

4. Values and Significance Assessments for Terrestrial Fauna

The relevant plans and policies that provide guidance on the significance of the values for indigenous terrestrial fauna (birds, bats and *Powelliphanta* snails) and their habitats have been reviewed. **Table 1** below provides a summary of the significance of the values assessed in accordance with the relevant planning provisions in the West Coast Regional Policy Statement (**RPS**), the Westland District Plan (**WDP**) and the West Coast Conservation Management Strategy 2010-2020 (**CMS**). Additional comments on the National Policy Statement for Indigenous Biodiversity (**NPSIB**), the proposed Te Tai o Poutini Plan (**pTTPP**) and the provisions of each of the above planning documents relevant for assessing significance are provided in **Appendix F**. Note that renewable energy projects are exempted from consideration under the NPSIB, but it is utilised here to the extent that it provides helpful context.

The indigenous ecosystems within the Scheme's footprint, while reflective of the extensive indigenous ecosystems in the Waitaha Valley and the ED are significant in terms of habitat for threatened species and representativeness, particularly for long-tailed bats that have the highest DOC threat ranking ('Nationally Critical') (**Table 1**).

This value assessment excludes the highly modified habitats within which the access road and transmission line corridor will be predominantly located (i.e. SH6 to Macgregor Creek).

This overall assessment is consistent with relevant planning documents. However, there are concerns regarding the **viability and intactness** of the Waitaha Valley over time (CMS 3.3.2.3 (1) & WDP 4.9D(i)) and maintenance and enhancement of ecological and reproductive processes. Baseline bird surveys have found evidence of relatively low numbers of birds in the Waitaha Valley and evidence of male-biased populations of some threatened species. These are indications that predators are currently limiting indigenous bird populations in the Valley. Climate change, the spread of invasive species and bird diseases could also exacerbate threats to indigenous biodiversity and fauna in the future (e.g. Keegan, et al. 2021).

Table 1. Significance of terrestrial faunal values

Criteria	Current significance of values in the Waitaha Valley
Representativeness (RPS, WDP and CMS)	High value: stronghold long-tailed bat population; higher than expected long-tailed cuckoo population; isolated western weka population
Rarity/Distinctiveness (RPS, WDP and CMS)	High Value for (b) Threat and (d) Distinctive and restricted populations
Diversity and Pattern (RPS and CMS)	Moderate significance as high diversity of bird species
Ecological Context (RPS)	High value for threatened species and potentially high value for isolated population of western weka
Intactness (WDP and CMS)	High value in mid to upper reaches of catchment (low value north of Macgregor Creek)
Connectivity (RPS and WDP)	Low to no impediment to connectivity with wider habitats by proposed Scheme
Migratory Species (WDP)	Potentially high value for one threatened species: long-tailed cuckoo and moderate value for species such as kererū, but no envisaged loss of these values by proposed Scheme
Scientific or other cultural value (WDP)	Assessed of low value. No sites of significance listed in the pTTPP

In summary:

- Long-tailed bats are **of particular significance** as they are of highest threat status (Nationally Critical) and are regarded as regionally significant in the Waitaha Valley (comparatively[3] high pass rates, especially at Kiwi Flat around the proposed portal entry).
- Threatened and at-risk birds are **significant** because they are nationally declining. However, populations of all threatened bird species in the Waitaha Valley are widely represented elsewhere (note: whio are not considered in this assessment but are considered in the **Whio Report**).
- The nationally non-threatened western weka is of **potential significance** as it might be a genetically discrete population.
- Other birds of conservation importance[4] include kererū, rifleman and brown creeper as they are uncommon in the Waitaha Valley but are unlikely to be affected by the Scheme at a population level.
- Other non-threatened indigenous birds are of **lower significance** as they are well represented in adjoining forests and elsewhere in the South Island.
- Introduced birds have **no value of significance** as they are widespread, and some such as blackbird and song thrush might be competing with indigenous birds.

To be clear the use of the word 'bird' or avifauna' within this report refers solely to the species within the second to forth bullet points above, all being species of conservation importance.

5. Environmental Effects Assessment

The Scheme footprint will affect approximately 3.6 ha of mature/tall and regenerating forest, 2.0 ha of shrub/seral cover and 1.2 ha of open, generally non-woody vegetation (excluding farmland and road reserve) (**Table 2**). Nearly all of forested and other woody vegetation affected is within DOC conservation land south of Macgregor Creek. Approximately 1.8 ha of shrub/seral cover on DOC/LINZ land lies south of the farm boundary at Macgregor Creek, and only 0.2 ha of shrub/seral cover is north of the farm boundary at Macgregor Creek, near 'the Doughboy' on private land (see Taccra Ltd 2025: **Vegetation Report**). These vegetation types affect terrestrial fauna (bats and birds) to varying extents, though overall, effects on these faunas by the Scheme at a population level are considered **less than minor**. The very small area of riverbed and streambed affected by the Scheme is also considered to have **less than minor** effects on these faunas, but are assessed in this report. Potential, possible downstream effects by the Scheme on bats and riverine birds are also considered in this report.

The Scheme has been designed to first avoid, and then minimise, effects on terrestrial fauna as far as practicable. Key elements of the design to achieve this are:

- designing the Scheme as a "run-of-river" scheme as opposed to a dam, avoiding the formation of a lake which would have a greater impact on fauna and their habitat;
- the utilisation of an underground tunnel design (for access and water diversion), which avoids an access road through the area of most significant habitat (tall podocarp/broadleaved forests in the vicinity of Morgan Gorge);

[3] Compared with bat populations in many other parts of the West Coast.

[4] The term 'birds of conservation importance' used in this report specifically refers to all indigenous 'Threatened' and 'At Risk' birds, as well as non-threatened species that are uncommon, have fragmented/localised distributions, or have potentially genetic distinctiveness in the Waitaha Valley that potentially could be affected by the Scheme on a population level during construction. Such non-threatened birds would include weka, kererū, rifleman and brown creeper.

- designing structures and systems that minimise effects of sedimentation and river flow changes that could have consequential effects on fauna and their habitats (examples: next two bullet points);
- low weir design minimising area of backwater effect above the weir;
- including a bypass valve to minimise flow changes in the river following station outages;
- the small size of the Scheme's footprint within DOC land (c. 7.4 ha during construction and 5 ha during operation), particularly when compared with the extensive unmodified ecosystems surrounding the Scheme;
- to avoid as far as reasonably practicable and otherwise minimise the removal or modification of large trees (≥60 cm dbh for hardwoods and ≥30 cm dbh for podocarps) that provide important bat and bird habitat;
- minimising area of construction and mature forest removal at the tunnel portal sites (entrance and exit);
- to avoid or manage sensitive areas such as near the Stable Tributary, cliff faces, or unstable ground to reduce potential effects on bat and bird habitat;
- location of the proposed Power Station in habitat of relatively low importance to indigenous fauna (bats and birds);
- aligning the power transmission line along the access road or existing road reserves for most of the route from the Power Station to SH6 to reduce habitat clearance;
- having no lights along the access road to the Power Station and ensuring lights elsewhere are designed to have minimal adverse effects on wildlife; and
- eliminating or reducing the risk of birds getting electrocuted by transmission wires.

A project such as this does however have the potential to adversely impact terrestrial fauna. An assessment of effects on terrestrial fauna has been prepared utilising past experience, literature reviews, RMA guidelines and the Ecological Impact Assessment guideline document, published by EIANZ in 2018 (see **Table 3** and **Appendix G**, Section 2). The main environmental effects on terrestrial fauna as a result of the Scheme are considered to be:

- incidental direct loss (death) of individual fauna by habitat removal, other construction, traffic, electrocution, etc.;
- loss or modification of habitat for indigenous species; and,
- disturbance to breeding, roosting, commuting routes (particularly bats) and foraging activities caused by noise, vibration, lighting, traffic, human presence, etc.

Other environmental effects of the Scheme on terrestrial fauna are:

- downstream (or temporary upstream) effects for riverine birds;
- consequential effects on riverine birds from extraction of gravels from the braided dry riverbed of the Waitaha River and Macgregor Creek (localised effect); and,
- increase in pests because of roading or increased human presence.

For convenience, the Scheme's footprint is divided into four areas, being:

1. **Footprint Area 1** - upper footprint area (proposed Headworks infrastructure and temporary Construction Staging Area 1).
2. **Footprint Area 2** - middle footprint area between the farm boundary on the true right of Macgregor Creek and the proposed Power Station (vehicle access and transmission line route through DOC land, construction and structures around the proposed Power Station Site including Construction Staging Area 2).

3. **Footprint Area 3** - part of lower footprint area immediately north (downstream) of Macgregor Creek within farmland (spoil disposal area and Construction Staging Area 3) and the gravel extraction area within the Waitaha River.
4. **Footprint Area 4** - main lower footprint area from Construction Staging Area 3 to SH6 and along SH6, Beach Road and Bold Head Road to Waitaha Substation (road access and transmission line within farmland and road reserve).

Areas 3 and 4 are predominantly within private land and road reserve, differing from Areas 1 and 2 that are predominantly within DOC Conservation Estate (a very small area on the true right of Macgregor Creek is administered by Land Information New Zealand (LINZ) (see **Terrestrial Flora Report**)).

The areas of the Scheme's footprint where effects on terrestrial fauna are potentially the greatest are:

- Area 1: the Headworks above the Morgan Gorge (highest number of threatened species identified, but a relatively small area of affected habitat); and,
- Area 2: along the vehicle access/transmission route through DOC forested land from Macgregor Creek to the proposed Power Station (the largest area of affected habitat).

The greatest potential effects on fauna will be along the access road/transmission line route between Macgregor Creek and the Power Station (Area 2). This is where the most forest clearance will occur, with the potential of affecting bat and bird habitat and incidentally killing individuals. The forest area affected is largely older regenerating forest found to have lower indigenous species diversity and very low bat activity compared to Area 1 above Morgan Gorge. The access road and transmission corridor through this area to the Power station was survey by Jan Derks. That survey was designed to minimize effects on large emergent trees. Following that survey the route was amended to avoid wetlands. The corridor has therefore been developed to respond to various ecological matters but, importantly for bats and birds, to reduce as far as practicable effects on large emergent trees.

While Area 1 abuts habitats considered the most important for indigenous bats and birds, the Scheme has a very small footprint within this area. With the proposed mitigations and management during construction (see **Table 5**) effects on terrestrial fauna (bats and birds) are **less than minor** for Areas 1 and 2. Effects are likely to be **less than minor** around the proposed Power Station Site (within Area 2), as the surrounding forest habitat is not disturbed.

The least adverse effects on bats and birds are predicted to occur in the highly modified part of the Scheme's footprint north of Macgregor Creek (Area 3 & 4) where there will be little to no significant habitat for indigenous birds or bats affected. While long-tailed bats, falcon, kea and weka are known from this general area, they are likely to be negligibly affected by the Scheme. Therefore, effects of the Scheme on indigenous bats and birds are considered **less than minor** to **negligible** in Areas 3 and 4.

The approximate extent of vegetation affected in these four areas (and Scheme total) during construction is shown in **Table 2**. For more detail, including areas affected permanently, refer to the **Vegetation Report**.

Table 2. Indication of broad-type vegetation areas (in hectares) affected by the Scheme in defined areas during construction phase.

Table and notes below provided by Jan Derks.

Scheme Area	Predominant Land Status*	Mature/tall forest & regen forest	Shrub/seral cover	Open generally non-woody cover	Area totals
Area 1	DOC	0.04 ha	0.89 ha	0.07 ha	1.01 ha
Area 2	DOC / LINZ	3.53 ha	0.91 ha	1.14 ha	5.58 ha
Area 3	Private freehold	non-indigenous	non-indigenous	non-indigenous	0.00 ha
Area 4	Private freehold	0.0 ha	0.20 ha	0.0 ha	0.21 ha
Scheme footprint total		**3.57 ha**	**2.00 ha**	**1.21 ha**	**6.80 ha**

Notes: * LINZ administer small riparian areas, e.g. around Macgregor Creek.

Notes referring to Table 2 (provided by Jan Derks)

1/ Regenerating Forest is grouped with Mature/Tall Forest because Regenerating Forest contains a high incidence of stems ≥15 cm dbh: the stem diameter at breast height triggering the DOC bat roost protocol (see Section 6 below);

2./ Shrub/Seral cover category will contain some varying frequency (generally low) of stems ≥15 cm dbh, however predominant cover is by stems <15 cm dbh; and,

3./ Open, Generally Non-Woody Species Occupancy refers to areas of herbaceous/monocot cover with some incidence (extremely low, if any, of stems ≥15 cm dbh) of woody shrub species.

Approximately 23,000 cubic meters of gravel will be taken from the Waitaha River braided channel, and up to 100,000 cubic meters from the Spoil Disposal Areas on the farm to build the access road across the farm and from the farm boundary of the true right of Macgregor Creek to the Power Station. This operation could affect some riverine birds (e.g. oystercatchers, pied stilt and banded dotterel) if undertaken during their breeding season (can extend from July to late February). However, mitigation is proposed to ensure that effects on these birds will be **negligible** (**Table 5**).

It is noted that the overall effects of the Scheme on bats and forest birds are likely to be **less than minor** after mitigation. While there are plentiful smaller trees with ≥15 cm dbh along the proposed access and transmission line route between Power Station and Macgregor Creek, these trees are largely kamahi that have relatively few bat roosting characteristics such as cavities, bark crevices, etc to provide bat roosting/breeding habitat. In comparison, there is an abundance of larger more suitable roost trees outside the linear, access road/transmission line footprint which is very small given the scale of surrounding habitat.

To evaluate the area of forest in the Waitaha Valley catchment suitable for long-tailed bat roosting, the extent of lowland podocarp-hardwood forest in the Waitaha catchment was determined by Dr Brian Lloyd from vegetation types in the Land Resource Inventory Version 3 (**NZLRI**)[3] spatial database (see **Table 3**). The NZLRI database was derived from stereo aerial photograph interpretation, with field verification and measurement, undertaken between 1973 and 1983 (Blaschke, Hunter, Eyles, & Van Berkel, 1981; Hunter & Blaschke, 1986) and provides better resolution between vegetation types than the most recent spatial database LCDB v5.0, which does not distinguish between major indigenous forest types. Mature forest in DOC managed areas will not have changed significantly in the 40 years since the NZLRI database was compiled. In the immediate vicinity of the scheme there is a 737ha area of mature podocarp hardwood forest, which extends 5.8 km along the banks of Waitaha River, with 627 ha on the true right and 110 ha on the true left of the river. Four kilometres further upstream there is another 86-ha patch of mature podocarp on the true left of Waitaha River. Because long-tailed bats rarely roost at elevations >500 m a.s.l., the total area of forest suitable for roosting in the Scheme's vicinity is 630 ha.

Table 3. Areas of mature podocarp hardwood forest in the Waitaha catchment, from NZLRI database

Location		Area (ha)		
	Elevation:	60-500m	>500m< 600m	60-600 m
Scheme vicinity	True Right	520	108	627
	True Left	110	0	110
	Both sides	630	108	737
6 km upstream		39	48	86

It is unlikely bats would select the smaller trees within the Scheme footprint to roost when there are plentiful larger more ideal roosting trees beyond the footprint (as shown in **Table 3**. This is supported by surveys (Wildlife Surveys 2013) which found very low to no bat activity within the access and transmission line route and relatively low numbers of threatened birds along this route between Power Station and Macgregor Creek. Therefore, the risk of harming bats or disrupting bat flight routes within Area 2 is **low** during construction, as are effects on threatened indigenous birds.

While the extent of significant bat and bird habitat affected at the Headworks and Construction Staging Area 1 (Area 1) is relatively low, this area has the most faunal significance regarding threatened species and forest habitat than other parts of the footprint. However, minimising removal of large diameter trees and controlling construction noise and lighting where practicable should ensure **less than minor** adverse effects on bats and birds in this area. Potential adverse effects on fauna are greatest during the construction phase, as this involves felling of trees, vehicle (land and helicopter) movements, noise and vibration from construction activities, increased lighting and the use of fuel and other chemicals. After construction and during the Scheme's operation, overall effects on fauna are **negligible**.

Overall, the effects on fauna during construction are **less than minor** providing the recommended mitigation is carried out, including adherence to the DOC protocol to reduce potential loss of long-tailed bat roosts and minimising effects on the Morgan Gorge commuting route.

In addition, although the risk is very low, if bat colonies or maternity roosts were harmed during construction, then overall effects on bats are potentially **significant**. While I understand from Dr Brian Lloyd that as far as he is aware such an event has not occurred when the DOC protocol is applied, as a precautionary measure, a financial contribution to an ecosystem programme within the region (for example the programme undertaken by Zero Invasive Predators) is recommended.

Hydro-electricity schemes can potentially have downstream effects on fauna as a result of significant changes in river flow dynamics, sedimentation or contaminant spills, etc. that could affect the fish or invertebrate food resource for bats and birds (aquatic flying insects),or affect nesting riverine birds from sudden surges in river flow. However, Doyle, 2025, Proposed Waitaha Hydro Scheme. Changes to the natural environment: Hydrology (the **Hydrology Report**), Hicks, 2025, Proposed Waitaha Hydro Scheme assessment of environmental effects: Sediment (**Sediment Report**) and EOS, 2025, proposed Waitaha Hydro Scheme assessment of environmental effects: freshwater ecology (**Freshwater Ecology Report**) consider that the downstream effects of the Scheme on hydrology, sediment and freshwater ecology will be no more than minor, particularly as the bypass valve will largely resolve the issue of flow ramping effects that could potentially affect riverine birds and bat food resource (see AusHydro, 2025, Waitaha Hydro Project: downstream flow modelling (**Flow Modelling Report**) the **Hydrology Report**, the **Sediment Report** and the **Freshwater Ecology Report**).

In light of this, the effects on habitat and food resource for bats and birds are **less than minor**. Downstream effects are discussed in **Appendix G** (Section 3.2.6).

6. Adverse Effects Management Recommended

Having considered the **Project Description** (as of 6 June 2025) it is evident that Westpower's 'best practice' approach is aimed at avoiding and minimising potential effects where practicable, by minimising footprint size, minimising the removal of big trees, and mitigating the effects of vehicle movement, construction noise and lighting, etc. as part of the Scheme's design (see Section 5 above).

While the project design will help minimise potential adverse effects on terrestrial fauna, further measures are suggested to ensure the overall effects of the Scheme on terrestrial fauna are **less than minor**. In particular, it is considered that more needs to be done to ensure that long-tailed bats are not harmed by construction and that effects on the commuting route through Morgan Gorge are minimised (refer to **Table 5**). These suggested extra measures for long-tailed bats will also benefit threatened and non-threatened indigenous birds present in the area.

Given uncertainties even with the implementation of strong ecological protocols, and also the practical ineffectiveness of monitoring, it is recommended that Westpower proactively financially contribute to an ecosystem programme during construction (at a minimum), for example predator control, within the region and over an area having similar bat and bird assemblages as within the Waitaha Valley. One option is a financial contribution to Zero Invasive Predators (ZIP) currently carrying out predator control for Predator Free South Westland, a project launched in March 2021 by the then Minister of Conservation. ZIP's broad approach is not control, but elimination of predators (possums, stoats and ship rats) within highly defendable boundaries (large rivers and alpine country). ZIP is at the cutting edge of predator management in New Zealand. While it is too early to fully assess outcomes of their work, huge beneficial effects to indigenous fauna are expected within the boundaries of their control regime.

Therefore, in addition to Westpower's proposed design to avoid or minimise effects on fauna, the key effects management recommendations are listed below:

Bats

Bats preferentially select large, old trees for their roosts (Griffiths 2007; Sedgely & O'Donnell 1999). These larger preferable bat roosting trees are relatively uncommon within the Scheme footprint but are common outside it (including outside the access route and transmission line corridor and particularly above Morgan Gorge) as illustrated in **Table 3**. Very few of these larger ideal bat roosting trees will be directly affected by the Scheme.

This means that the plentiful smaller trees with ≥15 cm dbh along the proposed access and transmission line route between Power Station and Macgregor Creek are unlikely to be used for bat roosting with bats preferring the larger trees beyond the footprint. The smaller trees have relatively few bat roosting characteristics such as cavities, bark crevices, etc to provide bat roosting/breeding habitat. Furthermore, surveys have identified low activity of bats along this route between the Power Station Site and Macgregor Creek (Wildlife Surveys 2013).

The DOC protocol specifies that trees with a diameter of ≥15 cm dbh require further assessment to determine whether they may provide a bat roost. However, for the reasons set out above it is unlikely bats would select these smaller trees for roosting when there is an abundance of larger more suitable roost trees (mostly outside the Scheme's footprint). This assessment is supported by the surveys.

Therefore, to reduce the chance of harming bats within areas of forest proposed to be felled, the DOC Protocols for minimising the risk of felling occupied bat roosts (Version 4, October 2024) (**DOC Bat Roost Protocols**) are being applied for the Scheme. Further detail on the DOC Bat Roost Protocols is provided in the Bat Management Plan (**BMP**).

Bat Management Plan

Dr Brian Lloyd, an independent qualified competent bat expert, has been consulted on by Westpower in the development of the BMP provided as part of this application. The critical measure in the BMP is the avoidance of tree felling (>/=15dbh) in the months of May to September (when bats are in torpor and difficult to detect).

In addition to the steps in the DOC Bat Roost Protocols, the following measures are recommended, and included in the BMP, to further reduce harm or disruptions to bats:

- For tree felling (≥15dbh) in all Areas 1 and 2:
    - Ideally, begin vegetation clearance before or after the peak breeding season (December and January) as bats will then likely select off-site maternity roosts in the abundant available habitat outside the Scheme's footprint;
    - Where practicable, minimise tree felling commencing during the peak bat breeding season (December and January) at the Headworks (if vegetation clearance begins during the peak breeding season there is more risk of incidentally killing or harming nursing colonies of bats);
- Minimise construction activities, open-air blasting and lighting at the Headworks between sunset and sunrise over summer, when bats are actively foraging for food (bats very likely use Morgan Gorge as a flight path);
- Lighting must emit no UV, are reflected downwards/designed to reduce scatter and turned on only when required (as in **Project Description**).
- Use blinds or curtains at night when lights used in temporary contractor's facilities at Construction Staging Areas 1 and 2;
- Minimise lighting at the Headworks as far as practicable from sunset to sunrise especially during main bat activity season (October to April);
- To reduce light effects on bats construction of the road and transmission line access should be carried out only during daytime if practicable;
- Manage road speeds (50 kph or less) and minimise use of access roads between sunset and sunrise during both construction and operation periods, especially during December and January during the breeding season to minimise incidental roadkill (bats are vulnerable to roadkill); and
- Ensuring all food and rubbish is collected, stored securely and removed from the site promptly to avoid local pest problems.

These measures will greatly minimise adverse effects on bats (and birds).

Birds

As mentioned above, an accumulated total of over 40 species of birds have been recorded in the Waitaha Valley from the end of Waitaha Road to Kiwi Flat between 2006 and 2024. Birds (like bats) prefer to nest in bigger trees (≥60 cm dbh for hardwoods and ≥30 cm dbh for podocarps) or in older, more establish forest that surrounds the Scheme (see **Table 3**). Overall, the vegetation to be cleared by the Scheme is younger forest where nesting is less likely to occur. While most of the bird species appear to be localised and uncommon in the area, within the Scheme the area of greatest potential nesting value is Area 1 (Morgan Gorge and Kiwi Flat (which is surrounded by large areas of older growth forest (see above)). The degree of works in Area 1 likely to affect older forest is very limited (vegetation clearance is c. 1 ha of indigenous vegetation reducing to c. 0.13 ha permanent loss). Clearance within Area 2 (access road and transmission line to the Power Station) is also through younger forest. Therefore, effects on nesting birds of conservation significance within the Scheme's footprint are considered **less than minor**. However, caution is required within the main breeding season, including for weka, which may be the most likely species to nest within Area 2.

The same applies to the area of the Waitaha River where gravel extraction is proposed to occur. The environment in that area for nesting birds is not as favourable as further downstream. Nesting birds have not been identified in the extraction area with, as above, banded dotterel and variable oystercatcher being recorded outside the Scheme's footprint along the braided river above the Waitaha Bridge (well downstream of the Scheme area).

The proposed mitigations therefore focus on Areas 1 and 2 and also include the gravel extraction in the Waitaha River. While birds of conservation importance may nest in Areas 3 and 4 it is considered very unlikely given the extent and types of vegetation present, the extensive better-quality vegetation elsewhere in the area, the limited vegetation clearance occurring and the existing noise and disturbances in those locations.

The Project Ecologist will be engaged during construction and should any specific issues in Areas 3 and 4 be identified during construction that person will be able to assist the contractor with any responses. Further, the Project Ecologist will also be available should any issues during vegetation clearance in Areas 1 and 2 arise outside of the peak breeding season for both forest birds and river birds. The Project Ecologist can also advise the contractor on potential nesting disturbances that could be utilised in advance of, and during, the peak breeding season.

The bird species of focus during the active breeding season are falcon, kea, kākā, kākāriki, weka and long-tailed cuckoo (noting that Kākā and kākāriki were not detected on baseline surveys in Area 2). It is, as above, unlikely that the nests of any of these species, apart from weka in Area 2, will be found but to be cautious a check should occur in Areas 1 and 2 during the peak breeding season.

In addition to the role of the Project Ecologist above, specific avifauna vegetation removal and gravel extraction protocols for Areas 1 and 2 and for the gravel extraction area in the Waitaha River bed measures are recommended to minimise adverse effects on the bird species above. These protocols are set out in the AMP. In addition to the avifauna vegetation removal and gravel extraction protocols in the **AMP**, potential effects on avifauna during construction of the Scheme will be minimised by (and these are included in the **AMP**):

- Manage lighting and noise, in accordance with the **Project Description** and relevant expert reports. Having no 'street' lighting along the access road to the Power Station (as per the **Project Description**) will minimise adverse effects on nocturnal fauna. Minimising traffic at night where practicable will reduce adverse effects on nocturnally active birds (e.g. weka, kea and morepork).
- Manage vehicle speed limits (50 kph or less) and other rules (minimising traffic between sunset and sunrise) upstream of MacGregor creek to reduce risk of incidental roadkill.
- Where practicable, along the access road upstream of Macgregor Creek to the Power Station ensure vehicles do not travel close to each other and slow down when two vehicles pass in opposite directions. This will prevent weka from becoming confused and getting run over.
- Follow recommendations in Marshall Day Acoustics Ltd (2025) Westpower Ltd Proposed Waitaha Hydro Scheme Assessment of Noise Effects 'the **Noise Report'** to minimise noise levels and noise persistence on wildlife.
- Manage the risk of electrocution to birds, in accordance with the **Project Description**.
- Manage potential downstream effects to birds (hydrological, sedimentation, accidental pollutants) as proposed in the **Project Overview Report** and other relevant reports.
- Ensure all food and rubbish is collected, stored securely and removed from the site promptly to avoid local pest problems and scavenging behaviour by kea or weka.
- Dogs will not be allowed into the area by personnel associated with the Scheme. Except dogs may be required for monitoring purposes e.g. for whio (blue duck) or in an emergency / specific purpose for Scheme construction and operation.

These measures will greatly minimise adverse effects on bats and birds. For further details refer to the **AMP**.

7. Evaluation of effects

Effects (actual and potential) are assessed mainly using RMA criteria, but also considers EIANZ criteria. Values of significance are: 1) negligible (less than minor), minor, more than minor and significant[5]. The EIANZ criteria aligns with the RMA criteria in **Table 4**.

Risk levels used are self-explanatory but subjective: negligible, low, moderate and high (**Table 3**).

Table 4. Aligning values of threat between RMA, EiANZ and subjective risk assessments

[5] Quality Planning website (www.qualityplanning.org.nz)

Criteria base↓	Negligible Effect	Low Effect	Moderate Effect	High or Significant Effect
RMA	Negligible (less than minor)	Less than minor	More than minor	Significant
EiANZ	Negligible	Low	Moderate	High or Very High (significant)
Risk Assessment	Negligible	Low	Moderate	High

Table 5 below sets out a summary of:

- the types of adverse effect;
- the degree of effect (unmitigated);
- measures to avoid, remedy and mitigate;
- the level of effect following mitigation; and,
- whether additional effects management is required.

Note: The following table is based on the recommended mitigation above, not worse case scenarios when mitigation is not practicable. If for some reason, any of the steps recommended are not practicable (e.g. project timing, etc), then additional effects management may need to be considered. This would be determined by the appointed project ecologists.

Table 5. Potential effects and recommended management measures

Effect	Degree of effect (unmitigated)	Key measures to avoid, remedy, mitigate	Level of effect following mitigation	Additional effects management measures required
Long-tailed bats				
Incidental harm or death during construction	**Risk: low-moderate** **Effect: potentially more than minor** Very low bat pass rates in main habitat affected area (between Power Station and Macgregor Creek) during 2012 surveys indicating that bats were not roosting there. Large-diameter trees and podocarps are uncommon in this area and the vegetation in general is not ideal bat roosting habitat. In contrast, there is abundant ideal bat roosting habitat surrounding the headworks and outside the Scheme's footprint that will not be affected.	Minimise the access road and transmission line footprints to reduce vegetation removal (as per the **Project Description**). Adhere to the DOC Bat Roost Protocol when felling trees to minimise the risk of harming bat roosts. Follow the BMP that: requires adherence to the DOC Bat Roost Protocols and specifies specific management measures additional to the DOC Bat Roost Protocols, including where practicable minimising vegetation clearance during the main bat breeding season (December & January) in Areas 1 and 2. Otherwise, avoid tree felling during winter (May to September) (as per DOC Bat Roost Protocols).	**Risk: low** **Effect: less than minor**.	No, but compensation in the form of a financial contribution to enhancing bat (and other threatened fauna) in the region (such as Zero Invasive Predators) for a 10-year period is recommended, particularly if it is not practicable to adhere fully to proposed mitigation.
Incidental death or injury from roadkill	**Risk**: **low-moderate** **Effect: minor** most seasons but potentially **more than minor** during peak breeding season	Minimise road traffic between sunset and sunrise during both construction and operation where practicable, especially during December and January (peak breeding season).	**Risk:** l**ow** **Effect: less than minor**	No, but compensation in the form of a financial contribution to enhancing bat (and

Effect	**Degree of effect (unmitigated)**	**Key measures to avoid, remedy, mitigate**	**Level of effect following mitigation**	**Additional effects management measures required**
	(December & January) when young bats are being carried between roosts or learning to fly.	Minimise speeds along the access road upstream of Macgregor Creek (50km or less).		other threatened fauna) in the region (such as Zero Invasive Predators) for a 10-year period is recommended, particularly if it is not practicable to adhere fully to proposed mitigation.
Loss of roosting and breeding habitat	**Risk: low** **Effect: less than minor** Very low bat pass rates in main bat habitat affected area (between Power Station and Macgregor Creek) during 2012 surveys indicating that bats were not roosting there. While there are plentiful trees with ≥15 cm dbh along the proposed vehicle/transmission line route between Power Station and Macgregor Creek, these trees are largely kamahi that have relatively few cavities, bark crevices, etc to provide bat roosting/breeding habitat. Plentiful and more ideal bat roosting habitat outside the Scheme's footprint, which is very small given the scale of surrounding habitat.	Minimise the access road and transmission line footprints to reduce vegetation removal (as per the **Project Description**).	**Risk: low** **Effect: less than minor**	No

Effect	Degree of effect (unmitigated)	Key measures to avoid, remedy, mitigate	Level of effect following mitigation	Additional effects management measures required
Noise affecting breeding, roosting, commuting or foraging activities	**Risk: moderate** **Effect: potentially more than minor** during construction and **negligible** during operation **Negative**: Loud or persistent noise, particularly at twilight or at night could potentially affect breeding colonies of bats if they are close to construction activities. Noise could also affect bat commuting or foraging behaviour. **Neutral**: Bats will likely habituate to a constant noise source. They can use other roosts if noise affects them.	Where practicable, minimise traffic and construction activities and open-air blasting (outside of the tunnel) between sunset and sunrise, particularly (at the Headworks area where high pass rates of bats were recorded in 2012 and where they probably use the Morgan Gorge for commuting. It is noted that helicopters will not operate at twilight hours or at night for safety reasons. If practicable, begin construction soon before the peak breeding season (December to January) to encourage selection of breeding roosts outside the Scheme footprint area.	**Risk: low-moderate** during construction and **negligible** during operational period. **Effect: less than minor** during construction and **negligible** during operation	**No,** but compensation in the form of a financial contribution to enhancing bat (and other threatened fauna) in the region (such as Zero Invasive Predators) for a 10-year period is recommended, particularly if it is not practicable to adhere fully to proposed mitigation
Lighting affecting roosting, commuting or foraging activities	**Risk: moderate** **Effect: potentially more than minor.** **Negative**: Lighting could disrupt commuting and foraging flight paths, or make roosts unsuitable. Morgan Gorge is likely to be an important commuting route for bats and any bright lights at the headworks could have serious adverse effects on them. **Neutral**: Bats might adapt to any potential disruptions.	Lights must emit no UV, are reflected downwards/designed to reduce scatter and turned on only when required (as in **Project Description**). Minimise vehicle use where practicable between sunset and sunrise, particularly above Morgan Gorge and other riparian areas. Minimise lighting at the Headworks where practicable from sunset to sunrise especially during main bat activity season (October to April). Use blinds or curtains at night when lights are used in temporary contractor's facilities at Construction Staging Area 1 and 2.	**Risk: low** during construction and **negligible** during operational period. **Effect: less than minor** during **construction** and **negligible** during operation.	No.

Effect	Degree of effect (unmitigated)	Key measures to avoid, remedy, mitigate	Level of effect following mitigation	Additional effects management measures required
	Positive: Lights attract flying insects that in turn attract foraging bats.	To reduce light effects on bats construction of the road and transmission line access should be carried out only during daytime if practicable.		
Other effects on bat commuting or foraging activities	**Positive**: forest corridors created by new road and transmission line corridors through tall forest provide new foraging opportunities and commuting routes for bats.	None required	**Minor Positive effect**	None
Any increase in numbers of pests and predators	**Risk: negligible** **Effect: negligible** Predators are likely to be periodically at population saturation levels related to food abundance and predator control by OSPRI. The riverbed provides access to predators during low-moderate river levels and the road is unlikely to significantly increase risk. Predators are attracted to human activity.	Ensuring all food and rubbish is collected, stored securely and removed from the site promptly to avoid local pest problems.	**Risk: negligible** **Effect: negligible**	No

Effect	Degree of effect (unmitigated)	Key measures to avoid, remedy, mitigate	Level of effect following mitigation	Additional effects management measures required
Potential downstream effects on food resource	**Risk: low** **Effect: minor-less than minor** Long-tailed bat activity at riparian areas north (downstream) of Macgregor Creek was recorded to be moderate in 2012 indicating this area was an important foraging area for bats. Potential effects of changes in sedimentation or river flow by the Scheme could affect food resource for bats (aquatic flying insects). However, bats may be largely feeding on flying insects along the farm edge north of Macgregor Creek and this resource would not be affected by the Scheme. Refer to the **Sediment Report and the Hydrology Report**. Sedimentation should not be an issue below the Power Station and the use of a bypass valve will largely resolve the issue of flow ramping effects that could potentially affect bat food resource.	Use of a bypass valve as per the **Project Description**. Mitigation for sedimentation and other matters regarding water quality and aquatic invertebrates in relevant reports (e.g. **Sediment Report, the Hydrology Report &** the **Freshwater Ecology Report**).	**Risk: low** **Effect: negligible**	No

Effect	Degree of effect (unmitigated)	Key measures to avoid, remedy, mitigate	Level of effect following mitigation	Additional effects management measures required
'Threatened', 'At Risk' birds and weka				
Incidental harm or death during construction	**Risk: moderate** **Effect: potentially more than minor** Potentially affecting falcon, kākā, kākāriki, kea, long-tailed cuckoo and weka, etc. Kea and weka in particular, as these species are found in the main area of construction between the proposed Power Station and Macgregor Creek (Area 2) and at the Headworks and Construction Staging Area 1. Kākā and kākāriki were not detected on baseline surveys in Area 2 but have been conservatively assumed to be present. They are unlikely to be present in Area 3 and 4 due to absence, or at most very small amount of suitable habitat. Importantly, few 'Threatened' or 'At Risk' birds were recorded in the main area of habitat removal between Macgregor Creek and the Power Station. Very little forest habitat for threatened indigenous birds affected at other areas during construction such as the	Minimise the access road and transmission line footprints to reduce vegetation removal (as per the **Project Description**). As set out in the **AMP**, where practicable, minimise vegetation clearance during the peak forest bird breeding season (November to December) in Areas 1 and 2. Otherwise, if practicable, begin construction before (or after) the peak breeding season to allow opportunity for birds to select nest sites outside the Scheme's footprint. As set out in the **AMP**, otherwise, during vegetation clearance in November to December months in Areas 1 and 2 walk-through surveys involving visual and aural observations must be undertaken to check for active falcon, kea, kākā, kākāriki weka or long-tailed cuckoo nests. Reduced speeds along access road south (upstream) of Macgregor Creek to 50 kph (or less). Minimise traffic at night and artificial lighting (as per **Project Description**). As set out in the **AMP**, manage gravel extraction from the Waitaha Riverbed between July to February (peak nesting season) for oystercatchers, banded dotterel, and pied stilt, **or** inspect for nests, chicks and bird nesting behaviour immediately prior to works. If nests are found manage extraction activities as set out in the **AMP**. The use of a bypass valve will largely resolve the issue of flow ramping effects that could otherwise	**Risk: low** during construction. **Effect: less than minor** for birds.	**No**,

Effect	Degree of effect (unmitigated)	Key measures to avoid, remedy, mitigate	Level of effect following mitigation	Additional effects management measures required
	Headworks, Construction Staging Area 1 or Power Station (providing larger trees are avoided around these areas). There is abundant habitat outside of the Scheme's footprint and low encounters of threatened birds within main affected habitat locations. Potentially affecting riverine birds nesting in part of the braided river channel where gravel will be extracted for roadworks. Sudden flow surges from ramping effects potentially harming riverine birds nesting in the braided riverbed. Note that natural flood events that are frequent in the peak bird nesting season (spring and early summer) have similar effects on nesting riverine birds.	affect some riverine bird nesting habitat (refer the **Flow Modelling Report** and the **Project Description**).		
Incidental road kills	**Risk: moderate** (for weka), **low** for other birds **Effect: potentially more than minor** for weka; **minor** or less for other birds Potentially affecting weka more than other birds.	Manage access road speeds at and upstream from Macgregor Creek (suggested 50 kph or less) and minimise (as practicable) traffic using the road at twilight or night. Use of road signs and staff induction. Where practicable, on the access road upstream of Macgregor Creek to the Power Station ensure vehicles do not travel close to each other and slow down when two vehicles pass in opposite	**Risk: low** during construction. **Effect: less than minor** for forest birds.	No

Effect	Degree of effect (unmitigated)	Key measures to avoid, remedy, mitigate	Level of effect following mitigation	Additional effects management measures required
		directions. This will prevent weka from becoming confused and getting run over.		
Loss of roosting and breeding habitat	**Risk: low** **Effect: Less than minor** for forest birds as the footprint is narrow and linear, and nearly all habitat loss is within regenerating forest of lower conservation value than original mature forest cover found mainly outside the Scheme footprint. Importantly, few 'Threatened' or 'At Risk' birds were recorded in the main area of habitat removal between Macgregor Creek and the Power Station. Very little habitat for threatened indigenous birds affected at other areas during construction such as at the Headworks (providing larger trees are avoided around the Headworks and Construction Staging Area 1). Further, there is abundant roosting and breeding habitat outside the construction footprint. Potentially, but unlikely to be **more than minor** for riverine bird nesting and foraging habitat in the braided river channel below Macgregor Creek.	Minimise the access road and transmission line footprints to reduce vegetation removal (as per the **Project Description**). Allow natural revegetation or where practicable, undertake vegetation rehabilitation where original vegetation has been removed or disturbed, or to protect any forest edges that might be exposed to wind, light etc., in accordance with the **Vegetation Report**. The use of a bypass valve will largely resolve the issue of flow ramping effects that could otherwise affect riverine bird nesting habitat (refer **Project Description**). As set out in the **AMP**, extract gravel from the Waitaha Riverbed outside the nesting season for oystercatchers, banded dotterel and pied stilt, **or** inspect for occupied nests and bird nesting behaviour immediately prior to works as set out in the **AMP.**	**Risk: low** **Effect: less than minor**	No

Effect	Degree of effect (unmitigated)	Key measures to avoid, remedy, mitigate	Level of effect following mitigation	Additional effects management measures required
	Any potential breeding habitat for riverine birds that might be lost during gravel extraction would be temporary, (and minor given the scale of habitat) affecting only the season gravel is removed and only if excavated during the bird breeding season (July to February). Natural flood events that are frequent in peak bird nesting season (spring and early summer) have similar effects on nesting riverine birds.			
Loss or modification of habitat affecting food resource.	**Risk: low** (excluding potential downstream effects: see below) **Effect: less than minor** (excluding potential downstream effects: see below) Abundant food habitat adjacent to and outside the footprint. New forest edges (when rehabilitated) might benefit insectivorous birds and corridors might provide commuting routes for some species (**minor positive effect**).	Minimise the access road and transmission line footprints to reduce vegetation (food resource) removal (as per the **Project Description**). Rehabilitate where practicable, or encourage natural regeneration at forest edges or disturbed areas to armour them against micro-habitat effects and improve habitat for edge-seeking birds such as weka, brown creeper and grey warbler in accordance with the **Vegetation Report**.	**Risk: negligible** **Effect: negligible**	No

Effect	Degree of effect (unmitigated)	Key measures to avoid, remedy, mitigate	Level of effect following mitigation	Additional effects management measures required
Noise, lighting, or other disturbance affecting breeding, roosting or foraging activities	**Risk: moderate** during construction phase: **negligible** after construction **Effect**: **Potentially more than minor** Most effects expected at Headworks, where threatened and 'At Risk' species such as kākā, kākāriki and robin have been recorded. Weka could be affected throughout the Scheme footprint. Breeding might be affected for some birds locally during the construction phase.	Where practicable, avoid or reduce traffic and construction activities including open-air blasting (outside of the tunnel) between sunset and sunrise, when weka and other crepuscular species are more vulnerable to disturbance. As set out in the **AMP**, where practicable, minimise vegetation clearance during the peak forest bird breeding season (November to December) in Areas 1 and 2. Otherwise, if practicable, begin construction before (or after) the peak breeding season to allow opportunity for birds to select nest sites outside the Scheme's footprint. As set out in the **AMP**, otherwise, during vegetation clearance in November to December months in Areas 1 and 2 walk-through surveys involving visual and aural observations must be undertaken to check for active falcon, kea, kākā, kākāriki weka or long-tailed cuckoo nests. As in the **Project Description** use lighting only where necessary, and ensure lights emit no UV, are designed to reduce light scatter (i.e. reflected downwards where possible). Ensuring all food and rubbish is collected, securely stored and removed from the site promptly.	**Risk: low** to **moderate** during construction**.** **Effect: less than minor** during construction phase; **negligible** after construction	No

Effect	Degree of effect (unmitigated)	Key measures to avoid, remedy, mitigate	Level of effect following mitigation	Additional effects management measures required
Potential downstream effects	**Risk: potentially low-moderate**: largely unpredictable **Effect: potentially more than minor:** Braided river below Power Station is important habitat for a range of riverine species including oystercatchers, banded dotterel, gulls and paradise shelduck. Major changes to sedimentation and/or river flow regimes could cause loss of nests and affect food resource. Natural flood events during the breeding season of these birds are relatively common and it is unlikely that the relatively few maintenance and emergency stop-startup events will greatly add to existing flood effects. An undesired, but **positive effect** of fish strandings in the lower Waitaha River (if they occur) caused by shutdowns **(**see **Freshwater Ecology Report)** would be opportunist foraging by fish-eating birds.	Use of a bypass valve as per the **Project Description** Refer to the **Sediment Report,** the **Hydrology Report** and **Downstream Flow Modelling** report. Sedimentation should not be an issue below the Power Station and the use of a bypass valve will reduce the issue of flow ramping effects that could otherwise affect some riverine birds. Manage disturbance of water flows or water quality when extracting gravel from the Waitaha River as this could affect riverine birds nesting or foraging downstream.	**Risk: low.** **Effect: less than minor**	**No**
Electrocution along the	**Risk: low** **Effect: minor**	Use the most effective design (c. 2-2.7 m horizontal spacing between conductors is proposed) to reduce the chance of electrocution to	**Risk: negligible** **Effect: negligible**	No

Effect	Degree of effect (unmitigated)	Key measures to avoid, remedy, mitigate	Level of effect following mitigation	Additional effects management measures required
transmission route		birds along the transmission route (as per the **Project Description**).		
Any increase in numbers of pests and predators	**Risk: negligible** **Effect: negligible** Dogs could pose a threat to weka and whio.	Ensuring all food and rubbish is collected, securely stored and removed from the site promptly to avoid local pest problems. Use of signs and advocacy recommended (noting **Project Description's** prohibition of staff from bringing dogs onsite except for specific purpose (such as monitoring dogs / health and safety).	**Risk: negligible** **Effect: negligible**	No
Window & other obstacle strikes.	**Risk: negligible** **Effect: negligible** given that windows are only proposed for contractor's temporary buildings. Birds used to transmission line structures in area below farmland.	Where windows are involved (e.g. temporary contractor's facilities at the staging areas) have measures to reduce reflection (e.g. screens, blinds), or mark the glass to indicate a barrier to birds. When buildings not in use, turn off lights or close blinds or curtains. Mark power lines across Macgregor Creek.	**Risk: negligible** **Effect: negligible**	No

In summary, provided the effects management measures outlined in **Table 5** above and the **AMP** are implemented, the effects of the Scheme on ecological values and ecosystem integrity in the Waitaha Valley are considered **less than minor**. As noted above in the summary to **Table 5,** any impracticability of implementing the recommended mitigation might require additional effects management (such as a contribution to a predator control scheme).

Additional effects management measures

While it is extremely unlikely that long-tailed bats and birds would be adversely affected by the Scheme on a population level within the Waitaha Valley, compensation is recommended in the form of a financial contribution for a ten-year period to an ecosystem programme, for example predator control, in the region (such as Zero Invasive Predators) where bat and bird assemblages are similar to those in the Waitaha Valley. This would be a precautionary measure against any potential critical adverse effects caused by construction, though this is acknowledged to be unlikely. The anticipated **less than minor** adverse effects on terrestrial fauna at a population level do not warrant *in situ* management.

7.1. Conclusion

Although implementing the Scheme will not completely avoid the risk of incidental killing or disturbing indigenous bats and birds, adverse effects at a population level are extremely unlikely. Nonetheless, a precautionary approach in the form of compensation set out above will reduce the level of effects to negligible, with a likely net conservation gain outcome in the future.

APPENDIX A: FURTHER DETAIL ON THE PROJECT DESIGN AND PROJECT BACKGROUND INFORMATION AS IT RELATES TO TERRESTRIAL FAUNA (BATS, BIRDS AND *POWELLIPHANTA* SNAILS)

Location of the Scheme

The Scheme is proposed to be located predominantly on the true right side of the Waitaha River from State Highway 6 (**SH6**) to about halfway up Kiwi Flat. For convenience, the Scheme's footprint is divided into four areas, being:

- upper footprint area (proposed Headworks infrastructure and temporary Construction Staging Area 1) (**Footprint Area 1**)
- middle footprint area between the farm boundary on the true right of Macgregor Creek and the proposed Power Station (vehicle access and transmission line route through Department of Conservation (**DOC**) land, construction and structures around the proposed Power Station site including Construction Staging Area 2) (**Footprint Area 2**);
- part of the lower footprint area immediately north of the farm boundary at Macgregor Creek (Spoil Disposal Areas, Construction Staging Area 3) (**Footprint area 3**); and,
- vehicle access across farm to Anderson Road, and transmission line route to connect to SH6 and along SH6, Beach Road and Bold Head Road to Waitaha Substation (**Footprint area 4**).

Areas 3 and 4 are within private land and road reserve, differing from Areas 1 and 2 that are within DOC Conservation Estate (a very small area on the true right of Macgregor Creek is administered by Land Information New Zealand (LINZ)).

These areas are shown in **Figure 1** below.

Project design

The potential effects on terrestrial fauna in this document (**Appendix G**) are based on design parameters for the Scheme as set out in the **Project Description** (6 June 2025).

The proposed vehicle access and transmission line within Footprint Areas 3 and 4 will be located along the existing roads, road reserves and private land which is largely devoid of indigenous vegetation that could be important habitat for indigenous fauna. The access route and transmission line corridor are not within any wetland or riparian habitat. However, the scrubby undergrowth close to the farm edge is ideal habitat for western weka, and kea, falcon and black shag have been recorded near Macgregor Creek. Notwithstanding, Areas 3 and 4 on private land and road reserve are considered to have very low importance to indigenous fauna (bats and birds) compared with Areas 1 and 2 within DOC conservation estate.

The effects of the access and transmission line route on fauna, including in relation to Area 4, are evaluated in **Appendix G**.

Approximate footprint areas for the various main components in Areas 1 and 2 (areas within DOC estate) are given in **Table 1** below. For convenience, components that sit, more or less, within the same fauna habitat locations are combined. Refer to **Table 2** in the front section of this report for indigenous vegetation types affected in the four Scheme areas.

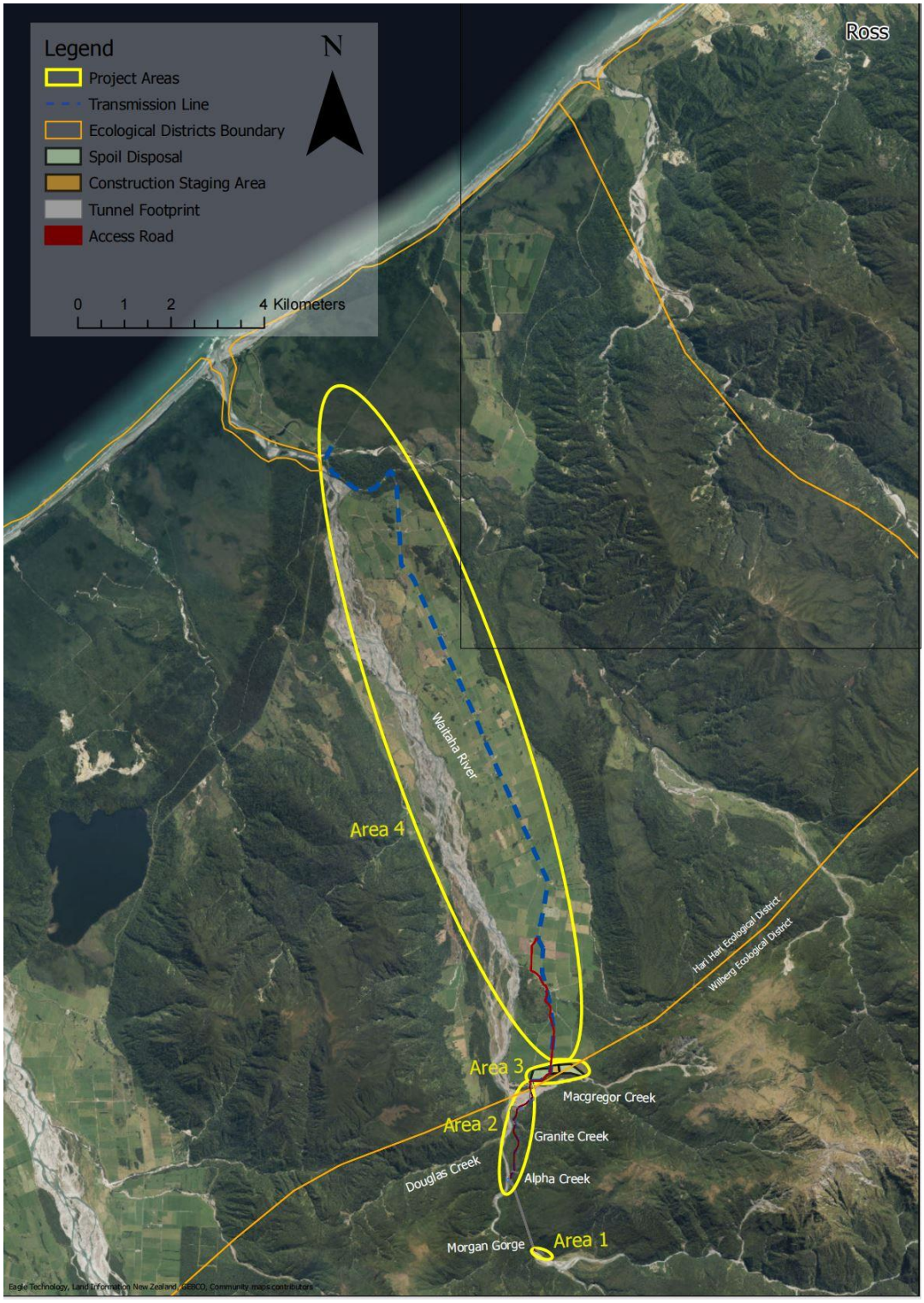


Figure 1. Waitaha Hydro Scheme footprint areas

Area 1: Headworks and temporary Construction Staging Area 1;
Area 2: Macgregor Creek to proposed Power Station;
Area 3: North bank Macgregor Creek: Construction Staging Area 3 and spoil disposal area
Area 4: North bank Macgregor Creek to SH6 and Waitaha substation.

Table 1. Approximate areas of public conservation land potentially affected by the Scheme components up valley from Macgregor Creek.

Scheme component (s)	Construction (ha)	Permanent (ha)
Access road and transmission line. Flood protection at Alpha Creek	4.6	4.0
Power Station Area	1.6	0.7
Headworks: Intake Area, Staging Areas and access roads	1.2	0.3
Approximate Area Totals	**7.4**	**5.0**

In summary, there will be a localised loss of indigenous forest/vegetation cover on conservation land during construction of the Scheme. This will be approximately 6.6 ha which will reduce, through rehabilitation and regeneration, to approximately 4.3 ha during the operational phase. The majority of this clearance is made up of the access road and transmission line route (from Macgregor Creek to the Power Station) and the Power Station Site. A smaller area of clearance will be at the Headworks above Morgan Gorge (c. 1.0 ha temporary, 0.13 ha permanent). All areas not required for the ongoing maintenance or operation of the Scheme will be rehabilitated or naturally regenerated.

Construction of the tunnels (water and access) and portal infrastructure, etc will take approximately 3-4 years to complete (approximate times of each construction component given in **Table 2** below). While the Scheme's underground component will not affect fauna habitat, there are potential effects of noise and vibration (see **Appendix G**).

The road/transmission line parallel footprint will be an average 17.5m in width during construction and 15m wide once operational. Where the road and transmission line are separate (between Macgregor Creek and Granite Creek), each component will be up to 10m wide. Access road/transmission line lengths are approximately:

1. Westpower's Bold Head Road substation to farm boundary at Macgregor Creek: 16 km (private land and road reserve);
2. Macgregor Creek to Power Station: 2.2 km (mainly forested DOC land); and,
3. Headworks to proposed Construction Staging Area 1: 140 m (mainly shrubland on DOC land).

Other features of the Scheme design relevant to potential effects on fauna are given below. Full details are provided in the **Project Description** and **Project Overview Report.**

- The Scheme's footprint south of Macgregor Creek is less than 8 ha during construction and less than 5 ha during operation (permanent): More than two thirds of the operational footprint (c. 3.6 ha) is made up of the road between the Power Station and Macgregor Creek. The footprint reduces by almost 2 ha after construction with natural regeneration and localised rehabilitation of disturbed areas (see the **Vegetation Report**).
- Remaining footprint south of Macgregor Creek is spread over two distinct and discrete areas, the Headworks and the Power Station Sites.
- The Scheme has been designed to minimise the footprint and potential effect on the environment within which it is located.
- An additional approximately 21 ha of transmission line footprint, and including the access road through the farm, is from the farm boundary on the true right of Macgregor Creek to SH6 and along SH6 to the Waitaha Substation (Areas 3 & 4). The line is located within existing road reserve and across farmland, which is devoid of important vegetation/habitat for fauna.

- The most effective design to reduce the chance of electrocution to birds along the transmission route will be used. Spacing between conductors will exceed the wingspan of most birds (c. 2-2.7 m horizontal spacing between conductors).
- No lighting is planned along the access road and transmission line corridor. There will be artificial lighting at the Power Station and Headworks, but minimal and operated on sensors (for the Power Station Site) or intermittent manual/remote use (for Headworks). Lighting will be required at the Headworks for monitoring; however, this will be turned on only when required. Consideration will be given to using lighting that produces light at one wavelength, but emits no UV and is designed to maximise downward light and reduce light scatter.
- Planned maintenance at the Headworks will be done in summer (January to March) in low flow periods and outside of the whio breeding season (August-December). The requirement for ongoing maintenance is an integral component of this application.
- During the first year of operation there may be one or two weekly site visits to check on structures and for regular maintenance, after which these are expected to drop back to one visit per week.
- The majority of vehicles will be light utility vehicles or small trucks. Heavy vehicles will occasionally be used during the construction period. Access to the Headworks may be either through the tunnel (once completed) and/or by foot or helicopter dependent on requirements and work needed.
- Helicopters will be used for maintenance and monitoring purposes.
- Localised active weed control management programme will be implemented within the project and operational footprints.
- No dogs will be brought into the area by personnel associated with the construction and operation/maintenance of the Scheme. Except dogs may be required for monitoring purposes e.g. for whio (blue duck).

Construction Scheme design for consenting is subject to detailed design and to minimise potential effects. For the detailed design refer to Westpower's **Project Description** (6 June 2025). The following description is summarised to include main components affecting terrestrial fauna. Note: No works occur within an existing Scenic Reserve.

Pre-construction activities particularly related to terrestrial fauna include:

- Investigative geotechnical drilling for tunnel construction (which may occur under separate concession if the work needs to start before the Fast-track application is processed). This will involve drilling rigs and possibly camp sites or temporary portable huts as described in the **Project Description**.
- Surveying for final road/access alignments. This includes consideration of works in the vicinity of the Stable Tributary.
- Surveying of vegetation to avoid, where practicable, any trees of significant size (hardwood trees (≥60cm dbh) and podocarps (≥30cm dbh)).
- Following the DOC bat roost protocols for trees ≥15 cm dbh that are to be removed.

Construction Activities include:

- An intense period of activity over a period of about 3-4 years as the Scheme is established, followed by a low level of activity during routine operation and maintenance.
- All areas not required for the ongoing maintenance or operation of the Scheme will be rehabilitated or left to naturally regenerate.

In summary, there will be areas of disturbance on conservation land during construction of the Scheme, including in places a localised loss of forest/vegetation cover. The area of potential disturbance between the farm boundary on the true right of Macgregor Creek and the Power Station Site, and at the Headworks, will be approximately 7.4 ha, which will reduce through rehabilitation and regeneration to 5 ha during the operational phase. The majority of this

clearance is made up of the access road and transmission line between the farm boundary and the Power Station Site.

Construction of the Scheme can be considered in four key stages (**Table 2**). There will be some overlap between stages 2, 3 and 4 with stages 3 and 4 occurring concurrently.

Table 2. Approximate construction times

Stage	Description	Estimated period from start
1.	Access road and transmission line from Waitaha Rd to the Power Station Site. Staging Areas 2 and 3. Bridge across Granite Creek	1-10 months
2.	Tunnels and subsurface structures. Early works at the intake. Construction Staging Area 1 and the access track from the access portal to Construction Staging Area 1. Short access track from access portal at the intake to the river.	7-27 months
3.	Remaining water tunnel and desander excavations completed. Construction of the intake channel and weir. Construction of Power Station, switchyard and tailrace. Construction of the remaining section of the transmission line from Westpower's Waitaha Substation near SH6 to Macgregor Creek. Rebuild of Waitaha Substation.	28-33 months
4.	Equipment installation and commissioning in Power Station, switchyard and intake.	32-37 months

Spoil

- Spoil from the tunnel will be utilised within the development earthwork areas where possible, or temporarily stockpiled before being transferred off conservation land.
- Vegetation from the formation of the access road to be disposed of.
- There will be a requirement for temporary stockpiling locations in both Kiwi Flat and at the Power Station Site. This will be kept to a minimum (and no more than 100 m^3)

Construction Areas

- Access road corridor will provide for parking and storage areas as the road is progressively formed rather than the creation of further separate areas. The transmission line will mainly run parallel to the access road, but deviate from it for a short distance on the true left of Macgregor Creek.
- There will be waterway training and flood protection at Alpha Creek near the Power Station. In addition, there will be a concrete ford across Macgregor Creek and a bridge across Granite Creek.
- Power Station site: construction will be kept to a minimum (and no more than 100 m^3).

- Temporary Construction Staging Area 1 above Morgan Gorge: located on a low terrace, on the true right of Waitaha River above Morgan Gorge. Proposed area will be approximately 0.7 ha. The land will be rehabilitated to indigenous vegetation cover or left to naturally regenerate following construction.
- Construction Staging Area 3, true right of Macgregor Creek: developed on private land outside the margin of the creek. Approximately 3.2 ha in size. The land will be rehabilitated to pasture, in accordance with the requirements of and as part of, the farming operation.

Noise and vibration

- Noise generation from helicopter movements and noisy construction activities, such as blasting and possibly piling will occur intermittently during the construction period.
- Tunnel excavation will create noise in the early stages. During the initial stages of tunnelling it is common practice to confine work to a single extended day shift to limit the blasting to daylight hours and that is what is proposed in this case, after which it becomes a 24-hour operation.
- Underground blasting could occur at any time over the 24-hour working period, depending on when the tunnelling cycle is ready for blasting.
- At the Headworks, noise will be intermittent over the period of construction.
- Once the Scheme is operational, noise generation will generally be very low, the main exception being occasional helicopters for staff visit/maintenance. Diverting some of the flow from the Waitaha River will generally slightly reduce ambient noise levels in the vicinity of the Waitaha River from intake downstream within the abstraction reach.

Traffic

Land vehicles

- During the busiest period (when the tunnelling, Power Station, Headworks and transmission line works are overlapping), there will be approximately 32 light vehicle movements one way (64 both ways) per day. The numbers exclude frequent short trips along the Waitaha Valley Road when transmission line will be built along the road corridor, and when there will be a constant presence of workers due to frequently moving between poles.
- After the initial few months, there will be a steady movement of trucks (= heavy vehicles) bringing in gravel and cement for concrete (for tunnel lining, intake, Power Station) for approximately two years, with an average number of trucks being four per day one way (eight both ways) with a short five months period where there will be up to 6 trucks per day one way (12 both ways). It is assumed that gravel for the access road between Macgregor Creek and the Power Station would be sourced from Waitaha River near the road construction site, and these numbers have been excluded from the calculations for Waitaha Road. The calculations also exclude transporting spoil from tunnel, Power Station Site and road excavations to the designated area on the farm.
- Oversize vehicle movements will occur sporadically. Initially, to bring in parts for the temporary and permanent bridges for Granite Creek and Macgregor Creek, and then when the road to the Power Station becomes useable to bring in tunnel excavation machines. Later in the build, the turbine and switchyard equipment (generator, transformer) will be brought in.
- Vehicle movements will generally occur during daytime hours only. A small number of light vehicle movements will occur at night during the tunnelling stage of construction as this is a 24-hour activity.

- The majority of traffic movements will be between the contractors' facilities situated on private farmland on the true right of Macgregor Creek and the construction works to the Power Station Site.
- Existing access roads will be used from Waitaha Road end at SH6 to Macgregor Creek both over private farmland and the true right of the Waitaha River. The roads will provide for both light and heavy vehicles, light vehicles using the true right bank Waitaha River route.

Helicopters

- Helicopters will be used to transport personnel, equipment and materials between the construction staging areas, and to the Headworks for construction. They will also be used for establishing the surface components of the investigative drilling.
- Frequency of helicopter movements: anticipated an average eight movements per day (when conditions are suitable for flying and for work to be carried out) between these sites over a period of up to 24 months.
- Helicopter movements will occur only during daytime hours and do not occur during dawn or dusk for safety reasons.
- Flights taking concrete into the site will be undertaken in such a manner that there could not be an accidental release into the active river channel.

Refuelling

- Refuelling will only be conducted at specified sites, being:
    - Construction Staging Area 1 above Morgan Gorge and Construction Staging Area 3 on the true right of Macgregor Creek;
    - controlled areas along the access road corridor during road formation; and,
    - Power Station site during tunnel construction.
- No storage and refuelling within the beds, or on the bank of, any waterway. This includes within 10 m of waterways and 20 m from the Stable Tributary.
- Fuel will be stored in double skinned containers within bunded areas, with accidental spill procedures established.

Gravel Extraction

Approximately 23,000 cubic meters of gravel will be taken from the Waitaha River braided channel on the north and south side of the Doughboy, and approximately 100,000 cubic metres will be taken from the Spoil Disposal Areas on the farm, to build the access road from Macgregor Creek to the Power Station, and upgrade the access road through the farm (refer Project Description).

Pests and Weeds

- All machinery used on site as part of this development will be required to be weed free upon arriving.
- All gravel, fill or other material brought onto the site comes from a weed free source.
- Compliance with the Didymo prevention and cleaning protocols.
- Localised weed control management programme implemented within the project footprints.
- No dogs will be brought into the area by personnel associated with the construction of the Scheme. Except dogs may be required for monitoring purposes e.g. for whio.

APPENDIX B: RHYS BUCKINGHAM QUALIFICATIONS AND EXPERIENCE

Rhys Buckingham has a BSC degree (Otago University) majoring in zoology and botany. He was awarded the Member of the New Zealand Order of Merit (MNZM) in 2000, in recognition for services to ecology, specifically for participating in a long-term voluntary search for South Island kōkako. Rhys is on the Buller Council's list of approved wildlife ecologists (in litt. 30 August 2005) and has bat competency Class A and B (in litt. 3 October 2019).

Rhys has over 45 years of experience surveying fauna in New Zealand. He began contract work for Ecology Division, Department of Industrial and Scientific Research (DSIR) in 1979 beginning with a fauna survey of D'Urville Island in Marlborough. Shortly after he worked with the New Zealand Wildlife Service engaged voluntarily with kākāpō work in Fiordland and Stewart Island, later 'caretaking' kākāpō on Codfish Island and undertaking other bird work there (1992-1993). He also worked with other threatened birds including takahē, whio and North Island kōkako.

In 1994 Rhys began a small consultancy business (Wildlife Surveys), specialising in bird, bats and *Powelliphanta* land snails for various clients including New Zealand Forest Service, Oceana Gold, Solid Energy Ltd, Meridian Energy, Bathurst Ltd and Westpower Ltd. This work involved planning, field work, and preparing Assessment of Environmental Effects (AEE) reports and Environment Court documents.

Rhys has had considerable field experience recording and observing fauna in remote forest and mountain areas throughout New Zealand, particularly on Stewart Island, the West Coast of the South Island, Nelson province and central North Island. Also, he has been engaged in ecological work on New Zealand offshore islands (including the sub-Antarctic islands), and Galapagos Island (Ecuador). He has also worked mainly voluntarily for the Ornithological Society of New Zealand, mapping birds in remote areas for the second Bird Atlas project.

Rhys began working for Westpower in the Waitaha Valley in summer 2006.

APPENDIX C: SCOPE AND APPROACH OF TERRESTRIAL FAUNA REPORT

The purpose of this report is to assess the effects of the Scheme on indigenous terrestrial fauna (bats, birds and *Powelliphanta* land snails). The assessment of effects on whio are covered independently in the **Whio Report**). In order to make this assessment, this report:

1. describes the existing environment and terrestrial fauna within the Scheme's footprint and neighbouring areas;
2. lists fauna species currently present, notes those historically reported to be present, and evaluates current species' distributions and relative abundances;
3. assesses the significance of potentially affected fauna;
4. assesses the potential effects of the Scheme on indigenous terrestrial fauna;
5. recommends mitigation and compensation.
6. assessments are based on four periods of baseline surveys being:
    - a general baseline survey: October 2006;
    - a targeted survey for threatened species: January 2007;
    - a survey in November & December 2012 (three separate trips focusing on bats, fernbirds and *Powelliphanta* snails); and,
    - an acoustic bird survey in August 2024.

An additional bat survey was not undertaken in 2024 alongside the bird survey because bats would be largely inactive at the time of the bird survey and it was assumed long-tailed bats, pekapeka (*Chalinolobus tuberculatus*) would still be present in the Waitaha Valley. Given this assumption, there was no requirement for further bat surveys to address the main mitigation recommendation for bats (i.e. following guidelines in DOC's protocols for minimising effects on bat roosts during construction). There have not been any detectable broad changes in avifauna distributions and relative abundance since 2006, so there is no particular reason that there would be broad changes in the bat population.

While most of the field work was carried out within DOC administered land within and outside the proposed footprint, some of the survey was carried out on private land downriver of Macgregor Creek.

APPENDIX D: SUMMARY OF THE EXISTING ENVIRONMENT

Geology and landscape

The Waitaha Valley, like many other valleys draining from the Southern Alps, Kā Tiritiri o te Moana, is geologically and ecologically characterized by the alpine fault that lies approximately 20 km west of the Main Divide. The mountains east of the fault are rugged and dissected, composed of sedimentary schists and greywacke, while the geology is more complex westward, with granites and younger sedimentary rocks. The Scheme is largely located within gentle sloping country and flat river terraces close to the Waitaha River in many places **(Figure 2**).

Figure 2. Waitaha Valley looking upriver from Macgregor Creek

Land administration and Scheme location

The Scheme's proposed footprint lies within both private and public land. Largely, the footprint area lies within unmodified indigenous vegetation of the Waitaha Forest Conservation Unit, being Stewardship Land administered by DOC. The Waitaha Valley lies within the Wilberg ED (south of Macgregor Creek) and the Harihari ED (north of Macgregor Creek).

The proposed Scheme is located predominantly on the north (true right) side of the river from Macgregor Creek to Kiwi Flat, above Morgan Gorge. Between Macgregor Creek and SH6 the Scheme footprint traverses predominantly farmed private land.

Vegetation

Several different vegetation types were identified within the footprint area during initial baseline surveys (TACCRA Ltd 2013, and the **Terrestrial Flora Report**). These types are sometimes clearly demarcated by different topography such as above and below terraces, or between alluvial river flats and forest margins. However, it is common to have various degrees of intergradation between types. Below, I list the main vegetation habitat types with regards to terrestrial fauna, within the Scheme's footprint.

The principal forest types within the Scheme's footprint below Morgan Gorge are broadly grouped as kamahi forest (establishing, regenerating or mature) and seral forest (also establishing, regenerating or mature). In general, emergent mature podocarps are sparse or absent in the forest footprint affected by the Scheme. Most of the taller, intact indigenous forest is avoided by underground tunnelling.

Grassland with sparse shrubs and tree fern is present on a relatively recent alluvial flat where the Power Station and associated infrastructure is proposed. On low outwash riverside terraces there are areas of broadleaved shrub and podocarp/hardwood in varying stages of regeneration. Hardwood/tree fern shrub interspersed with grassy clearings are also present on parts of these terraces (TACCRA Ltd 2013, and the **Terrestrial Flora Report**).

Key forest types identified by TACCRA Ltd (2013) and the **Terrestrial Flora Report** above Morgan Gorge are: mature podocarp/hardwood hill forest such as surrounding the intake portal area above Morgan Gorge, and successional hardwood shrub such as on the terrace true right above Morgan Gorge where a temporary contractor's facilities area is proposed.

Fauna

Regionally significant populations of long-tailed bats ('Nationally Critical')[6] are present in the Waitaha Valley, with greatest activity recorded at Kiwi Flat, and moderate activity along the river north of Macgregor Creek. It is assumed that they roost and breed in the taller forest areas within the Valley and feed mainly on the river flats, or close to the river. The high bat pass rates detected soon after dark near the proposed intake portal could indicate that the Morgan Gorge is an important commuting route for them.

Several other threatened species were recorded, including: kea ('Nationally Endangered'[7]), South Island kākā ('Nationally Vulnerable'), yellow-crowned kākāriki ('At Risk Declining'), migratory long-tailed cuckoo ('Nationally Vulnerable') and falcon 'Nationally Increasing')[8]. Long-tailed cuckoos were relatively frequently heard in both 2006/07 and 2012 surveys and kea on all surveys. Western weka although not threatened, is of conservation interest as an isolated population that might be genetically distinct from the expanding weka populations further north.

Apart from kea, long-tailed cuckoo, and weka that were widely but thinly distributed throughout the footprint, most threatened birds were recorded only higher up the Valley in the vicinity of Morgan Gorge and Kiwi Flat. Here the vegetation cover is more intact with an abundance of podocarps and taller trees. We also found a similar localised distribution for robins ('At Risk' Declining) and rifleman (not threatened). Small numbers of kererū were recorded on all surveys. Their distribution patterns reflected their use of seasonally available foods. Kererū were seen in more diverse vegetation in the lower valley in early to mid-summer and in taller podocarp/hardwood forest up-valley in winter.

Grey duck (currently 'Nationally Vulnerable'; formerly 'Nationally Critical') was recorded once in 2006 at Kiwi Flat, but not on later surveys. Black shag (At Risk: Relict) is occasionally seen along the river or river margins.

In total, over the four baseline terrestrial fauna surveys, over 40 species of birds were recorded in the Waitaha Valley from the end of Waitaha Road to Kiwi Flat. Introduced species were far more often recorded on farmland and more disturbed habitats further down the Valley (particularly north of Macgregor Creek) while the proportion of indigenous species increased in the less-modified forested habitats further up-river.

[6] O'Donnell et al 2023

[7] Robertson et al 2021

[8] See Appendix J for scientific and Māori names of birds

No evidence of kiwi or short-tailed bats, pekapeka (*Mystacina tuberculata*) was found and therefore presume they have now gone from the area (notwithstanding very low numbers or intermittent presence of species can be missed by field surveys).

Also, no evidence of *Powelliphanta* land snails were found present in the Valley. This was not surprising as they are not known from lowland forest in this locality (Walker 2003). The occasional *Powelliphanta* shell reported to be found on the riverbed was likely washed down from subalpine populations that are not affected by the Scheme.

Bird relative abundance data and the observation that weka and robin populations appeared to be male-biased, indicated that predators might be limiting indigenous bird populations in the area. John McLennan (2007a & b), who carried out two small mammal surveys in 2007, found abundant presence of rats, stoats and possums, the primary threat to birds in New Zealand forests.

An acoustic bird survey carried out in August 2024 found similar bird species assemblages (species list, relative abundance and distributions) to the earlier surveys. While species numbers have been relatively high on all baseline surveys undertaken, individual numbers have been relatively low for most species. Precise population trend data between 2006 and 2024 has not been assessed, as this would require regular replicated monitoring surveys.

It is probable, that intermittent possum control by OSPRI (formerly the Animal Health Board) throughout the Waitaha Valley catchment has maintained bird populations and prevented major declines or extinctions of threatened indigenous species.

Climate change poses a significant threat to indigenous ecosystems and biodiversity in the future. Already, by influencing likely increases in the frequency of seed mast events, this leads to a flow-on effect of increasing the frequency of predator population irruptions (e.g. Christie 2014; Keegan et al. 2021; McGlone 2001; McGlone et al. 1998; Schauber et al. 2008). An increased frequency of these events would give less time for indigenous birds and bats to recover between predator irruptions (Robertson et al 2021). River specialist birds (e.g. whio, shags, banded dotterel, oystercatchers) could be impacted by greater and more frequent fluctuations of river flow. While there are currently not many New Zealand examples of climate change affecting indigenous fauna (review in Keegan et al. 2021), Pryde et al. (2005) have linked declines of long-tailed bats to climate change in the Eglinton Valley, Fiordland.

The panel determining the conservation status of New Zealand birds in 2021 assessed that 69 taxa are known or predicted to be adversely affected by long-term climate change trends and/or extreme climatic events (Robertson et al 2021). While the main taxa affected are marine birds, riverine species, forest birds and alpine specialists will also be affected by climate change. 85% of the 27 taxa assessed as ‘At Risk: Declining’ have been given the ‘CI’ (Climate Impact) qualifier.

Within the Waitaha Valley, at least 10 species have been listed with the CI qualifier. Within the Scheme footprint these species include kea, kākāriki, long-tailed cuckoo, whio, and robin.

In addition to climate change, other effects on indigenous biodiversity and ecosystem functioning are predicted with the immediate threat of invasive species and possible arrival of diseases, such as avian influenza (HPAI) that is currently rapidly spreading in other parts of the globe (most recently it has spread to Antarctica).

The rupture of the alpine fault when it occurs would have devastating effects on fauna (terrestrial and aquatic) and faunal habitats along the West Coast. GNS (Institute of Geological and Nuclear Sciences Ltd) predict that there is a 70% probability of the alpine fault earthquake occurring in the next 50 years. More than likely, this would be an earthquake of magnitude 8+ and would produce aftershocks of up to magnitude 7 for many years after. These earthquakes would cause widespread landslides, rivers damming, and consequent serious impacts on fauna and their habitats.

APPENDIX E: INVESTIGATIONS

Fred Overmars and I first carried out baseline fauna surveys for Westpower in the Waitaha Valley in October 2006. These initial surveys aimed at evaluating the presence/absence, distribution and relative abundance of bats, terrestrial birds (except whio that were covered separately by Fred Overmars) and *Powelliphanta* land snails. Subsequently, I carried out further surveys in January 2007, November and December 2012 and a recent survey for birds in August 2024. The key findings from all the surveys are summarised in the existing environment section above (**Appendix D**) with additional detail provided below. The survey area coverage in 2006/07 and 2012 is shown in **Figure 3** below.

1. Field Survey October 2006 and January 2007

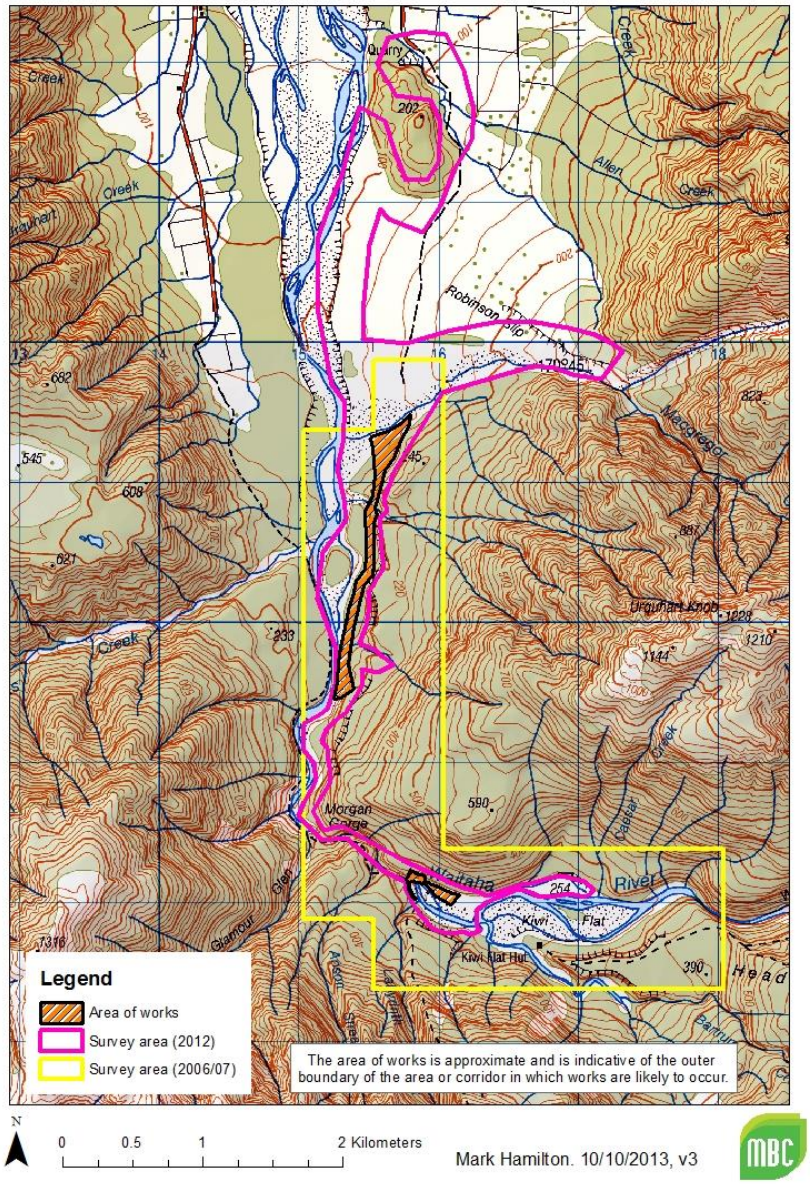


Figure 3 Survey Area and proposed Scheme footprint as at 14 October 2013

Note: the 2006/07 survey area is bounded by yellow polygon.

Fred Overmars and I carried out a baseline fauna survey in October 2006 to evaluate the presence, distribution and relative abundance of bats and birds in the mid to lower Waitaha Valley. Fred had previously carried out an environmental prefeasibility risk assessment

(Overmars et al. 2005). He found that the environment of the then proposed Waitaha hydro scheme area is poorly known. Information on fauna was known from five sources only:

- anecdotal wildlife observations by Charlie Douglas during a surveying exploration of the Waitaha Valley in late October 1892 (Douglas 1936);
- forest below Morgan Gorge was included within the coverage of the South Westland wildlife survey (Coker & Imboden 1979);
- Jolly (1992) included the Waitaha Valley within the scope of a survey for great spotted Kiwi on the western slopes of the Southern Alps;
- the DOC West Coast bat database has a long-tailed bat survey record from Kiwi Flat in 1994 (DOC pers. comm.); and,
- observations during a site reconnaissance investigation (Overmars et al. 2005), including DOC hut book records.

These information sources suggested that the general area of the proposed Waitaha hydro scheme might support a range of common and threatened native avifauna and mammals. In particular, there were recent and not so recent records of thirteen nationally threatened animal species (note that the conservation status of birds has changed since 2005). Threatened species' records included long-tailed bat, whio, grey duck, New Zealand 'bush' falcon, western weka (no longer threatened), kea, South Island kākā, yellow-crowned kākāriki, long-tailed cuckoo and black shag. The presence of great spotted kiwi was considered possible.

In addition, the large indigenous land snail *Powelliphanta rossiana rossiana* (nationally endangered) is present 8 km away on Mt Bonar and shells of an unconfirmed *Powelliphanta* taxon have been found east of the Alpine Fault on Karnback and in the Tuke River headwaters (Walker 2003). These records are in subalpine rather than the lowland forest habitat of the proposed hydro scheme, but it is conceivable that *Powelliphanta* may occur in the general hydro scheme area.

1.1. Survey area

The survey covered about 600 ha of terrestrial and river habitats (**Figure 3**). This comprised areas that might be affected by the different scheme options (2005-2007) and some adjoining similar habitats. The latter were included to increase the likelihood of encountering threatened or rare species with low density populations, and to take account of potential edge effects.

1.2. Survey methods

1.2.1. Bats

Bats were surveyed using standard techniques of the time to determine bat presence or absence (O'Donnell & Sedgeley 1994, 2001). A number of bat detection units were set up to automatically record ultrasonic echo-location calls from bats passing within a range of about 50 m. Each unit contained a Batbox III™ bat detector, noise-activated tape-recorder and a talking watch that recorded the time of each bat call. The bat detectors were set primarily to 40 kHz to detect long-tailed bats (the most likely species to be found). Some detectors were set on 28 kHz to detect short-tailed bats. Because the call frequencies and harmonics of the two species occasionally overlap, call rates were used to confirm species identification. The call rate of short-tailed bats is twice as fast as long-tailed bats (O'Donnell et al. 1999).

Minimum temperatures during the spring survey were mostly favourable for bat monitoring (i.e. an overnight temperature equal to or greater than 5°C, O'Donnell & Sedgeley 1994). Dusk temperatures were between 8-10.5°C, and minimum temperatures were between 5.5-8°C except on 24 October when there was a slight frost.

We extended the bat survey to include all of Kiwi Flat. Six bat detectors were set out on each of four nights (23-26 October inclusive) at sites at/near the Kiwi Flat hut. Some detectors were placed at the same survey site through the survey period, while others were shifted to new

sites. Twelve survey sites were surveyed in total; these were mostly on forest edge or open habitats (**Figures. 4 & 5**).

During the summer survey (January 2007), up to six bat detectors were set out on each of four nights (16-19 January inclusive) at sites spread through the hydro scheme area, including some sites surveyed in October 2006. Some detectors were placed at the same survey site through the survey period, while others were shifted every day or every second day to a new site. Sixteen survey sites were surveyed in total (**Figures. 4 & 5**). Manually-held bat detectors were also used on transects and at kiwi listening stations. Dusk temperatures in January were between 14-17°C and minimum temperatures were between 11-13.5°C.

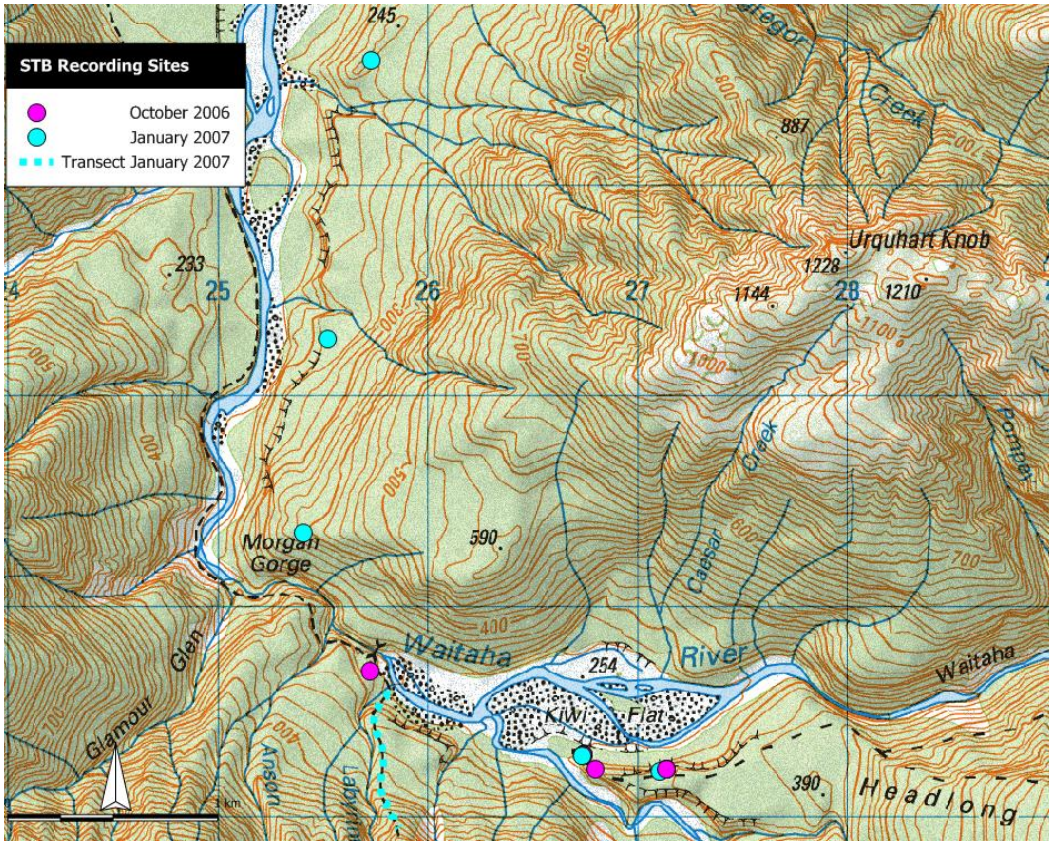


Figure 4. Short-tailed bat recording sites, proposed Waitaha hydro scheme area, October 2006 and January 2007. Some recording sites near to others are not visible at this scale.

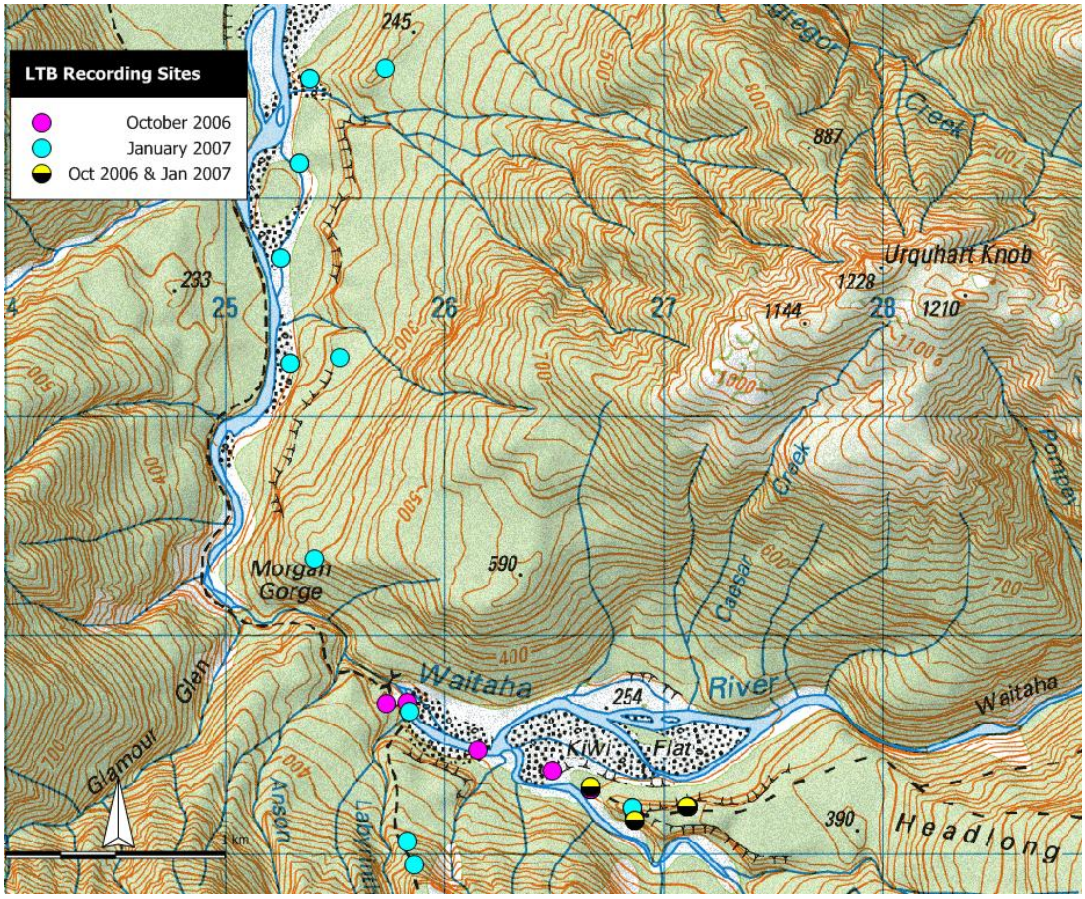


Figure 5. Long-tailed bat recorder sites, proposed Waitaha hydro scheme area, October 2006 and January 2007. Some recording sites near to others are not visible at this scale

1.2.2. Birds

General Bird Presence and Abundance

We evaluated distribution and relative abundance of diurnal birds using two survey methods:

- a time-based grid-square method (approximate numbers of each species seen/heard per hour per 500 m x 500 m grid sub-square; O'Donnell & Dilks 1988)
- five-minute bird counts (usually two per 500 m sub-square; Dawson & Bull 1975).

These surveys were undertaken in mid-spring (24-28 October 2006) when forest birds are typically most conspicuous during courtship and pre-breeding. Twenty-four 500 m sub-squares were surveyed by the time-based method, and 44 five-minute bird counts were carried out at 22 sub-squares (i.e. two counts per sub-square). One sub-square (255860) that was inadvertently omitted during the spring survey was specifically surveyed in December 2006. The sub-squares are shown in the distribution maps of indigenous birds (refer Results Section: 1.3.2).

Surveys were undertaken between 0900-1800 hours (NZ Daylight Time). Except for some counts on the first day, survey conditions were generally favourable: fine or overcast weather, mild to warm temperatures, and light winds. The Waitaha River and its tributaries frequently created substantial background noise.

Great Spotted Kiwi and Weka

Specialised dusk-nocturnal surveys were carried out to detect and evaluate the presence of great spotted kiwi and weka using standard listening call survey methods (McLennan 1992, Beauchamp 2000). We chose vantage points that provided good listening coverage away from excess river noise (**Figure 6**). We looked for kiwi sign (footprints, feathers, droppings or probe holes) during the day.

The weka listening period began at sunset and data was recorded for one hour. The two-hour kiwi listen period began at nightfall and data was recorded separately for each hour. Specific details recorded for kiwi and weka were species name, gender, time called, direction of call and estimated distance to the bird responsible for the call.

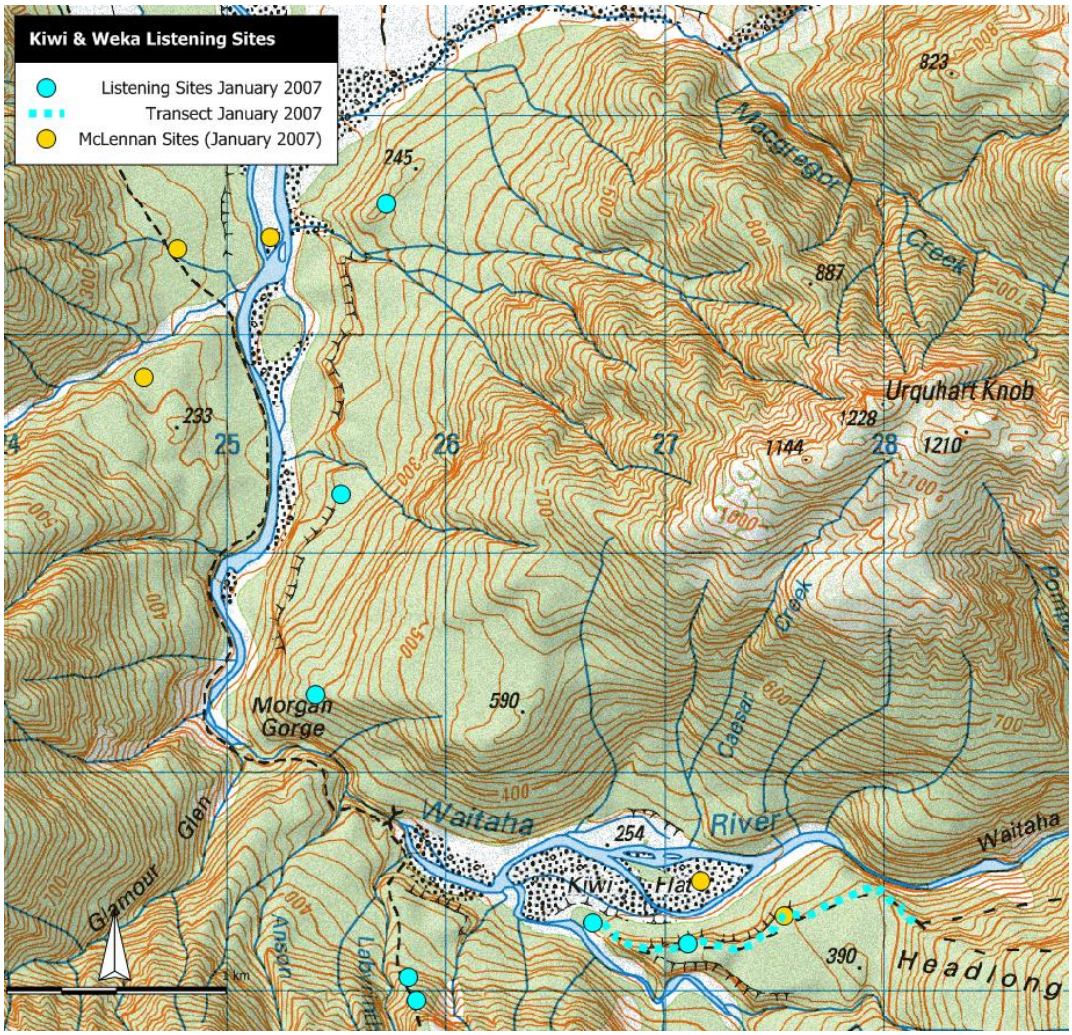


Figure 6. Kiwi and weka listening and transect sites within proposed Waitaha hydro scheme area, January 2007. McLennan's (2007a) five listening sites are also shown (one at Headlong Spur is partially obscured).

Playback Calls of Threatened Species

To increase the chance of observing species of conservation importance, taped calls of weka and kākāriki were played during diurnal surveys and calls of kiwi and weka were played at the end of the nocturnal listening periods.

Habitat Descriptions

The habitats in each 500 m sub-square and at many five-minute bird counts were briefly described (e.g. species composition of forest canopy and subcanopy).

1.2.3. Other Fauna

We searched for *Powelliphanta* snails and shells during the day, within forest, shrubland and open habitats. I carried out a nocturnal search along the track from Kiwi Flat Hut to Headlong Spur on the night of 18-19th January. More casually, we looked for signs of introduced mammals and fauna of interest (e.g. lizards, frogs, macro-invertebrates).

1.3. Results

1.3.1. Bats

Short-tailed Bats

Detectors set on short-tailed bat frequencies were deployed at four survey sites above Morgan Gorge for 64 hours in October 2006, and at five survey sites and one transect covering much of the study area for 38.5 hours in January 2007 (**Figure 4**). Two passes were recorded on 28 kHz at one site on the Headlong Spur Track near Kiwi Flat Hut, but these signals were slow pulse "clicks" characteristic of long-tailed bats rather than short-tailed bats. No calls were detected that could be attributed to short-tailed bats.

Long-tailed Bats

Long-tailed bats were monitored at eight survey sites above Morgan Gorge for 152.5 hours in October 2006, and at 14 survey sites throughout the study area for 157 hours in January 2007. They were detected at five of the eight survey sites in October 2006 and at four of the fourteen survey sites in January 2007 (**Figure 7**).

In sites where bats were found, numbers of passes/hour in October (0.19) were substantially lower than in January (0.45) when weather conditions were considerably warmer. No bats were recorded when overnight minimum temperatures were below 5ºC in October (**Table 3**).

Long-tailed bats were found in the Kiwi Flat area, but not below Morgan Gorge (**Figure 7, Table 3**). They were recorded at the top of Morgan Gorge, on the track to Scamper Torrent Hut, at the Kiwi Flat Hut, on the lower reaches of Whirling Water and on the track to Headlong Spur. Note that in 2012, long-tailed bats were recorded below Morgan Gorge, with highest pass rates downriver of Macgregor Creek (see Section 2.3.2).

Bats were consistently found at the same or nearby sites during both the October 2006 and January 2007 surveys, except none were detected at the head of Morgan Gorge during the January survey. The Scamper Torrent Track site was not surveyed in October (2006).

The number of passes per site ranged from 0-16 in the October survey and 0-12 in the January survey. A site below the Whirling Water bluff had the highest number of passes in October whereas Kiwi Flat Hut had the highest pass rate in January (10 and 12 passes on the nights of 18 and 19 January respectively). Four passes were recorded overnight on 18 January at the Whirling River bluff site (lowest black-yellow circle bottom right in **Figure 7**).

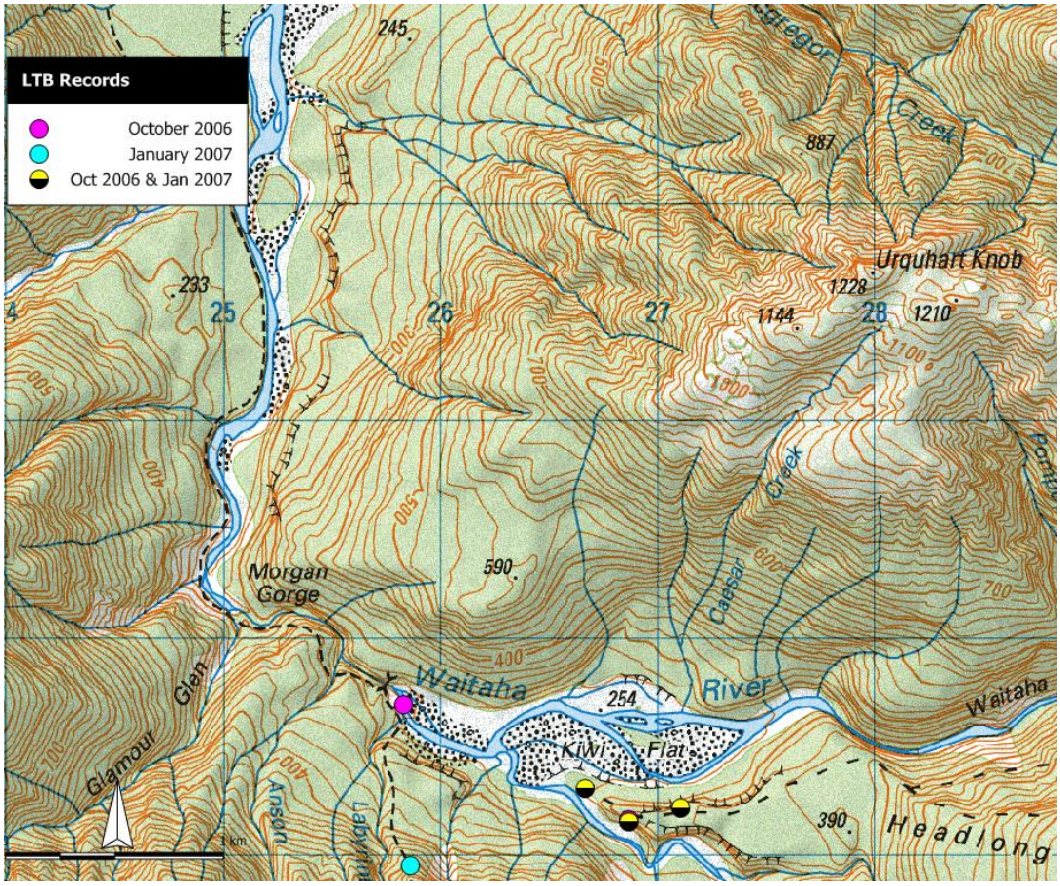


Figure 7. Sites where long-tailed bats were recorded, Waitaha River, October 2006 and January 2007. Three sites close to others are not visible at this scale. No bats recorded below Morgan Gorge in 2006-07.

Table 3. Bat detections at different locations in the Waitaha hydro scheme area. B/D nights = bat detector nights (≥6 hrs of recording).

	40 kHz (Long-tailed bat)			28 kHz (Short-tailed bat)		
Area	B/D nights	Hours	# passes	B/D nights	Hours	# passes
Above Morgan Gorge	23	219.5	59	8	76	0
Below Morgan Gorge	9	90	0	3	26.5	0
All survey areas	32	305.5	59	11	102.5	0
Above Morgan Gorge (<5˚C)	3	30	0	-	-	-
Above Morgan Gorge (≥5 ˚C)	20	189.5	59	-	-	-
Above Morgan Gorge (Oct 2006)	16	152.5	29	-	-	-
Above Morgan Gorge (Jan 2007)	7	67	30	-	-	-

1.3.2. Birds

Species present

Twenty-seven indigenous and eight introduced bird species were recorded during the combined October 2006 and January 2007 surveys. Twelve of these species were listed as threatened by DOC (Hitchmough et al. 2007[9]). Other species not observed but likely to be present seasonally include shining cuckoo and kingfisher. Canada geese (*Branta canadensis*) are also reported as seasonal visitors to the area (anecdotal report, 17 January 2007).

Threatened species (as at 2006/2007) and rarely recorded species

The conservation status of species below is corrected in brackets if their status has changed since 2007.

Kākā ('Nationally Endangered', now 'Nationally Vulnerable') were heard in low numbers (1-2) at some sites within rimu-southern rata forests. A kākā was also heard at Kiwi Flat on 25 July 2006 (F. Overmars pers. obs.).

Kea ('Nationally Endangered') were heard or seen in low numbers at sites scattered through the study area. The Kiwi Flat Hut hut book records 10-12 kea at the hut on 3 March 2000.

Grey duck ('Nationally Endangered', now 'Nationally Vulnerable') were recorded several times in October at Kiwi Flat. Their habitat use appears to include a wetland (including raupo) on the south bank of the river. They were not recorded below Morgan Gorge, although they are likely to be present there. It is possible that these birds were hybrid mallard-grey (not threatened) (Williams & Basse 2006). Mallard ducks (introduced) were not observed in the survey area.

One or a pair of **NZ falcon** ('bush falcon', then 'Nationally Vulnerable', now 'Nationally Increasing') were heard or seen at two sites; at Granite Creek at the lower end of the study area and around Kiwi Flat.

Weka ('Serious Decline', now 'Not Threatened') were heard near the farmland edge at the lower end of the study area, near Morgan Gorge and on the north and south banks of the river at Kiwi Flat (including Kiwi Flat Hut). McLennan (2007a) found weka at similar locations and also on the south bank of the Waitaha River downstream of Douglas Creek. Weka were in low numbers and were not recorded during the five-minute bird counts.

Kererū ('Gradual Decline', now 'Not Threatened') were recorded once in hillslope forest north of Morgan Gorge in October 2006 and once in scattered low broadleaved forest on the river terrace below Morgan Gorge in January 2007. The carcass of one killed by a NZ falcon was also found at Kiwi Flat in October 2006 (Dave Barker pers. obs.).

Long-tailed cuckoo ('Gradual Decline', now 'Nationally Vulnerable') were recorded at several sites, often with several birds at each site. They appeared to be in higher numbers than observed in other parts of the West Coast over the past two decades, unless summer 2006-2007 was an exceptional year for them on the Coast (R.P. Buckingham pers. obs.).

Kākāriki ('Gradual Decline', now 'At Risk: Declining') were heard occasionally during the October survey in rimu-southern rata forests. These were not identified to species, but based on current distribution patterns are probably yellow-crowned kākāriki (gradual decline).

Great spotted kiwi ('Gradual Decline', now 'Nationally Vulnerable') were not heard during the survey, from seven overnight listening sites and one walking transect (**Table 4**). No sign of kiwi was found during the day. McLennan (2007a) did not record kiwi either from five listening sites within and near our survey area.

Great spotted kiwi are now probably absent from the Waitaha Valley. They were not found during this survey, nor during other recent surveys along the Main Divide in the central part of

[9] Conservation threat status has changed for most species since then: see individual species listings

the West Coast (Jolly 1992, Stilwell & Barnett 1993). Jolly (1992) found no kiwi in the major valleys between the Kakapotahi River and Paringa River where they were historically present. His search coverage included four sites in the Waitaha Valley: County Stream hut, Moonbeam Torrent track, Kiwi Flat and Headlong Spur, and the west side of the lower valley ("Alpha"/"Beta" Creeks). Three local respondents reported that great spotted kiwi were present above "the gorge" (presumed to be Morgan Gorge), and particularly at Kiwi Flat, until at least the late 1960's. They were still present in the upper headwaters of the Waitaha River as recently as 1978 (McLennan & McCann 2002).

SI riflemen ('Gradual Decline', now 'Not Threatened') were observed in low numbers at several sites within tall rimu-southern rata forest.

A **black shag** ('Gradual Decline', now 'At Risk: Relict') was recorded during the January small mammal survey on the Waitaha River below the gorge (McLennan 2007a), and a probable black shag skull which is awaiting formal identification was found on the flats near Kiwi Flat Hut (John McLennan, pers. comm., 05/03/2007). The apparent scarcity of shags above Morgan Gorge may be related to the low densities of fish being present there (kōaro (*Galaxias brevipinnis*) are the only fish species above Morgan Gorge (EOS 2025)).

SI fernbird ('Sparse', now 'At Risk: Declining') were not recorded during the fauna surveys, but were heard in September 2006 in scrub on the north bank of the Waitaha River at Kiwi Flat (F. Overmars pers. obs.)

South Island robin (then 'Not Threatened', now 'At Risk: Declining') were patchily distributed during the spring survey (2006) and were not encountered on the January 2007 survey. McLennan (2007a) reported one single bird and a pair on the hillside north of the footbridge (single bird 70 m from footbridge, pair 300 m up from footbridge). In May 2007 robins were heard singing in a number of new locations, indicating that some new territories had been established since January McLennan (2007b). A robin was heard at Kiwi Flat Hut in April 2007 (F. Overmars pers. obs.).

Nocturnal listening surveys

Bird species recorded during the nocturnal listening surveys are shown in **Table 4**.

Table 4. Bird species and numbers heard on nocturnal counts, January 2007. L-t cuckoo = long-tailed cuckoo.

Kiwi count (21:30-23:30 hrs)

Total Hours	Sites	Kiwi	Weka	Kaka	Morepork	Kea	L-t cuckoo
14	7	0	1	6	5	4	4

Weka count (sunset-1 hour)

Total Hours	Sites	Kiwi	Weka	Kaka	Morepork	Kea	L-t cuckoo
7	7	0	2	4	4	5	2

Playback transects (17-18 January 2007)

Total Hours	Kiwi	Weka	Kaka	Morepork	Kea	L-t cuckoo
2.5	0	1	0	2	0	1

Relative Abundance of birds

Bird species abundance as measured by 44 five-minute bird counts in 22 sub-squares (500 m x 500 m) is shown at **Table 5**.

Table 5. Bird species abundance measured by 44 five-minute bird counts in 22 500 m x 500 m sub-squares, Waitaha fauna survey area, October 2006. Introduced species denoted by an asterisk (*).

Species	Mean Count	Standard error (N=44)
NZ falcon	0.02	0.02
Black-backed gull	0.02	0.02
SI rifleman	0.11	0.06
SI fantail	0.39	0.10
Brown creeper	0.16	0.07
Grey warbler	1.34	0.14
SI tomtit	1.32	0.16
SI robin	0.02	0.02
Silvereye	0.82	0.14
Bellbird	1.00	0.14
*Blackbird	0.05	0.03
*Chaffinch	0.34	0.11
*Redpoll	0.07	0.05
Native Birds	5.20	0.36
Introduced Birds	0.45	0.14
Total Birds	5.66	0.42
Number of Native Species	3.27	0.21
Number of Introduced Species	0.32	0.08
Total Species	3.59	0.24

Species not recorded but likely to be present seasonally include shining cuckoo and kingfisher. Little shag may possibly be present. No sign of mohua (yellowhead) or South Island kōkako was found.

Bird species distributions

Bird distribution maps are shown in **Figures 8-20** below. Brief notes on the distribution and relative abundance of threatened and rare species are given above.

The most widely recorded indigenous species were tomtits, grey warblers, fantails, bellbirds and silvereyes. Grey warblers and tomtits were recorded in all 24 500 m x 500 m sub-squares and silvereye, bellbird and SI fantail were recorded in 23, 21 and 17 sub-squares.

Brown creepers were widely distributed (11 of 24 sub-squares) but were recorded in low numbers.

Moreporks were heard during the nocturnal surveys at only two sites. McLennan (2007a) also recorded morepork on the south bank of the Waitaha River downstream of Douglas Creek. Morepork were conspicuous by their absence at Kiwi Flat Hut during various visits in July and September 2006, although one was heard there in April 2007 (F. Overmars pers. obs.).

Tūī were not recorded during formal surveys, but were conspicuous where rata was flowering in January 2007.

A group of welcome swallows was seen circling Kiwi Flat hut on 19 January 2007 and others were seen nearby on the Waitaha River in September and October 2007. This species was also seen on the riverbed near the farmland in January.

1.3.3. Other fauna

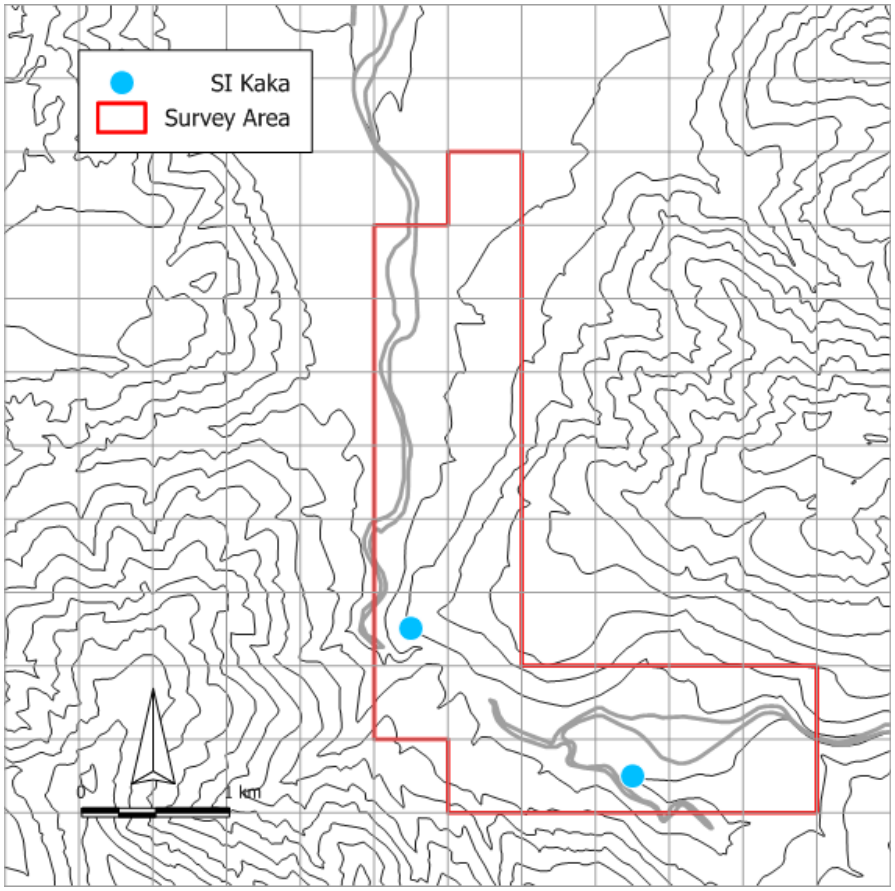
We did not find *Powelliphanta* land snails or their empty shells during the 2006/07 field surveys: including daytime activities, nocturnal bird listening searches or on a specific nocturnal search along the track from Kiwi Flat Hut to Headlong Spur on the night of 18-19th January. Conditions on the latter occasion were ideal for observing foraging snails (warm and wet).

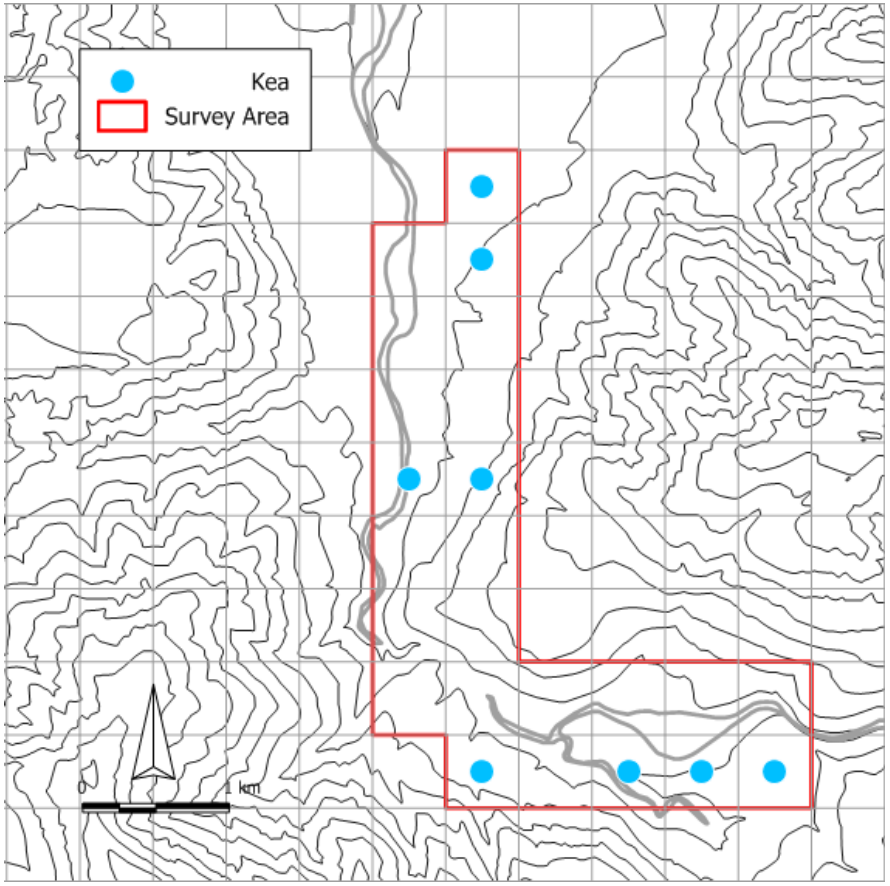
McLennan (2007b) collected a damaged shell of an undetermined *Powelliphanta* taxon on a sand bank just downstream from the confluence of Whirling Stream and the Waitaha River. It had been transported there by one of the rivers during a recent fresh because it was sitting amongst leaves and twigs on a strandline. The shell was damaged in a way which suggested it had been preyed on by a weka before it was washed into the water.

No lizards were seen during these surveys. The introduced whistling frog (*Litoria ewingi*) is well established on the river flats of the Waitaha River immediately above Morgan Gorge, and probably further upstream too (this survey and McLennan, 2007a).

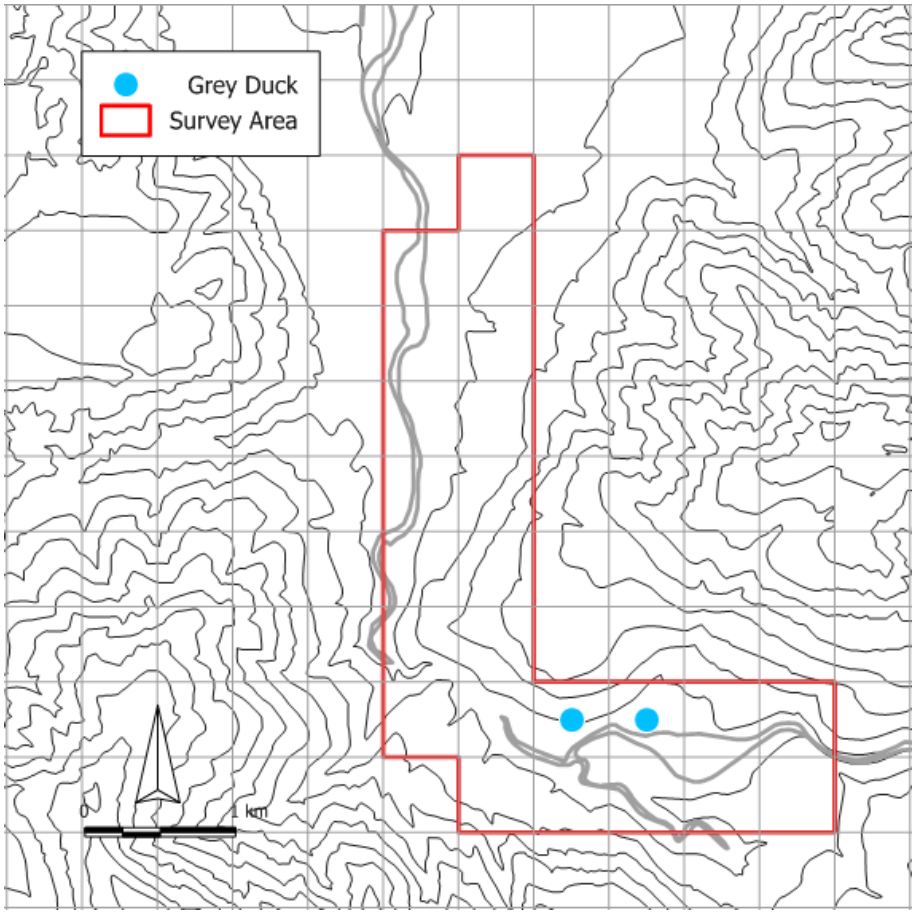
Brushtail possum (*Trichosurus vulpecula*) and red deer (*Cervus elaphus scoticus*) sign was frequent on the banks of the Waitaha River, and high numbers of possums were observed on the Waitaha River bed at night in September 2007. Goats (*Capra hircus*) were observed on both banks of the Waitaha River downstream of Morgan Gorge. A hare (Lepus europaeus occidentalis) was observed at Macgregor Creek.

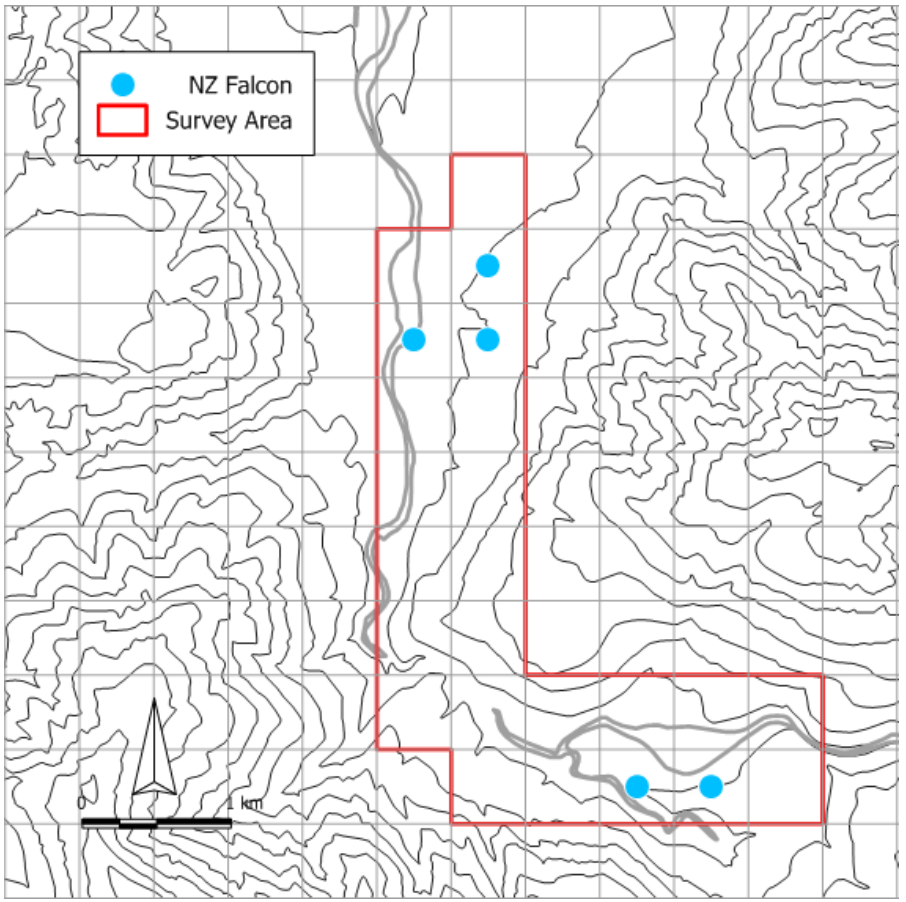
McLennan (2007a, b) describes the findings of a predator survey in and near the study area in January and May 2007.



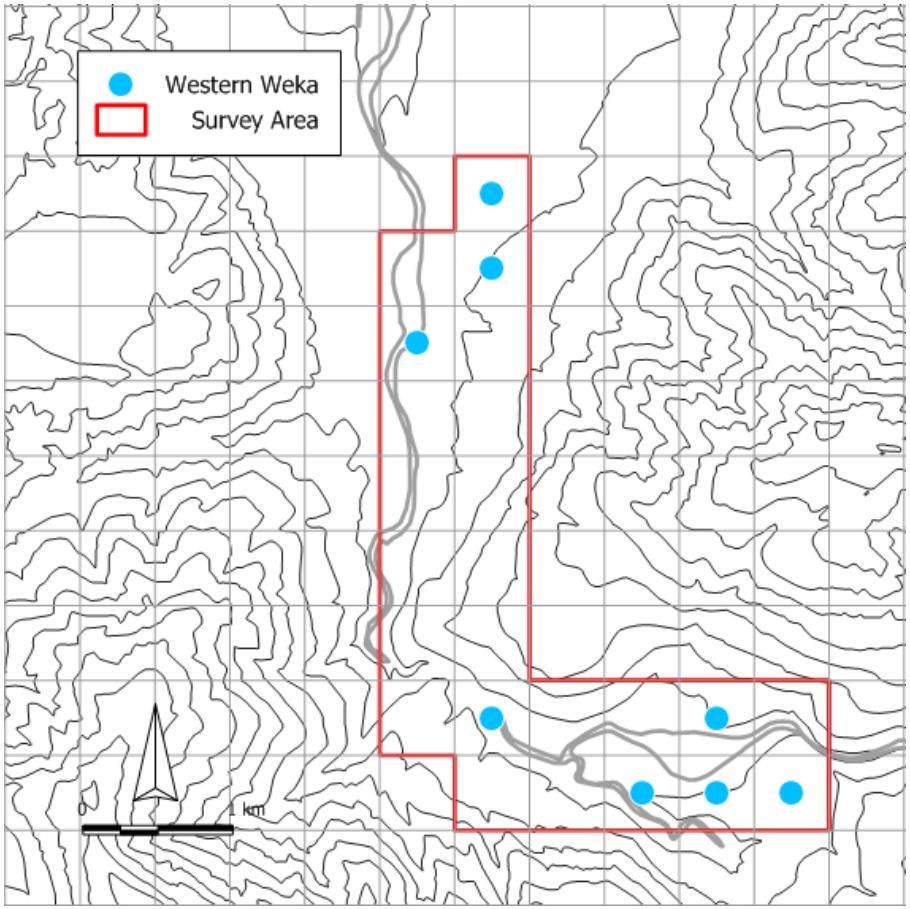


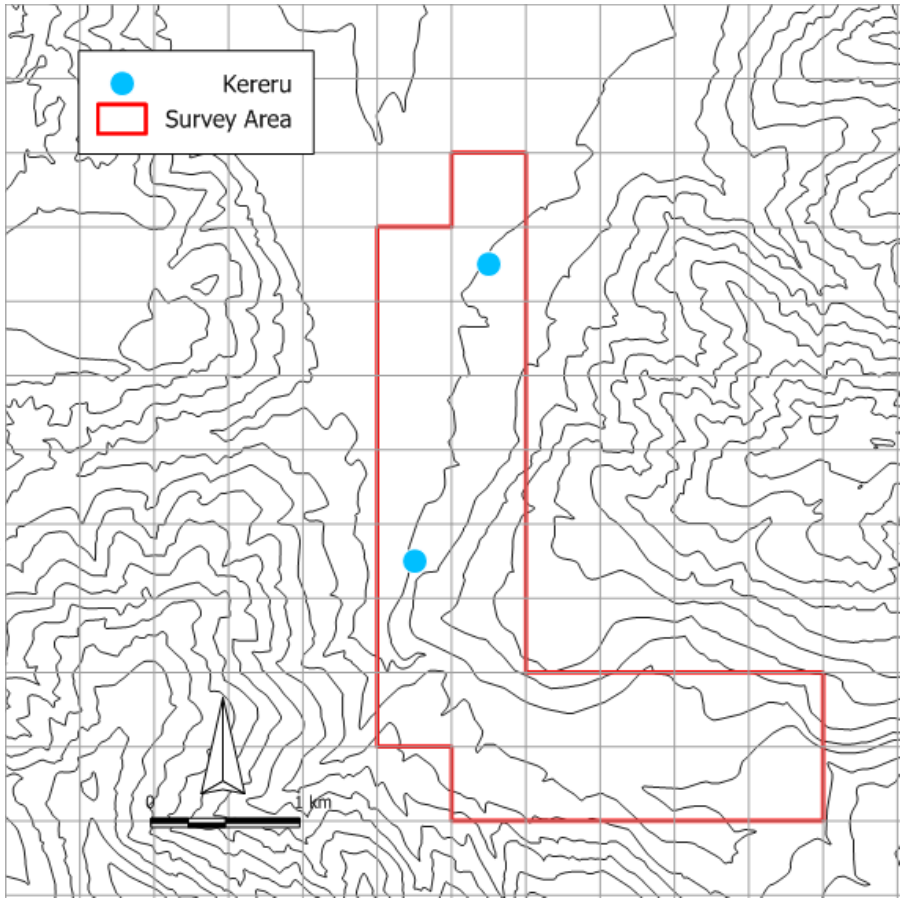
Figures 8 & 9. Kākā and kea encounters 2006/07



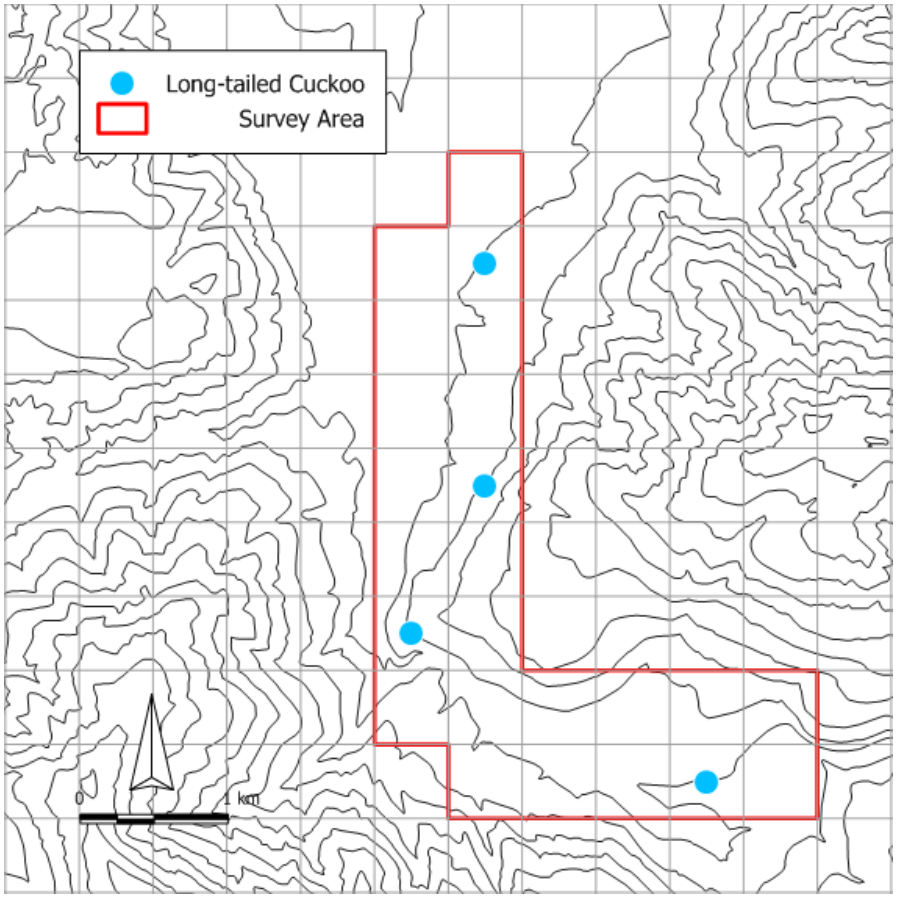


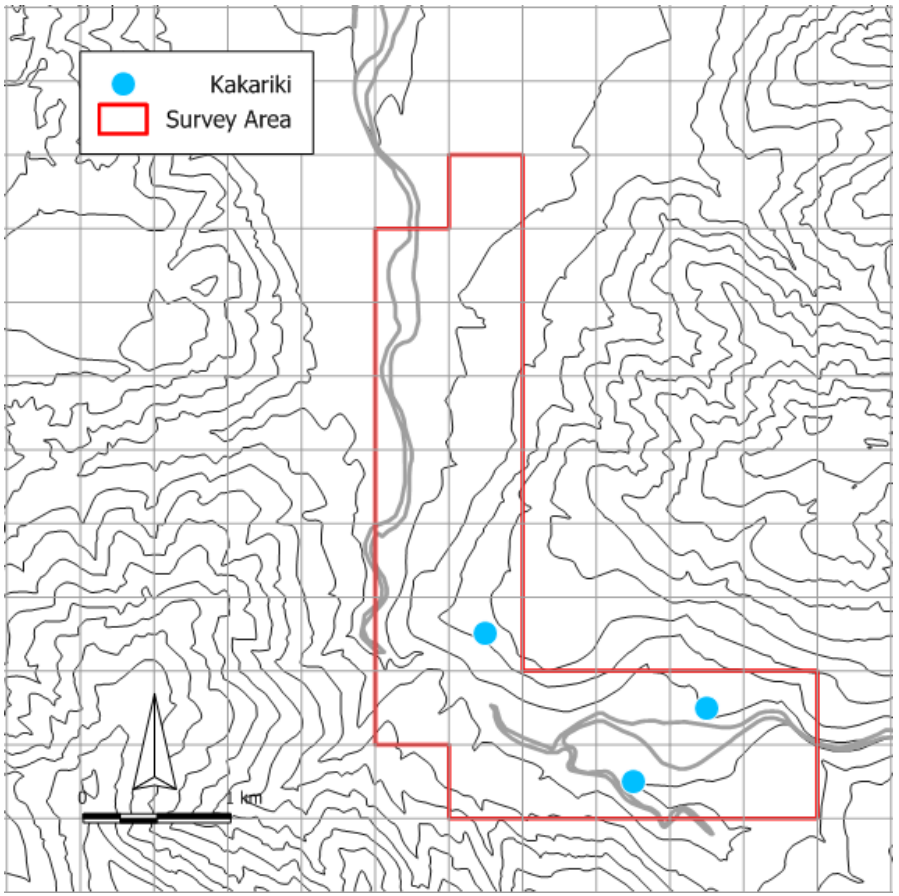
Figures 10 & 11. Grey duck and falcon encounters 2006/07



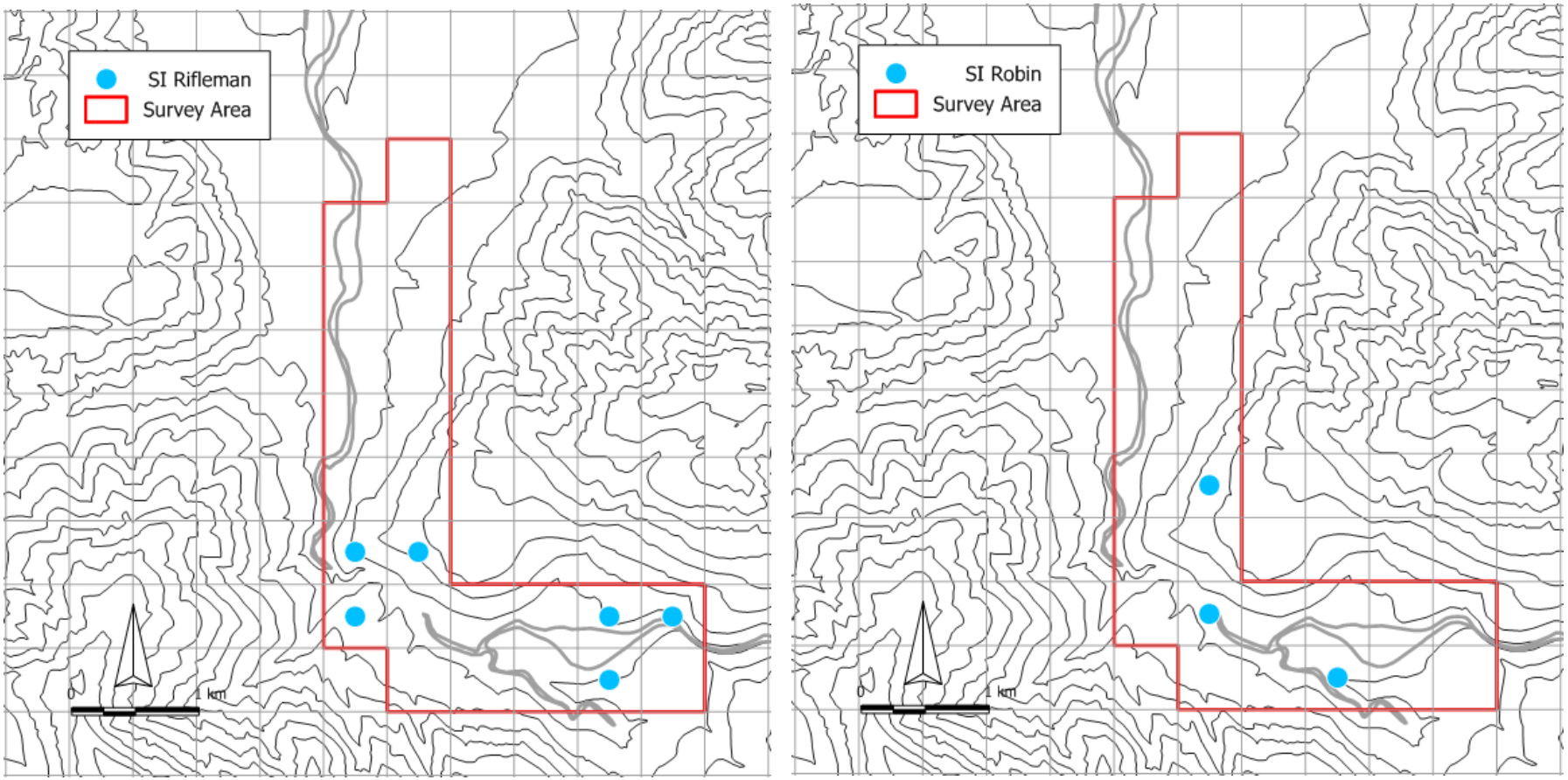


Figures 12 & 13. Western weka and kererū encounters 2006/07

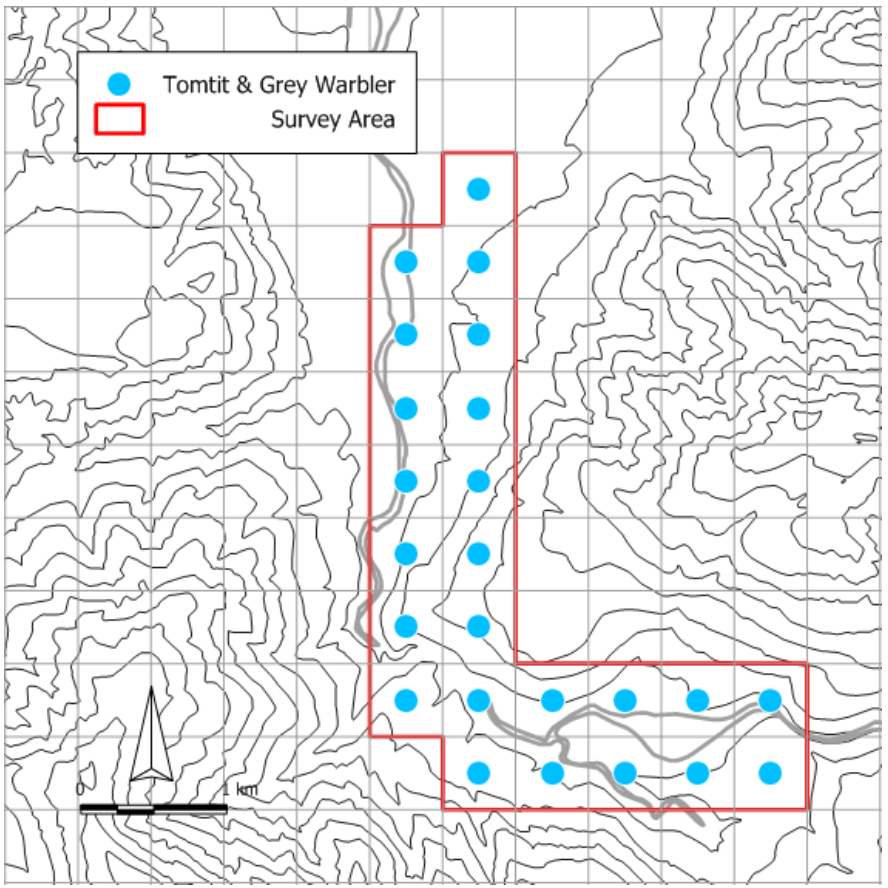


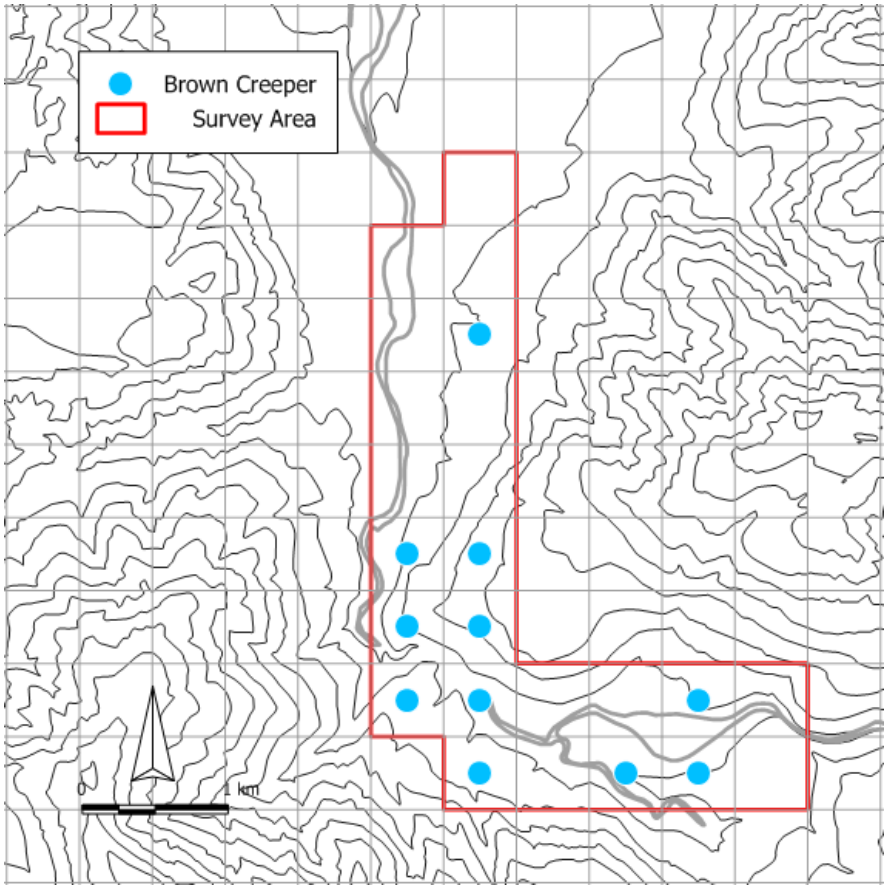


Figures 14 & 15. Long-tailed cuckoo and kākāriki encounters 2006/07



Figures 16 & 17. Rifleman and robin encounters 2006/07





Figures 18 & 19. Tomtit, grey warbler and brown creeper encounters 2006/07

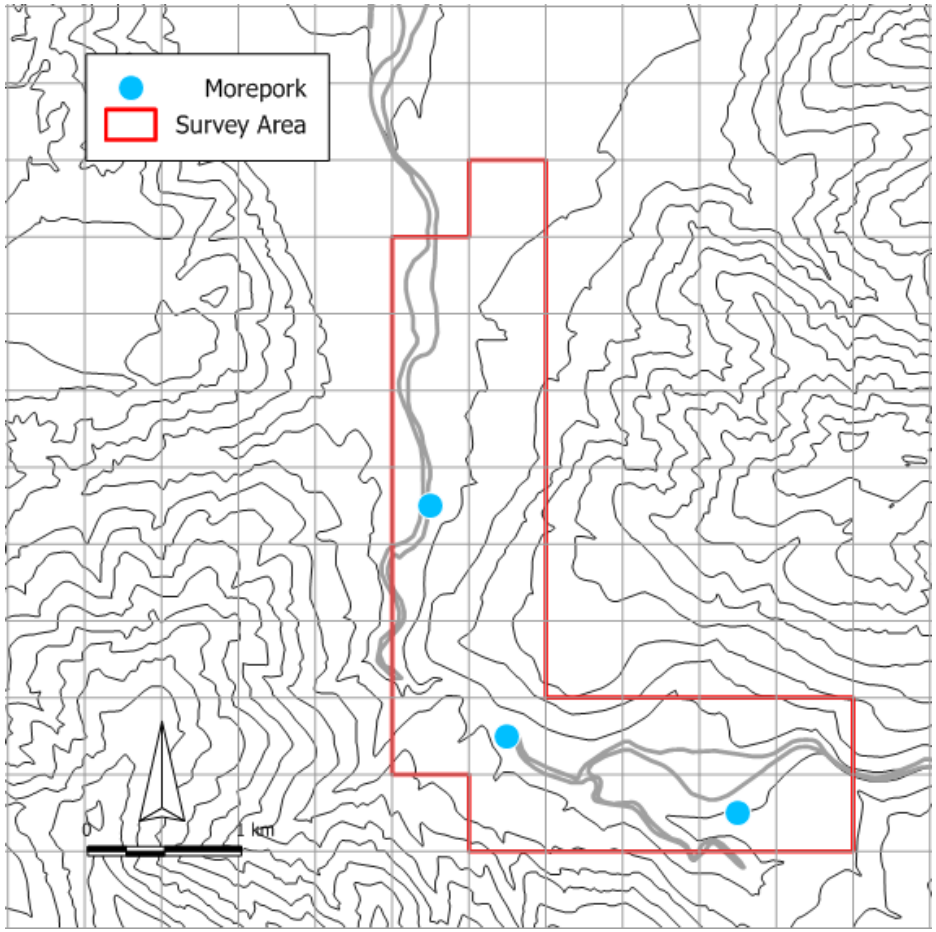


Figure 20. Morepork encounters 2006/07

1.4. Discussion

1.4.1. Bats

Weather conditions for recording bats were ideal throughout the January survey, yet bats (long-tailed bats only) were recorded only at Kiwi Flat and Scamper Torrent Track (**Figure 7**). Their apparent absence below Morgan Gorge was surprising given that the bat detectors were placed in favourable localities (e.g. alongside creeks, near forest edges or in grassy clearings) and that individual bats could easily travel from Kiwi Flat to below Morgan Gorge (O'Donnell 2001)[10]. Conceivably, the removal of large podocarp trees in the early 1990s from the terraces below Morgan Gorge may have reduced the quality of this habitat for bats. However, we suspect that more intensive sampling would show that bats do use the lower valley at least from time to time. Their distribution further up the Waitaha Valley and in tributaries near Kiwi Flat is unknown.

Long-tailed bats were detected in January 2007 mostly at the same sites that they were detected in October 2006. The overall higher numbers of passes/hour in January may reflect the warmer conditions and greater abundance of night-flying insects (bat food). It may also result in part from a seasonal increase in population size caused by the departure of young from breeding colonies.

Dave Eastwood (DOC Hokitika) also recorded long-tailed bats at one of three bat detector sites between Kiwi Flat Hut and the Waitaha River on 23 October 1994. Five bat passes were recorded in 2 hrs 20 mins on a detector perched in branches of a fallen tree by a small clearing. No bat passes were recorded on three other recording occasions that night.

The methods used in this survey are appropriate for determining the presence of bats, but they do not accurately indicate abundance (O'Donnell & Sedgeley 2001). However, the results indicate the presence of a moderately dense population in the Kiwi Flat area. The number of bat passes per hour at Kiwi Flat are higher than those recorded during extensive surveys of indigenous forests on the West Coast then administered by Timberlands West Coast (Buckingham 1999, 2002; Buckingham & Brown 1996; Buckingham & Nilsson 1994a & b; **Table 6**), and they are towards the top of the abundance range of DOC West Coast bat records (DOC Hokitika, pers. comm.) (**Figure 2**, Page 5). These data indicate that long-tailed bats are of regional significance.

The most likely causes of decline in long-tailed bat populations are considered to be loss of roosting trees following forest clearance, and predation by introduced animals (O'Donnell 2000, Pryde et al. 2005). Like the declining forest bird populations, the long-tailed bat population in the Waitaha Valley is probably at risk from predation by predators, notwithstanding that the habitat is mostly structurally intact.

The failure to detect short-tailed bats should not be interpreted as an absence of this species. Short-tailed bats are more elusive forest dwellers and are more difficult to detect with bat detectors (O'Donnell 1997, O'Donnell & Sedgeley 1994).

[10] Note that bats were detected below Morgan Gorge in summer 2012 with highest pass rates along the river bank north of Macgregor Creek that was not surveyed in 2006/07

Table 6. Bat detections at different locations between Reefton and Franz Joseph on the West Coast (after Buckingham 2002). B/D Nights = bat detector nights (≥6 hrs of recording), long-tailed bats only.

FOREST	B/D Nights (≥6 hrs)	Hours (40 kHz)	Hours (28 kHz)	# Passes (40 kHz)	# Passes (28 kHz)
Waitaha (above Morgan Gorge)	23	219.5	76	59	0
Waitaha (below Morgan Gorge)	9	90	26.5	0	0
Waitangi	6	62.5	20	0	0
Wanganui	19	198.5	72	3	0
Ianthe	22	225.5	114.5	4	0
Totara	7	77.5	56	0	0
Mahinapua	12	129.5	81	24	0
Kaniere	20	229	148	20	0
Waimea	8	86	50	0	0
Nemona	11	114.5	78	1	0
Omoto	4	40.5	20	0	0
Mawhera	11	123	110	0	0
Hochstetter	11	118	80	0	0
Craigieburn	11	115.5	70	8	0
Victoria	4	56	24	4	0

1.4.2. Birds

We found eleven of the twelve threatened species that previous information suggested may be present in the hydro scheme area. We also found fernbird, an additional species. Great spotted kiwi was the only species that was not found. They are probably now gone from the Valley (see Section 1.3.2).

The finding of weka in the Waitaha Valley was surprising. Weka were present in the Valley in 1892 (Douglas 1936) and in the nearby Wanganui Valley in 1900 (Douglas 1937). They died out in South Westland in the 1930s and 1940s except for populations that survived in the Copland Valley and at Karangarua (Beauchamp 1999, Beauchamp et al. 1999). Weka in North Westland began expanding their population southwards from the late 1970s, and reached as far south as Ross and the Mikonui River by 1997 (Eastwood 1998). This expansion south averaged approximately 10 km/annum from 1978 to 1988, and approximately 3.5 km/annum between 1988 and 1998 (Beauchamp 2000). Coker & Imboden (1979) also reported weka in nearby Ianthe Forest but there is no further information on this record. No weka were recorded in Ianthe Forest during diurnal and nocturnal surveys in 2001 (Buckingham 2002).

There are reliable reports of weka in the Waitaha Valley that precede the re-colonisation of weka towards the Waitaha. Peter Harker, a hunter and later manager of the Coal Town Museum in Westport, recalls “in about 1968 … seeing a weka at Kiwi Flat on about 3 or 4 occasions on the old track that was just above where Kiwi Flat hut was built”. He also saw one or two weka on the flats in Happy Valley (Kakapotahi catchment) just near the old hut (Peter Harker, pers. comm. 30 April 2007). Ted Brennan (DOC Hokitika) reported a weka at Top Waitaha Hut in Easter 1991. These reports precede by 10-30 years the arrival of weka in 1997 in the Mikonui Valley, 15 km north of the Waitaha Valley.

While there are anecdotal reports of weka being deliberately shifted (Eastwood 1998), and this is conceivable for the weka on the Waitaha farmland boundary near Macgregor Creek, this is unlikely to have occurred in remote areas such as Kiwi Flat and the top of the Waitaha Valley. Another possible scenario is that weka may have gone locally extinct in the Valley since the reports of Harker and Brennan but have re-established by migration from birds reaching the Mikonui Valley by 1997 (Eastwood 1998). Weka are recorded in the Kiwi Flat Hut book on 28 December 2003. The migration rate required for the Mikonui birds to reach the Waitaha by then is 2.5 km/annum, which is well within the rates achieved in North Westland (Eastwood 1998).

Whether the weka now in the Waitaha Valley are derived from a surviving isolated population or are sourced from the expanding population in North Westland is probably now very difficult to determine. Information on weka populations between the Mikonui and Waitaha Valleys would help to establish whether the Waitaha and Mikonui populations are joined or remain disjunct. Genetic studies would also assist.

In the absence of definitive information, it is prudent to regard the weka population in the Waitaha Valley as a remnant of the original one rather than the result of a recent colonisation from the north. If it is a remnant, it may well have genetic and/or behavioural attributes that differ from other weka populations on the West Coast (e.g. Hale & Briskie 2007). A precautionary approach is warranted to protect those potential values.

Long-tailed cuckoos, which are now rare in the central and northern parts of the West Coast, were encountered throughout the survey area (one or two birds heard at most nocturnal listening stations and also heard during the day). Their main host species (brown creeper) is present in the area although they were observed to be in relatively low numbers. In the absence of surveys during the same season elsewhere, the abundance of long-tailed cuckoos in the survey area relative to other forest areas in South Westland is not known.

Moreporks were in low numbers and patchily distributed in the survey area. Reasons for their comparative scarcity are unknown.

Robins in the study area are on the margin of a significant robin population in low-altitude forests west of the Alpine Fault between Waitaha and Okarito (Coker & Imboden 1979, Robertson et al. 2007). This population also extends into the Wanganui and Whataroa mountain catchments east of the Alpine Fault.

Several species (e.g. kākā, grey duck, kākāriki, riflemen, robin and brown creeper) were more frequently encountered further up the river, at and above Morgan Gorge (see **Figures 8, 10, 15, 16, 17, & 19**, respectively). This may indicate associations with less disturbed and more diverse habitats, or lower densities of predators away from the farmland edge.

Bird Species Richness and Numbers

There are few recent surveys of comparable podocarp forests in central Westland to compare the bird species richness and numbers in the Waitaha fauna survey area. The most recent survey data (2001) is from six forests between Hokitika and Franz Josef that had been logged or were near areas that had been modified (**Table 7**; Buckingham 2002). Of these seven forests, the Waitaha had the highest number of indigenous bird species and was the only forest with kākā present, probably due to its less modified and fragmented forest habitat and greater survey time spent in the Waitaha.

In contrast, older survey data from two nearby predominantly unmodified hill country forests (Waitangi State Forest and Totara State Forest; Coker & Imboden 1979, Morse 1981) suggests the Waitaha fauna survey area has lower numbers of indigenous birds and indigenous bird species than these areas. This is more likely to arise from a general decline in forest bird numbers caused by predation and reducing habitat quality over the period rather than a difference in populations *per se*. Six of the forest bird species recorded in the Waitaha (SI kākā, kea, long-tailed cuckoo, SI rifleman, brown creeper and tomtit) have shown nationwide declines in distribution over the past two decades (Robertson et al. 2007). That forest bird populations in the Waitaha are declining is also supported by the overall low densities of the majority of species there (particularly kākā, kākāriki, kererū, rifleman and robin), the patchy distribution of many species (e.g. robin and rifleman) and the observed male-biased sex ratio of one species (robins; McLennan 2007b).

Despite these grim observations, it is evident that the Waitaha survey area supports reasonably rich populations of indigenous bird species including several of particular conservation importance. Individual numbers of some birds (e.g. tomtit, grey warbler) were also relatively high (**Table 5**; R.P. Buckingham pers. obs.).

Table 7. Distribution and relative abundance of birds and bats of particular conservation importance or of limited distribution within the Waitaha survey area (2006-2007) and other indigenous podocarp forest areas between Hokitika and Franz Josef surveyed during 2001 (Buckingham 2002). Kiwi were not found in any of these seven forests.

AREA (Forest)	WTH	WAI	WAN	IAN	TOT	MAH	KAN
Time (days)	9	<4	≥6	≥6	<4	<4	≥5
Native bird sp.	27	14	21	20	11	13	19
Weka	√I				√	√	√√
Falcon	√		√	√√			√
Kererū	√	√	√√	√√	√	√	√
Kākā	√						
Kea	√	√	√	√	√		√
Kākāriki	√	√	√	√	√		√
Rifleman	√1		√I				√I
Robin	√I	√	√√	√√			
L.T. Bats	√√I		√	√		√	√

KEY
Forests: WTH, Waitaha; WAI, Waitangi, WAN, Wanganui; IAN, Ianthe; TOT, Totara; MAH, Mahinapua; KAN, Kaniere.
√ Present but not commonly encountered
√√ Commonly encountered
I Localised

Seasonal and Altitudinal Habitat Use

The one-off survey techniques used were not designed to detect seasonal and altitudinal variation in habitat use by birds (e.g. O'Donnell & Dilks 1994). For example, kererū may be more common in the Valley at times of the year that were not surveyed, and birds such as kea and riflemen may become more common in lowland forests during winter. The use of flowering rata by tūī in January is consistent with patterns recorded elsewhere, though the numbers of tūī in the Waitaha survey area seemed surprisingly low. The detection of migrant species such as long-tailed cuckoos and welcome swallows was made possible by surveying during summer.

1.4.3. Powelliphanta land snails

No evidence of *Powelliphanta* land snails was found within the fauna survey area. They are unlikely to be present given the extent of fauna surveys carried out in the area and the relative conspicuousness of *Powelliphanta* shells lying on the ground surface. The nocturnal search on the night of 18-19th of January was ideal for *Powelliphanta* activity, and so probably would have detected the animals had they been present.

McLennan (2007b) found a damaged *Powelliphanta* shell, possibly predated, on the Waitaha River just below its confluence with Whirling Water. The shell had a diameter of approximately 30 mm and was damaged, perhaps by a weka. It was dark in colour, more similar in appearance to *P. fletcheri* than *P. r. rossiana* (Walker 2003).

The finding of a *Powelliphanta* shell in the Waitaha is an interesting new record. *Powelliphanta* are recorded from nearby subalpine-alpine sites on Mt Bonar and Karnback, and in the headwaters of the Tuke River. In the absence of genetic analysis, Walker (2003) refers the Mt Bonar snails to *Powelliphanta rossiana rossiana* but states that the identity of the snails on Karnback and in the Tuke River is not yet confirmed.

None of these three sites has drainage into the Waitaha catchment, and they are therefore unlikely to be the source of the *Powelliphanta* shell. Walker (2003) suggests that snails are likely to be present at other sites east of the Alpine Fault between Karnback and the Tuke River sites, and the most parsimonious explanation of the McLennan (2007b) report is that the shell was sourced from a currently unknown *Powelliphanta* population in the headwaters of the Waitaha River or Whirling Water.

The significance of the find remains to be determined. The shell has been forwarded to a snail expert for identification, at least as determined from its morphology. Very probably it will be related to one of the *Powelliphanta* taxa on nearby peaks, but that it belongs to a new taxon is not inconceivable.

1.4.4. Pest and predator observations

Casual observations indicate that possums are numerous and possum-preferred plant species such as fuchsia, wineberry and mahoe are not abundant within the study area. Substantial possum-induced dieback of southern rata, Halls totara, kamahi and *Libocedrus bidwillii* has occurred at higher altitudes in the Waitaha Valley (Rose et al. 1992). Possums are likely to be causing a decline in the habitat quality of the forests of the study area for wildlife (Sweetapple et al. 2004). Possums have also been recognized as a significant predator on indigenous wildlife (Sadlier 2000).

Deer and goats are present in the study area. Heavy browsing was evident only in the lower reaches near Macgregor Creek in 2007. Currently, browsing effects on vegetation within the forested parts of the Scheme's footprint appears very low (TACCRA Ltd 2013, 2025).

The predator surveys (McLennan 2007a, b) found that that the study area has a 'deep forest' community of small mammals dominated by ship rats, mice, possums and stoats. In May 2007 rats were at high levels of abundance in the forests of the Waitaha survey area (McLennan 2007b). Two outcomes are probable if rats remain at or above their current levels in the Waitaha over the winter: they will impact significantly on various species of forest birds when they begin to breed in spring, and they will generate a numerical response in stoats that

will lead to a stoat plague in the summer of 2007/2008[11]. Much depends on the food supply (podocarp fruit?) and whether it remains at levels that allow rats to breed throughout winter.

Amongst the current avian inhabitants of the Waitaha survey area, robins are probably the most vulnerable to rats, and their current patchy distribution within the Valley and male-biased sex ratios are almost certainly the product of past predation events (McLennan 2007b).

The relatively low rates of stoat catch measured in the Waitaha in the summer and autumn of 2007 are certain to increase in November and December 2007, perhaps four-fold, if rats remain abundant through to spring (McLennan 2007b). Stoat impacts on whio, weka, robin, bellbird, kererū, tūī and kākā are therefore likely to increase in summer 2007-08.

Including possums, the study area therefore supports all of New Zealand's most significant predators, all at levels of abundance that exceed recognised damage thresholds for reptiles, large invertebrates and various forest birds (McLennan 2007b).

2. Terrestrial fauna surveys in 2012

The main aim of the 2012 fauna survey was to extend on information collected in 2006/07 and focus on increasing the knowledge of the presence, distribution and relative abundance of specific threatened species (long-tailed bat, fernbird and *Powelliphanta* land snails). I carried out the survey in November and December 2012, involving three separate surveys. Matt Charteris (Waybacks Ltd) assisted on the first survey in November 2012.

The 2006/07 surveys had found significant regional populations of long-tailed bat and whio, as well as lower-density populations of other threatened fauna such as kākā and western weka[12]. Highest faunal values were found at Kiwi Flat, and surrounding forest and riverine habitats. No bats were recorded below Morgan Gorge then. Scant records of whio were obtained below the gorge from sightings and faecal sign (Overmars 2013; Overmars & McLennan 2010). Fernbirds were recorded at only one locality and on one occasion: in scrub on the north side of Kiwi Flat in September 2006 (Fred Overmars, pers. comm.).

The 2012 faunas focused more on evaluating indigenous fauna (birds, bats) below Morgan Gorge than above it, though I carried out intensive surveys for fernbirds and *Powelliphanta* snails at Kiwi Flat.

2.1. Objectives

- To determine whether long-tailed bats are present below Morgan Gorge;
- to evaluate the extent of bat activity (measured in pass rates) throughout the proposed Scheme footprint;
- to evaluate the presence/absence, distribution and relative abundance of fernbirds (and other birds) within the proposed Scheme footprint; and
- to evaluate the presence/absence of *Powelliphanta* snails by searching for shells on the ground surface, particularly at Kiwi Flat where shells were found in 2007 and 2011.

2.2. Methods

2.2.1. Bats

Since 2007, DOC had developed a more effective fully digital bat detector (**Figure 21**). These were used to evaluate the presence of bats within the survey area (the proposed Scheme

[11] Predator population irruptions are a response to periodic beech or podocarp seed masting. The extent of resulting predator densities is related to the extent of the masting

[12] Note that Western weka is currently 'Not Threatened'

footprint from Waitaha Road end to Kiwi Flat). Twenty recorders were deployed at various locations below Morgan Gorge and one detector was deployed near the proposed headworks at Kiwi Flat (**Figure 22**).

These detectors were configured to automatically record bats at night over a 45-day period between 12 November and 27 December 2012. In addition, I carried out one walkthrough survey using a hand-held heterodyne bat detector along the true right river terrace north of Macgregor Creek on 8 December 2012.

Bat detectors were spaced about 300 m apart at quieter locations along the lower river terrace and backwaters extending from the river below Morgan Gorge (true right bank) to Doughboy Hill (quarry site) and near the end of Waitaha North Bank Road. Some detectors were positioned in forest well away from the river, along tributary streams, terrace slopes and high terraces. One detector was deployed in forest about 50 m above the proposed weir near the swing bridge at the top of Morgan Gorge. This was the sole bat surveillance site in the Kiwi Flat area above Morgan Gorge in 2012.

The recorders were deployed at sites where bats are likely to be detected if present: along river/stream terraces and forest edges for long-tailed bats, and within forest for short-tailed bats. The recorders were left in place to monitor bat echolocation calls continuously overnight for periods of about 20 nights, after which batteries and SD cards were replaced and monitoring resumed. Some detectors were then moved to different sites to ensure wide surveillance coverage. Bat detectors were deployed at a total of 31 sites (discounting site changes of <50 m) (**Figure 22**).

Figure 21. Digital bat recorders used in early summer 2012

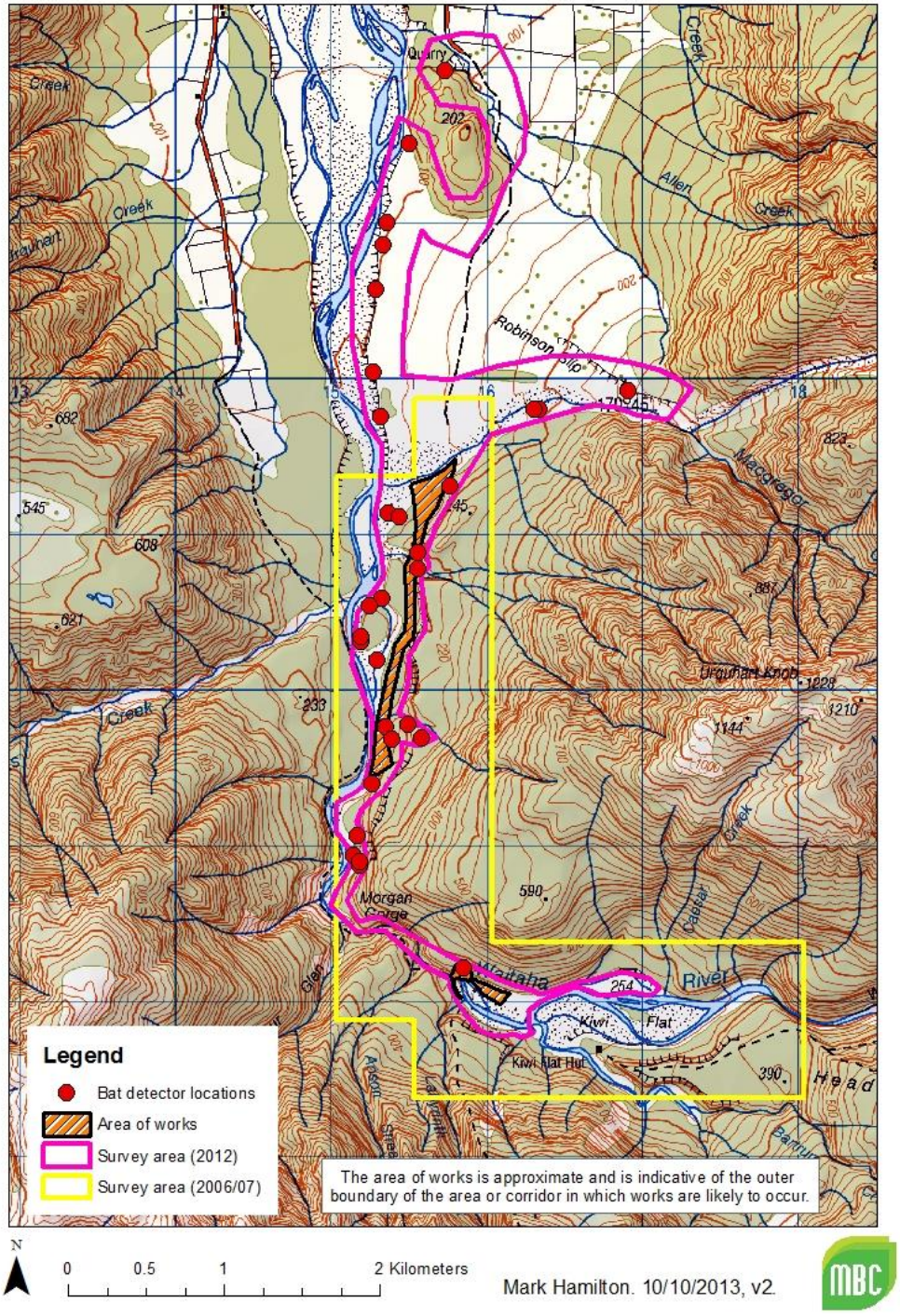


Figure 22. Locations of bat detectors within the proposed Scheme footprint area, 2012

2.2.2.Fernbirds

In November 2012, Matt Charteris and I carried out a walkthrough transect survey using fernbird call playback in areas offering suitable fernbird habitat (i.e. low scattered shrubs, tall grass and wetland) within the survey area (**Figures 23**). Typical areas searched are shown **in Figure 24 a & b** (foreground in each photo) and **Figure 25**). We carried acoustic equipment to record fernbird calls if they were located, as most birds respond best to locally recorded dialect. Surveys along these transects were carried out during early morning or later afternoon when fernbirds tend to be most vocal. Counts were replicated on three consecutive

days in November (12-14 November), while I carried out a more general search using tape playback over the same locations in December.

Figure 23. Fernbird search coverage in 2012

Transects followed the true right side of the Waitaha Valley below Morgan Gorge to Doughboy Hill downriver of the Robinson Slip (**Figure 23**). Other transects followed the true right side of Macgregor Creek. An intensive search using playback was also carried out at Kiwi Flat (**Figures 23 & 25**), as fernbirds had been recorded on the north side of Kiwi Flat in September 2006 (Overmars & Buckingham 2007).

Figure 24 a & b. *Top*: in the vicinity of the 'Stable Tributary' not far below the proposed Power Station site. Abundant suitable fernbird habitat. *Bottom*: Abrupt forest edge and mixture of grasses and tree ferns offering possible fernbird habitat.

Figure 25: low-stature shrub-hardwood vegetation on a relatively recent alluvial terrace where Staging Area 1 is proposed.

The area was searched intensively for fernbirds and *Powelliphanta* snails in 2012.

In addition to playback surveys, I deployed Wildlife Acoustics Songmeter (SM2)™ digital programmable acoustic recorders **(Figure 26**) at sites offering suitable habitat for fernbirds (**Figure 27**). These recorders were programmed to record from 5 am to 10 am and from 5 pm to 10 pm covering times when fernbirds were most likely to be vocal (early morning and around sunset). The times were selected also to coincide with peak calling of other birds (daytime and early evening). Recordings were reviewed using Song Scope™ software, by scanning spectrograms or listening to .wav files.

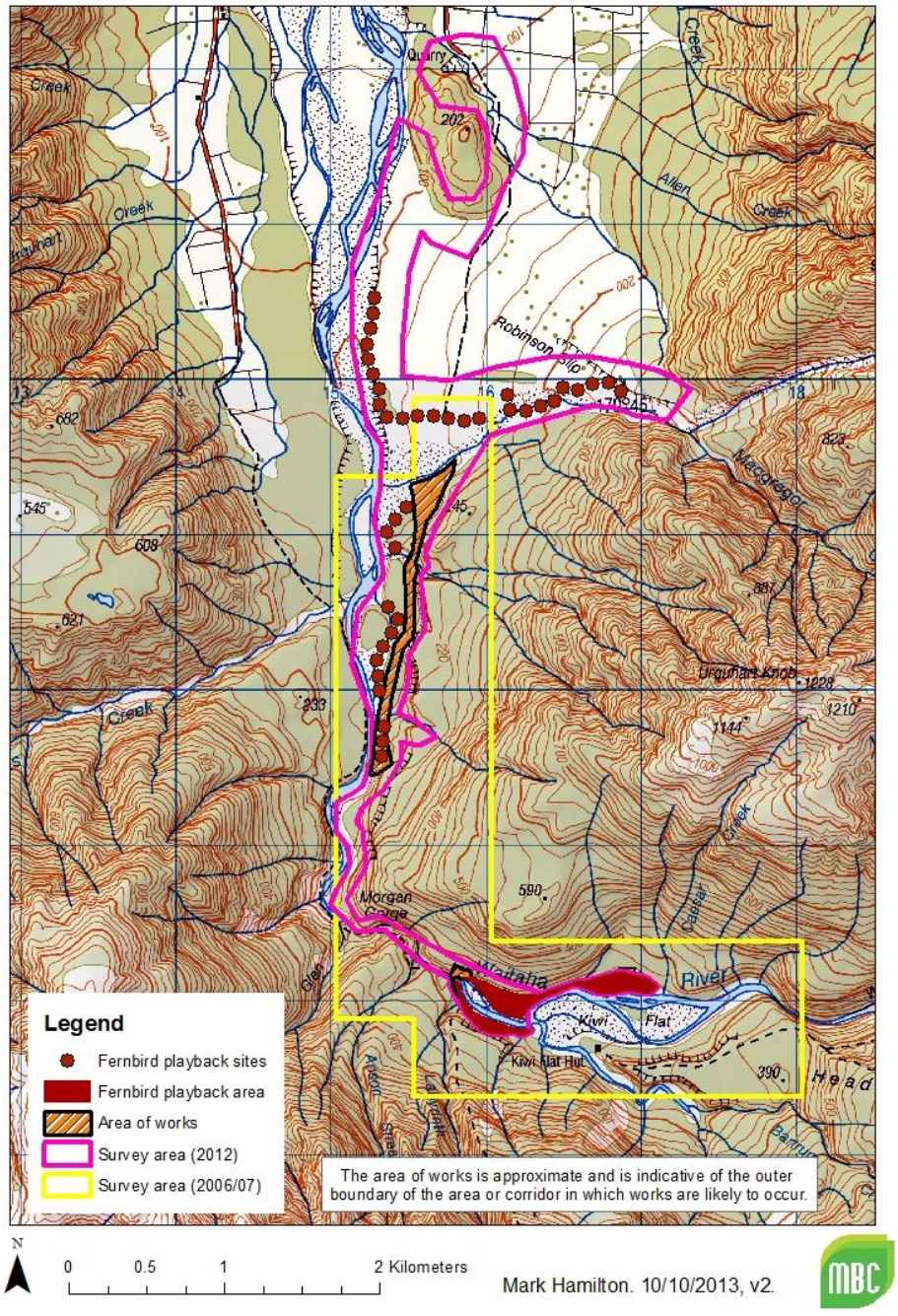

Legend
Fernbird playback sites
Fernbird playback area
Area of works
Survey area (2012)
Survey area (2006/07)
The area of works is approximate and is indicative of the outer boundary of the area or corridor in which works are likely to occur.
N
0
0.5
1
2 Kilometers
Mark Hamilton. 10/10/2013, v2.
Quarry
Creek
Allen
Robinson Slip
MacGregor
Urquhart Knob
Morgan Gorge
Waitaha River
Kiwi Flat
Kiwi Flat Hut
Head

Figure 26. Wildlife Acoustics Songmeter (SM2)™ digital programmable acoustic recorder

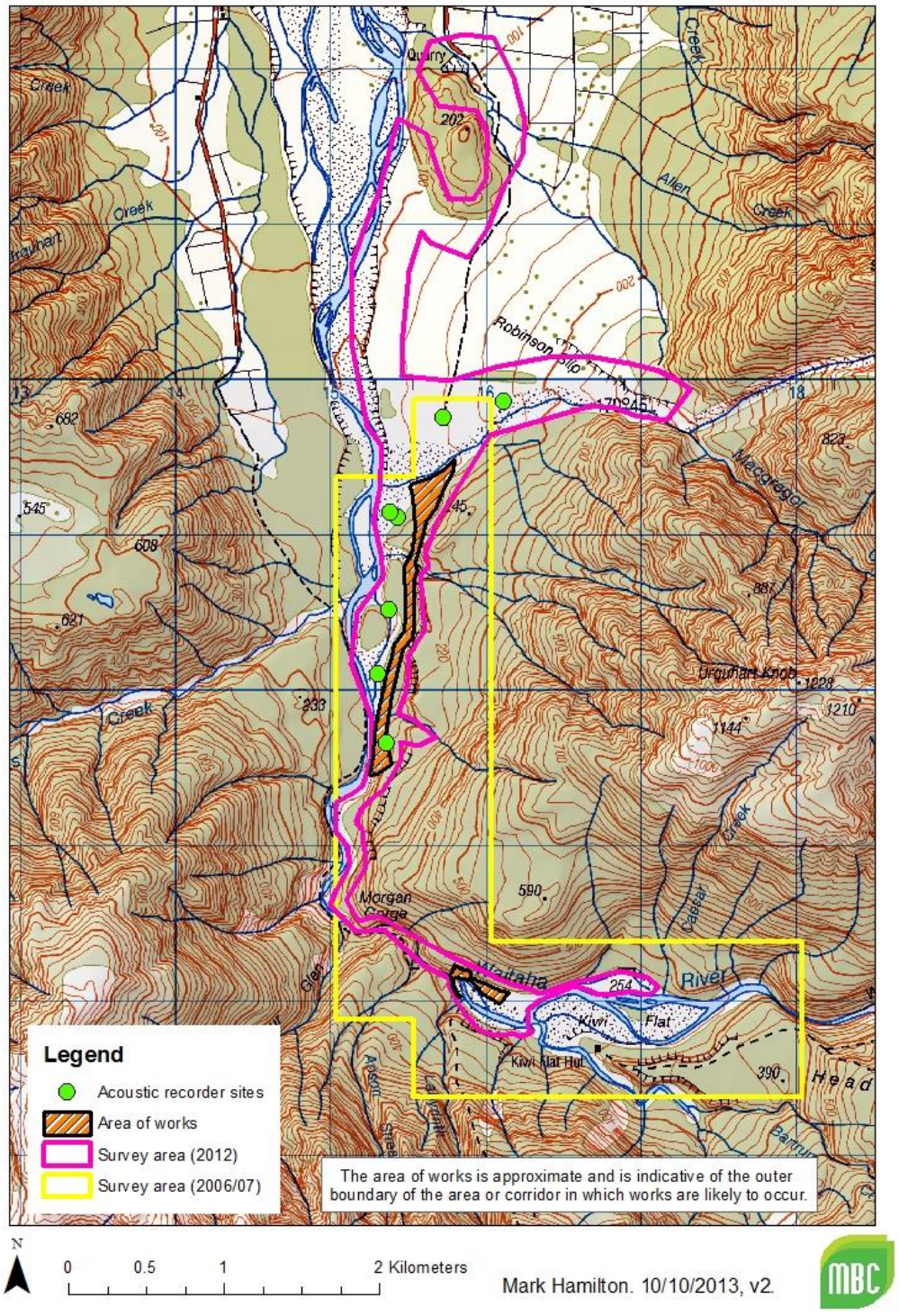


Figure 27. Automatic acoustic recorder deployment sites, early summer 2012

2.2.3. Powelliphanta land snails

We searched for *Powelliphanta* throughout the proposed Scheme footprint and outside it in places (e.g. Kiwi Flat) in November and December 2012. This involved searching for *Powelliphanta* shells on the ground surface during walkthrough surveys using standard methodology (after Walker 1997). We focused on areas we considered to be ideal *Powelliphanta* habitat such as terrace scrub on alluvial flats (e.g. **Figures 24a & 25**).

2.3. Results

2.3.1. Summary

We recorded long-tailed bats throughout the survey area, from above Morgan Gorge to the lower Waitaha Valley (they were not detected below Morgan Gorge on earlier surveys (**Appendix E,** Sections 1.3.1 & 2.3.2). Bats were most active (highest pass rates) at the single surveillance site located close to the proposed intake portal above Morgan Gorge. Moderate bat activity occurred near the river terrace downriver of Macgregor Creek confluence, while low activity of bats was recorded between Macgregor Creek and Morgan Gorge, (**Figure 28**). No short-tailed bats were detected.

We noted similar bird assemblages (species, distributions and relative numbers) to 2006/2007 surveys. Distributions and observed densities were similar for a range of species including western weka, New Zealand falcon, native parrots (kea, kākā and kākāriki), robin and rifleman. Some species recorded were likely to be seasonal visitors (e.g. Canada goose, South Island pied oystercatcher and shining cuckoo in early summer 2012). Fernbirds, whio and moreporks were recorded during 2006/2007 in low-moderate numbers, but were not encountered in 2012.

No sign of *Powelliphanta* land snails was found. However, there are two independent incidental records of *Powelliphanta* found at Kiwi Flat. A damaged empty shell was found on a strandline of leaves and twigs near the confluence of Whirling Water in 2007 (McLennan 2007b) and another shell was found nearby on the true right bank of Whirling Water in June 2011 (Fred Overmars, pers. comm.). In both cases the shells had probably been washed downstream during a flood.

2.3.2. Bats

All bat calls recorded during the acoustic survey were identified as being from long-tailed bats, an endemic New Zealand insectivorous bat ranked as Nationally Critical in DOC's conservation classification list (O'Donnell et al. 2023). No short-tailed bats were recorded in 287 bat-detector nights at the ten forest sites considered suitable short-tailed bat habitat. Although this negative result does not rule out the possible presence of short-tailed bats, they are probably absent given their rarity in the South Island (Lloyd 2001, 2005 & 2009).

Long-tailed bats were relatively active in some parts of the Waitaha Valley (**Figure 28**). They were frequently recorded at Kiwi Flat and other sites above Morgan Gorge during 2006-2007 (Overmars & Buckingham 2007; **Appendix E**, Section 1.3.1), but none were recorded below Morgan Gorge during a survey in January 2007. When the results of all surveys are combined, long-tailed bats were recorded at 7 out of 15 survey sites above Morgan Gorge, and 10 out of 38 sites below Morgan Gorge (zero out of eight sites in January 2007). The bat pass rate at Kiwi Flat was high compared to most other areas where bats have been detected on the West Coast (**Table 6 & 8**)

Low pass rates of bats were detected between Morgan Gorge and Macgregor Creek at several sites, including sites that failed to record bats in 2006/07 using earlier Batbox III™ bat detectors. However, in early summer 2012, the DOC bat detectors recorded moderate bat activity on river terraces north of Macgregor Creek that were not surveyed in 2006/07 (**Figures 28-30** inclusive).

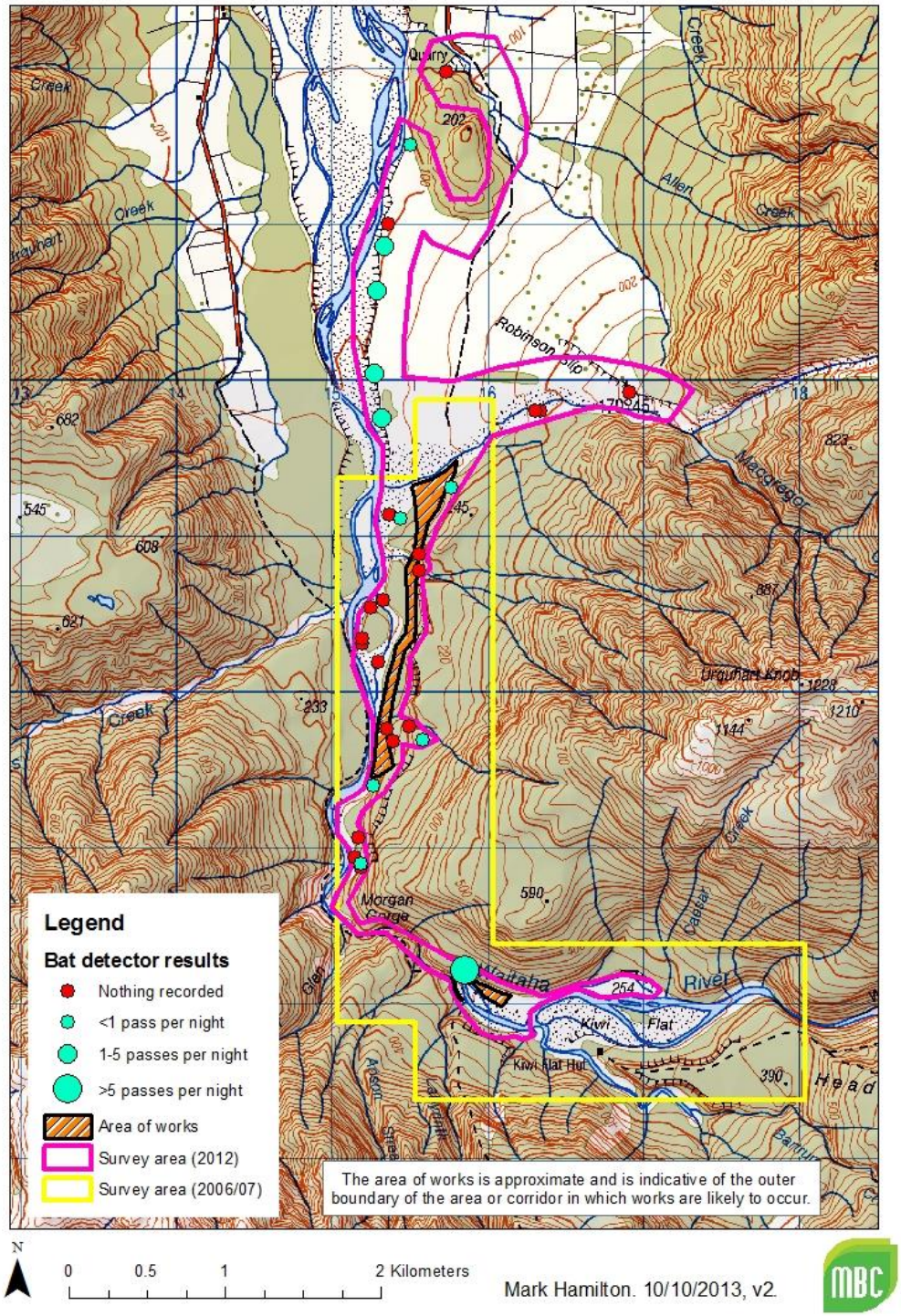


Figure 28. Bat survey results in early summer 2012

Highest bat call rates were recorded on a single detector deployed at Kiwi Flat above Morgan Gorge (in forest above the swing bridge, on the true right). The call rate was 8.83 calls/night compared to 4.35 calls/night, the highest mean call rate at any other site (**Figures 28 to 30** inclusive). The detector at Kiwi Flat was located close to the proposed intact portal and headworks infrastructure.

Table 8. Mean bat pass rate/night at different locations on the West Coast

(after Buckingham 2002, Lloyd 2011, and Overmars & Buckingham 2007

Location	Date	Bat-detector nights	Mean pass/night
Waitaha River: Kiwi Flat	2006-07	23	2.57
Waitaha River: Kiwi Flat	2012	35	8.83
Waitaha River north of Macgregor Ck	2012	129	2.12
Waitaha River south of Macgregor Ck	2012	246	0.02
Lake Ianthe Forest	2001	22	0.18
Wanganui Forest	2001	19	0.16
Mahinapua Forest	2001	12	2.0
Kaniere Forest	2001	20	1.0
Craigieburn Forest (Paparoa)	2001	11	0.73
Mokihinui River (above Mokihinui forks)	2010-11	307	12.07
Mokihinui River (Below Mokihinui forks)	2010-11	833	0–0.65

Long-tailed bat activity was higher in riverine habitats (river terrace, flats, or over water) than other habitats sampled (**Figure 31**). Few bat calls were recorded in forest habitat remote from the river except at Kiwi Flat (though this site was within 100 m of the river above Morgan Gorge so is included in riverine data in **Figure 31**).

Bats were recorded at only one of five detector sites below Morgan Gorge along the forest edge >100 m away from the river (near Macgregor Creek: NZTMP 1415433 5225119). Another detector located at the forest edge about 50 m from the river (NZTMP 1415257 5223401) recorded only two bat calls in 37 bat-detector nights. These results were surprising given that other studies have found that long-tailed bats favour forest edge (e.g. O'Donnell 2000, 2001).

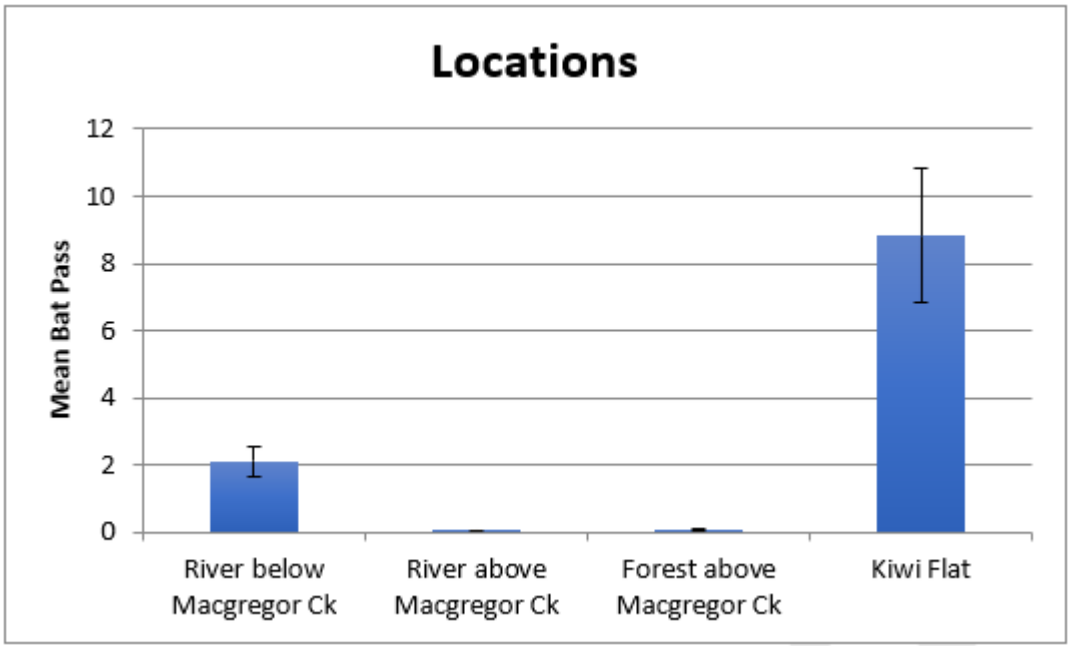


Figure 29. Bat activity rates in the lower Waitaha Valley (bars represent standard error on all charts)

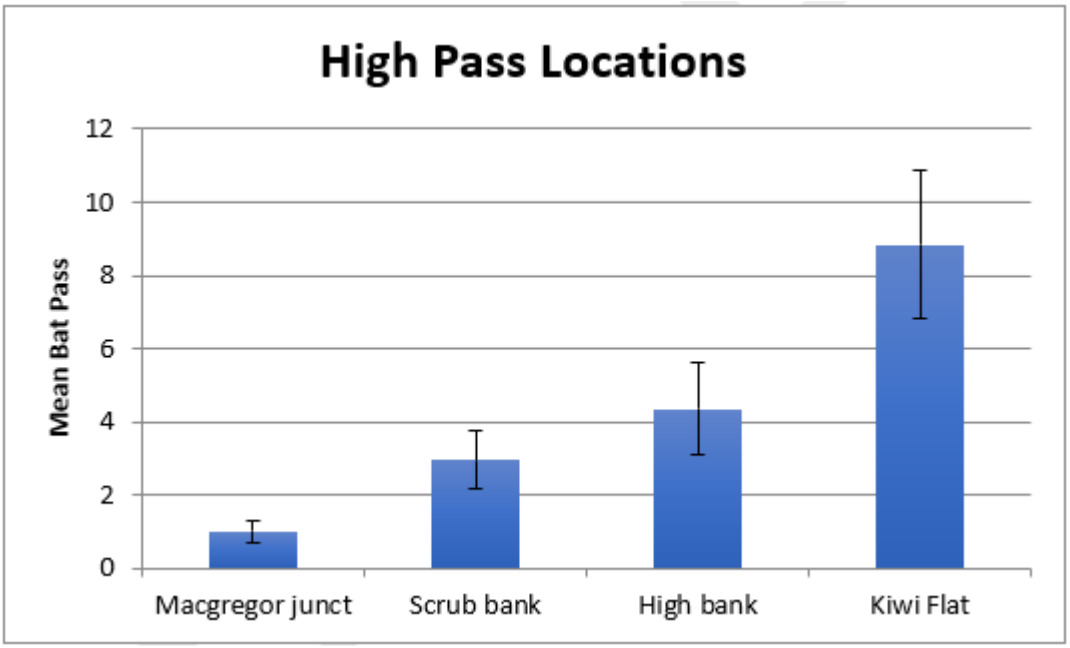


Figure 30. Comparisons of mean call rates at three sites with high bat activity levels downriver of Macgregor Creek and the Kiwi Flat site

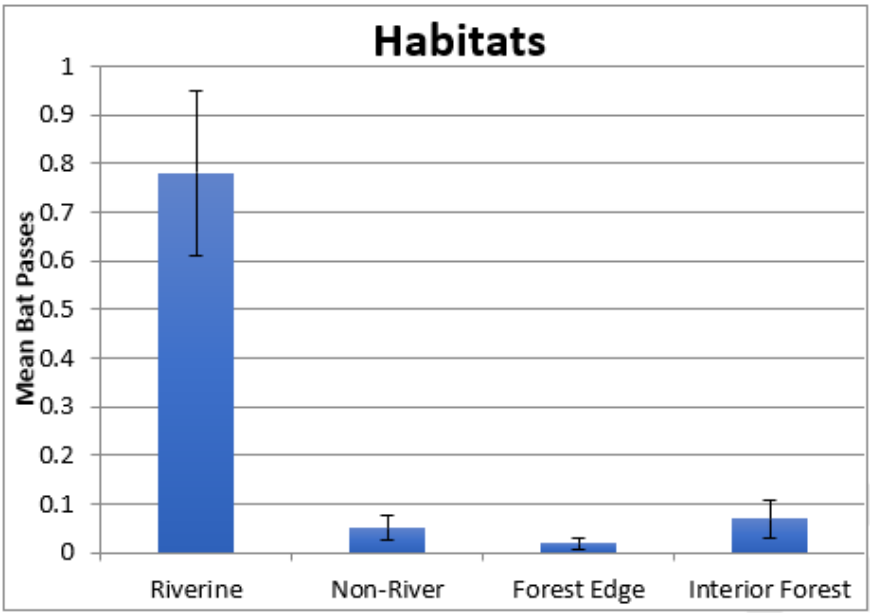


Figure 31. Mean bat call rates in various habitats (data from bat detectors at forest edge >100 m from river used for Forest Edge value)

Bat activity data indicates that bats were using riverine habitats for foraging and probably commuting. Feeding buzzes were recorded on a few occasions in the area downriver of Macgregor Creek. At most sites, bat activity typically began soon after 22:00 hrs with activity peaking during the following hour. However, at the Kiwi Flat site there was a second smaller peak of activity between 1 am and 3 am (**Figure 32**). None of the detectors recorded the high levels of bat activity in the early evening and morning that are typically associated with bats leaving and returning to a nearby active colonial roost. Although there was ample roosting habitat for bats near the Kiwi Flat detector site, there was no suitable roosting habitat close to the detector sites in the lower part of the Valley, downriver of Macgregor Creek where moderate activity levels were recorded.

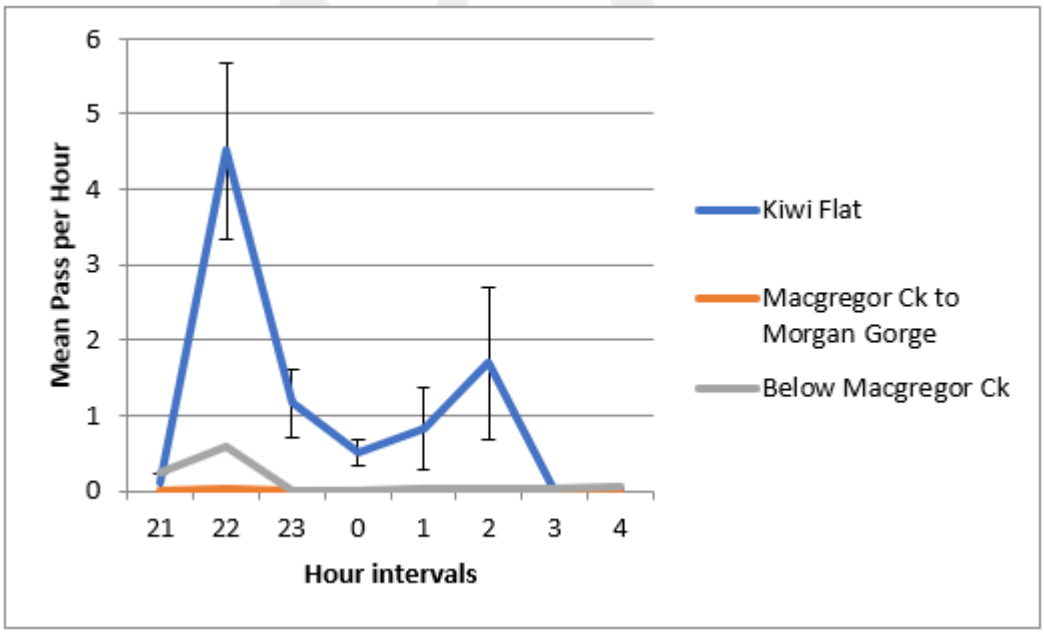


Figure 32. Bat activity throughout the night at various locations

Nighttime temperatures were relatively low at the beginning of survey in November 2012 (8 °C at dusk, 3–5 °C minimum), but became warmer by early December (10–13 °C at dusk, 10 °C minimum). Weather records from the closest weather recording station (at Hokitika Airport) showed mean daily maximum temperatures of 16.57 °C in November and 18.55 °C in December 2012 during the survey period (calculated from data provided by http://freemeteo.com). Mean daily minimum temperatures each month were 7.29 °C and 10.09 °C respectively. Wind speeds were similar in the two months, but rainfall was higher in December (5.87 mm in December cf. 3.62 mm in November).

Bat activity below Morgan Gorge appeared to be higher in December than November, whereas the reverse pattern was observed at Kiwi Flat. One explanation for this could be that the bats extended their range downriver from their core home range at Kiwi Flat as summer progressed, however the differences are probably not significant (**Figure 33**).

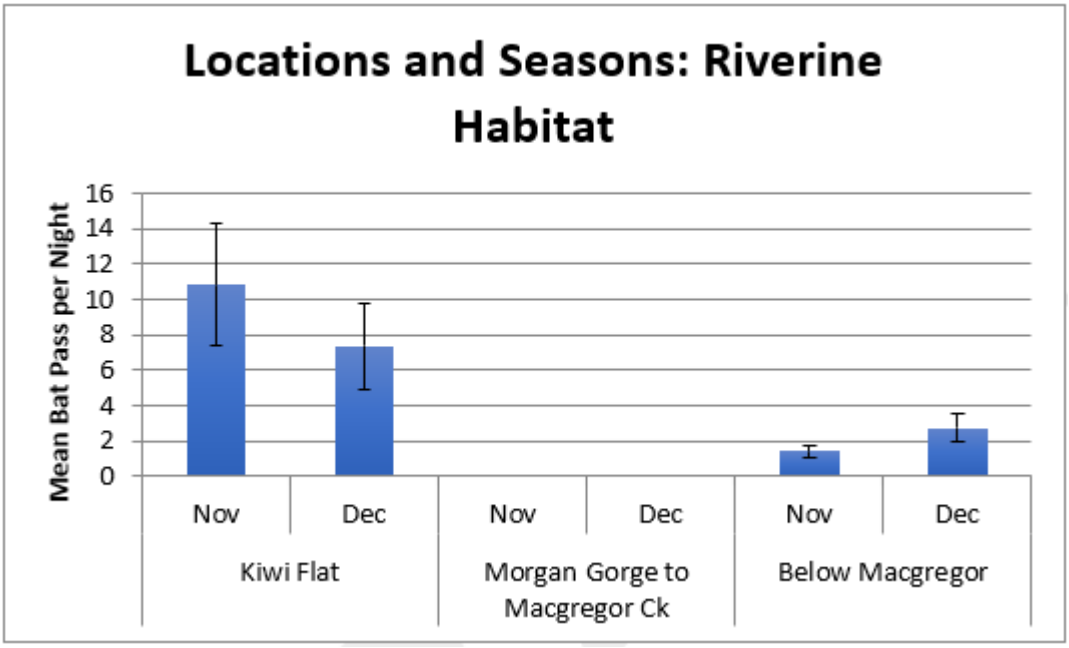


Figure 33. Bat activity during November and December 2012 at various locations within the survey area. Note: Chart uses data from detectors located within c.100 m of main river

2.3.3. Fernbirds

No fernbirds were encountered during November and December 2012 and they did not respond to tape playbacks of recorded fernbird calls. Some fernbird-like calls were heard, but these were all tracked to song thrush or yellowhammer (background river noise often make initial identification of calls difficult). Automatic audio recorders did not record fernbirds.

Perhaps the most typical fernbird habitat surveyed (patchy scrub and wetland) was on the northern side of Kiwi Flat outside the proposed hydro footprint (**Figure 34**). Fernbirds were recorded there in 2006 (Overmars & Buckingham 2007: **Appendix E**, Section 1.3.2), but they were not encountered throughout Kiwi Flat after an exhaustive search using tape playback in November 2012.

Figure 34. Fernbird habitat upper Kiwi Flat. Fernbird were recorded here in 2006, but there was no response to playback in 2012. The site is well outside of the Scheme's footprint.

Fernbirds may occasionally visit the area and even establish in small colonies, as there is suitable habitat on many river terraces, and along the true right of Macgregor Creek. Suitable habitat includes scattered scrub near the forest edge and tall grasses, fern and patchy scrub on the river flats upriver from Macgregor Creek.

2.3.4. Other birds

We recorded a total of 38 bird species (26 indigenous and 12 introduced) during November and December 2012. This compared to 35 bird species (27 indigenous and 8 introduced) recorded during the 2006 and 2007 surveys (Overmars & Buckingham 2007, **Appendix E**, Section 1.3.2). Species not observed in 2012, but recorded in 2006/2007 were grey duck (Nationally Critical[13]), whio (Nationally Endangered), fernbird (At Risk), morepork (Not Threatened) and goldfinch (Introduced). Species recorded in 2012, but not in 2006/2007 included white-faced heron (Not Threatened), South Island pied oystercatcher (At Risk), shining cuckoo (Not Threatened, one record) and introduced species: Canada goose, little owl (one record), greenfinch and magpie (one record).

Of the indigenous birds recorded in 2012, two (falcon and kākā) are "Threatened" and seven are "At Risk" (Miskelly et al 2008). Including grey duck and whio (recorded in 2006/2007), four threatened bird species are known to be present in the Waitaha Valley. The inclusion of the 2006 fernbird record at Kiwi Flat gives a total of eight At Risk bird species. The threat classification list for birds used in Overmars & Buckingham (2007) was Hitchmough et al. (2007), whereas the 2012 report used Miskelly et al (2008).

There were both similarities and differences in the distribution of various bird species between 2006/07 and 2012. Long-tailed cuckoos were widely distributed and relatively often

[13] Note that threatened status has changes over the years. Please refer to Table 10.

encountered in 2006/2007 and 2012 (**Figures 14 & 36**) whereas kea were encountered more widely in 2006/07 than in 2012 (**Figures 9 & 35**). Kākā, kākāriki and riflemen were infrequently recorded during both survey periods, but at similar locations toward and above Morgan Gorge (**Figures 8, 15, 16, 35 & 38**). Western weka were widely found in 2006/07 (**Figure 12**), but found only in the lower part of the survey area in 2012 (**Figure 37**). Kererū were concentrated in the lower survey area during both periods (**Figures 13 and 37**) (note that kererū were found higher up the Valley in winter 2024: **Appendix E**, Section 3.3.3). In 2012 long-tailed cuckoos were heard quite often throughout and one was seen near the confluence of Alpha Creek (**Figure 1 Appendix 1 & Figure 36**). Shining cuckoos were not heard, but an automatic recorder recorded a single call. Western weka were localized in distribution, being most conspicuous near the farm edge near Robinson Slip (**Figure 37**).

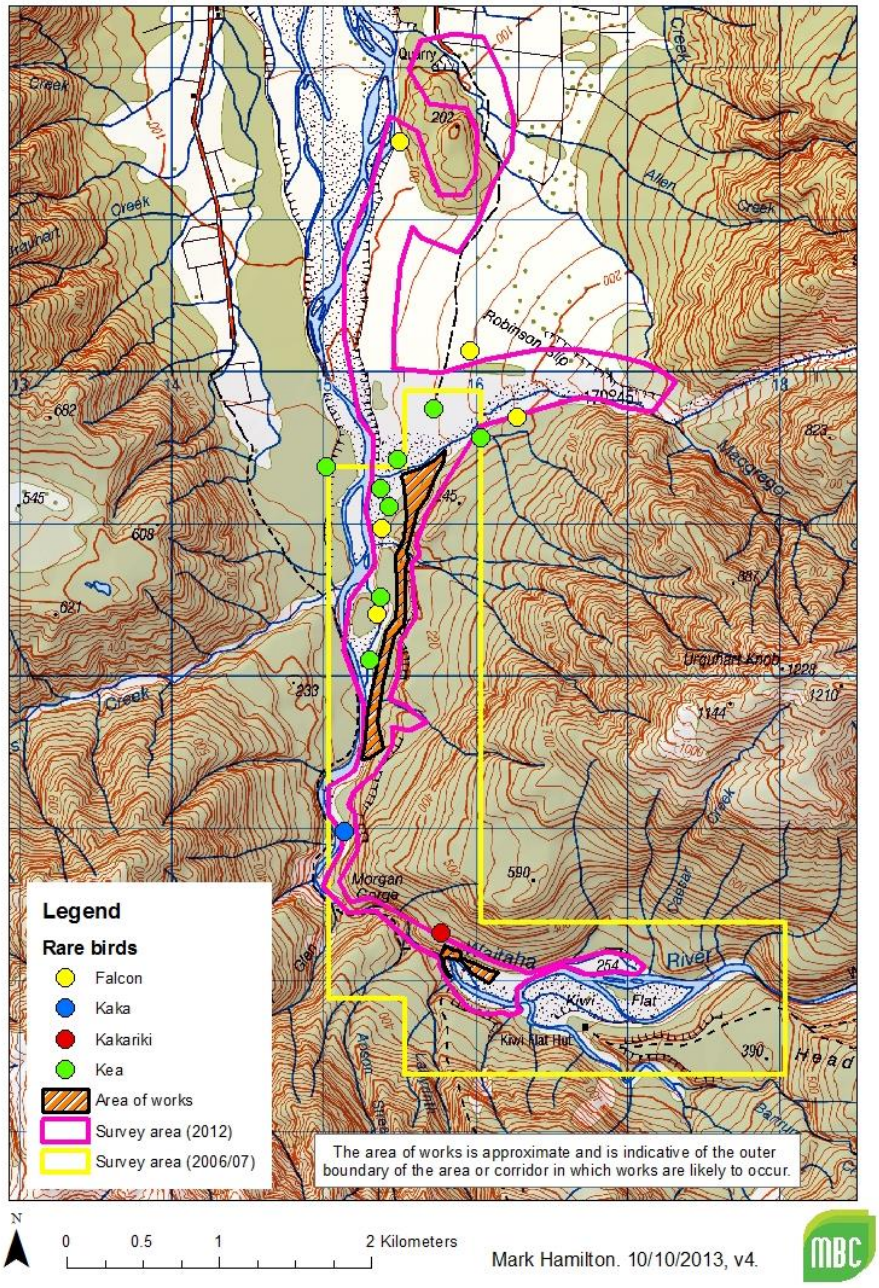


Figure 35 Records of falcon, kākā, kākāriki and kea in 2012

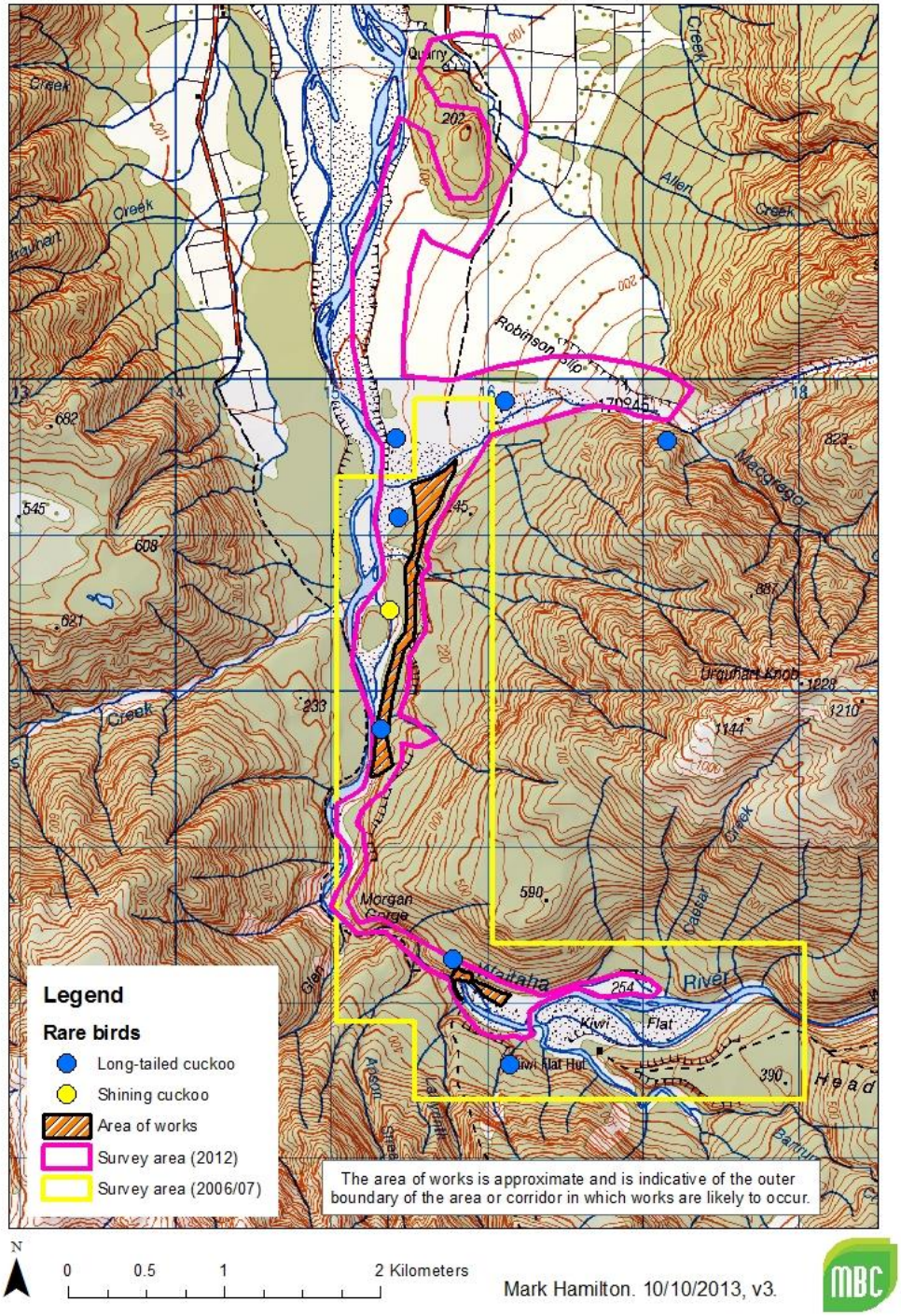


Figure 36 Records of long-tailed cuckoo and shining cuckoo in 2012

I observed a family of weka in patchy scrub and grassland just upriver of Robinson Slip between the forest edge and the river. Weka are also present at Kiwi Flat. The occasional kererū was seen mainly in regenerating forest along the river terrace upriver of Macgregor Creek (**Figure 37**). Rifleman were present in taller podocarp forest toward Kiwi Flat but were

infrequently encountered (**Figure 38**)

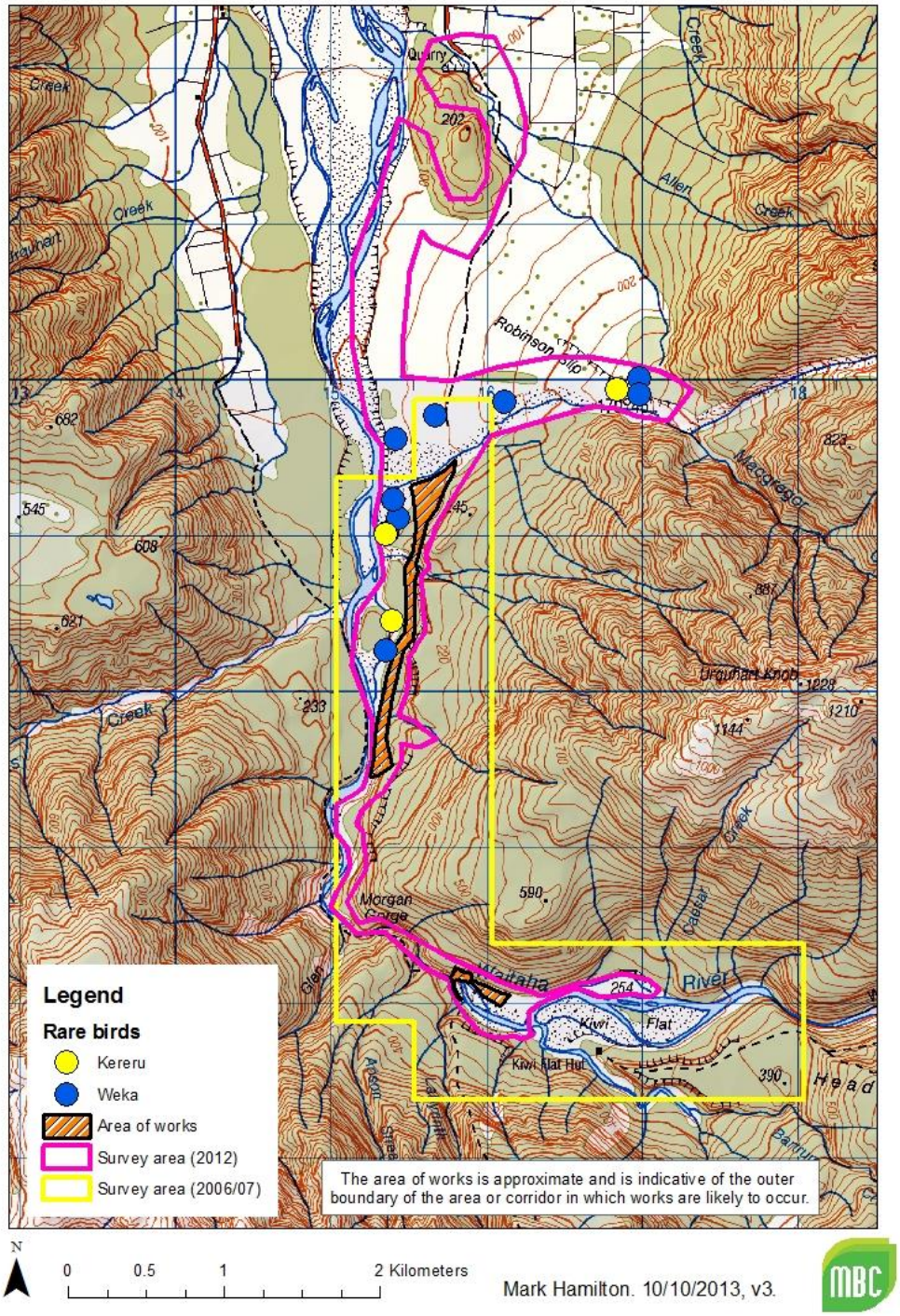


Figure 37. Records of kererū and weka in 2012

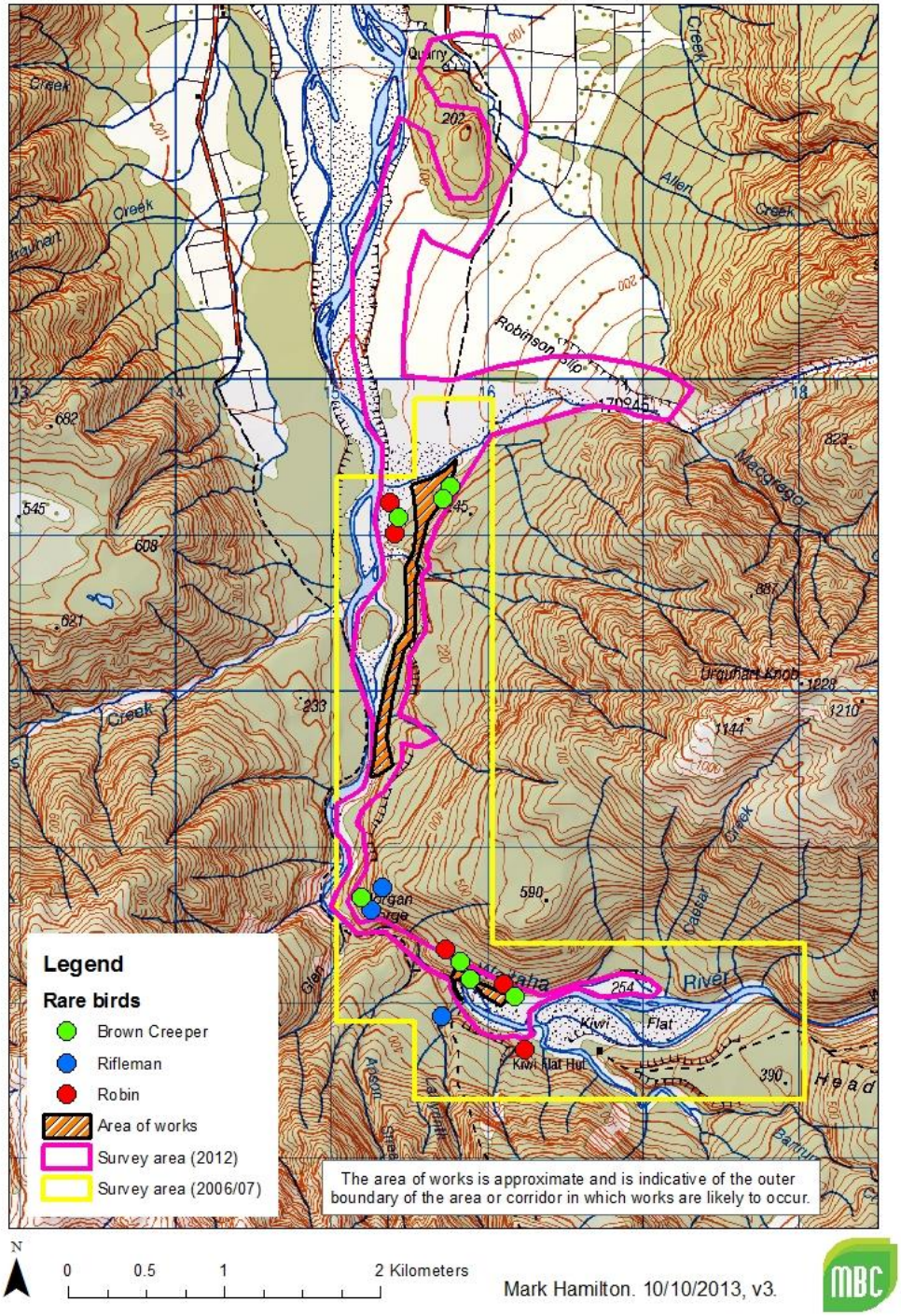


Figure 38. Records of brown creeper, rifleman and robin in 2012

We found no signs of kiwi in 2012, or on a more focused survey for them in 2006-2007 (Overmars & Buckingham 2007, **Appendix E**, Section 1.3.2). We did not see whio or grey ducks in 2012.

Single black shags were occasionally seen flying up or down the river below Morgan Gorge in 2012. We frequently saw or heard South Island pied oystercatchers around Robinson Slip and adjacent farmland and river flats. Other indigenous birds associated with the river or river

flats included white-faced heron (infrequent), paradise duck (frequent), spur-winged plover (occasional) and southern black-backed gull (occasional).

Many non-threatened small indigenous passerines were conspicuous in forest habitat upriver from Robinson Slip. These included bellbirds, tomtits, grey warblers and silvereyes, while fantails were occasionally observed particularly near the forest edge. Robins and brown creeper were less often encountered (**Figure 38**) and tomtits and robins were not recorded downriver of Robinson Slip. We observed tūī occasionally throughout, but rarely recorded them on automatic recorders. Moreporks were not recorded in 2012 and their scarcity was noted during 2006/2007 surveys (Overmars & Buckingham 2007, **Appendix E**, Section 1.3.2).

A higher ratio of introduced birds was found in 2012 than 2006/07 surveys, presumably because this survey focused more on modified habitat in the lower Waitaha Valley than earlier surveys. Introduced birds were most abundant downriver of Robinson Slip where the habitat is most modified. In this area, blackbirds, redpolls, song thrushes and chaffinches dominated calls on automatic recording devices. Canada geese were reported as seasonal visitors in Overmars & Buckingham (2007) and this was confirmed in November/December 2012. While a single Canada goose was repeatedly seen in the main river near the Douglas Creek confluence in November, twenty were seen together on the riverbed downriver of Macgregor Creek on 27 December 2012. There was one recording of two little owls calling to each other on an automatic audio recorder deployed near a backwater approximately opposite Douglas Creek (NZTMP 1415374 5224522). This was a new bird record for the Valley.

2.3.5. Acoustic recordings

Reviewing audio recordings involved both listening to .wav files in real time and scanning spectrograms using Song Scope™ software. A total of 111.25 hours of recordings were reviewed (five recorders in use 12-15th November and two recorders 7-9th December 2012). This included 90.75 hours of recordings from south of Macgregor Creek and 20.50 hours from downriver of Macgregor Creek.

A total of 17 indigenous and 9 introduced bird species were identified during the acoustic review. A higher proportion of introduced bird species were recorded downriver of Macgregor Creek than upriver of this creek (37% cf. 32% respectively of total bird species), consistent with general observations as described above.

Two species identified from audio recordings were not observed in the field: the indigenous shining cuckoo (one occasion south of Macgregor Creek: NZTMP 1415374 5224522) and the introduced little owl (same recorder location). No calls of moreporks or kākā were noted, though occasional falcon, kea and long-tailed cuckoo were recorded.

2.3.6. Powelliphanta snails

No signs of *Powelliphanta* land snails were found during searches for empty shells on the ground surface. Most search effort was undertaken in dense low-canopy shrub hardwood vegetation covering low terraces at Kiwi Flat, and forest flats upriver of Robinson Slip. These were considered the most likely habitats for *Powelliphanta*. Similarly, no sign of *Powelliphanta* was found during specific searches for them in 2006-2007 (Overmars & Buckingham 2007: **Appendix E**, Section 1.3.3 and 1.4.3).

A damaged, empty *Powelliphanta* shell was found on a sand bank just downstream from the confluence of Whirling Water and the Waitaha River in May 2007 (McLennan 2007b). Another shell was found in the same general area in June 2011 (Fred Overmars, pers. comm.). The locations of both these shells indicated that they were washed downstream in floods. Failure to find *Powelliphanta* snails or shells in nearby habitats after a reasonable search effort further suggests that these shells were not from local *Powelliphanta* populations.

2.4. General Discussion

2.4.1. Short-tailed bats

The combined results of bat surveys in the Waitaha Valley during 2006/2007 and 2012 suggest that short-tailed bats are probably absent in this area. No records of short-tailed bats were obtained in 64 hours of surveillance at four survey sites above Morgan Gorge in 2006, in 38.5 hours at five survey sites and one transect throughout the survey area in 2007 (Overmars & Buckingham 2007, **Appendix E**, Section 1.3.1), and in 287 bat-detector nights during November and December 2012. (Only forest sites suitable for short-tailed bats are included in these figures).

Short-tailed bats are now rare and localized in mainland South Island, the only known population being in Fiordland (Lloyd 2001, 2005, 2009; O'Donnell et al. 1999). A population found in the Oparara Valley near Karamea in the 1990s is now believed to be locally extinct (Lloyd 2009). Predation and possibly competition by introduced fauna are the most likely reasons for the disappearance of short-tailed bats (and decline of long-tailed bats) in forest locations in the South Island. Recent studies have shown that predators are impacting on populations of New Zealand endemic bats (Elliott & Suggate 2007; Pryde et al. 2005). Densities of small, introduced mammalian predators are high in the Waitaha Valley (McLennan 2007a & b). The absence of kiwi and the rarity of other Threatened/At Risk species such as kākā, kākāriki and rifleman suggest that introduced mammalian predators have had a significant impact on predator-sensitive species (including bats) in the Waitaha Valley.

2.4.2. Long-tailed bats

The survey results indicate that there is a regionally significant long-tailed bat population in the lower-mid Waitaha Valley (**Figure 2**, Page 5), with apparently a core activity range at Kiwi Flat[14] (Overmars & Buckingham 2007, **Appendix E**, Section 1.3.1). Based on call-rate data, the Waitaha bat population is denser than populations in many other parts of the West Coast (**Tables 6 & 8**). The known range of long-tailed bats in the Waitaha Valley was extended in 2012 by increasing survey coverage and sampling intensity. Bats might also be present in the upper valley above Kiwi Flat, but this part of the Valley has not been surveyed.

The reason for the apparent patchiness of bat activity below Morgan Gorge is not known. The 2007 and 2012 surveys both found nil to very low bat activity between Macgregor Creek and Morgan Gorge. The occasional pass in November and December 2012 in that stretch of valley might have been bats flying over (perhaps between Kiwi Flat and the lower river) or foraging. Higher bat activity was recorded immediately downriver of Macgregor Creek, close to the Waitaha River flats. The recordings of feeding buzzes in this area indicate that bats were foraging. The river forms a wide flood plain below Robinson Slip (Plate 2b), perhaps providing a greater invertebrate food supply for bats than upriver where the river narrows.

Long-tailed bats are also known to be present in coastal forests near the Waitaha River (Lake Ianthe Forest to the south and Kakapotahi Forest to the north) (Buckingham 2002; pers. obs.). Individuals from these populations could fly to the lower Waitaha River to feed, as the distances (<19 km) are within bat flight range (O'Donnell 2001). It would require radio-tagging bats to determine bat movement patterns in this area.

Although long-tailed bats are known to have large home ranges, core activity areas are much smaller (Griffiths 2007; O'Donnell 2001). For example, the home ranges of long-tailed bats in Fiordland, calculated by median minimum convex polygons, were 1,589 ha for adult males, 1,361 ha for post-lactating females, 657 ha for non-reproductive females and 330 ha for lactating females (O'Donnell 2001), whereas the core activity areas averaged only 5.7% of the home ranges and the ranges of roosting sites was 9.4% of home range. In South

[14] Further bat surveys would be required upriver from Kiwi Flat to evaluate bat populations there.

Canterbury, the mean home range size for long-tailed bats was 471.4 ± 50.9 ha while the core areas of activity were 54.4 ± 5.4 ha (Griffiths 2007).

Relatively little is known about seasonal movements and habitat use of long-tailed bats (Griffiths 2007; O'Donnell 2000). Studies indicate that patterns of activity vary between populations. Both Griffiths (2007) and O'Donnell (2000a &b) have shown a strong correlation between intensities of bat activity, dusk and minimum temperatures, and invertebrate activity.

It is unlikely that bats roost or breed on the river flats below Morgan Gorge given the general absence of suitable roosting trees in the immediate vicinity. The vegetation in this part of the Valley is low-stature forest and scrub that becomes more fragmented and weed-infested (e.g. gorse and exotic grasses) downriver of Macgregor Creek. Taller forest is present at Doughboy Hill, and on forest slopes generally >200m asl on each side of the Valley below Morgan Gorge. Suitable bat roost trees are abundant in forest surrounding Kiwi Flat, including tall forest close to the proposed headworks.

The absence of bat passes in the first hour after sunset at Kiwi Flat (and most other sites) suggests that detector sites were not close to bat roosts. Long-tailed bats typically leave roosts soon after sunset (average c. 17 minutes after) though emergence time varies considerably with different locations (O'Donnell 2001). Typically, detectors placed near roosts show peak bat activity soon after sunset, but this was only noted at detectors along the river terrace downriver of Macgregor Creek in November and December 2012. As none of these detectors was close to suitable bat roost habitat it was assumed that bats flew rapidly to this area immediately after emerging from their roosts. Long-tailed bats are capable of flying large distances (c. 3-11 km) at speeds of up to 60 kmph (O'Donnell 2001). This would mean that bats leaving roosts at Kiwi Flat, some 4-5 km away, could reach the area downriver of Macgregor Creek in as little as four minutes.

2.4.3. Birds

Fernbirds

The absence of fernbird records from the lower Waitaha Valley in November and December 2012 does not necessarily imply that fernbirds are absent. However, if they present, they are in very low numbers. Fernbirds may be infrequent visitors or occasional colonisers. Fernbirds can be notoriously cryptic at certain times of the year, but they tend to be most conspicuous during their peak-breeding season (November and December) when the 2012 survey was undertaken. Fernbirds were easily detected using call playback in a wetland area at Kakapotahi Forest in December 2012. Therefore, response would also have been expected had fernbirds been present in the Waitaha survey area then.

Because fernbirds appear to be good dispersers, they might frequent the Waitaha Valley from time to time. For example, elsewhere fernbirds have occasionally been recorded some distance from core fernbird habitat, such as roadside scrub at Granville Forest (Grey Valley) or scrub below power pylons at Orikaka Forest (lower Buller Valley) (pers. obs.).

The fernbird record at the northeast corner of Kiwi Flat in 2006 is from the best fernbird habitat surveyed during 2012: an area of wetland with patchy cover of shrubs and tall grasses (Plate 3). The area is well outside the area affected by the Scheme.

Birds in general: comparison with 2006-2007 baseline survey

Terrestrial bird distributions and relative abundances recorded in 2012 were similar to those recorded in 2006-2007 (Overmars & Buckingham 2007, **Appendix E**, Section 1.3.2). Species such as falcon, kākā, kākāriki, weka, kererū, rifleman and robin were recorded in low numbers on both surveys and with more or less the same distribution patterns. Weka were commonly encountered along the farm edge in the lower valley, but rarely further up the Valley until Kiwi Flat where a small population is present. Kākā and riflemen were encountered only in taller forest between Morgan Gorge and Kiwi Flat. Kea were as conspicuous in 2012 as on earlier surveys, with groups of at least three birds seen in the lower valley near Robinson Slip in 2012. Both robins and rifleman tended to have a very patchy distribution within forest habitat. Long-tailed cuckoos were relatively conspicuous both summers (2006-07 and 2012), while moreporks were rare in 2006-07 and not recorded in

2012. Common indigenous passerines (e.g. tomtits, grey warblers, bellbirds and silvereyes) showed similar levels of abundance and distribution during each survey.

Additional species recorded in 2012 included Canada goose (introduced), which were previously reported as seasonal visitors to the area, and shining cuckoo (indigenous), which was expected to be present seasonally (Overmars & Buckingham 2007). The presence of the introduced little owl was perhaps more surprising, although they are occasionally recorded on the West Coast (Robertson et al. 2007; M. Charteris, pers. comm.; pers. obs.).

The differences in bird species and relative abundances recorded between the survey years are probably related to differences in survey coverage as well as seasonal influences. The 2006-2007 survey largely focused on more unmodified forest ecosystems surrounding Kiwi Flat and the high terraces in the lower valley, while the 2012 survey focused on valley floor ecosystems in the lower valley that were variably modified, or in stages of regeneration.

2.4.4. Powelliphanta snails

The absence of *Powelliphanta* sign was not surprising, as they are not known to be present in lowland forest habitat in this locality (Walker 2003). The only known *Powelliphanta* species present in the area is the alpine snail *Powelliphanta rossiana rossiana*. This Nationally Endangered snail is known to be present on Mt Bonar, some eight kilometres to the west, and elsewhere at isolated alpine sites between Ross and Harihari (Walker 2003). Although a population of lowland *Powelliphanta* may have been missed during the surveys, this is probably unlikely.

From the site descriptions where shells were found at Kiwi Flat in 2007 and 2011 (McLennan 2007b; Overmars, pers. comm.), it is most likely that they were washed downstream in a flood. A relatively intensive search for shells in scrub habitat at Kiwi Flat including an area close to where the shell was found failed to find any sign of *Powelliphanta*.

3. Acoustic bird survey, August 2024

This survey was carried out to evaluate any broad changes in bird assemblages (distributions and relative abundances) since earlier surveys (2006/07 and 2012) as described in Sections 1 & 2 of this Appendix. The 2024 survey focused only on birds, as it was too early in the season to effectively survey for long-tailed bats that were assumed to be present in the same general areas as on previous surveys. The bird survey involved a rapid walk-through survey (with one camp night) and an acoustic survey over a six-day period during early August 2024 (**Figure 39**).

This was the first survey for terrestrial fauna carried out since the 2012 survey undertaken on behalf of Westpower. The DOC officer's report (2016) submitted as part of Westpower's concession application process agreed with Westpower's commissioned report from Wildlife Surveys Ltd that the Scheme has significant conservation values for birds and bats (see **Appendix F**). The officer's report also noted the relatively high numbers of 'Threatened' and 'At Risk' birds within the Wildlife Surveys Ltd baseline survey area. DOC stated "The greatest impact overall on birds and bats is potential loss of a bat roosting tree/s". During the 2024 acoustic survey for birds, observation notes of the potential roosting habitat for bats and the locations likely to be most affected were taken.

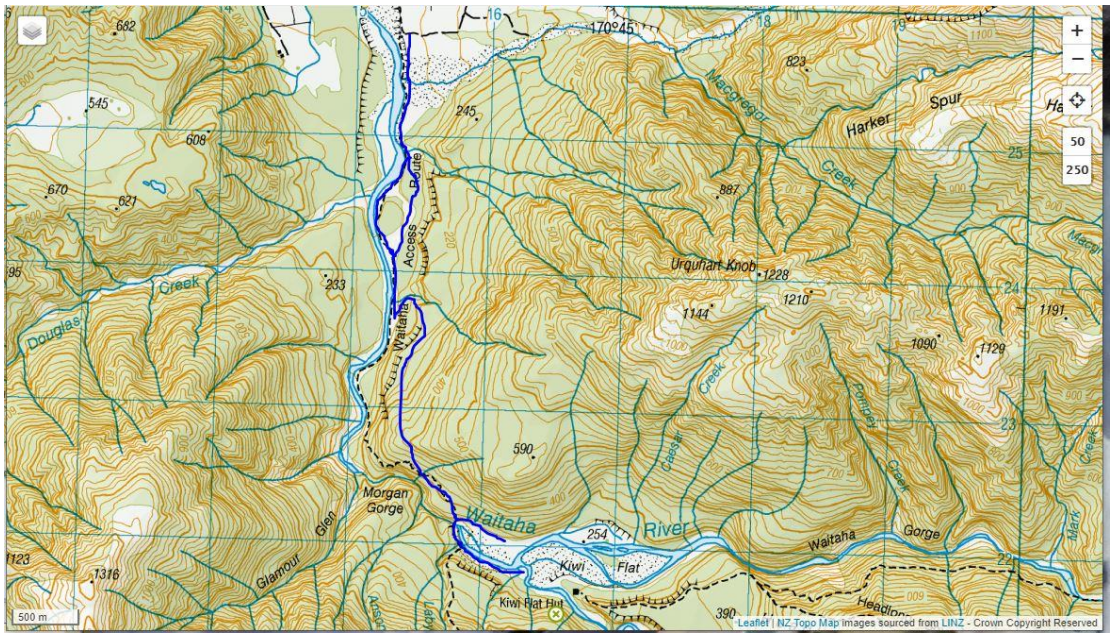


Figure 39. Walk-through survey route: 1-2and 6 August 2024 Survey coverage

The survey area is shown in **Figure 39**. Apart from in the lower reaches of the Valley between Granite Creek and the proposed Power Station site the route largely followed the walking track on the true right bank and river terraces to the swing bridge above Morgan Gorge. The walk-through survey to Whirling Water extended along the riverbed (true left), and also the riverbed and river terrace on the true right of the Waitaha Valley at Kiwi Flat. Part of this terrace is proposed as a construction staging area and access.

Between 1-2 August, I carried out a return walk-through survey from Macgregor Creek to Whirling Water (Kiwi Flat), deploying six acoustic recorders on the way in. I camped the night in tall forest above Morgan Gorge. On 6 August, Fletcher Anderson of Anderson Helicopters flew me and a small team of consultants into Kiwi Flat. I retrieved the six recorders on the walk out that day.

3.1. Field Methods

I carried out two methods to evaluate birds on this survey. First a walk-through survey (1-2 and 6 August 2024) noting all birds seen or heard along the route. This also involved one night camped in tall forest above Morgan Gorge, from which I carried out an informal dawn, dusk and evening listen for birds.

On 1 August I deployed six DOC AR4 acoustic recorders (**Figure 40)**, approximately 500 m apart, on the true right side of the river from Granite Creek to Morgan Gorge near the swing bridge above it (**Figure 41**). The route largely followed a walking track that had been conveniently re-routed along a high river terrace (less river noise for recording), though I deployed two recorders (AR 1 and AR 2) near the ‘Stable Tributary’ below the proposed Power Station. I retrieved these recorders on 6 August.

Figure 40. AR4 acoustic recorder deployed for recording bird calls

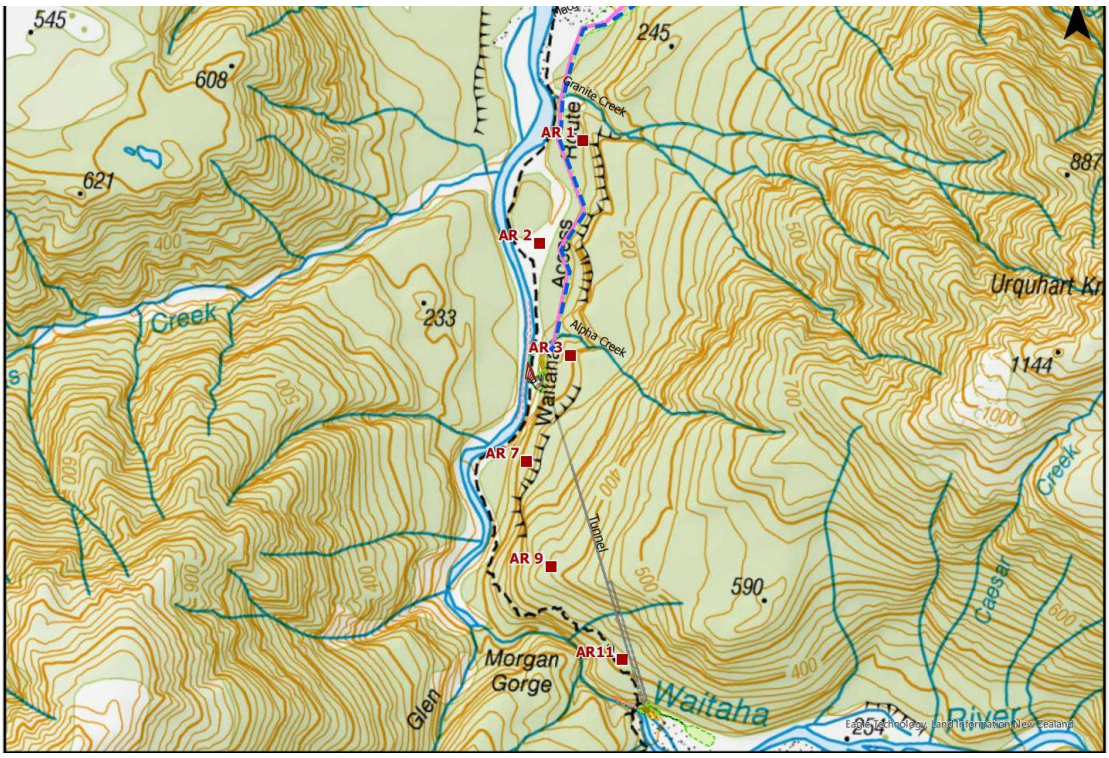


Figure 41. Acoustic recorder locations in August 2024

3.2. Data processing/analysis

All recorders performed accurately, meaning I retrieved a full eight hours of recordings for each survey day, from all six recorders. I used the software SONGSCOPE™ developed by Wildlife Acoustics Inc, USA for analysis of acoustic data. The software provides a spectrogram from the .wav acoustic files collected by the recorder. By quickly scanning the acoustic data I identified different bird species from signal graphics on the spectrogram. When there was doubt, I scrolled back and listened to the call. I annotated and saved any unidentified or interesting call detected.

For the dawn recording sessions (07:00-09:00 NZST) I reviewed each 15-minute session that the AR4 recorders provide and entered results from each session into an Excel spreadsheet (noting presence or absence of species detected). Frequency of occurrence of diurnal birds was calculated by measuring the detection of a bird species in each 15-minute recording period within the dawn period (07:00-09:00am) at each recorder site (n=240).

For the dusk/nocturnal sessions (17:00-23:00 NZST) I first joined the 15-minute sessions into a single 6-hour session using the free on-line programme provided by Clideo (https://clideo.com/merge-audio). It was much more convenient to 'fast scan' longer files than a large number of smaller ones, particularly on nocturnal sessions where bird calls are very infrequent.

I did not use any statistical programmes to analyse data. For objectives stated above it was adequate to review bird species presence, distribution and relative abundance (frequency of encounters) using a simple spreadsheet. However, the acoustic data is backed-up and could be used in future, as baseline data for a long-term monitoring programme. Data from each recorder site would then be treated as independent (500m apart), while data over the five days at each site would be treated as dependent replicates.

3.3. Results and Discussion

3.3.1. Overview

A total of 23 bird species (19 indigenous) were recorded during the August 2024 survey (not counting birds seen on farmland north of Macgregor Creek). This compares to 38 bird species (26 indigenous) recorded during early summer 2012 and 35 species (27 indigenous) in summer 2006/07 (Wildlife Surveys 2013) (**Appendix E:** Sections 1.3.2 & 2.3.1). The lower numbers of bird species recorded in 2024 is probably due to the shorter survey period, smaller survey footprint and different time of year (winter *cf*. spring-summer). For example, long-tailed cuckoo and shining cuckoo are summer migrants to New Zealand forests. Many other species are relatively quiet and therefore inconspicuous during cold winter weather.

The distribution and relative abundance of most species were similar to that observed and mapped in 2006/07 (Overmars & Buckingham 2007, Appendix 2; Wildlife Surveys 2013, Appendix 6). Notable 'missing' species were falcon and riflemen, although unconfirmed possible riflemen call notes were heard in taller forest above the Morgan Gorge. Robins were particularly quiet and inconspicuous on the recent survey.

I identified five 'Threatened' or 'At Risk' species (after Robertson et al. 2021) during the 2024 survey: kea (Nationally Endangered), South Island kākā (Nationally Vulnerable), kākāriki (presumed yellow-crowned: At Risk: Declining), South Island robin (At Risk: Declining) and black shag (At Risk: Relict). While kea were heard and recorded throughout the survey area (usually as single birds), kākā was recorded only once and kākāriki twice, both at dawn in taller forest above Morgan Gorge. Similarly, robins were rarely heard and recorded: again, all records are from taller forest above Morgan Gorge. A single black shag was seen flying near Macgregor Creek. Note that the conservation status of New Zealand birds has changed over the years. These changes since 2006/07 are shown in **Table 9**.

Table 9. Conservation Status of New Zealand birds relevant to the Waitaha Scheme: 2008 to 2024

Common Name	Scientific name	Miskelly et al 2008	Robertson et al 2013	Robertson et al 2017	Robertson et al. 2021
Great spotted kiwi*	*Apteryx haastii*	Nationally Vulnerable	Nationally Vulnerable	Nationally Vulnerable	Nationally Vulnerable
Whio (blue duck)	*Hymenolaimus malacorhynchos*	Nationally Vulnerable	Nationally Vulnerable	Nationally Vulnerable	Nationally Vulnerable
Grey duck	*Anas superciliosa*	Nationally Critical	Nationally Critical	Nationally Critical	Nationally Vulnerable
Little shag**	*Phalacrocorax melanoleucos brevirostris*	At risk: Naturally Uncommon	Not Threatened	Not Threatened	At Risk: Relict
Black shag	*Phalacrocorax carbo novaehollandiae*	At risk: Naturally Uncommon	At risk: Naturally Uncommon	At risk: Naturally Uncommon	At Risk: Relict
Bush falcon	*Falco novaeseelandiae*	Nationally Vulnerable	Taxonomically Indeterminate: Nationally Vulnerable	Nationally Increasing	Nationally Increasing
Western weka	*Gallirallus a. australis*	At risk: Declining	Not Threatened	Not Threatened	Not Threatened
S.I. pied oystercatcher	*Haematopus finschi*	At risk: Declining	At risk: Declining	At risk: Declining	At risk: Declining

Table 9 continued

Common Name	Scientific name	Miskelly et al 2008	Robertson et al 2013	Robertson et al 2017	Robertson et al. 2021
Pied stilt**	*Himantopus himantopus leucocephalus*	At risk: Declining	At risk: Declining	Not Threatened	Not Threatened
Southern black-backed gull	*Larus d. dominicanus*	Not Threatened	Not Threatened	Not Threatened	Not Threatened
kererū (NZ pigeon)	*Hemiphaga novaeseelandiae*	Not Threatened	Not Threatened	Not Threatened	Not Threatened
South Island kākā	*Nestor m. meridionalis*	Nationally Endangered	Nationally Vulnerable	Nationally Vulnerable	Nationally Vulnerable
Kea	*Nestor notabilis*	At risk: Naturally Uncommon	Nationally Endangered	Nationally Endangered	Nationally Endangered
Yellow-crowned kākāriki	*Cyanoramphus auriceps*	Not Threatened		Not Threatened	At risk: Declining
Long-tailed cuckoo	*Eudynamys taitensis*	At risk: Naturally uncommon	At risk: Naturally uncommon	At risk: Naturally uncommon	Nationally Vulnerable
South Island rifleman	*Acanthisitta c. chloris*	At risk: Declining	Not Threatened	Not Threatened	Not Threatened
South Island robin	*Petroica a. australis*	Not Threatened	Not Threatened	At risk: Declining	At risk: Declining
South Island fernbird	*Bowdleria p. punctata*	At risk: Declining	At risk: Declining	At risk: Declining	At risk: Declining
NZ pipit	*Anthus n. novaeseelandiae*	At risk: Declining	At risk: Declining	At risk: Declining	At risk: Declining

Note: * Not recorded on any survey and unlikely present: ** Not recorded on any survey, but possibly (or seasonally) present. Yellow highlight denotes current (2024) changes in status since Robertson et al. 2017.

Table 10 Distribution and relative abundance of threatened, formerly threatened and uncommon birds recorded in the Scheme footprint 2006-2024.

Common Name	Threat Status 2024	Summer 2006-07	Summer 2012	August 2024
Great spotted kiwi	Nationally Vulnerable	Not recorded, presumed locally extinct	Not recorded, presumed locally extinct	Not recorded, presumed locally extinct
Whio	Nationally Vulnerable	Moderate numbers above Morgan Gorge	Scant records	Not encountered
Grey duck	Nationally Vulnerable	Recorded at Kiwi Flat	Not encountered	Not encountered
Black shag	At risk: Relict	Rarely recorded	Occasionally recorded flying up or down river	Recorded once flying near Macgregor Creek
NZ (Bush) falcon	Nationally Increasing	Occasional	Occasional	Not encountered
Western weka	Not Threatened	Patchy distribution	Patchy distribution	Widespread but infrequent. Male-biased population suspected
S.I. pied oystercatcher	At risk: Declining	Not recorded	Frequent in lower valley	Not encountered
Kererū	Not Threatened	Infrequent	Occasional	Encountered in low numbers only in tall forest above Morgan Gorge
South Island kākā	Nationally Vulnerable	Infrequent	Infrequent	One record only, in tall forest above Morgan Gorge
Kea	Nationally Endangered	Frequent at Kiwi Flat	Frequent in lower valley	Widespread but in low numbers

The distribution and relative abundance of these threatened species and many other (non-threatened) bird species are broadly consistent with the findings of the 2006/2007 surveys (Overmars & Buckingham 2007; Wildlife Surveys 2013) **(Table 10**). Western weka ('At Risk: Declining' in 2006/07, but now 'Not Threatened') were heard and recorded generally as single males, not answered by neighbouring weka. Few weka duets were recorded (estimated total of three pairs): two pairs near the upriver part of the 'Stable Tributary' (AR 2) and one pair above Morgan Gorge (AR 9) (**Figure 41**).

The most frequently encountered and most widely distributed indigenous birds recorded in August 2024 were tomtit, silvereye, bellbird, warbler and fantail (**Table 11**). These were also the species showing widespread distribution and relatively high mean counts in October 2006 (Overmars & Buckingham 2007; **Appendix E**, Section 1.3.2).

Dawn chorus data and general field observations indicated that avifauna population levels are depressed, which is common in unmanaged mainland forests. Male-biased weka and robin populations (results of this survey and previous surveys; McLennan 2007b) also suggest that predators are limiting bird populations in this area.

3.3.2. Threatened birds

Five 'Threatened'/ 'At Risk' bird species (Robertson et al. 2021) were detected on the recent August 2024 survey, including one 'Nationally Endangered' (kea), one 'Nationally Vulnerable' (South Island kākā) and three 'At Risk' (yellow-crowned kākāriki, South Island robin and black shag). Several 'Threatened' or 'At Risk' species listed on previous surveys were not detected during the current survey, being whio, grey duck, NZ falcon, long-tailed cuckoo, fernbird and NZ pipit. As stated earlier, the cuckoos are summer migrants, not likely to be present in August, and the other species could easily be missed during relatively short field surveys during winter. I found no sign of kiwi, during the walk-through survey or when reviewing acoustic data.

Of the threatened species noted during previous surveys (summer 2006/07 and early summer 2012), only kea and long-tailed cuckoos was found to be relatively frequent and widespread. The others were listed as 'infrequent', or for falcon 'occasional' and tended to have patchy distributions (**Table 10**, Wildlife Surveys 2013). Refer to the **Whio Report** for updated information on whio.

Kea

I heard kea throughout the survey area and their calls were recorded at every surveillance site (**Figure 41**). This matched their distribution during the 2006/2007 surveys (Overmars & Buckingham 2007) (**Figure 9**). Kea were more frequently recorded than other threatened species in 2024 (**Table 11**).

Except on one occasion, only single kea were heard (or recorded) at any given time. Two birds were calling to each other above Morgan Gorge on the morning of 4 August 2024. Overall, the kea population appears to be quite low, despite kea being heard relatively often.

South Island kākā

Kākā were detected only once on one acoustic recorder (AR 9 above Morgan Gorge) in the early evening 2 August (**Figure 41; Table 10**). They were also recorded only infrequently during the 2006/2007 and 2012 surveys, and were encountered at similar locations (Overmars & Buckingham 2007; **Figures 8 & 35**).

Yellow-crowned kākāriki

Similarly, kākāriki (presumed yellow-crowned kākāriki) were recorded at only one site (recorder AR 9) above the Morgan Gorge in August 2024 (**Figure 41**), close to where they were found in 2006/2007 and 2012 (Wildlife Surveys 2013) (**Figure 15 & 35**). Kākāriki, like kākā, were listed as infrequent during both 2006/07 and 2012 surveys.

Black shag

Black shags were rarely encountered during 2006/2007, but were occasionally recorded flying along the river in 2012 (Wildlife Surveys 2013). One black shag was seen flying over farmland near Macgregor Creek on 1 August 2024.

South Island robin

Very few South Island robins were observed (or recorded) in August 2024 (**Table 11**), but during winter they are usually quiet and inconspicuous. The only robins seen or heard were in tall forest above Morgan Gorge (all recordings from AR 11). This distribution corresponds with their distribution in 2006/2007 (Overmars & Buckingham 2007; **Figure 17**) and partly with their distribution in 2012 (**Figure 38).**

Table 11. Frequency of occurrence, distribution and habitats of forest birds within the August 2024 survey area

Species	% Occurrence	Distribution	Habitats
Tomtit	78.3%	Throughout	Forest & shrubland
Silvereye	70.0%	Throughout	Forest & shrubland
Bellbird	63.8%	Throughout	Forest & shrubland
Grey warbler	50.8%	Throughout	Forest & shrubland
Fantail	22.9%	Throughout	Forest & shrubland
Song thrush	17.9%	Throughout	Forest & shrubland
Blackbird	6.3%	Throughout	Forest & shrubland
Kea	5.0%	Throughout	Mainly forest
Tūī	3.3%	Patchy	Mainly forest
Chaffinch	2.9%	Patchy, lower valley	Regenerating forest
Kererū	1.7%	Morgan Gorge	Tall forest
Robin	1.7%	Morgan Gorge	Tall forest
Brown creeper	1.3%	Morgan Gorge	Tall forest
Kākāriki	0.8%	Morgan Gorge	Tall forest
Kākā	0.4%	Morgan Gorge	Tall forest

Note: Frequency of occurrence of diurnal birds was calculated by measuring the detection of a bird species in each 15-minute recording period within the dawn period (07:00-09:00am) at each recorder site (n=240).

3.3.3. Non-threatened birds

Western weka

Western weka, although no longer ranked as threatened ('At Risk: Declining, before 2013), are of potential conservation importance, because the Waitaha population has been isolated from other populations of western weka on the West Coast. The Waitaha population might be genetically distinct.

Weka were heard occasionally throughout the survey area during August 2024 (**Table 12**), but nearly always only single males, without answering calls from other weka. From the acoustic data (T=180 hrs), I estimated that there were three pairs calling (duet calls) during the evenings from 17:00-23:00 hrs (NZST) (**Table 12**). Two pairs called near 'Stable Tributary' (recorder AR 2), and one pair called above Morgan Gorge (AR 9) (**Figure 41**). At

least two pairs were assumed to be present in the 'Stable Tributary' area (one pair calling close to a microphone and the other distant). One weka (presumed male) was fleetingly seen above Morgan Gorge near the swing-bridge. Weka appeared to be more evenly distributed in 2024 than during 2006/2007 surveys (Overmars & Buckingham 2007) (**Figure 12**). During the current survey, they were recorded at all acoustic recorder sites except AR 6 (**Figure 41).**

Table 12. Number of weka calls and estimated number of pairs (identified from duets) per evening (17:00-23:00 NZST) between 1 and 6 August 2024

Recorder	Male weka	Female weka	Total call count	Estimated pairs
AR 1	3	0	3	0
AR 2	8	5	13	2
AR 6	0	0	0	0
AR 7	5	0	5	0
AR 9	3	1	4	1
AR 11	3	0	3	0

Kererū

Kererū were recorded infrequently, only in tall forest above Morgan Gorge on the August 2024 survey (Recorder AR 11 only) (**Figure 41; Tables 10 & 11**). This distribution differed from earlier surveys when all kererū records were from below Morgan Gorge (**Figures 13 & 37**). During 2006/2007, they were listed as infrequently seen below Morgan Gorge (Overmars & Buckingham 2007), while in 2012, they were listed as 'Occasional' (Wildlife Surveys 2013) (**Table 10**).

Kererū are very mobile birds that move over large distances to forage on seasonally available foods. During winter, they frequent podocarp-rich forests, while during spring and summer, they tend to move out of the tall forest to feed on a range of foods including kowhai and exotic legumes, which are often in highly modified habitat. Kererū were probably feeding on ripe miro and supplejack berries, which were found to be locally plentiful during the current survey (particularly above Morgan Gorge and tall forest at Kiwi Flat).

South Island rifleman

Riflemen tend to be vocal all year, but were not conclusively heard or recorded during the August 2024 survey. Two strident notes, (a sequence both acoustically recorded and heard once, at different times), in tall forest above Morgan Gorge, might have been from riflemen, but sometimes such calls can be confused with tomtit alert calls. Graham Ussher also heard possible riflemen in the same general location on 6 August 2024. Riflemen are likely to be present, as they can be quite cryptic. They were recorded as 'infrequent' at similar locations during earlier surveys (Overmars & Buckingham 2007; Wildlife Surveys 2013) (**Figures 16 & 38**).

Brown creeper

Brown creepers were detected during August 2024 by recorders only (all calls from AR 11 in tall forest above Morgan Gorge: **Figure 41; Table 11**). They were more widely reported during 2006/2007, but most frequently in the taller forest habitats above Morgan Gorge and surrounding Kiwi Flat (Overmars & Buckingham 2007) (**Figure 19**). Brown creepers tend to be more conspicuous during the breeding season (spring and early summer) when they are very vocal.

Morepork

Morepork tend to be much quieter during winter than summer. I was therefore not surprised to hear them infrequently during early August 2024 (one heard on camp night, 1-2 August, others acoustically recorded). For comparison, moreporks were not detected during 2012 and

were rarely heard during the 2006/07 survey, where they showed a sporadic distribution (Overmars & Buckingham 2007; Wildlife Surveys 2013) (**Figure 20**).

Welcome swallow

I observed two welcome swallows near Whirling Water on Kiwi Flat on 1 August 2024 as well as a larger group near Macgregor Creek. They were also recorded at the same general locations on previous surveys (Overmars & Buckingham 2007; Wildlife Surveys 2013).

Common birds

Table 11 shows frequency of encounter data for common (and less common) birds, based on their presence detected in 15-minute acoustic .wav file sequences during dawn (07:00-09:00 hrs NZST). General observations during the walk-through survey support this data.

The species are tabled in descending order of frequency of occurrence. By far the most frequently encountered birds throughout forest and tall shrub habitats were tomtit, silvereye, bellbird and grey warblers.

I was surprised to hear grey warbler in full song frequently, as normally during cold winter months, they are quiet and inconspicuous. In contrast, male tomtits were reasonably quiet, only occasionally singing short songs. While bellbirds were relatively vocal and conspicuous, tūī were seldom heard or seen. Much the same was found in 2012 when tūī were occasionally observed throughout the survey area, but rarely recorded on acoustic recorders (Wildlife Surveys 2013).

Fantails are often uncommon in forest habitat during winter, but I observed them frequently during the August 2024 survey.

Song thrush and blackbird were found throughout and within all habitats surveyed. Song thrushes were heard in full song, while blackbirds were more often detected from their alarm calls (particularly toward last light of day). I observed other introduced birds (goldfinch and chaffinch) in regenerating forest, shrubland, or farmland in the lower reaches of the survey area.

3.4. Further Discussion and Recommendations

Bird species' distribution and detection frequencies were remarkably similar during the 2024 survey and previous surveys (2006/07 and 2012) (Overmars & Buckingham 2007; Wildlife Surveys 2013). Fewer species were encountered during the recent survey, but this was most likely due to surveying in winter instead of spring/summer, surveying a smaller footprint and having a shorter survey period. Notwithstanding, the relative sparsity of birds and lack of singing at dawn and dusk (usually peak periods for bird song) indicate that bird population levels are depressed compared to populations in DOC predator-managed forests. Periodic aerial sodium fluoroacetate toxin (1080) operations carried out by OSPRI within the Waitaha catchment (valley floor to alpine areas) could explain why bird populations have appeared to remain fairly stable over the last 20 years.

In **Figures 42-44** inclusive, I have compared spectrograms of recordings of dawn chorus at Waitaha (unmanaged forest) and in two managed forests (Venture Creek near Lake Moeraki in South Westland and Falls River in Abel Tasman National Park). These three comparisons have been selected to represent typical examples of dawn bird song between the areas. Care should be made in interpreting these figures, as the intensity of bird chorus can vary, even in managed forests, according to topography, aspect, vegetation, food resource, time of year, time of day, etc. To reduce the influence of season and time, I have presented spectrograms of recordings taken at 07:59-08:00 hrs (NZST) in August (different years) at each site. Within this one-minute time span, I have tried to select the frame showing most bird species calling.

The habitat at Venture Creek comprises podocarp dominant canopy with dense shrub-hardwood understory in canopy gaps. At Falls River the habitat is beech forest with lush shrub-hardwood understory in places. While the habitats in Waitaha Valley and Venture Creek show some similarities, the habitat at Falls River habitat is quite different.

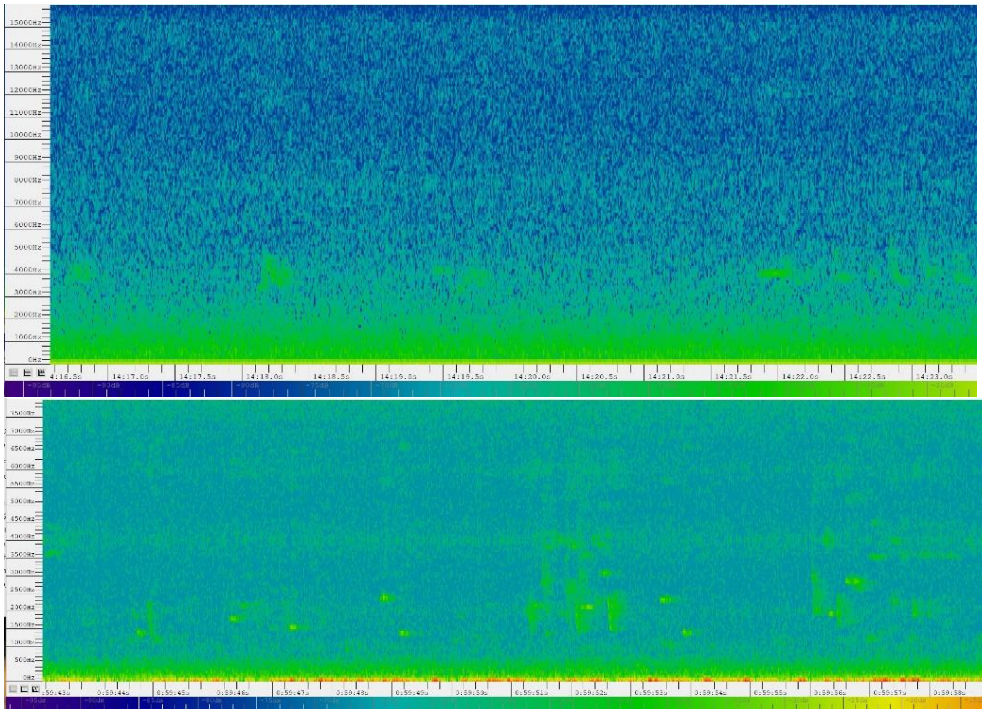


Figure 42. Spectrogram comparison 1.

Top: Waitaha AR1, 2 Aug 2024. Bottom: Venture Creek, 2 August 2017.

Only silvereyes calling at Waitaha whereas bellbirds very vocal at Venture Creek

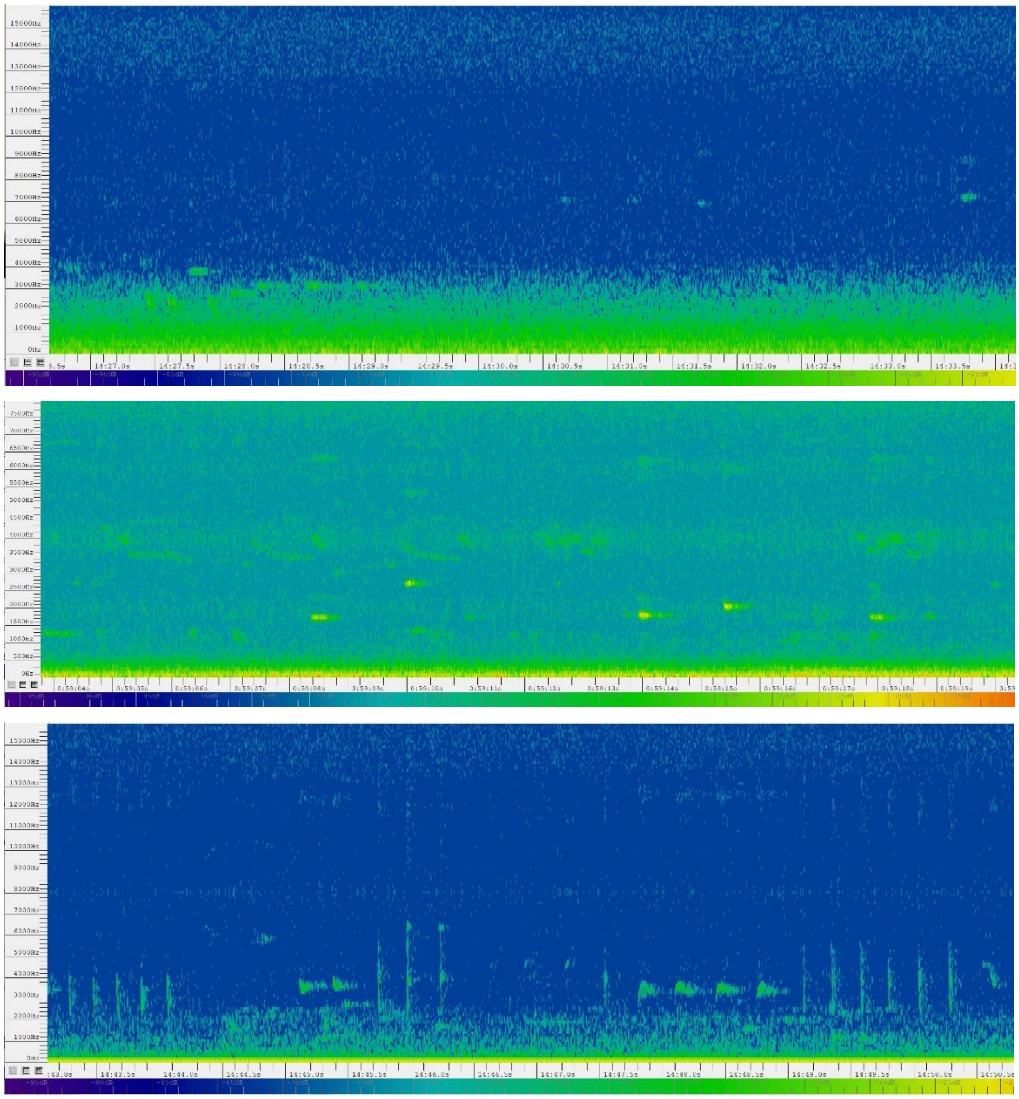


Figure 43. Spectrogram comparison 2

Top: Waitaha AR2, 4 Aug 2024. Centre: Venture Creek, 3 August 2017. Bottom: Falls River, 3 August. Note: bellbird to left of top spectrogram and tomtit higher frequency to right. Bellbird mainly frequent single notes, centre spectrogram, while bellbird and robin calling strongly at Falls River.

While there were one-minute sequences with no birds calling on the Waitaha recordings, this was never the case for recordings from Venture Creek or Falls River. Bird chorus at these latter sites was noticeably rich and continuous at dawn during August.

These are just a few examples of spectrograms that I looked at. The overall pattern was infrequent calling of both bellbird and tūī at Waitaha sites compared to the other areas. Robins were also very vocal in August at Falls River, but were recorded only occasionally during dawn at Waitaha (only from AR11 above Morgan Gorge). Robins are absent at Venture Creek.

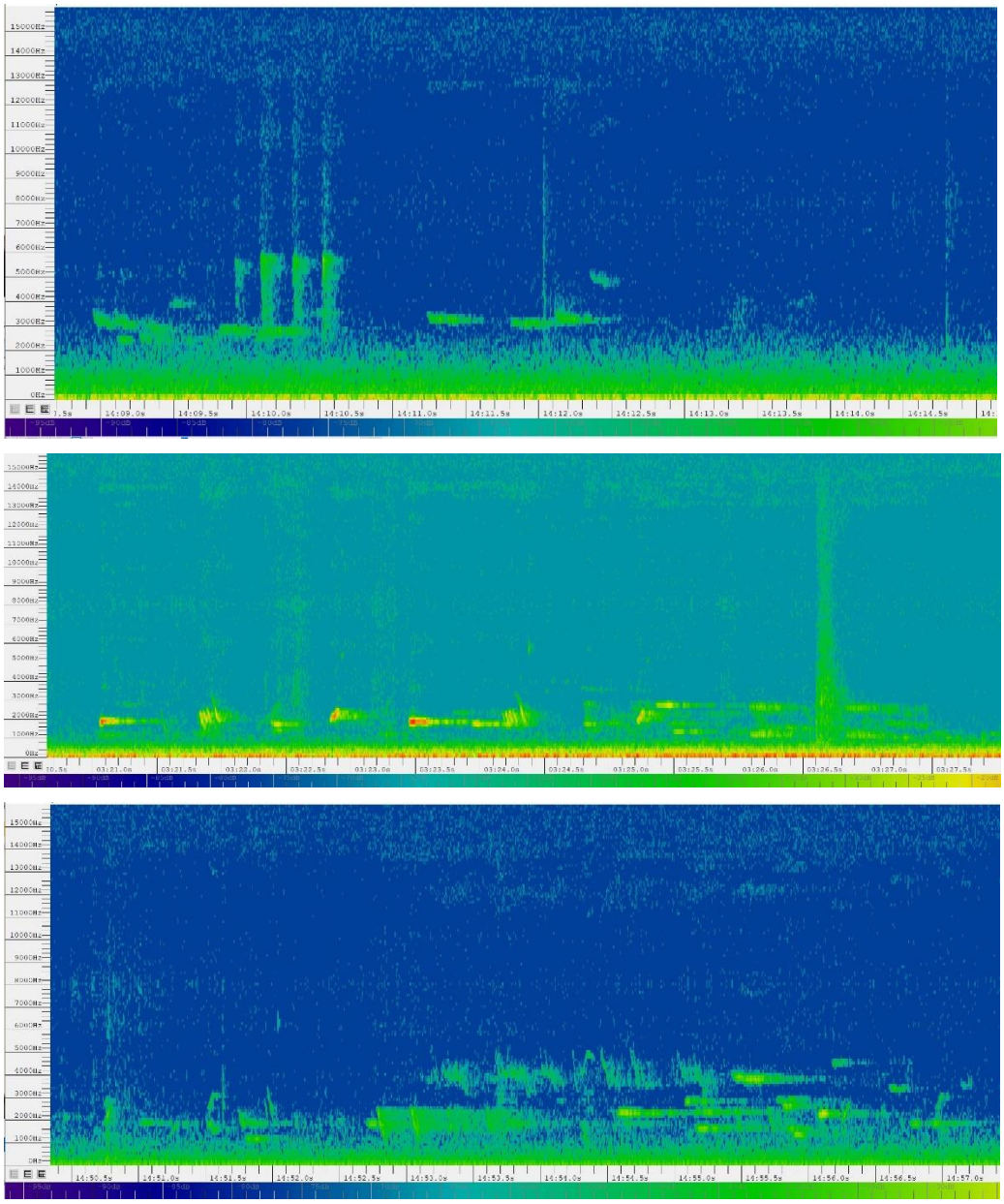


Figure 44. Spectrogram comparison 3

Top: Waitaha AR11, 4 Aug 2024 (blackbird and song thrush). Centre: Venture Creek, 1 August 2017 (tūī and bellbird). Bottom: Falls River, 1 August 2023 (bellbird and silvereye).

The relatively low numbers of bellbirds and tūī within the Waitaha Valley suggest that their populations are being suppressed by predators. Predation pressure would also explain the scarcity of kea, kākā, kākāriki, weka and robins found during the field surveys. The apparent male-biased weka population in the Valley also indicates a declining population (the majority of weka call recordings were of unanswered male birds). Similarly, McLennan (2007b) reported an apparent male-dominated robin population in the Valley.

Research has found that stoat control alone is effective in benefitting some bird populations: e.g. whio and bellbird (Glaser et al 2010; Innes et al. 2010; Kelly et al 2005). Intensive rat control is required to sustain populations of smaller birds such as robins and riflemen that are particularly sensitive to rat predation. Possums and feral cats also pose a risk to the survival of threatened species.

4. Riverine birds

Several bird species associated, or partly associated, with river and riverbed habitats were recorded in the Waitaha Valley during all baseline surveys since 2006 (**Table 13**). These included 'Threatened' species such as whio and grey duck, 'At Risk' species such as black shag and South Island pied oystercatcher, and 'Not Threatened' species such as white-faced heron, paradise shelduck, mallard and mallard-grey ducks, spur-winged plover, southern black-backed gull and the introduced Canada goose. While some riverine birds (e.g. oystercatcher and Canada goose) are seasonal visitors, the majority are permanent residents. A total of potentially 13 species were recorded over all surveys, though it is visually difficult, if possible, to distinguish between grey duck, mallard-grey or mallard duck (**Table 13**).

Table 13 List of riverine or partly riverine birds recorded on Westpower surveys

Species common name	Threat status	Permanent or seasonal visitor
Canada goose	Not Threatened; introduced	Seasonal
Paradise shelduck	Not Threatened	Permanent
Whio	Nationally Vulnerable	Permanent
Grey duck	Nationally Vulnerable	Permanent
Mallard duck	Not Threatened; introduced	Permanent
Mallard/grey duck	Not Threatened hybrid	Permanent
Black shag	At Risk: Relict	Permanent
White-faced heron	Not Threatened	Permanent
S.I. pied oystercatcher	At Risk: Declining	Seasonal
Spur-winged plover	Not Threatened	Permanent
Southern black-backed gull	Not Threatened	Permanent
NZ kingfisher	Not Threatened	Permanent
Welcome swallow	Not Threatened	Permanent

In addition to this list, three other bird species have been recorded between the proposed Scheme footprint and SH6 bridge (Colin O'Donnell, pers. comm.; DOC Officer's report (2016)). These are variable oystercatcher ('At Risk: Recovering'), pied stilt ('Not Threatened') and banded dotterel ('Nationally Vulnerable'). All these species could from time to time be present within the riparian areas of Scheme footprint.

5. eDNA sampling and results, July-August 2024

EOS Ecology collected 20 eDNA freshwater samples from various locations in the Waitaha River catchment between 18 and 21 July 2024 (**Figures 45-46**). Samples were taken in the mainstem river and tributaries providing a good representation of the different habitat types present within the Waitaha catchment (the **Freshwater Ecology Report**). The samples were sent to Wilderlab Ltd, an environmental DNA testing laboratory based in Wellington.

The analysis results show a very wide range of animal and plant species via their DNA that is captured in flowing streams and other waterbodies. While the technique is especially useful for detecting aquatic fauna and flora, some terrestrial fauna DNA is also captured in samples.

No bat, kiwi, grey duck or *Powelliphanta* DNA was detected. The only riverine birds detected to species were whio and mallard duck. No shag, heron or oystercatcher DNA was detected. A total of eight bird species (to specific name) were detected. These were: whio, mallard duck, weka, kererū, tomtit, grey warbler, silvereye and song thrush.

Other species might have been detected within the order Passeriformes, family: Anatidae (ducks, geese, swan), sub-family Phasianinae (pheasants, quail, chickens) and genus's Petroica (robin and tomtit) and Turdus (blackbird, thrush). The family Acanthizidae was also detected, but this is represented by only one extant species in New Zealand being the grey warbler.

The sites where weka and kererū DNA was found are shown in **Figures 45 & 46**, respectively. Locations for both weka and kererū broadly match the sites where they were recently encountered on walk-through and acoustic surveys, August 2024 (see **Appendix E** Section 3.3.3).

No indigenous mammals (i.e. bats) were recorded in the eDNA samples. A range of introduced mammalian pests were detected, being cattle, red deer, Himalayan tahr, goat, sika deer (?), hare, dog, brushtail possum, ship rat and house mouse. I question the presence of sika deer, as they are not known to be present on the West Coast. Curiously, no chamois, mustelids or feral cats were detected through DNA analysis. The sika deer detection and the absence of stoats in particular indicates that the water sampling technique has shortfalls when evaluating terrestrial fauna. Therefore, the absence of bat DNA should not be interpreted as an absence of bats in the Valley.

While no *Powelliphanta* were specifically detected, DNA from their class Gastropoda were frequently sampled. The order Stylommatophora was identified, comprising a large range of terrestrial pulmonate land snails and slugs. Other snails included freshwater varieties (e.g. *Potamopyrgus antipodarum* and family Sphaeriidae) and surprisingly, a range of saltwater molluscs were identified from DNA traces.

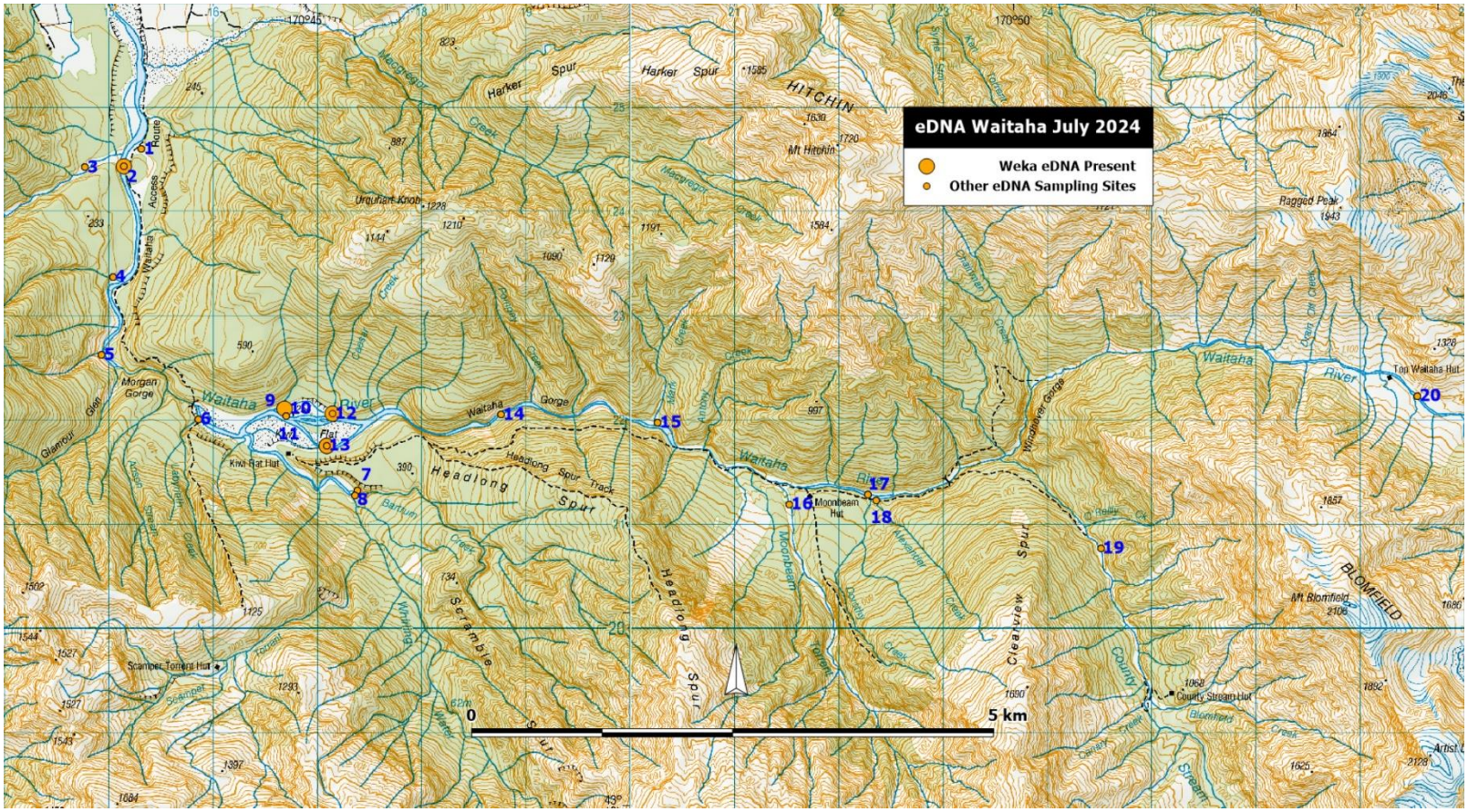


Figure 45. Western weka DNA detected in the 20 eDNA sampling sites within the Waitaha River catchment (Fred Overmars map)

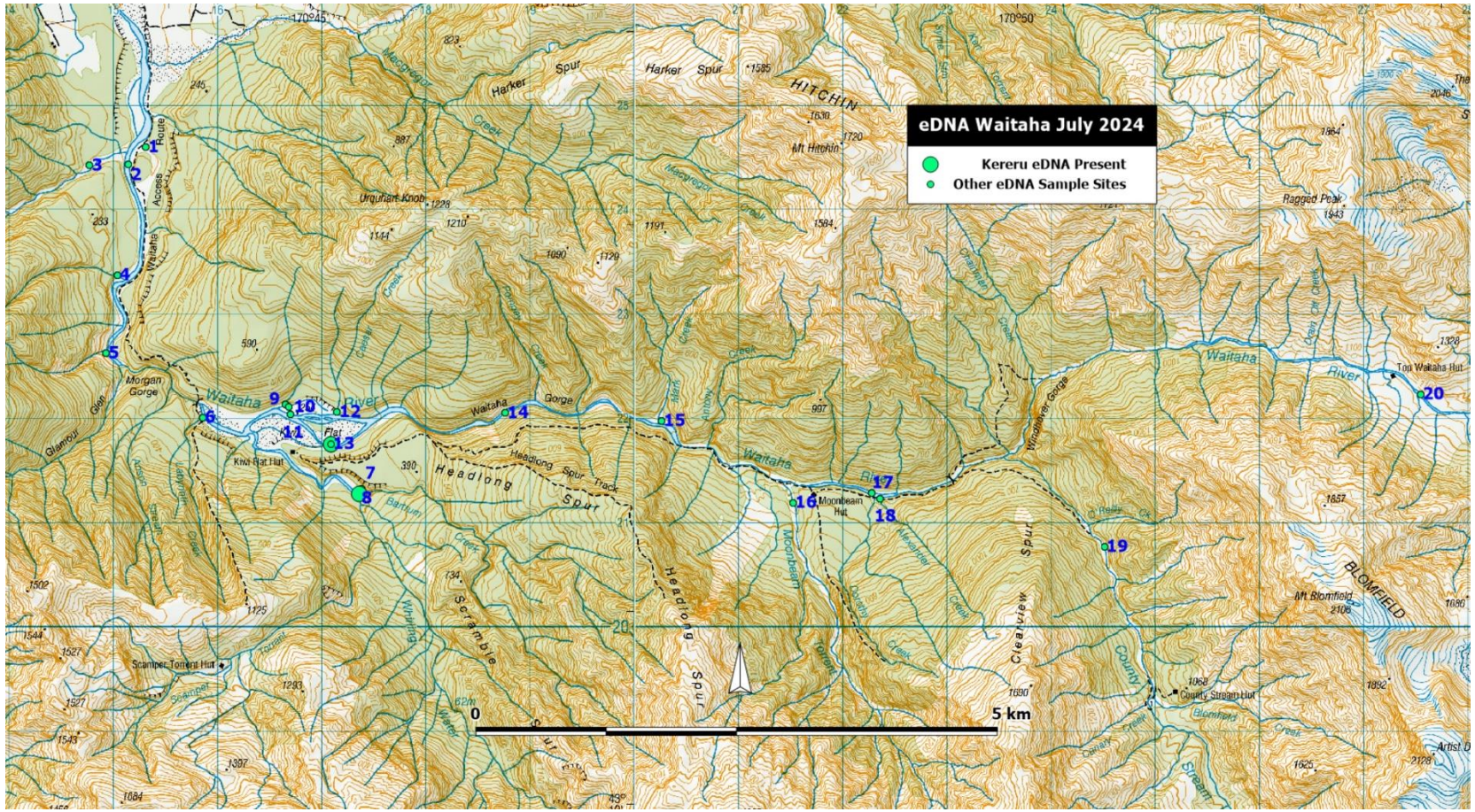


Figure 46. Kererū DNA detected in the 20 eDNA sampling sites within the Waitaha River catchment (Fred Overmars map)

APPENDIX F: SIGNIFICANCE OF VALUES RELATING TO TERRESTRIAL FAUNA (BATS, BIRDS AND *POWELLIPHANTA* LAND SNAILS)

1. Planning and Policy Documents

The significance of terrestrial fauna values relating to the proposed Scheme was assessed using criteria guidelines in the following documents:

1. The National Policy Statement for Indigenous Biodiversity (NPS-IB);
2. West Coast Regional Policy Statement (2020) (RPS);
3. Westland District Plan (WDP);
4. The proposed Te Tai o Poutini Plan (pTTPP); and
5. The West Coast Conservation Management Strategy 2010-2020 (CMS).

The criteria terminology in the various plans and policies varies. TACCRA Ltd has interpreted and aligned these criteria in Table 4 of Appendix E of the **Terrestrial Flora Report**). A similar summary of the relevant documents is given below.

1.1. The National Policy Statement for Indigenous Biodiversity (NPS-IB)

The NPS-IB (2023) sets the objective to maintain indigenous biodiversity in New Zealand so that there is no overall loss in indigenous biodiversity. However, as the NPS-IB (2023) specifically excludes renewable energy generation under sub clause 1.3(3) below from its application, the NPSIB is not specifically referred to in assessing the significance of indigenous fauna and habitat values.

Sub-clause 1.3(3): *Nothing in this National Policy Statement applies to the development, operation, maintenance or upgrade of renewable electricity generation assets and activities and electricity transmission network assets and activities. For the avoidance of doubt, renewable electricity generation assets and activities, and electricity transmission network assets and activities, are not "specified infrastructure" for the purposes of this National Policy Statement*.

Much of the NPS-IB criteria and guidelines is however aligned with other planning/policy documents such as the RPS, WDP and pTTPP that are discussed in more detail below. The NPS-IB does conveniently list highly mobile fauna and their threat status in Appendix 2, but with a few omissions (significantly long-tailed cuckoo) and errors (e.g. kiwi and robin are not highly mobile birds).

1.2. West Coast Regional Policy Statement 2020 (RPS)

Chapter 7 of the RPS addresses ecosystems and indigenous ecological diversity mimicking requirements of Section 6 of the Resource Management Act (**RMA**). The stated objectives are:
1. Identify in regional and district plans, and through the resource consent process, areas of significant indigenous vegetation and significant habitats of indigenous fauna in a regionally consistent manner.
2. Protect significant indigenous vegetation and significant habitats of indigenous fauna.
3. Provide for sustainable subdivision, use and development to enable people and communities to maintain or enhance their economic, social, and cultural wellbeing in areas of significant indigenous vegetation and significant habitats of indigenous fauna.
4. Maintain the region's terrestrial and freshwater indigenous biological diversity.

Key policies relating to indigenous fauna and biodiversity are:

1 (a) Identifying Significant Natural Areas (**SNAs**) being significant indigenous vegetation and significant habitats of indigenous fauna; and (b) identifying significant wetlands.

2 *Activities shall be designed and undertaken in a way that does not cause:*
a) The prevention of an indigenous species' or a community's ability to persist in their habitats within their natural range in the Ecological District, or

b) A change of the Threatened Environment Classification to category two or below at the Ecological District Level;2or
c) Further measurable reduction in the proportion of indigenous cover on those land environments in category one or two of the Threatened Environment Classification at the Ecological District
Level; 3 or
d) A reasonably measurable reduction in the local population of threatened taxa in the Department of Conservation Threat Classification Categories 1 – nationally critical, 2 – nationally endangered, and 3a – nationally vulnerable.

3 *Provided that Policy 2 is met, when managing the adverse effects of activities on indigenous biological diversity within SNAs:*
a) Adverse effects shall be avoided where possible; and
b) Adverse effects that cannot be avoided shall be remedied where possible; and
c) Adverse effects that cannot be remedied shall be mitigated.
d) In relation to adverse effects that cannot be avoided, remedied or mitigated, biodiversity offsetting in accordance with Policy 4 is considered; and
e) If biodiversity offsetting in accordance with Policy 4 is not achievable for any indigenous biological diversity attribute on which there are residual adverse effects, biodiversity compensation in accordance with Policy 5 is considered.

8. *Maintain indigenous biological diversity, ecosystems and habitats in the region by:*
a) Recognising that it is more efficient to maintain rather than to restore indigenous biological diversity;
b) Encouraging restoration or enhancement of indigenous biological diversity and/or habitats, where practicable; and
c) Advocating for a co-ordinated and integrated approach to reducing the threat status of indigenous biological diversity.

Criteria for determining significance is found in Appendix 1 of the RPS and copied into in **Table 14** below.

1.3. Westland District Plan 2002 (WDP)

The WDP is the operative plan while the proposed Te Tai o Poutini Plan is being progressed. The WDP establishes a framework within which natural and physical resources will be managed in Westland. Section 4.9 states the policies relating to natural habitats and ecosystems. It states:

A. *Adverse effects on the integrity, functioning and health of natural habitats and ecosystems and indigenous species shall be avoided, or where avoidance is not practical, remedied or mitigated.*
B. *The protection and enhancement of areas of significant indigenous vegetation and habitats of indigenous fauna, and outstanding natural features in the district will be encouraged.*
C. *To control the modification of natural wetlands to protect their natural character, landscape values and their significance as areas of indigenous vegetation and habitat for indigenous fauna, and to sustain their life supporting capacity as indigenous ecosystems.*
D. *Council will protect areas of significant indigenous vegetation and significant habitats of indigenous fauna and outstanding natural features in the District Council will, in particular, target those indigenous vegetation types occurring in alluvial and coastal areas.*
All areas of significant indigenous vegetation and habitats shall meet one or more of the following criteria:

The plan identifies specific criteria in respect of areas of significant indigenous vegetation and habitats of indigenous fauna, being:

(i) ***Intactness:***
The area is unmodified by human activity, comprises a predominantly

intact indigenous system and is not affected in a major way by weed or pest species; AND
***Size**:*
The area of indigenous vegetation has a predominant cover of 5 hectares of more.
(ii) ***Representativeness:***
The area is one of the best examples of an association of species which is typical of its ecological district;
(iii) ***Distinctiveness:***
The area has indigenous species or an association of indigenous species which is unusual or rare in the ecological district, or endemic or reaches a distribution limit in the ecological district. The area may be distinctive because of the influences of factors such as altitude, water table, soil type or geothermal activity.
(iv) ***Protected Status:***
The area has been set aside by New Zealand Statue or Covenant for protection and preservation or is a recognised wilderness area.
(v) ***Connectivity:***
The area is connected to one or more other significant areas in a way, (including through ecological processes) which makes a major contribution to the overall value or natural functioning of those areas.
(vi) ***Threat:***
The area supports an indigenous species or community of species which is threatened within the ecological district or threatened nationally.
(vii) ***Migratory Species:***
An inter-tidal area or area of forest, wetland, lake, estuary or other natural habitat that is important for migratory species or for breeding, feeding or other vulnerable stages of indigenous species.
(viii) ***Scientific or other Cultural Value**:*
The area is a type, locality or other scientific reference area, is listed as a geopreservation site, or has a distinctive amenity value (e.g. it contributes to a distinctive and outstanding landscape of the district, has other significant cultural value or is of international importance).

These criteria, often expressed by different words or terminology in other plans and policy documents, are the primary criteria considered when assessing significance of terrestrial fauna relating to the proposed Scheme within the Waitaha Valley (see **Appendix F**, Section 2).

1.4. The proposed Te Tai o Poutini Plan (pTTPP)

The pTTPP is a developing plan aimed to eventually replace the three district plans of Buller, Grey and Westland District. The pTTPP aligns with the RMA requiring integrated management of the environment, including responsibility for protecting and maintaining terrestrial ecosystems. Management of indigenous biodiversity is to be affected in two particular ways:

- *The control of any actual or potential effects of the use, development, or protection of land for the purpose of maintaining indigenous biodiversity.*
- *It is required to recognise and provide for the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna.*

Due to the very large land area covered by indigenous vegetation on the West Coast, a detailed assessment of significant vegetation, or habitat for indigenous fauna has not yet been undertaken. The pTTPP recognizes the criteria set out in Appendix 1 of the RPS to assess areas of significance for indigenous vegetation and fauna habitat. For Buller and Westland, the assessment, identification and mapping of SNAs will be undertaken and completed by June 2027.

Similar to the RPS, the pTTPP policies require activities to avoid, remedy or mitigate where possible significant adverse effects on terrestrial biodiversity. Where this is not possible and

residual effects remain, the appropriateness of biodiversity offsetting or compensation is to be considered.

When assessing resource consents in areas of significant indigenous vegetation and significant habitats of indigenous fauna, the pTTPP policy does consider the necessity for the activity to provide for critical infrastructure or renewable electricity generation.

1.5. The West Coast Tai o Poutini Conservation Management Strategy 2010-2020 (CMS)

The CMS implements general policies and establishes objectives for integrated conservation management under Section 17D of the Conservation Act 1987. All operative provisions of the CMS are interpreted and applied in line with that legislation.

Relevant policies relating to indigenous terrestrial fauna are found on Page 78-82; 86-91 of the CMS:

In order to manage threats to terrestrial species, habitats and ecosystems across all public conservation lands on the West Coast there is requirement to:

a) prevent the loss of indigenous species and the full range of their habitats and

ecosystems;

b) maintain contiguous sequences of indigenous ecosystems (e.g. from mountains

to sea);

c) maintain representative examples of the full range of indigenous ecosystems;

d) maintain populations of indigenous species, habitats and ecosystems with

unique or distinctive values;

e) achieve recovery of threatened indigenous species (including their genetic

integrity and diversity) and restore their habitats where necessary;

f) restore threatened indigenous ecosystems and connections between

ecosystems where necessary;

g) maintain the ecological integrity of indigenous ecosystems consistent with the

purposes for which the land is held;
h) protect recreational freshwater fisheries and freshwater fish habitats; and

i) achieve integrated management at priority sites.

Section 3.3.3.5 (Pg 86) of the CMS addresses threatened species management. This section is particularly relevant to the Waitaha Valley, primarily because of the presence of ‘Nationally Critical’ long-tailed bat and several threatened bird species within the Scheme’s footprint.

The CMS states two objectives:

1. To prevent further extinctions or range contractions of indigenous species found on the West Coast Te Tai o Poutini.

2. To ensure, where practicable, that representative populations of all indigenous species have long-term security in predominantly natural habitats within their natural range.

Key policies include:

1. Gaps in knowledge of the distribution and abundance of threatened species may be identified, and surveys undertaken to fill these gaps.

2. Causal agents of decline for each threatened species should be identified.

3. Work on threatened species should focus on preventing extinction and maintaining genetic diversity. Subsequent priorities should include progressively increasing the security, range and population size of species.

4. Where possible, threatened species management should be implemented at sites where other biodiversity work is already happening (i.e. priority sites for biodiversity management in order to maximise biodiversity gains.

Table 14. Policy, information and criteria framework for determining significance and natural heritage values for purposes of Section 6 (c) of the RMA 1991

RPS (Policy 7.1 (a), Appendix 1) and pTTPP (Policy ECO-P1 (2))	**WDP (Policy 4.9C)**	**CMS (Policies 3.3.3.2 and 3.3.3.5 for management of threatened species)**
Not assessed	(iv) **Protected Status** *The area has been set aside by New Zealand Statue or Covenant for protection and preservation or is a recognised wilderness area*	**Protected Status** Stewardship land: part of Wilberg ED. The boundary of Hokitika Place and Te Wahi Pounamu Place. No special protection (Reserve, National Park, Wilderness area, etc).
Policy 1(a): **Areas of significant indigenous vegetation and significant habitats of indigenous fauna**. pTTPP: ECO-04: *to maintain the range and diversity of ecosystems and indigenous species found on the West Coast/Te Tai o Poutini*	Policy 4.9 (b). t*he protection and enhancement of areas of significant indigenous vegetation and habitats of indigenous fauna, and outstanding natural features in the district will be encouraged*	Policy 3.3.3.2 (d). *maintain populations of indigenous species, habitats and ecosystems with unique or distinctive values.*
App. 1(a). **Representativeness**: *Indigenous vegetation or habitat of indigenous fauna that is representative, typical or characteristic of the indigenous biological diversity of the relevant ecological district.* *(b) Indigenous vegetation or habitat of indigenous fauna that is a relatively large example of its type within the relevant ecological district.*	(ii) **Representativeness** *The area is one of the best examples of an association of species which is typical of its ecological district.*	**Representativeness, Diversity** Policy 3.3.3.2 (c). *maintain representative examples of the full range of indigenous ecosystems.* Policy 3.3.3.2 (g) *maintain the ecological integrity of indigenous ecosystems consistent with the purposes for which the land is held.*
RPS (Policy 7.1 (a), Appendix 1) and pTTPP (Policy ECO-P1 (2)	**WDP (Policy 4.9C)**	**CMS (Policies 3.3.3.2; 3.3.3.5)**

App. 2(b) **Rarity/Distinctiveness** *Indigenous vegetation or habitat of indigenous fauna that supports an indigenous species that is threatened, at risk, or uncommon, nationally or within the relevant ecological district.*	(vi) **Threat** *The area supports an indigenous species or community of species which is threatened within the ecological district or threatened nationally.*	**Threatened species and habitat** Policy 3.3.3.2 (e) *achieve recovery of threatened indigenous species (including their genetic integrity and diversity) and restore their habitats where necessary.*
App. 2(c) **Rarity/Distinctiveness** *The site contains indigenous vegetation or an indigenous species at its distribution limit within the West Coast region or nationally.*	(iii) **Distinctiveness** *The area has indigenous species or an association of indigenous species which is unusual or rare in the ecological district, or endemic or reaches a distribution limit in the ecological district.*	**Representativeness and diversity** Policy 3.3.3.2 (d). *maintain populations of indigenous species, habitats and ecosystems with unique or distinctive values.*
App. 2(d) **Rarity/Distinctiveness** *Indigenous vegetation or an association of indigenous species that is distinctive, of restricted occurrence, occurs within an originally rare ecosystem, or has developed as a result of an unusual environmental factor or combinations of factors.*	(iii) **Distinctiveness** *The area has indigenous species or an association of indigenous species which is unusual or rare in the ecological district, or endemic or reaches a distribution limit in the ecological district.*	**Representativeness and diversity** Policy 3.3.3.2 (d). *maintain populations of indigenous species, habitats and ecosystems with unique or distinctive values.*
App. 3 (a) **Diversity and Pattern** *Indigenous vegetation or habitat of indigenous fauna that contains a high diversity of indigenous ecosystem or habitat types, indigenous taxa, or has changes in species composition reflecting the existence of diverse biological and physical features or ecological gradients.*	(iii) **Distinctiveness** *The area has indigenous species or an association of indigenous species which is unusual or rare in the ecological district, or endemic or reaches a distribution limit in the ecological district.*	**Diversity:** Policy 3.3.3.2 (a): *prevent the loss of indigenous species and the full range of their habitats and ecosystems.*
RPS (Policy 7.1 (a), Appendix 1) and pTTPP (Policy ECO-P1 (2)	**WDP (Policy 4.9C)**	**CMS (Policies 3.3.3.2; 3.3.3.5)**
App. 4 (a) **Ecological Context**. *Vegetation or habitat of indigenous fauna that provides or contributes to an important ecological*	(v) **Connectivity**. *The area is connected to one or more other significant areas in a way (including through*	**Diversity and viability.**

linkage or network, or provides an important buffering function.	*ecological processes) which makes a major contribution to the overall value or natural functioning of those areas.*	*Policy 3.3.3.2 (b): Maintain contiguous sequences of indigenous ecosystems (e.g. from mountains to sea.*
App. 4 (b) **Ecological Context**. *Indigenous vegetation or habitat of indigenous fauna that provides important habitat (including refuges from predation, or key habitat for feeding, breeding or resting) for indigenous species, either seasonally or permanently.*	(ii) **Representativeness**, (iii) **Distinctiveness** & (vii) **Migratory Species** *The area is one of the best examples of an association of species which is typical of its ecological district.* *The area has indigenous species or an association of indigenous species which is unusual or rare in the ecological district, or endemic or reaches a distribution limit in the ecological district.* *An inter-tidal area or area of forest, wetland, lake, estuary or other natural habitat that is important for migratory species or for breeding, feeding or other vulnerable stages of indigenous species*.	**Diversity,** **Taonga Species and Habitat, Natural landscape character. Threatened species.** Policy 3.3.3.2 (a): *prevent the loss of indigenous species and the full range of their habitats and ecosystems.* Policy 3.3.3.2 (e): *achieve recovery of threatened indigenous species (including their genetic integrity and diversity) and restore their habitats where necessary.* Policy 3.3.3.2 (f): *restore threatened indigenous ecosystems and connections between ecosystems where necessary.* Policy 3.3.3.5 (3): *Work on threatened species should focus on preventing extinction and maintaining genetic diversity.*

* pTTPP uses criteria set out in Appendix 1 of the RPS to assess significance.

** For Buller and Westland, the assessment, identification and mapping of SNAs will be undertaken and completed by June 2027 (pTTPP). NP-SIB uses criteria set out in Appendix 1 of the RPS to assess significance.

2. Assessments of significance for indigenous fauna (bats, birds and *Powelliphanta* snails)

2.1. Overview

Values of significance for terrestrial fauna using the various criteria listed in the plans and policy documents referred to in Section 1 have been assessed. **Table 15** summarises my interpreted values of significance across the Scheme's footprint, the Waitaha Valley as a whole, regionally and nationally. **Table 16** summarises predicted changes to significance values for terrestrial fauna if the Scheme goes ahead with compliance of the mitigation recommended (see **Table 5,** the **BMP** and the **AMP**).

The Scheme's footprint in combination with the wider Waitaha Valley contains areas of significant habitat for indigenous fauna based on assessing guidelines/criteria for significance set out in the various plans and policy documents listed in Section 1 above. Similarly, the Valley has high natural heritage values based on assessment criteria in the CMS.

Assessing Representativeness, Diversity, Connectivity and Pattern of the mid Waitaha Valley (and the proposed footprint within this area) in context with the wider Wilberg ED using the RPS and other assessment criteria is difficult, as other parts of the Wilberg ED have not been surveyed, at least not to the same extent as in the Waitaha Valley. However, the regionally significant populations of long-tailed bats (Nationally Critical) (see **Figure 2**, Page 5), higher than expected numbers of long-tailed cuckoo (Nationally Vulnerable) [15] and the presence of an isolated, possibly genetically distinct, western weka population indicate high values for Threat, Representativeness, Distinctiveness and Rarity within the Waitaha Valley. In addition, several other 'Endangered' or 'At Risk' birds were identified within the Scheme's footprint area, albeit usually localised and generally in low numbers. An exception was for the Nationally Endangered kea, that was widely dispersed and found in all habitats surveyed. But the kea population too is probably low with few breeding pairs.

Birds of conservation significance within the Scheme footprint are defined as all 'Threatened' and 'At Risk' species, as well as non-threatened species that are uncommon, have fragmented/localised distributions, or have potentially genetic distinctiveness in the Waitaha Valley that potentially could be affected by the Scheme on a population level during construction. Such non-threatened birds would include weka, kererū, rifleman and brown creeper.

While the Waitaha Valley clearly has high significance values for these faunas, the sustainability of threatened fauna populations and indigenous biodiversity is less certain. There are sufficient signs that indigenous fauna in the Waitaha Valley (and presumably in surrounding unmanaged forests) are being limited by predators. This situation probably applies to all unmanaged forests on the West Coast and elsewhere in New Zealand (i.e. where no robust integrated predator control is carried out). It is acknowledged that OSPRI undertake periodic aerial 1080 operations in the Waitaha catchment and other parts of the Wilberg and Harihari EDs as part of their TB eradication program. This management probably helps to maintain biodiversity to some extent and help prevent local extinctions of threatened species.

The proposed Scheme should have little or no effect on Connectivity and Migratory bird species. The full range of vegetation types will not be affected from river level to high-altitude sub-alpine and alpine habitats. This range of unaffected indigenous habitats are important for many species including bats, and mobile birds such as kākā, kākāriki, and kererū. Seasonal migrations between different altitudes and habitats are important for some species of birds

[15] More detected than in a large number of indigenous forest areas I have surveyed on the West Coast from Mokihinui Valley to Venture Creek (Lake Moeraki area).

(e.g. kākā, kākāriki, tūī, riflemen and robins) (Best & Harrison (1976), Dawson et al 1978, Saunders 1980, Wilson et al. 1988, O'Donnell 1991).

Long-tailed cuckoos are a migratory species that breed in New Zealand during spring and summer, and spend NZ winter in the tropical pacific. Like other cuckoos, they are nest parasites of other birds, the main host species being yellowhead and brown creeper. Yellowheads are absent in the Waitaha and most West Coast valleys. The higher-than-expected encounters of long-tailed cuckoo in the Waitaha Valley survey areas (summer 2006/2007 and 2012) indicates a regionally significant population in the Valley. Their population status there becomes more important considering a recent elevation in their threat status from 'At Risk' to 'Nationally Vulnerable' (Robertson et al. 2021). This worsened conservation status resulted from count data indicating a plummeting population in southern New Zealand.

Both long-tailed cuckoo and brown creeper distributions were found to be widespread across the proposed footprint in 2006/07 (Overmars & Buckingham 2007). In August 2024 brown creepers were encountered only in tall forest above Morgan Gorge (Wildlife Surveys 2024). Long-tailed cuckoo numbers will likely decline if there is a shrinkage of their primary host. Further bird count monitoring would be required to evaluate any change in long-tailed cuckoo populations of in the Valley. Predation is likely to be the main limiting factor on numbers of long-tailed cuckoos, brown creeper and a range of other indigenous birds in the Valley.

The presence of threatened riverine or river-associated fauna in the Waitaha Valley is as significant as threatened forest-dwelling fauna (see **Appendix F**). This fauna comprises species that essentially spend all their lives within the river or riparian habitat (e.g. whio, grey duck, black shag) or other species that use these habitats for feeding (e.g. long-tailed bat and pied oystercatcher). Potential effects from the Scheme on these faunas are discussed in **Appendix G**.

Significance values based on populations of *Powelliphanta* land snails do not apply to the proposed Scheme, as living populations of *Powelliphanta* are not known to be present. Only the alpine snail *Powelliphanta rossiana rossiana* is known to be present in the surrounding area. This species is restricted to isolated alpine sites between Ross and Harihari, such as at Mt Bonar, some 8 km to the west of the lower Waitaha Valley (Walker 2003).

Table 15. Assessed values of significance for terrestrial fauna within the Scheme's footprint, locally, regionally and nationally.

Criteria	Proposed Footprint	Waitaha Valley	Wilberg ED	Nationally
1. Representativeness (RPS)	Potentially high value: stronghold long-tailed bat population; higher than expected long-tailed cuckoo population; isolated western weka population	High value: stronghold long-tailed bat population; higher than expected long-tailed cuckoo population; isolated western weka population	Comparative faunal values un-assessed	High value for long-tailed bat ('Nationally Critical' threat status). Potentially high value for long-tailed cuckoo.
2. Rarity/Distinctiveness (RPS) (vi) Threat (WPD)	Potentially high Value for (b) Threat and (d) Distinctive and restricted populations.	High Value for (b) Threat and (d) Distinctive and restricted populations	High Value for (b) Threat and (d) Distinctive and restricted populations	High value for long-tailed bat (Nationally Critical threat status)
3. Diversity and Pattern (RPS)	Moderately significance as high diversity of bird species	Moderately significance as high diversity of bird species	Not assessed	
4.Ecological Context (RPS)	High value for threatened species and isolated population of western weka	High value for threatened species and isolated population of western weka	Not assessed	High value for long-tailed bat (Nationally Critical) and potentially high value for long-tailed cuckoo (Nationally Vulnerable)
(i) Intactness (WDP)	Varies over the footprint. Low down-valley, higher up-valley. Footprint size <5 ha.	High value in mid to upper reaches of catchment	Not assessed	
(v) Connectivity (WDP)	Significance values not affected	No impediment to connectivity with proposed Scheme	Not assessed	
(vii) Migratory Species (WDP)	Assumed low value as development would have less than minor effects on migratory birds	Potentially high value for one threatened species: long-tailed cuckoo and moderate value for species such as kererū	Potentially high value for one threatened species: long-tailed cuckoo and moderate value for species such as kererū	Potentially high value for one threatened species: long-tailed cuckoo
(viii) Scientific or other cultural value (WDP)	Assumed low value. No sites of particular significance to Māori listed in the pTTPP	Assessed of low value. No sites of significance listed in the pTTPP	Not assessed	

Table 16. Predicted changes to current values of significance for terrestrial fauna by the proposed Scheme after recommended mitigation.

Criteria	Proposed Scheme	Waitaha Valley
1. Representativeness (RPS)	Negligible to no change in current assessed significance values (shown in column to the right)	High value: stronghold long-tailed bat population; higher than expected long-tailed cuckoo population; isolated western weka population
2. Rarity/Distinctiveness (RPS) (vi) Threat (WPD)	Minor to no change in current assessed significance values. Low risk to long-tailed bat population, but must be mitigated. Expected improvement if effective, long-term predator control undertaken (recommended compensation relative the effect of the Scheme)	High Value for (b) Threat and (d) Distinctive and restricted populations
3. Diversity and Pattern (RPS)	Negligible to no change in current assessed significance values. Improvement likely depending on extent and quality of predator control (recommended compensation relative the effect of the Scheme)	Moderately significance as high diversity of bird species
4.Ecological Context (RPS)	Negligible to no change in current assessed significance values. Improvement likely depending on extent and quality of predator control (recommended compensation relative the effect of the Scheme)	High value for threatened species and isolated population of western weka
(i) Intactness (WDP)	Negligible to no change in current significance values	High value in mid to upper reaches of catchment
(v) Connectivity (WDP)	Negligible to no change in current significance values	No impediment to connectivity with proposed Scheme
(vii) Migratory Species (WDP)	Negligible to no change in current assessed significance values. Improvement likely depending on extent and quality of predator control (recommended compensation relative the effect of the Scheme)	Potentially high value for one threatened species: long-tailed cuckoo and moderate value for species such as kererū
(viii) Scientific or other cultural value (WDP)	No change in current significance values	Assessed of low value. No sites of significance listed in the pTTPP

2.2. Evaluating significance using criteria from the RPS, WDP, pTTPP and CMS

2.2.1. Protection Status

WDP 4.9D (iv) Protected Status: The area has been set aside by New Zealand Statue or Covenant for protection and preservation or is a recognised wilderness area.

No matching criteria in other policies and plans.

The area is largely located within fully protected public conservation land administered by DOC. The remainder, being the downriver part north of Macgregor Creek is mostly farmland (developed and undeveloped) that has generally low values for conservation protection (exception being the river and Macgregor Creek that provide important foraging habitat for long-tailed bats). The Scheme area has no special reserve or wilderness status.

2.2.2. Representativeness

RPS 7.1(a)1(a & b) and pTTPP ECO-P1(2)(i)1(a &b) – Representativeness - Indigenous vegetation or habitat of indigenous fauna that is representative, typical or characteristic of the indigenous biodiversity of the relevant ecological district. This can include degraded examples where they are some of the best remaining examples of their type, or represent all that remains of indigenous biological diversity in some areas.

WDP 4.9D(ii) – Representativeness - The area is one of the best examples of an association of species which is typical of its ecological district.

CMS 3.3.2.3(1) – Representativeness and Diversity.

Four species found within the Scheme's footprint have particular values regarding representativeness. These species are long-tailed bat, whio, western weka and long-tailed cuckoo. Frequency of encounters of long-tailed bat, whio and long-tailed cuckoo were relatively high (2006/07 and/or 2012 surveys) compared with other areas surveyed in the region and the West Coast generally. Western weka appears to be an isolated population with potential genetic significance. Without comprehensive surveys throughout the Wilberg Ecological Area, it is not known whether the Waitaha populations of any or all of these species could be considered as one of the best examples of a species association in the region.

Several surveys for bats in the Buller Region mostly have failed to find bats in lower valley catchments or coastal foothills (Buckingham 1999, 2002, 2006; Lloyd 2011). In South Westland, records indicated small populations of bats in lowland forest and swampland areas (Buckingham 2002; DOC bat data base). Therefore, the moderate-high activity of long-tailed bats detected in the Waitaha Valley is of importance.

Notwithstanding, all species detected within the Scheme's footprint and adjacent areas have relatively wide distributions regionally or nationally and no particularly representative habitat or ecosystem was identified. Similarly, the proposed footprint has no identified vegetation communities that were not represented regionally in the Wilberg Ecological Area (TACCRA Ltd 2013, 2025).

2.2.3. Intactness and Viability

WDP 4.9D(i) Intactness and Size

CMS 3.3.2.3(1) Viability, Intactness

The Waitaha Valley is subject to the usual variability of natural processes found in other wild river valleys on the West Coast, and this is not likely to change in the long term unless subject to a catastrophic event such as a major earthquake or global warming. On the other hand, the effects of introduced fauna on indigenous ecosystems are likely to exacerbate over time, leading to a reduction of fauna populations including possibly local extinctions, as well as impacting on the quality of their habitats.

Overall, the Scheme is unlikely to significantly change the viability, quality and integrity of processes due to its relatively small footprint (<8ha within conservation land during construction), its avoidance of significant habitats and habitat components, and prioritised use of already modified areas in the lower valley. Any potential effects caused by the Scheme are likely to be **negligible** compared to the serious ongoing threat of introduced mammalian predators.

2.2.4. Rarity, Distinctiveness, Threatened species

RPS 7.1(a), 2(b) and pTTPP: ECO-P1(2i). Indigenous vegetation or habitat of indigenous fauna that supports an indigenous species that is threatened, at risk, or uncommon, nationally or within the relevant ecological district.

RPS *9.2(f) The degree to which the area is distinctive in terms of indigenous species that are unusual, endemic, or that reach a distribution limit in the region;*

WDP 4.9D (vi) *Threat: The area supports an indigenous species or community of species which is threatened within the ecological district or threatened nationally.*

WDP 4.9D(iii) Distinctiveness: The area has indigenous species or an association of indigenous species which is unusual or rare in the ecological district, or endemic or reaches a distribution limit in the ecological district. The area may be distinctive because of the influences of factors such as altitude, water table, soil type or geothermal activity.

CMS 3.3.2.3(1) *Threatened Species and Habitat*

Several threatened species have been found within the Scheme's footprint. These include one 'Nationally Critical' species (long-tailed bat), one 'Nationally Endangered' species (kea), three 'Nationally Vulnerable' species (whio, kākā and long-tailed cuckoo) and one 'Nationally Increasing' species (bush falcon). In addition, at least three 'At Risk' species are present: black shag, yellow-crowned kākāriki and South Island robin. Therefore, the proposed Scheme and wider area score a high value of significance for threatened species. All these species are threatened or at risk both regionally and nationally. As stated earlier, populations of long-tailed bat and long-tailed cuckoo have particular significance in the Waitaha Valley because of their apparent stronghold presence there.

The presence of western weka (not threatened) is a distinctive feature of the Waitaha Valley as this is an isolated population. While the weka population is expanding southwards on the West Coast (Beauchamp 1999; Beauchamp et al. 1999; Eastwood 1998), isolated populations such as found in the Waitaha, Karangarua and Copland Valleys might be genetically distinct.

2.2.5. Diversity and Viability

RPS 7.1(a)3(a) and pTTPP ECO-P1(2)(i)3(a) – Diversity and Pattern - Indigenous vegetation or habitat of indigenous fauna that contains a high diversity of indigenous ecosystem or habitat types, indigenous taxa, or has changes in species composition reflecting the existence of diverse biological and physical features or ecological gradients.

CMS 3.3.2.3(1) Viability, Intactness

CMS 3.3.2.3(1) Diversity and Viability

The **Terrestrial Flora Report** concludes that the Scheme's footprint does not encompass a high diversity of indigenous ecosystem or habitat types. This is partly surprising given the relatively high avifaunal diversity recorded in the Valley. The highest numbers of indigenous species and threatened species were recorded in the vicinity of Morgan Gorge and above it. The habitat might reflect relatively high numbers of invertebrates (for insectivorous and omnivorous birds) and relatively high diversity and abundance of fruiting plants (for frugivorous and omnivorous birds). The river and its associated riverine habitats also contribute to overall diversity of avifauna in the Valley.

The proposed footprint can be divided into four general areas regarding bird diversity and habitat intactness. These areas correspond to vegetation type delineations the **Terrestrial**

Flora Report. These areas have also been identified earlier in this document (**Appendix A**, page 26).

1. Footprint Area 1 - upper footprint area (proposed Headworks infrastructure and temporary Construction Staging Area 1);
2. Footprint Area 2 - middle footprint area between Macgregor Creek and the proposed Power Station (Vehicle access and transmission line route through DOC land, construction and structures around the proposed Power Station Site including Construction Staging Area 2);
3. Footprint Area 3 - part of lower footprint area immediately north of Macgregor Creek within farmland (spoil disposal area and Construction Staging Area 3); and,
4. Footprint Area 4 - main lower footprint area from north of Macgregor Creek to SH6 and the Westpower network near the Waitaha Bridge (road access and transmission line within farm land and road reserve).

Areas 3 and 4 are within private land and road reserve, differing from Areas 1 and 2 that are within DOC Conservation Estate.

Area 1. Survey count and acoustic data showed that this area has the highest diversity of indigenous and threatened birds as well as being important for potential bat breeding habitat. Notable 'Threatened' or 'At Risk' species include long-tailed bat, kea, falcon, kākā, kākāriki and robin. The last three species were detected only in Area 1 during the August 2024 acoustic survey. Brown creepers (not threatened) were also recorded only in this area during the 2024 survey. Riflemen (not threatened) have been recorded only in this area.

Area 2. The lowest diversity of the three defined areas for birds in general, but a higher ratio of indigenous to introduced birds than Area 3. Common forest birds such as bellbird, tomtit, grey warbler and fantail are relatively abundant, while western weka appears to be more common here than other areas. The only pairs detected (calling duets) were recorded in this area in August 2024. Low numbers of 'Threatened'/'At Risk' species were listed here, notably being kea, long-tailed cuckoo, falcon and black shag (kea being the only threatened species detected in Area 2 in August 2024).

Areas 3 & 4. The diversity of bird species is relatively high with a dominance of introduced species, several non-threatened indigenous species adapted to farmland and riverine habitats (e.g. paradise shelduck, pūkeko, spur-winged plover, welcome swallow and southern black-backed gull) and non-threatened birds that live or feed in small bush-lots, gardens and shrub edges etc (e.g. bellbird, tūī, kererū, grey warbler and fantail). Potential threatened species present include whio, kea (occasional) and bush falcon. A black shag ('At Risk: relict') was seen in this area in August 2024 and other 'At Risk' birds might include South Island pied oystercatcher and little shag[16]. Some of these species could be seasonal visitors. Long-tailed bats have been detected around Macgregor Creek and might also be present along the forest edges within the powerline and access road footprint. The presence of long-tailed bats using the riverbed for foraging north of Macgregor Creek is of particular note, but this is outside the Scheme's footprint (see **Appendix E**, Section 2.3.2).

Overall, Areas 3 & 4 have the least significance value for bats and indigenous birds compared to Areas 1 and 2 within the conservation estate.

The proposed Scheme has minimal effect on habitats within Area 1 that shows the highest diversity of indigenous birds. The proposed construction footprint is greatest within Area 2 (nearly half the footprint construction area within DOC land). It is anticipated, even within Area 2, the proposed Scheme will have negligible adverse effects on the existing diversity, intactness and viability of terrestrial fauna. Also, less than minor effects on threatened

[16] Black shag and little shag's conservation threat status was elevated from 'Not Threatened' to 'At Risk: Relict' in 2021. Little shags have not been observed in the Valley, but could well be present.

indigenous species (bats and birds) as these species were found to be relatively uncommon in Area 2.

The presence of robins, riflemen and brown creepers at relatively low altitudes within the Valley is of interest, as these species become scarce or absent further south on the West Coast. Similarly, the presence of three endemic, threatened parrot species at relatively low altitudes within the Scheme's footprint reflects some significance relating to diversity of birds as a whole. However, avian diversity is similar in beech dominated forests further north on the West Coast.

The viability of bat and bird populations, i.e. the sustainability of these populations over time, will depend on the extent of predation pressure on these populations. The low numbers of encounters of threatened species such as kea, kākā, kākāriki and robin indicate already depressed populations of these species, most likely caused by predators. Predator threat is likely to be much more concerning than any effect of the proposed Scheme on these vulnerable species. The threat of predators is not restricted to the Waitaha Valley, but is far-reaching to all indigenous, unmanaged habitats.

2.2.6. Intactness and Size

WDP 4.9D(i) Intactness and Size: *The area is unmodified by human activity, comprises a predominantly intact indigenous system and is not affected in a major way by weed or pest species;*

AND,

The area of indigenous vegetation has a predominant cover of 5 hectares or more.

CMS 3.3.2.3(1) Viability, Intactness

Habitat values for indigenous fauna decrease down-valley, becoming poorest north of Macgregor Creek as the habitat becomes degraded (farmland, undeveloped farmland, patchy shrubland and gorse). The larger part of the proposed Scheme lies within relatively unmodified vegetation and therefore rates significantly in this regard. While introduced browsers (particularly goats and deer) have localised effects on the quality of these habitats, TACCRA Ltd (2013 and the **Terrestrial Flora Report** 2025) observed browse effect on indigenous vegetation to be very low. Weeds have spread up the Valley as far at least as Kiwi Flat, but they have little influence on the faunal values described in this report.

The area has relatively high densities of introduced mammalian predators (McLennan 2007a & b) that have ongoing impacts on indigenous fauna, as indicated in the relatively low numbers of predator sensitive species (e.g. whio in the lower catchment, kākā, kākāriki, robin etc.).

The part of the Scheme's footprint downriver of Macgregor Creek is highly modified and has relatively low values for many faunas, but not bats and riverine species such as paradise shelduck, South Island pied oystercatcher and southern black-backed gulls. Bat activity surveys in 2012 indicated that the lower Waitaha Valley is important foraging habitat for bats (See **Appendix E**, Section 2.3.2 & 2.4.2).

2.2.7. Connectivity, Migratory species

RPS 9.2(h). Its connection with other areas of significant indigenous vegetation or significant habitats of indigenous fauna;

WDP 4.9D(v) Connectivity: *The area is connected to one or more other significant areas in a way (including through ecological processes) which makes a major contribution to the overall value or natural functioning of those areas.*

The Scheme's footprint is contiguous with a large area of similar indigenous habitats within the Waitaha Catchment. Many mobile species of birds and long-tailed bats range widely to forage on available foods. While long-tailed bats have a core area for breeding and roosting, that might overlap with the Scheme's footprint around Morgan Gorge, they range very widely to forage, presumably well outside the footprint. Long-tailed bats very possibly use the

Morgan Gorge as a commuting route between roost sites (presumed in Kiwi Flat area) and foraging grounds (data indicates importance of the braided lower river flats as a food resource for bats). Any disturbance at the top of Morgan Gorge might therefore affect bat flight route. Apart from that potential deterrence, the Scheme is unlikely to significantly influence connectivity for bats (and birds) due to its small linear footprint and use of underground tunnels.

Long-tailed cuckoo and shining cuckoo are summer migrants to New Zealand while other species such as kea, kākā, kererū and tūī can travel over long distances to seek seasonally available foods. The proposed Scheme should have little or no effect on the significance values of migratory and mobile species, as the footprint is relatively small and linear, and would have little impedance on movements of highly mobile species. Predation is likely to be the main limiting factor on numbers of migratory long-tailed cuckoos in the Valley, probably mainly by indirectly affecting their main host species, the brown creeper.

2.2.8. CMS 3.3.2.3(1) Taonga Species and Habitat

I am not aware that the Waitaha Valley has particular values for Māori regarding fauna or faunal habitats that are different from other wild rivers on the West Coast. Taonga species found within the West Coast *Tai Poutini* are listed in Appendix 4 of the CMS.

APPENDIX G: POTENTIAL EFFECTS OF THE SCHEME

3. Summary of Project Description (6 June 2025) on which potential effects are assessed

In summary, the Scheme is proposed to:

- operate as a run-of-the-river design chosen to avoid large-scale dam structures, impoundment and water storage lakes;
- divert up to a maximum of 23 m³/s (‘cumecs’);
- retain a residual flow of 3.5 m³/s;
- have an abstraction reach (intake weir to tailrace) approximately 2.5 km long;
- use a weir to divert some water from the main flow above Morgan Gorge down a tunnel to the Power Station;
- have a 10 cumecs bypass valve to maintain water flow following station outages; and,
- have an operational footprint within DOC administered Stewardship land of <8 ha during construction and <5 ha post construction).

Within DOC land, more than two thirds (c. 3.8 ha) of this post-construction footprint is made up of the road and transmission lines between the farm boundary on the true right of Macgregor Creek and the Power Station Site. The remaining footprint is spread over two distinct and discrete areas, the Headworks and the Power Station Sites. The Scheme is designed to minimise the footprint and potential effect on the environment within which it is located.

Outside DOC land, an additional approximately 21 ha (c.16 km) which includes the access road across the farm, the transmission line Construction Staging Area 3 to SH6 and along SH6, Beach Road and Bold Head Road to Waitaha Substation. This footprint mostly follows the existing network through farmland and road reserve.

Other features of design include:

- No lighting along the road corridor and lighting will be minimal at the Power Station and Headworks sites. Light design will aim to reduce light scatter.
- Planned maintenance at the Headworks will be done in summer (January to March) in low flow periods and outside of the whio breeding season (August-December).
- Construction has a planned duration of three to four years.
- During the first year of operation there may be one or two weekly site visits to check on structures and for regular maintenance, after which visits are expected to reduce to one a week.
- The majority of vehicles will be light utility vehicles or small trucks, though heavy and oversized vehicles will be used during the construction period.
- Access to the Headworks might be through the tunnel (once completed), by foot, or helicopter dependent on requirements and work required (there will be two tunnels: one for the conveyance of water (pressure tunnel) and the other for human access).
- Helicopters will be used periodically for maintenance and monitoring, but will not operate at night, or around dusk and dawn for safety reasons.
- Dogs will not be allowed into the area by project personnel.
- Localised active weed control will be implemented within the Scheme’s footprint.

- Rehabilitation of disturbed areas during construction will be carried out as per the Vegetation Management Plan.

Details of construction components and areas in hectares are found in **Appendix A**.

In terms of main vegetation types representing main habitats for terrestrial fauna, refer to Table 2 in the front part of this report. In brief, the Scheme footprint will affect approximately 3.6 ha of mature/tall and regenerating forest, 2.0 ha of shrub/seral cover and 1.2 ha of open, generally non-woody vegetation (excluding farmland and road reserve). Nearly all of this affected vegetation is within DOC conservation land south of Macgregor Creek, with only c. 0.2 ha of shrub/seral cover north of the farm boundary at Macgregor Creek (see Terrestrial Vegetation Report). Given the extensive area of tall and mature forest outside the Scheme's footprint, the overall effect of the Scheme on terrestrial fauna habitats are considered to be **less than minor**. The very small area of riverbed affected by the Scheme (for gravel extraction) is considered to have **negligible** effects on these faunas, but are assessed below. Potential downstream effects by the Scheme on bats and riverine birds are also considered below.

4. Assessment Approach

Assessments of potential effects by the Scheme are based on past experience, literature reviews, RMA guidelines and the Ecological Impact Assessment guideline document, published by EIANZ in 2018 (Roper-Lindsay et al 2018). EIANZ 'Ecological Impact Assessment' has provided a process for identifying, quantitating and evaluating potential impacts (effects) by development on ecosystems.

The EIANZ document is very useful in assessing effects of the Scheme on fauna and faunal habits in general, as well as on particular terrestrial fauna of conservation importance. Apart from assessment of potential and actual effects, EIANZ provide guidelines for:

- scoping;
- describing ecological features through detailed investigations;
- evaluating ecological features;
- management options; and,
- developing monitoring requirements.

Tables 8 & 9 of the EIANZ document is of particular importance in helping to frame the magnitude of effect and the possible timescales for the duration of effects relevant to the Scheme. I have summarised the criteria presented in **Tables 17 & 18** below.

Table 17. EIANZ Criteria for rating magnitude of effects (adapted and summarised)

Rating	Criteria description
Very high	Total loss of, or very major change to key elements/features of existing baseline conditions, such that the post development character, composition and/or attributes will be fundamentally changed and may be lost from the site altogether; AND/OR loss of a very high proportion of the known population or range.
High	Major loss or major change to key elements/features of existing baseline conditions, such that the post development character, composition and/or attributes will be fundamentally changed; AND/OR loss of a high proportion of the known population or range.
Moderate	Loss or alteration to one or more key elements/features of existing baseline conditions, such that the post development character, composition and/or attributes will be partially changed; AND/OR loss of a moderate proportion of the known population or range.
Low	Minor shift away from existing baseline conditions. Change arising from the loss/alteration will be discernible, but underlying character, composition and/or attributes of the existing baseline condition will be similar to pre-development circumstances or patterns; AND/OR having a minor effect on the known population or range.
Negligible	Very slight change from existing baseline conditions. Change barely distinguishable, approximating the 'no change' situation; AND/OR having negligible effect on the known population or range.

Table 18. EIANZ Possible timescales for duration of effects (adapted and summarised)

Timescale	Definitions
Permanent	Effects continuing for an undefined time beyond the span of one human generation (c. 25 years)
Long term	Where there is likely to be substantial improvement after a 25-year period
Temporary	• Long-term (15-25 years); • Medium term (5-15 years) • Short-term (up to 5 years) • Construction phase (c. 3-4 years to WP Scheme completion)

4.1. Overall assessment of potential and actual effects using EIANZ and RMA-based Criteria

Within the construction period, overall effects on terrestrial fauna (bats and birds excluding whio) are assessed as **moderate** to **negligible** using EiANZ criteria **(Table 17)**. With proposed mitigation (**Table 5**, the **BMP** and the **AMP**) these effects drop to **low/negligible** for most fauna (weka still remain a **moderate** risk). Risks drop to **low/negligible** for all fauna after the construction period. However, a compensation package is recommended as a precautionary measure against a loss of bat colonies or maternity roosts (and weka population impacts (noting these are unlikely if the proposed mitigation is undertaken)) (see **Table 5**, the **BMP** and the **AMP**).

With respect to downstream effects of the Scheme's operation on fauna, with the implementation of the proposed management measures in relation to flows and

sedimentation, effects will be **negligible** for bats and **low** for birds (see Section 3.2.6 below). It is acknowledged that downstream effects from emergency shutdowns and startups are very difficult to predict, therefore some monitoring is recommended (see **Freshwater Ecology Report**).

The EIANZ criteria corresponds to RMA-based criteria, the latter being mainly used in this document's assessments. EIANZ **moderate** to **very high** equates to potentially **more than minor to significant using RMA criteria,** while **low** and **negligible** are **minor** to **negligible** in the RMA.

Using RMA criteria, it is anticipated that overall effects by the Scheme on terrestrial vertebrate fauna and their habitats will be **less than minor** and have short, or at most medium-term effects (**Table 18**).

While some adverse effects might be more than minor before mitigation, all effects drop to **less than minor** after mitigation and **negligible** during the Scheme's operation (providing any potential downstream effects are managed). compensation is recommended in the form of a financial contribution for a ten-year period to an ecosystem programme, for example predator control, in the region (such as Zero Invasive Predators) where bat and bird assemblages are similar to those in the Waitaha Valley.

5. Identified effects and potential effects of the Scheme on terrestrial fauna

The main adverse effects on terrestrial fauna (bats and birds) are:

- potential incidental direct loss (death) of individual fauna caused by construction and traffic roadkill, etc.; and,
- loss or modification of habitat for indigenous species.

5.1.1. disturbance to breeding, roosting, commuting and foraging activities caused by noise, vibration, lighting, traffic, human presence Direct loss of threatened fauna populations

The local population of long-tailed bats in the Waitaha Valley is considered of regional and national importance (**Tables 15 & 16**). Given the behaviour of bats (O'Donnell 2001; Sedgeley & O'Donnell 1999) it is possible that even a very small removal of breeding or roosting trees could lead to their local extinction.

Bat roosts are critical to the survival of bats. They are used for shelter during day and night, for socialising and breeding. Bats have very specific requirements when choosing roosts (Sedgeley & O'Donnell 1999), making them rare and potentially irreplaceable in the short term.

The highest risk of injuring or killing bats is during the breeding season (December and January). Heavily pregnant bats are not very agile and young bats cannot fly, restricting their chances of escape if trees containing roosts are felled. On a worst scenario, a whole colony of bats could be destroyed at one time. Regardless of time of year, long-tailed bats are known to remain in their roosts when trees are felled, so consequently can be injured or killed when this occurs (Borkin & Parsons 2010).

Adding to these risks, bats move regularly between roosts during the breeding season, adults carrying their young with them. This means that detecting bat roost trees requires frequent surveillance, right up to the time when trees are to be felled.

Additional effects management measures are recommended to mitigate the impacts of felling during the bat breeding season.

During winter, when bats are in torpor (semi-hibernation) they are relatively inactive. Therefore, they might not be able to fly away if trees containing them are felled. Furthermore, at these times, bats cannot easily be detected using acoustic monitors, imposing greater risks to bats if operations are carried out during this season.

However, this risk should not apply in regard to the Scheme as it proposes to avoid tree felling in winter (as per DOC bat roost protocol). Additional effects management measures are recommended to mitigate the impacts of felling during winter.

Long-tailed bats have very large home ranges (over 1,500 ha mean for adult males and c.350 ha mean for post-lactating females in Fiordland studies). However, the range for roosting sites in Fiordland were found to be much smaller, about 9.4% of total range size (O'Donnell 2001).

The low bat activity recorded between the bottom of Morgan Gorge and Macgregor Creek in 2012 indicated that bats were not roosting (or hunting very much) in this area where the valley forest in general is composed of smaller, less suitable roost trees than hill-country forests surrounding and above the Gorge. The river is a single channel for most of this stretch, so probably does not offer as good feeding opportunities as provided by the lower braided river flats. Bats preferentially select large, old trees for their roosts (Griffiths 2007: South Canterbury; Sedgely & O'Donnell 1999: Fiordland) and such trees are relatively uncommon within the Scheme footprint (Arlea 1 & 2), but common outside it. Very few to none of these trees will be affected by the Scheme, therefore risk to bats should be low.

Predation and competition by introduced mammals and vespulid wasps are implicated in the decline of long-tailed bats (O'Donnell et al. 2010). Climate change has also been implicated in

adversely affecting bats (Pryde et al. 2005, Schauber et al. 2008). The long-term survival of long-tailed bats can be enhanced by integrated predator control (O'Donnell et al. 2017).

Some incidental loss of individual birds is likely during tree felling and to a lesser extent by roadkill (except perhaps for weka that are particularly vulnerable to roadkill).

Adverse effects are expected to be **less than minor** at a population level for all bird species. While weka are particularly vulnerable to roadkill and nests could be missed during nest surveillance prior to tree-felling. weka are present relatively widely outside the footprint area.

Extraction of gravels from the dry braided channel of the Waitaha River for access road construction could potentially cause loss of nests and temporary breeding habitat for some riverine birds (e.g oystercatchers, pied stilt and banded dotterel.). However, this adverse effect can be easily mitigated (see **Table 5** and the **AMP)**.

Incidental bird death by electrocution or structure impact are predicted to be **less than minor**. While the proposed mitigation for lighting affecting bat and bird behaviour should result in **less than minor** effects on these faunas both during construction and permanently. Similarly, the effects of noise and vibration are considered **less than minor** on populations of these fauna during construction (dropping to **negligible** during operation).

Given the proposed Scheme's construction design minimising areas of disturbance (**Appendix A**); the bat and bird activity data collected from baseline surveys identifying low numbers of Threatened and At Risk fauna in the main construction area (access and transmission line route – Area 2); the absence of large older trees within the Scheme's footprint and abundance of preferable nesting and roosting trees beyond the Scheme footprint (**Appendix F**) the risk of harm to bats and birds is potentially more than minor pre-mitigation. However, with the recommended mitigation, including following DOC bat protocols for bats and undertaking visual and aural observations of larger trees for birds, etc, adverse effects on these faunas are predicted to be **less than minor**.

'Critical Effects' (**significant effects**) as those effects that potentially could have irreversible or long-term effects on indigenous fauna, particularly threatened fauna, at a population level. Effects assessments indicate no critical effects on birds by the Scheme. The risk of the Scheme having a critical effect on long-tailed bats is very low/unlikely after mitigation. However, because of the difficulty of locating bat roosts such an effect cannot be completely eliminated. Compensation is recommended in the form of a financial contribution for a ten-year period to an ecosystem programme, for example predator control, in the region (such as Zero Invasive Predators) where bat and bird assemblages are similar to those in the Waitaha Valley as a precautionary measure (see **Table 5** and the **BMP**).

5.1.2. Loss of habitat

No large-scale removal of habitat, fragmentation, or disruption to connectivity for terrestrial fauna will occur under the Scheme. The Scheme's footprint is very narrow compared to the ample available habitat for bats and birds surrounding the Scheme. More extensive, and often better habitat for bats and endangered birds (e.g. kea, kākā, kākāriki) is found outside the Scheme's footprint. Fewer 'Threatened' and 'At Risk' bird species were found in the area most affected by construction (Area 2 between the Power Station and Macgregor Creek) than further up the Valley in the vicinity of Morgan Gorge and Kiwi Flat where loss of habitat is minimal and very localised. Bat surveys have also identified low numbers of bats within the main construction areas. Pre-mitigation therefore the impact on bats and birds is likely to be **less than minor**. Large diameter trees and dead standing trees are particularly important as nesting, roosting or food resource for many species of birds and bats (e.g. Leitão et al. 2022; Moreira-Arce et al 2021; O'Donnell & Dilks 1986, 1987), but few of these trees will be removed during construction.

As above, extraction of gravels from the dry braided channel of the Waitaha River for access road construction could potentially cause loss of nests and temporary breeding habitat for some riverine birds (e.g oystercatchers, pied stilt, banded dotterel, paradise shelduck), though this potential effect is very localised and considered to be **nil-negligible** after mitigation. Any uncontrolled fluctuations in river levels (ramping effects) or changes in sedimentation could also potentially affect riverine birds downstream. Downstream effects are

difficult to predict. Without mitigation the effect on riverine birds is potentially more than minor. However, this adverse effect can be mitigated to some extent leading to overall low risk and **less than minor** effects (see **Table 5** and the **AMP**) and Westpower have taken adequate steps to address these concerns (refer **Project Overview Report**).

The Freshwater Ecology Report has some concerns regarding fish strandings in the lower braided mainstem channel during low flow changes caused by planned and emergency shutdowns and suggests monitoring this potential effect during test conditions. This monitoring is supported, including for up-ramping when flows rapidly increase downriver below the Power Station. While fish stranding is clearly an undesired effect, opportunist fish-eating birds would no-doubt benefit. Any change in the aquatic fauna populations downstream of the Power Station caused by the Scheme, particularly within the braided river channel, would have a flow-on effect for bats and riverine birds that feed on this fauna.

Construction and increased vehicle and machinery use can increase the risk of fires, that if become uncontrolled could affect fauna and faunal habitat within and outside the Scheme footprint. Such hazards and appropriate contingencies have been addressed in the **Project Overview Report**.

Therefore, while there will be temporary disruption to some individuals during the construction phase that might result in localised loss of breeding for one or two seasons, this will not impact bats and birds at a population level. Rehabilitation of habitat within parts of the footprint not used permanently will lessen overall effects on terrestrial fauna. This will reduce edge effects that can have an adverse local effect on terrestrial fauna (Norton 2002). Overall, effects of habitat loss for bats and birds by the Scheme is predicted to be **low** (EiANZ) or **less than minor** (RMA) for bats and non-riverine birds and **nil-negligible** for riverine birds post mitigation.

5.1.3. Disturbance to bat commuting routes

Disturbance to long-tailed bat commuting routes could potentially have **more than minor** effects without mitigation. The main part of the Scheme where flight paths of long-tailed bats could be affected is at the Headworks, as the Morgan Gorge is very likely an important route taken between roosts above the gorge and foraging areas downriver. Measures to reduce potential disturbance to bats are however available (see **Table** 5 and the **BMP**) which will reduce these effects to **less than minor** during construction and **negligible** during operations**.**

New forest corridors created by access roads and transmission line routes will likely have a positive effect on bats by creating foraging areas and commuting routes. Acoustic surveys have found high long-tailed bat call rates along roads or tracks passing through forest (O'Donnell 2000b; Brian Lloyd, pers. comm.).

5.2. Other effects on fauna

5.2.1. Road kills

Roadkill effects within the Scheme's footprint are greatest in Area 2 which has the largest area of clearance and disturbance within forest habitat. A much shorter access road between the proposed Headworks and Construction Staging Area 1 is temporary, within the construction phase only and will involve relatively little removal of forest habitat. Roadkill is also a likely consequence along parts of Area 4, particularly within forest or shrub margins. Weka are likely to be the most vulnerable species there.

The extent of roadkill depends on road use (daytime and night traffic) and vehicle speed. The highest risk of birds getting run over will be during the peak construction period when road traffic between the Spoil Disposal Areas and Construction Staging Area 3 and the Power Station Site will be approximately 38 truck movements per day (19 each way). Vehicle movements will generally occur during daytime hours only. A small number of light vehicle movements will occur at night during the tunnelling stage of construction as this is a 24-hour activity.

Western weka, pūkeko, harrier and kererū (all present within the proposed Scheme) are particularly susceptible to road kills. The flightless weka can get confused, running one way then quickly backtracking, when two vehicles are travelling close together or passing. I have seen harrier getting hit by trucks when trying to get uplift from scavenging food on the road. Kererū or pūkeko get killed by swooping across roads in front of moving vehicles. Some crepuscular and nocturnal species like weka and morepork become more vulnerable to roadkill at night or twilight hours. In addition, bats can be vulnerable to roadkill (Borkin et al 2019; Jones et al 2019). Without mitigation vehicle impacts on bats and birds are assessed as being minor – potentially more than minor.

However, as discussed in **Table 5** and the **AMP** measures can be adopted to reduce these effects so that the overall effects on fauna from incidental roadkill along access roads are considered **less than minor** for bats and birds, providing road speeds are imposed and night traffic use is limited.

5.2.2. Noise and vibration

Several overseas studies have shown the negative effects of anthropogenic noise on bats (e.g. Schaub et al 2008; Siemers & Schaub 2011; Jones et al 2019), however fewer studies have been undertaken in New Zealand (Simcock et al 2022). Most of the research has focused on the effects of road noise (mainly highway traffic noise). The impacts of non-traffic noise such as from blasting on New Zealand terrestrial birds are little understood. New Zealand has a wide range of acoustic-reliant fauna, especially birds and bats. Noise has the potential to mask acoustic signals that these faunas rely on to communicate with each other, or to hunt for food.

In a recent study, Hart (2022) found that traffic noise had an adverse effect on New Zealand bird and bat behaviour. Smith et al. (2017) and Borkin et al (2019) also found traffic volumes on highways affected bats. As overnight traffic increased the probability of detecting bats decreased. More research is required to fully understand the mechanisms underlying bat (and bird) response to noise in different environments. River noise is a natural feature of the Waitaha Valley. It is presumed that birds and bats have adapted to river noise in the Valley, but it is not known whether any extra noise such as from traffic or occasional blasting would significantly affect these faunas, though it would likely have localised and temporary effects. Acoustic surveys for bats in 2012 indicated that they foraged for food along the river flats below Morgan Gorge. It is probably unlikely that this activity would be greatly affected by traffic noise, as this would be reduced by the buffering effect of the forest between the river and road. An exception could be the temporary access road to Construction Staging Area 1e where high bat activity was recorded in 2012.

Vehicle noise is likely to have an overall **negligible** effect on terrestrial fauna within the Scheme's footprint. Much less so after the construction period when only one or two vehicles a week are likely to use the access road to the Power Station. Fauna is known to habituate to regular or constant noise or vibration, though this process can be slow (Brown 1990; Manci et al. 1998; Pater et al. 1999).

Less is known of the effects of blasting (noise and vibration) on New Zealand wildlife. Loud noise can cause loss of hearing (temporary or permanent), or behavioural changes, such as aversion to noise (Harbrow et al 2011). Noise fright could cause birds or bats to abandon nests, or fly/run into danger. Blasting also has the potential of killing birds or bats from falling debris, or damaging habitat on a local scale.

While blasting has potentially significant local effects on vertebrate fauna, the effects pre-mitigation are considered to be **potentially more than minor** during construction and **negligible** during operations. With the application of the recommended mitigation the effects on bats and birds are considered to be **less than minor** on a population level during construction and negligible during operations.

The recommendations found in the **Noise Report** are supported, particularly in regard to the effects of blasting, vehicle noise (including helicopters) and siren volumes on wildlife. Refer to Appendix G of the Noise Report for a summary of noise impacts on animals, including a literature review.

5.2.3. Artificial light

Recent research has found that artificial light at night (**ALAN**) is considered to be a growing threat to bats due to potential impacts on circadian cycles, increased predation risk and avoidance behaviour (Schamhart et al 2023). The study concluded that LED floodlights may have a negative effect on the behaviour of long-tailed bats by potentially excluding them from foraging habitat. Reflected light could potentially affect fauna navigation and orientation. If vehicles are used at night, headlights can disturb and alarm wildlife, increasing risk of harm or death.

On the other hand, lights benefit some nocturnal insectivorous fauna such as bats and moreporks by attracting insect prey. For example, long-tailed bats are frequently seen hunting insects around roadside lamps at Pelorus Bridge, Marlborough (Brian Lloyd, pers. comm.).

Lighting should have **negligible** effects on bats and birds within most of the Scheme's footprint post mitigation. Lighting will be very localised and is not proposed along the access road corridor. At the Power Station and Headworks, lighting will be minimal and operated on sensors (for the Power Station Site) or intermittent manual/remote use (for intake site). Furthermore, lighting where it is used will emit no UV and be designed to maximise downward light and avoid any upward light or light scatter (see **Appendix A**). Any adverse effects of lighting will be greatest during construction and lessen considerably during operation such that it has a negligible effect on fauna.

With respect to the impact of lighting on bats at the Headworks, given that the Morgan Gorge is likely to be an important commuting route for bats, without mitigation the impacts of lighting on bats at this area are potentially **more than minor**, reducing to **less than minor** following the application of mitigations and negligible during operation.

5.2.4.Electrocution

The power transmission line has potential effects on bats and birds, though with appropriate management as proposed in the **Project Description** along with additional effects management recommendations these effects are likely to be **negligible**. Transmission line effects include loss of habitat, death or disturbance of fauna during construction, electrocution and collision. New Zealand studies have shown that falcons and other birds are vulnerable to electrocution on power transmission lines (Fox & Wynn 2010; Gaze & Fox 2010). In a radio tracking study of 55 falcons on the Wairau Plain, Marlborough, 47% of 21 falcons whose cause of death was known were electrocuted (Fox & Wynn 2010). These included seven juvenile females, one juvenile male, one adult female, and one adult male. These studies suggested that electrocution might be the single greatest cause of mortality for the New Zealand falcon.

Overseas studies on bird deaths through electrocution are more extensive (e.g. Ferrer & Janss 1999; Lehman et al. 2007). However, power poles can provide some benefit to birds in providing perching and nesting sites (Potapov et al. 2001). It is understood from the **Project Description** that spacing between conductors on the 66 kV poles will be between 2.06 m and 2.67 m, with the shortest distance of 1.82 m (vertical) for the first kilometre from the Power Station switchyard. This should negate any risk of electrocution to birds (greater width than wingspan) such that it is a **negligible** effect.

5.2.5. Structure collisions

It is possible for birds such as falcon, harrier or kererū to be killed by flying into structures they are not used to, or did not see. Windows and glass doors are a particular hazard to birds, but fatalities can be easily reduced by mitigation (see **Table 5** and the **AMP**). It is estimated that several billions of birds worldwide succumb each year from window strikes (Klem et al 2024). Potential new structures associated with the Scheme that could be hazardous to birds (and probably less so for bats) are power poles and lines, and glass windows or doors. Bats are adept at recognising and avoiding obstacles and therefore unlikely to collide with objects like power poles, lines or buildings. However, young bats are less adept for a few weeks after first leaving their maternity roost (Brian Lloyd, pers. comm.).

It is understood that the Power Station will have no windows, but windows are likely for the temporary contractor's facilities in the Construction Staging Area 1 above Morgan Gorge. Overall, however, with mitigation bird-strike is considered to be a **negligible effect**.

5.2.6. Potential downstream and upstream effects on terrestrial fauna

Run-of-river hydro schemes have the potential to affect upstream and downstream fauna. In a global review of small run-of-river hydropower plants, Kuriqi et al (2021) listed the most common impacts as: water depletion downstream of the diversion, water quality deterioration, loss of longitudinal connectivity, habitat degradation and changes in biota composition. The extent of these effects varied between countries and locations. The authors considered that the greatest impacts derived from changes in flow regimes, particularly relating to instantaneous flow discharges through the turbines. They found knowledge gaps regarding potential upstream-downstream impacts from run-of-river schemes, but acknowledged that various mitigation measures to reduce these impacts were being investigated, experimentally tested, or successfully implemented.

Any changes in river flow, sedimentation, or water contamination, etc caused by the Scheme will potentially affect riverine birds and feeding habitat for bats to varying extents. These changes might affect nesting habitat, feeding habitat, or food resource. Adverse effects are potentially greater for river specialists such as whio, grey duck and black shag than other species such as spur-winged plover, white-faced heron and southern black-backed gull that have a more generalist diet and habitat use (see **Table 19**). Effects are likely to be greatest for those species that nest close to the river (e.g. whio, and grey duck if present).

Long-tailed bats could also be potentially affected as baseline surveys found that they appear to feed over the braided river flats in the lower Waitaha Valley (**Appendix E**, Section 2.3.2; Wildlife Surveys 2013). Long-tailed bats are exclusively insectivorous, taking prey on the wing from dusk through the night (O'Donnell 2001). They are often seen flying or foraging before dark. Studies have shown that long-tailed bats eat a large variety of aquatic and terrestrial flying invertebrates, particularly dipterans, coleopterans, and lepidopterans (Gillingham 1996).

Any effects on bat's insectivorous prey species caused by the Scheme might indirectly affect bats, although effects on bats are considered **negligible** and, in any case difficult to measure given other ongoing threats to invertebrates and bats by introduced mammalian predators, climate change, new invasive diseases, etc. Bats might primarily be feeding on flying invertebrates associated with the farm or farm/river edge in the lower reaches of the Valley that is outside the Scheme's footprint and not affected by the Scheme. For example, flight periods of Porina moth (*Wiseana* spp), likely to be an important prey of long-tailed bats, extend over summer on the West Coast (Mansfield 2017), coinciding with long-tailed bat's peak foraging period.

Other technical reports discuss the potential effects of river flow changes, sedimentation and land stability caused by the Scheme (Allen & Hay 2013; Doyle 2013, the **Hydrology Report**, Hicks 2013, the **Sediment Report**), and freshwater ecology that might affect some terrestrial fauna (the **Freshwater Ecology Report**). Having considered these reports it is understood that effects of the Scheme on riverine birds[17] will be **less than minor**, given the design of the Scheme, the short abstraction reach (2.5 km), the relative rarity of sensitive riverine fauna within that reach, the relatively low aquatic faunal productivity in the main stem, the frequent flooding that naturally affect these faunas, and the mitigation proposed.

An initial backwater effect above the weir may cause temporary loss of breeding and feeding habitat for some of these species. However, this upstream effect is localised and short-lived. Similar losses would be expected from normal flood events especially those occurring during the breeding season. Changes in residual flow through the abstraction reach are expected to

[17] Note: whio excluded, refer Overmars (2013, 2025)

have **negligible** effect on riverine birds, particularly fish feeders, due to the relatively low densities and diversity of fish within the abstraction reach (the **Freshwater Ecology Report**).

A greater potential effect (potentially **more than minor** for some species) are predicted fluctuations in flow when generation stops and starts, particularly when the natural river flow is around 15-35 cumecs (the **Hydrology Report**). Without mitigation, these effects will propagate downstream into the braided part of the river below the Power Station, that is presumed important feeding habitat for long-tailed bats and habitat (feeding and possibly nesting) for riverine birds such as oystercatchers, banded dotterels and gulls. The effect of rapidly fluctuating river levels could destroy nests and adversely affect fish and aquatic invertebrate faunas, that in turn could impact on food resources for bats and birds.

However, due to the management of flow during emergency stop and start operations (see **Project Overview Report** and the **Hydrology Report**: **Appendix A**, Section 2) whereby fluctuations in flow will be lessened and decrease with distance from the Power Station, there should be little effect on bird habitats and aquatic invertebrates (important bird prey) within this braided part of the river. Adverse effects are therefore assessed as being **negligible** to **less than minor** for bats and riverine birds (respectively) using the braided riverbed north of Macgregor Creek.

Periods of lower flow than pre-Scheme normal might also affect feeding regimes. For example, the **Freshwater Ecology Report**) states that run-of-the-river schemes can result in fish strandings during rapid flow reductions. While this might temporarily benefit fish-eating birds, it is obviously an adverse effect for fish and ongoing food supply for fish predators. The **Freshwater Ecology Report** recommendation for monitoring these potential effects is supported.

Building up of sediment may restrict breeding and feeding opportunities for riverine birds. However, the **Sediment Report** predicts overall, that the Scheme will have **less than minor** effects on sediment transport and channel characteristics along the Waitaha River below the proposed weir. It is particularly reassuring that the **Sediment Report** anticipates no downstream effects below the proposed Power Station relating to interruptions of sediment transport continuity. This is the section of river that provides important habitat for a range of threatened species including long-tailed bat, oystercatchers, and banded dotterel. The **Sediment Report** refers to possible sand deposition downstream of the Power Station that could affect river-dependent fauna, but these effects are considered **less than minor** after mitigation. Given the **Sediment Report's** conclusions and measures to manage potential ramping effects of river flow (**Flow Modelling Report; Project Description**), flow-on effects for fauna in the braided riverbed of the lower Waitaha River should be **less than minor** to **negligible**.

A potentially **more than minor** adverse effect of transient sediment deposition in the abstraction reach can be mitigated (the **Sediment Report**). This sediment deposition would occur during extended periods when the residual flow is stable. Observations from field surveys indicated that the abstraction reach was infrequently used by riverine fauna, therefore overall effects on them are likely to be **less than minor**.

The permanent loss of riparian habitat will to a minor extent affect riverine birds by reducing opportunity for roosting and breeding. The loss of river or streamside shading might also affect food resource (the **Freshwater Ecology Report**). However, the extent of riparian habitat loss is very low (0.7 ha) and avoids particularly sensitive waterways such as the Stable Tributary. Therefore, overall effects on riverine birds and other terrestrial fauna (birds and bats) from loss of riparian habitat is **negligible**.

The **Freshwater Ecology Report** considers that overall effects on fish and freshwater invertebrates by the Scheme are likely to be less than minor after mitigation. Therefore, it follows, that effects on riverine birds and bats, by way of their food resource, will also be **less than minor**. A direct localised effect on some riverine birds might occur during gravel extraction from the dry, braided part of the Waitaha River (see **Appendix A**), however, this potential effect can easily be mitigated (see **Table 5** and the **AMP**).

As noted in **Appendix D**, specialist river birds, and bats and birds that forage on riverbeds downstream are predicted to be impacted by climate change in the future. Climate change is

predicted to cause greater and more frequent fluctuations of river flow (Robertson et al 2021), with consequential effects on riverine habitat and its food resource.

Effects on specific riverine bird species are found in **Table 19**.

Table 19. Riverine birds recorded in the Waitaha Valley Scheme area and level of potential effect from the Scheme (information after Heather & Robertson 1996)

Species	Nesting habitat	Feeding habit	Level of potential effect
Black shag	Usually in trees or cliffs near water	Mainly small and medium-sized fish, but koura and invertebrates also taken	Negligible (nest high above river and food supply not affected)
White-faced heron	Usually high up trees not necessarily near water	Typically fish, frogs, tadpoles, invertebrates: generalist not necessarily aquatic food	Negligible (nest high above river and food supply not affected)
Paradise shelduck	Riverbed, farm pond etc with open view	Aquatic vegetation. Pasture grass and clover etc.	Negligible (generalist feeders)
Whio	Hollow log, cavity or dense vegetation near stream or river	Almost entirely aquatic insects: predominantly caddis fly larvae	(refer the **Whio Report**)
Grey duck	A bowl of grass generally away from water and up to 10m above ground	Mainly seeds sieved from the water and aquatic vegetation. Ducklings and nesting females take aquatic invertebrates	Negligible (possible temporary effect on nesting birds)
South Is pied oystercatcher	Territorial nesters: on riverbeds or farmland	Mainly molluscs, worms and insect larvae	Negligible (distribution mainly outside affected area)
Spur-winged plover	Generally rough open pasture or wet area but also riverbed	Generalists: earthworms, insects and their larvae but also seeds and leaves	Negligible (generalist feeders and distribution mainly outside affected area)
Black-backed gull	Usually colonial nesters: gravel beaches, coastal, riverbeds	Generalists and opportunists taking a wide variety of food: offal, refuse, carrion, invertebrates, fish, lizards, even birds	Negligible (generalist feeders and distribution mainly outside affected area)
Kingfisher	Hole nesters in rotten tree trucks, knotholes, riverbanks, cliffsides, etc	Small fish, koura, earthworms, large insects, lizards, small birds, mice	Negligible (generalist feeders). Beneficial re feeding on mice
Welcome swallow	Pairs built small mud nest under culverts, bridges, eaves of buildings, or natural sites such as rock or riverbank overhangs	Diet is entirely invertebrates, usually caught on the wing.	Negligible

5.3. Potential effects at different Scheme sites/components

The Scheme consists of a number of components that will affect or potentially affect terrestrial fauna to varying degrees. For convenience, I divide the Scheme footprint into four areas, as previously given in **Appendix F** under Diversity and Viability (2.2.5; see also **Figure 1** in **Appendix A**).

These areas are:

1. Footprint Area 1 - upper footprint area (proposed Headworks infrastructure and temporary Construction Stating Area 1);
2. Footprint Area 2 - middle footprint area between the farm boundary on the true right of Macgregor Creek and the proposed Power Station (vehicle access and transmission line route through DOC land, construction and structures around the proposed Power Station Site including Construction Staging Area 2);
3. Footprint Area 3 - lower footprint area immediately north of Macgregor Creek (Spoil Disposal Areas, Construction Staging Area 3); and,
4. Footprint Area 4 - the transmission line and access road route from Construction Staging Area 3 through private land to SH6, along SH6, Beach Road and Bold Head Road to Waitaha Substation.

In magnitude order of potential effects, each area is summarised below.

Area 2

The greatest loss of habitat and consequently the most individual birds affected will occur along the access road and transmission line corridor within forest habitat between Macgregor Creek and the Power Station.

In contrast, effects on long-tailed bats could be negligible or nil in this area, as surveys in 2012 indicated low numbers of bats in this area with bats present only near river and stream margins in this area (Wildlife Surveys 2013). The forest within this area has few large-diameter trees or trees showing typical bat roost characteristics, meanwhile there is an abundance of preferential roosting trees beyond the footprint of Area 2. Therefore, bats are unlikely to be roosting or breeding in this area.

The main effect on these fauna in Area 2 will be from the vegetation clearance required along the proposed vehicle access road and transmission line route which, amounts to around 2/3 the footprint area affected within conservation land. This area also includes the Power Station, outtake portal and associated structures, mainly situated on a river terrace that is located below Morgan Gorge. Area 2 has less overall value for threatened species than Area 1. Overall effects by the Scheme on fauna in Area 2 are considered likely to be **less than minor** after mitigation.

For birds (and less likely for bats as noted above) incidental direct loss or disturbance during tree felling might affect breeding and food resource, or cause territory displacement with its own suite of disturbances. Lesser effects will be from roadkill (both during construction and operation), noise and lighting (though it is understood there will be no permanent road lighting) and possible electrocution or collision impact regarding the transmission line. All such effects can however be adequately mitigated: see **Table 5** and the **AMP**).

Area 1

While potential effects might be greater in terms of extent of habitat affected and individual numbers in Area 2, effects in Area 1 might have more significance because ‘Threatened’ or ‘At Risk’ indigenous fauna are more represented in Area 1 than the other areas (e.g. long-tailed bat and birds listed below). Bird survey data since 2006 have shown the following species to be more represented (or only recorded) in Area 1 than other areas. These are grey duck (‘Nationally Vulnerable’), South Island kākā (‘Nationally Vulnerable’), kākāriki (‘At Risk: Declining’), South Island robin (‘At Risk: Declining’), South Island rifleman (‘Not Threatened’, but tending toward decline) and brown creeper (‘Not Threatened’, but the main host species for the threatened long-tailed cuckoo).

Overall, given that the amount of significant fauna habitat affected in Area 1 is extremely small (given most of the footprint there is underground), pre-mitigation the effects on fauna

are considered **negligible** in regard of habitat loss, but potentially **more than minor** in regard to noise and lighting (see Section 3.2.2 & 3.2.3). Noise in particular could have direct effects on fauna (e.g. hearing loss from blasting), or affect breeding success. Both noise and lighting could have potential effects on long-tailed bat commuting routes which are very likely using the Morgan Gorge as a commuting route. However, overall effects on terrestrial fauna in this area are considered **less than minor** after mitigation.

Areas 3 & 4

Potential effects on roosting bat habitat and forest birds will be **nil** to **negligible** within Area 3 and 4 that are predominantly within private farmland and road reserve that has no continuous forest component.

The threat of electrocution or collision with power poles/lines is considered **negligible** (see Section 3.2.4**)** as measures outlined in the project description greatly reduce this risk (**Appendix A,** Section 2). It is noted that birds might be largely habituated to power poles that are already present in the area, and that poles are used by many birds for perching.

Survey data (2012) indicates that riparian areas around Macgregor Creek and the main stem below it (Area 3) provides important foraging sites for bats. While most of this area lies outside the Scheme's footprint, minimising construction at Area 3 and parts of Area 4 near Macgregor Creek between dusk and dawn would reduce any potential impact on bats.

Pre- mitigation downstream effects of the Scheme during operation (particularly regarding the ramping effect that run-of-river hydro schemes can have on river flows) on riverine birds could be **more than minor**, but the proposed mitigation to manage potential downstream effects (inclusion of the bypass valve, will reduce the effect on riverine birds to **less than minor (**see Flow Modelling Report; **Project Description**)**.** To the extent that bats are affected by these downstream effects, with mitigation, the impact is considered **negligible.** Downstream effects are discussed in more detail in Section 3.2.6 above.

The effects for various components of the proposed Scheme are discussed in more detail below.

5.3.1. Transmission Line route from SH6 to North Bank Macgregor Creek (Area 4 and partly Area 3)

The route of the proposed transmission line is across farmland and road reserve outside any reserve or forested area. While parts of this area have been casually viewed, no fauna surveys have been carried out there. The route is well clear of river or riparian habitats, forest areas and wetlands, therefore has little significance for terrestrial birds or bats. Bats were detected within 2 km of this area during surveys in 2012 (Wildlife Surveys 2013).

Indigenous bird species known to be present in the general area are falcon, harrier hawk, kea, black shag, paradise shelduck, oystercatchers, southern black-backed gull, mallard duck, pūkeko, spur-winged plover and weka. Electrocution or impact collisions could impact some birds (e.g. birds such as black-backed gulls or harrier) but effects are likely to be **negligible**, particularly after birds become used to the new structures. As referred to above, transmission lines are well-established along or near the highway and along Waitaha Road. Increased traffic during construction will increase the risk of incidental roadkill, but the overall effect is considered **less than minor**.

5.3.2. Construction Staging Area 3 and Spoil Disposal Areas (Area 3)

The footprint in this area consists of Construction Staging Area 3 and the Spoil Disposal Areas, all on farmland close to Macgregor Creek (Figure 1, **Appendix A**). The area will involve a moderate use of heavy vehicles during the construction phase, but will be converted to farmland once the Scheme is operating. The only potential concerns for terrestrial fauna in this area are for long-tailed bats and birds such as kea, falcon and weka that are present in the area (Wildlife Surveys 2013). It is presumed that Macgregor Creek and riparian/forest edge vegetation on each side provide a food resource for these faunas.

The transmission line at Macgregor Creek (linking Areas 2 and 4, but close to Area 3) is planned to span the relatively wide creek bed without supporting poles and rejoin the access

road a short distance on the true left of Macgregor Creek. The line could pose a minor risk to bird collision at the point of crossing, although it will be visibly marked for health and safety reasons (i.e. visible to helicopters) (see **Project Description**).

While there are **negligible** effects on faunal habitats by the Scheme in this area, mitigation can help reduce the effects of incidental roadkill, construction noise and lighting and electrocution, etc (see **Table 5** the **BMP** and the **AMP**).

5.3.3. Access road and Transmission line from the farm boundary on true right of Macgregor Creek to proposed Power Station (Area 2)

The main consideration involves a c.15m wide operational corridor through DOC land from Macgregor Creek to the Power Station (corridor is 17.5m wide during construction). The corridor through the DOC estate will affect approximately 4.1 ha (during construction) and 3.5 ha (permanent) of indigenous vegetation (mainly forest habitat) as tabled in the **Terrestrial Flora Report**. Mostly, the transmission line is planned to run in parallel with the proposed access road, but there are places where this cannot be attained because of large tree avoidance or topographical constraints (in which case the road and line corridor will each be up to 10m wide). One section where the access road follows a different route to the transmission line is a section on the true left of Macgregor Creek. This short section of the transmission line is intended to depart the access road at a point on the true-left of Macgregor Creek, to another point higher on the hill foot-slope adjacent Macgregor Creek (both points to be determined in subsequent final Scheme design phase). The objective of this is to utilise height for placement of a double pole on the hill foot-slope to increase line span and avoid having any pole(s) in the Macgregor Creek bed/outwash fan.

The most likely vegetation types affected in this part of the footprint is given in Table 14 (Appendix F) of the **Terrestrial Flora Report**). A small part of this footprint (0.3 ha) is designated as riparian, but this does not necessarily mean different vegetation from adjacent non-riparian vegetation. However, clearance of vegetation along riparian areas will have some potential effects on species such as weka, tomtits and fantails that commonly forage on the riverbank edges, or use these edges for shelter. Construction near the riverbank might also increase the potential of erosion/slips/wind exposure causing further loss of habitat. One area where these effects could apply is within the proposed flood protection plans for Alpha Creek (see **Appendix A**).

Some of the vegetation proximal to the access road and transmission line is designated wetland (the **Terrestrial Flora Report**), but these areas are isolated and very small and are avoided by the proposed infrastructure alignment, that includes a buffer for these minor wetland zones. This type of wetland probably does not support fauna assemblages different from surrounding non-wetland forest areas. However, waterfowl such as grey duck (‘Nationally Vulnerable’) and black shag (‘At Risk: Relict’) could occupy or visit small streams and pools within the footprint.

Most of the area required for road/transmission line construction will need to be permanently removed of vegetation to allow continued access for facility inspection and maintenance. For safety and regulatory purposes, regenerating vegetation will need to be periodically trimmed to a required height below transmission lines (a minimum of 4 m clearance between vegetation and conductors in accordance with the Electrical (Hazards from Trees) Regulations 2003).

Roads have a broad range of adverse effects on terrestrial fauna: e.g. direct mortality from road construction and vehicle roadkill, fragmenting habitats, vehicle noise, micro-climate effects, invasion of weeds, leakage of chemicals and hydrological changes, etc. (Simcock et al 2022; Trombulak & Frissell 2000). Some effects are more or less contained within the corridor footprint while other effects can permeate for hundreds of metres outside it. Further information on some of these effects not directly related to habitat removal or fragmentation is given in Section 3.2 above.

Weka are particularly vulnerable to being run over by vehicles (e.g. Freeman 2010) and kererū can swoop low and be hit by vehicles (e.g. Clout et al. 1995). Also, long-tailed bats can be vulnerable to roadkill (Borkin et al 2019; Jones et al 2019). Although overall road effects by the Scheme are considered **less than minor** on a population level for terrestrial fauna,

effects are greatest during the construction period when traffic load is heavier and more frequent. Effects from roads on birds are likely to be greatest during the breeding season. Fragmentation of forest habitat will affect fauna by disrupting dispersal between patches, potentially affecting biological diversity. Roads also promote the spread of weeds and could affect waterways by chemical spillages and erosion effects. Roads could potentially enhance the risk of invasion by pests. However, there is scant evidence of introduced small mammals using roads and pathways to access forest (Dilks et al. 1996; Moller 1999). During seasons where food is abundant, these small mammals are already at carrying capacity irrespective of road or pathway access into the forest. Moreover, regarding the proposed access road to the Power Station, the riverbed provides a natural pathway to mammals and birds. I have seen stoat, possum, deer and weka footprints along sandy parts of the riverbed.

While there are some beneficial effects of roads, detrimental effects on fauna far outweighs beneficial effects (Simcock et al 2022; Spellerberg & Morrison 1998). However, the relatively narrow roads (<20m wide including transmission line footprint) proposed by the Scheme over a relatively short distance within forest habitat (c. 1.6 km) will not be significant barriers to bird dispersal. Most New Zealand indigenous birds can fly across gaps < c. 100 m (Simcock et al 2022). Beneficial effects of roads include cost-effective predator control access and creating forest edges that benefit insectivorous bats and birds (Moller 1999).

As most passerines have territories ≥ 1 hectare, the relatively narrow access road/transmission line footprint (average 17.5 m wide during construction) is unlikely to cause more than a temporary disruption to territory holders during the construction phase. However, those birds forced to leave parts of their territory may well be subject to conflicts from neighbouring birds. This could lead to fights causing injury or death. It is difficult to quantitate numbers of birds likely to be affected, but overall loss, particularly at a population scale, is likely to be **less than minor** given the very large surrounding areas of unaffected forest.

Anthropogenic noise is known to affect birds living near construction areas, or in roadside habitats (e.g. Ortega 2012; Parris & Schneider 2008). Bird response to noise tends to focus on avoidance of noise, changes in foraging and other behaviour, including vocal communication, changes in reproductive success, and stress responses.

All this aside, the risks to bats are likely to be **low** along this route, and effects likely **negligible** or **nil** in this area because during the 2012 surveys very few bat pass encounters were recorded between Morgan Gorge and Macgregor Creek, with nearly all records along riparian margins. In other words, there were low numbers of bats in this area. (Figure 28, **Appendix E;** Wildlife Surveys 2013). It is perhaps unsurprising that bat activity was rarely detected along the proposed access road and transmission corridor in 2012, as big, old trees are uncommon there and preferable bat roosting habitat is abundant outside of the Scheme footprint and more likely foraging areas would be along the riparian margins. Larger trees are dominated by kamahi that are generally not preferred bat roost trees as they have fewer crevices, holes, flaking bark and other characteristic bat roost features. Following the DOC bat protocol, the Bat Management Plan (**BMP**) and recommended mitigation (see **Table 5**) will reduce even further the effects on long-tailed bats should they be roosting along this part of the footprint at the time of construction (see **Table 5**).

Potential adverse effects on ‘Threatened’ and ‘At Risk’ birds along the proposed vehicle access and transmission line route are predicted to be **less than minor**, as few threatened species were encountered in this area (kea, long-tailed cuckoo and possibly black shag along waterways) and most other species are widely represented. An exception might be weka (not threatened but possibly genetically distinct) that seem to have a relatively limited distribution in the Waitaha Valley. Their ground-living habits make them more prone to harm from construction and road use. However, overall effects are unlikely to significantly alter the weka population in the Valley. Therefore, effects of the Scheme on weka are assessed as **less than minor**.

Potential adverse effects on birds of habitat removal within the access and transmission line route will include loss of nests and consequent lower breeding success. The effect on breeding would be greatest if construction is carried out during the peak breeding season for most birds, being spring and early summer. This does not mean that habitat removal outside the peak breeding would have no effects on breeding birds, as some birds such as weka,

kākāriki and kererū can breed almost throughout the year, even during winter months, if there is sufficient food. Mitigation is therefore recommended to avoid felling during the peak breeding season. Otherwise, one way to reduce effects on birds during the peak breeding season is to begin construction in early spring before most breeding begins where practicable. The footprint corridor is very narrow and there is abundant nesting habitat outside it. Most birds would shy away from construction activity and chose nest sites well away from it, thereby largely avoiding adverse effects by construction during breeding (see **Table 5** and the **AMP**). Other mitigation such as undertaking acoustic surveys and visual inspections of larger trees to ensure there are no nesting threatened birds (or other birds of conservation importance) when felling trees will also reduce the potential impact on birds (see **Table 5** and the **AMP**).

There are relatively few emergent or mature podocarp trees along the proposed road/transmission line route (**Terrestrial Flora Report**). Podocarps are disproportionately important to bats and many species of birds, as they provide abundant nesting sites for hole-nesting birds and bats, and are important fruit providers for a range of birds including kākā, kākāriki and kererū. Podocarps, having abundant crevices and loose bark are also favoured by insectivorous birds. Therefore, in addition to the mitigation discussed above, Westpower proposes to minimise felling the largest podocarps and a significant proportion of other large-diameter trees when constructing the access road.

Therefore, considering matters discussed above, overall effects on terrestrial indigenous fauna along the road access and transmission line routes are predicted to be **less than minor**, after mitigation.

5.3.4. Power Station, switchyard, tailrace other structures including cliff face stabilisation and vehicle parking/ access (Area 2)

The infrastructure components will affect approximately 1.4 ha of indigenous vegetation during construction and 0.67 ha permanent. Construction will likely affect a small area of vegetation outside the structure footprint, but the **Terrestrial Flora Report** considers vegetation effects in this area to be **negligible**.

Similarly, effects on fauna (bats and birds) are considered likely to be **less than minor,** because most of the Power Station and associated structures are outside forest habitat and not generally occupied by bats and forest birds. Exceptions are kea (‘Nationally Endangered’ and weka (‘Not Threatened’ but potentially a rare variety), that are both curious birds that occupy a range of habitats including forest and open areas. Providing care is taken not to harm, disturb or feed these birds, adverse effects on them should be **less than minor**. Forest edge species such as bellbird, fantail, grey warbler and tomtit are likely to be present in the vicinity of the site, but unlikely to be greatly affected by this development long term. Pipits (‘At Risk: Declining’) may occasionally visit this part of the river terrace, though they have not been recorded there on field surveys (Wildlife Surveys 2013; 2024).

Fuels if stored at the site could pose a risk of fire. Fire could be devastating on wildlife if it was to spread into shrub and forest habitat on the river flat, or into extensive areas of taller forest above the escarpment. However, various mitigation measures are available to ensure that such an event is very unlikely (see **Table 5**, the **BMP,** the **AMP** and **Project Overview Report**).

5.3.5. Headworks (Area 1)

Construction related to tree-felling at the Headworks is expected to have **less than minor** effects on forest bird habitat due to minimum habitat loss, particularly if the larger trees and broadleaf trees in the area are retained as recommended. The total areas of indigenous vegetation potentially affected at Area 1 are 1.01 ha during construction reducing to 0.13 ha permanent (**Terrestrial Flora Report**). The largest area affected there is Construction Staging Area 1 and the road accessing it (0.8 ha during construction regenerating after construction to zero ha permanent). Noise and vibration have potentially **more than minor** effects in this area, but are largely localised and temporary. The tall, dense forest above the Headworks and the river noise around the top of Morgan Gorge will to a certain extent buffer construction noise. After mitigation, adverse effects on birds (at a population level) should be

less than minor during construction, and **negligible** after construction (impacts on whio are covered separately in the **Whio Report**).

There is a potential for **more than minor** effects on bats from noise, vibration and lighting at the Headworks without mitigation. It is highly likely that long-tailed bats use the Morgan Gorge as a commuting route between their roosts at Kiwi Flat or further upriver to feeding areas downriver. However, it is unlikely that bats would be significantly deterred by construction activity and noise, but instead find an alternative route from Kiwi Flat to foraging areas in the lower river to avoid temporary obstructions. While some disruption might be unavoidable during construction, with mitigation imposed potential effects on bats will lessen **less than minor** during construction and **negligible** when the Scheme is operating. See **Table 5**, the **BMP** and the **AMP** for recommended mitigation to reduce disruption to bats and birds at the Headworks.

Affected vegetation at the Headworks (Area 1) occupies approximately 1 ha, comprising Vegetation Types 1/1, 1/2 and 1/3 (refer **Terrestrial Flora Report** and definitions from this report below). Most of this area will be left to naturally regenerate after construction leaving c. 0.13 ha permanently affected. Vegetation Type 1/2 will be the most affected where c. 0.9 ha will be affected. Mature tall forest will be minimally affected, if at all.

I refer to the **Terrestrial Flora Report** vegetation type descriptions relating to the Headworks:

Vegetation Type 1/1: Forest margin/riparian mixed ground cover and shrub hardwood.

Vegetation Type 1/2: regenerating hardwood shrub/tree mix with low podocarp element. Canopy height is 6-8 metres with broadleaf (*Griselinia littoralis*) being particularly frequent.

Vegetation Type 1/3: mature podocarp/hardwood hill forest. Canopy emergents are principally rimu (*Dacrydium cupressinum*) with Hall's totara (*Podocarpus laetus*), miro (*Prumnopitys ferruginea*), rata (*Metrosideros umbellata*) and occasional NZ cedar (*Libocedrus bidwillii*) also present. On the steep faces above Morgan Gorge the podocarps are either absent or uncommon and a hardwood canopy prevails: notably kamahi (*Weinmannia racemosa*), *Quintinnia serrata* and rata.

From this description, the construction of the Headworks could require the removal of some potential bat roost trees (≥15 cm dbh). However, by following the DOC bat roost protocol, there is a very low risk of harming bats (see **Table 5** and the **BMP**). Construction might affect the potential use of the Morgan Gorge as a commuting route for bats, though bats are likely to find alternative routes, and any adverse effects on them are likely to be temporary.

Overall effects on bats and birds after mitigation are predicted to be **less than minor** during construction and **negligible** during operation.

5.3.6. Road access to Construction Staging Area 1 (Area 1)

The exact route of this temporary c.9m average wide, 140m long road is yet to be determined, but given the limited area within which the road can be located, irrespective of the final location it is likely to mainly affect low shrub riparian vegetation (Vegetation Type 1/2 and 1/4). The road is required only during the period of construction and after use will naturally regenerate, but be supplemented with planting if required (refer **Table 5**, and the **Terrestrial Flora Report**).

This road access is considered to have **negligible** effects on terrestrial fauna (bats and birds) providing it avoids, where practicable, taller vegetation further away from the river as recommended. If this vegetation cannot be left for practicable reasons, then the DOC bat roost protocol and bird nest inspections will need to be carried out to ensure **less than minor** effects on terrestrial fauna.

5.3.7. Construction Staging Area (Area 1)

The development of this area is also temporary during the construction phase. It involves removal of Vegetation Type 1/4 situated on a fairly flat and expansive relatively recent alluvial terrace. Approximately 0.7 ha will be affected.

The area comprises very dense shrubland with occasional emergent *Griselinia littoralis*. Notable species present are *Olearia ilicifolia*, *Pseudopanax anomalus*, *Carmichaelia arborea*, *Myrsine divaricata* and several *Coprosma* species (**Terrestrial Flora Report**).

While removal of part of this habitat will have some adverse effects on birds and possibly bats, these effects are considered to be **less than minor**.

The proposed staging area has few trees with dbh ≥15 cm (mainly low stature, but mature *Griselinia littoralis*), these are significant because bats or hole-nesting birds could be using them. The bat protocol will need to be employed before felling these trees. Only very few emergent broadleaf trees within the proposed facilities area were noted and it is recommended these are retained where practicable during construction to reduce the risk of harming fauna (see **Table 5** and the **BMP**).

Some birds could be incidentally killed by construction and displaced from their territories. Several individuals of various species of common birds would be expected to be incidentally lost during construction. Weka have been recorded in this area and are potentially vulnerable to construction.

Bird species of most potential concern in this area are the threatened long-tailed cuckoo and also non-threatened birds such as weka, and possibly kererū depending on season and available foods. The dense shrubs provide ideal habitat for brown creeper, the most favoured species chosen by the nest parasitic long-tailed cuckoo. It would be expected, after construction finishes, that regrowth over the area would be rapid, given the wet climate and humidity during summer.

The overall effect on fauna in this area is considered likely to be **less than minor** providing the recommended mitigation is carried out.

5.3.8.Proposed drilling sites (between Areas 1 and 2)

There will be one heli-drill horizontal bore at the Headworks, two (or possibly three) heli-drill sites on the hill above and in the vicinity of the Headworks, one heli-drill site on the terrace above the Power Station and one heli-drill site at the Power Station site (refer **Project Description**).

These drilling sites are required during the construction of the tunnels, thereby affecting tall podocarp/hardwood forest habitat. It is understood that each drill site will require a clearance of c. 10m x 12m. Although these are very small disturbed areas, effects on fauna will depend on the number of drill sites, exact locations and whether larger diameter trees (especially podocarps) can be avoided (or not). However, it is understood that there can be flexibility in choosing borehole sites to avoid the need to removing large-diameter trees. Further if the trees cannot be avoided the bat protocol and similar measures in relation to bird nests will need to be complied with. Noise and vibration will also affect wildlife, but this is localised and of relatively short duration. The overall effects of borehole drilling on fauna would be **negligible** providing appropriate mitigation measures are taken as recommended.

5.3.9. Other relatively minor construction sites

During construction and pre-construction there will be other small areas of disturbance including helipads (10 x 12m), two campsites and laydown areas (10 x 10m; 3 x 4m, respectively) including portable toilets (3 x 3m), possibly an emergency hut (3 x 4m) and pump sites (3 x 3m), etc. The effects of these small constructions on terrestrial fauna will be **negligible** providing the sites are inspected before any vegetation removal.

5.4. Conclusion

Providing the recommended mitigation is carried out (see **Table 5,** the **BMP** and the **AMP**) it is considered that effects on the values of significance for terrestrial fauna within the Waitaha Valley (**Table 15**) would be **less than minor.**

While the risk to bat colonies is considered **low/unlikely**, any loss of colonies or maternity roosts would be regarded as **significant**. Therefore, a funding contribution is recommended as a precautionary measure (refer to **Table 5**).

These conclusions are based on:

- the small size of the Scheme's footprint within conservation land (approximately 6.6 ha) during construction compared to the extensive unmodified ecosystems in the surrounding area that provide abundant preferable habitat and avoidance of effects on the most significant habitat, particularly through the use of a tunnel;
- its avoidance (or near avoidance) so far as reasonably practicable of removing or modifying key significant habitat for fauna particularly large diameter hardwoods (≥60 cm dbh) or podocarps (≥30 cm dbh);
- surveys of bat and terrestrial bird distribution and population data derived from baseline surveys (2006/07, 2012 and 2024) which indicate relatively low numbers of threatened bats and birds in the Scheme footprint; and,
- bats were rarely detected within the proposed access road/transmission line corridor between Macgregor Creek and the Power Station with small numbers of passes being recorded at riparian margins that are largely avoided during construction;
- the mitigation proposed both by Westpower and in this report such as:
    - implementing and complying with the **DOC Bat Roost Protocol, BMP** and the **AMP**;
    - minimising and managing construction (particularly tree-felling) before the bat and bird peak breeding season (November to January) to encourage the use of roosts and nests outside the footprint area; and, compensating for any potential loss of bats or indigenous birds by contributing to an ecosystem programme, for example predator control, in the region (such as Zero Invasive Predators).

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APPENDIX J: SCIENTIFIC AND MAORI NAMES OF BIRDS REFERRED TO IN DOCUMENT (AFTER GILL *ET AL*. 2010)

Common Name	Latin Name	Māori Name
Great spotted kiwi*	*Apteryx haastii*	Roroa
Canada goose	*Branta Canadensis maxima*	
Paradise shelduck	*Tadorna variegata*	Pūtangitangi
Blue duck	*Hymenolaimus malacorhynchos*	Whio
Mallard*	*Anas p. platyrhynchos*	
Grey duck	*Anas superciliosa*	Pārera
Black shag	*Phalacrocorax carbo novaehollandiae*	Māpunga
Little shag*	*Phalacrocorax melanoleucos brevirostris*	Kawaupaka
White-faced heron	*Egretta n. novaehollandiae*	Matuku moana
Swamp harrier	*Circus approximans*	Kāhu
New Zealand falcon	*Falco novaeseelandiae*	Karearea
Banded dotterel*	*Charadrius b. bicinctus*	Pohowera
Western weka	*Gallirallus a. australis*	Weka
Pukeko	*Porphyrio m. melanotus*	Pūkeko
S.I. pied oystercatcher	*Haematopus finschi*	Tōrea
Variable oystercatcher*	*Haematopus unicolor*	Tōrea pango
Pied stilt*	*Himantopus himantopus leucocephalus*	Poaka
Spur-winged plover	*Vanellus miles novaehollandiae*	
Southern black-backed gull	*Larus d. dominicanus*	Karoro
New Zealand pigeon	*Hemiphaga novaeseelandiae*	Kererū
South Island kaka	*Nestor m. meridionalis*	Kākā
Kea	*Nestor notabilis*	Kea
Yellow-crowned parakeet	*Cyanoramphus auriceps*	Kākāriki
Shining cuckoo	*Chrysococcyx l. lucidus*	Pīpīwharauroa
Long-tailed cuckoo	*Eudynamys taitensis*	Koekoeā
Morepork	*Ninox n. novaeseelandiae*	Ruru
Little owl	*Athene noctua*	
New Zealand kingfisher	*Todiramphus sanctus vagans*	Kōtare
South Island rifleman	*Acanthisitta chloris chloris*	Tītitipounamu
Common Name	Latin Name	Māori Name
South Island kokako*	*Callaeas cinerea*	Kōkā

Grey warbler	*Gerygone igata*	Riroriro
Bellbird	*Anthornis m. melanura*	Korimako
Tui	*Prosthemadera n. novaeseelandiae*	Tūī
Yellowhead*	*Mohoua ochrocephala*	Mohua
Brown creeper	*Mohoua novaeseelandiae*	Pīpīpi
South Island fantail	*Rhipidura f. fuliginosa*	Pīwakawaka
South Island tomtit	*Petroica m. macrocephala*	Miromiro
South Island robin	*Petroica a. australis*	Toutouwai
South Island fernbird	*Bowdleria p. punctata*	Mātātā
Silvereye	*Zosterops l. lateralis*	Tautau
Welcome swallow	*Hirundo n. neoxena*	Warou
New Zealand pipit	*Anthus n. novaeseelandiae*	Pihoihoi
Introduced passerines		
Australian magpie	*Gymnorhina tibicen*	
Eurasian blackbird	*Turdus merula merula*	
Song thrush	*Turdus philomelos*	
Chaffinch	*Fringilla coelebs*	
European greenfinch	*Carduelis chloris*	
European goldfinch	*Carduelis carduelis britannica*	
Common redpoll	*Carduelis flammea*	
Yellowhammer	*Emberiza citrinella*	

* Not recorded on any survey since 2006. Colin O'Donnell recorded variable oystercatcher, pied stilt and banded dotterel along the braided riverbed below the proposed footprint in 2016.

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