



Bendigo-Ophir Gold Project

Avifauna Values Assessment

Report prepared for

Matakanui Gold Ltd

Prepared by

RMA Ecology Ltd

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The author of this report acknowledges that this report will be relied upon by a Panel appointed under the Fast Track Approvals Act 2024, and these disclaimers do not prevent that reliance.

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List of abbreviations

Abbreviation	Term	Description
AEE	Assessment of Environmental Effects	Report produced that identifies environmental effects and lays out approaches and mechanisms for addressing effects.
BOGP	Bendigo-Ophir Gold Project	Is the topic of this resource consent application and covers approximately 550 ha.
CIT	Come In Time	One of the open cut pits proposed for this project
CODC	Central Otago District Council	
CODP	Central Otago District Plan	
DDF	Direct Disturbance Footprint	Approximately 610.6 ha area of land within the ESA covering BOGP gold mining and ancillary activity areas that cause direct habitat loss through vegetation clearance and/or earthworks. Includes Thomson Gorge Road realignment footprint, and buffers which vary from 0-50 m in width for different component parts. As per the collated mine footprint shapefile provided to RMA ecology on 25 October 2024, and subsequent Thomson Gorge Road realignment footprint.
DOC	Department of Conservation	
ED	Ecological District	A local part of New Zealand where the topographical, geological, climatic, soil and biological features, including the broad cultural pattern, produce a characteristic landscape and range of biological communities.
ESA	Ecological study area	Approximately 5,000 ha area of land composed of a mix of grazing lands, and Crown land. For the purpose of this report, it is further divided into DDF and SL areas.
ELF	Engineered Landform	Land that has been modified by anthropogenic means.
EPA	Environmental Protection Authority	New Zealand government agency responsible for regulating activities within the country that affect the environment.
GLM	Generalized linear model	Statistical model used to analyse complex data.
LCDB	Land Cover Database	A multi-temporal, thematic classification of New Zealand's land cover.
MEP	Minerals Exploration Permit	MEP60311 is named Bendigo Ophir to indicate the exploration permit extends from the historic town of Bendigo to Ophir, with an area of 251 km ² (or 25,162 ha).
MGL	Matakanui Gold Limited	New Zealand company wholly owned subsidiary of Santana Minerals Ltd.
MPP	Minerals Prospecting Permit	
MRE	Mineral Resource Estimation	Evaluation estimating the grade and tonnage of an ore in a deposit.
NES Freshwater	Resource Management (National Environmental Standards for Freshwater) Regulations 2020	
NPS-IB	National Policy Statement for Indigenous Biodiversity 2023	
NZTCS	New Zealand Threat Classification System	System used within New Zealand to assess the conservation status of species.
OSNZ	Ornithological Society of New Zealand	
ORC	Otago Regional Council	
RAS	Rise and Shine	Area of land with gold resource containing a MRE (2024) of 2,217,000oz of gold at a grade of 2.3g/t.
RMA	Resource Management Act	Resource Management Act 1991.

Abbreviation	Term	Description
RPS	Regional Policy Statement	
SRX	Srex	Area of land with gold resource containing a MRE (2021) of 174,000oz of gold at a grade of 1.1g/t.
SRE	Srex East	Area of land with gold resource containing a MRE (2021) of 11,000oz of gold at a grade of 1.3g/t.
ELF	Engineered Landform	
SL	Surrounding Landscape	Area within the ESA that is not part of the DDF.
TAR species	Threatened and At Risk species	Species recorded in national or regional (Otago) Conservation Threat Status lists as being Threatened or At Risk.
TSF	Tailings Storage Facility	Engineered structures designed and constructed to hold mineral waste (tailings) generated after the gold has been recovered at the processing plant.
5MBC	Five-minute bird count	A standard method of recording birds, used in New Zealand.

Executive summary

This document presents a comprehensive avifauna survey throughout the Bendigo-Ophir Gold Project (BOGP) Ecological Study Area (ESA), which will inform the project's Assessment of Environmental Effects (AEE) to be reported separately. It establishes a comprehensive baseline of the avifauna within the ESA. Results demonstrate the area's avifauna and emphasise the importance of thoughtfully addressing potential consequences of planned mining operations.

Of note, no desktop records of Threatened or At Risk species are located in the Direct Disturbance Footprint (DDF); however, the site investigations for this project found 11 native species, one nationally Threatened species (New Zealand falcon) and two nationally At Risk species (New Zealand pipit and black shag) within the DDF.

The information contained herein informs the AEE and will guide the implementation of an effective avifauna management framework at the site. The consideration of potential adverse effects on avifauna values and their management are addressed in the Ecological Effects Assessment prepared by Alliance Ecology Ltd.

Key findings from this report include the following:

- During general and targeted field surveys during 2023 and 2024, 30 bird species were detected within the DDF, including 11 native species, one nationally Threatened species (New Zealand falcon) and two nationally At Risk species (New Zealand pipit and black shag).
- An additional five nationally or regionally Threatened or At Risk bird species were recorded or are likely to be present as residents or as occasional visitors (silveryeye, South Island pied oystercatcher, little shag, black-billed gull and black-fronted tern). Three of those species are associated with braided riverbeds and occasionally feed in cultivated fields.
- In five-minute bird counts, exotic birds dominate in terms of species richness and abundance, in both the DDF and SL. Finches were most abundant.
- There is no significant difference in the abundance and species richness of native birds in the DDF compared to the SL.
- Overall, woody vegetation supported the highest numbers of native birds, particularly grey warbler, silveryeye and fantail. Pipit were detected in exotic grassland, native tussock land and mixed grass/tussock/shrubland.
- No wetland birds were detected in the DDF or SL. Wetland habitat is of low-moderate quality, due to lack of shallow water and lack of tall vegetation during the breeding season caused by seasonal die-off and stock grazing.
- On the two small waterbodies in the DDF, two native duck species were detected, both Not Threatened. Their ecological value is low. The ecological value of the two waterbodies in the DDF is moderate, due to capacity to provide occasional habitat for black shag (one seen flying over the DDF) and little shag (present in the wider area).
- New Zealand falcon (Threatened – Nationally Vulnerable) are confirmed present in the DDF, with at least one pair likely nesting at the margin of the DDF in Shepherds Valley. They are very high ecological value, as are the rock outcrop habitats where they nest.

- Black fronted terns (Threatened – Nationally Endangered) are present on the Clutha River and are likely to visit the cultivated fields on the Ardgour terraces on occasion. They are very high ecological value. Another braided river bird, South Island pied oystercatchers (At Risk – Declining) were detected on several occasions in the cultivated fields, and black-billed gull (At Risk – Declining) are also likely to visit the cultivated fields on occasion. Both are high ecological value.
- New Zealand pipit (At Risk – Declining) are dispersed throughout the DDF and SL, and are high ecological value.
- Of avifauna species present or likely to be present in the DDF, four avifauna species are of very high ecological value, two are of high value, two are moderate-high, and one is moderate, with the remainder being of low ecological value.

Potential effects of the Project on avifauna include direct effects such as habitat loss, nest mortality or bird strike in the DDF, and indirect effects outside the DDF relating primarily to disturbance which may be caused by blasting noise and lighting.

These potential effects will be addressed in the Assessment of Ecological Effects report prepared by Alliance Ecology Ltd.

1.0 Introduction

1.1 Project background

Matakanui Gold Limited (MGL) is applying for resource consents to construct and operate a new gold mine, ancillary facilities and environmental mitigation measures on Bendigo and Ardgour Stations in the Dunstan Mountains of Central Otago. The project is named the Bendigo-Ophir Gold Project (BOGP) and is located approximately 20 km north of Cromwell.

The BOGP is located within the footprint of Minerals Exploration Permit 60311 (MEP), which overlays several pastoral stations that have grazed sheep and cattle in the area for over 100 years. MEP60311 is held by MGL under the Crown Minerals Act 1991. MGL has land access agreements with Bendigo and Ardgour Stations. The BOGP is located adjacent to land administered by the Department of Conservation (DOC), including the Bendigo Historic Reserve, the Bendigo Conservation Area and the Ardgour Conservation Area. The BOGP planned operations do not directly impact these areas.

The BOGP's exploration has discovered numerous soil geochemical anomalies and extensive drill evaluation has defined four gold deposits worthy of economic extraction. The most significant is the Rise and Shine (RAS) discovery, which is thought to be the most significant gold discovery in New Zealand in the past four decades. The other discoveries at Come in Time (CIT), Srex (SRX) and Srex East (SRE) are smaller in size and tenor.

The defined orebodies are planned to be mined by open pit methods. Underground mining is planned for the deeper parts of the RAS orebody in the later years of operation.

The majority of the mining activities, ancillary facilities and associated infrastructure will be located in the Shepherds Valley. Access, and service and administration offices are planned to be located on the adjoining Ardgour Terrace.

Figure 1 provides an overview of the footprint associated with the establishment, operation and rehabilitation within the BOGP. Direct disturbance will be approximately 595 hectares. A disturbance contingency has been allowed around the mine and infrastructure for footprint adjustments during detailed design. A further 13 ha (approximately) of disturbance will be needed to establish the Thomson Gorge Road alternative alignment (Ardgour Rise).

Up to 3 ha (approximately) of further disturbance will be needed to construct predator-proof fences around selected ecological sanctuaries as part of the ecological impact management package. The maximum potential disturbance, herein referred to as the Direct Disturbance Footprint (DDF), including contingency, Ardgour Rise, and the proposed predator proof fences is 610.6 ha (Figure 2).

Aspects of the project that are not included in the DDF are the pipeline, borefield, and walking track to the CIT battery (Figure 1) as we understand that these will be undertaken either as permitted activities (pipeline and borefield) or will have nil impact (walking track).

Approximately 52 ha of the DDF is in the agricultural area on Ardgour Terrace. This area will be used for offices, security, medical, laboratory, laydown, storage, contractor areas, topsoil storage, emulsion manufacture and magazine facilities, plus quarries and roading.

Ecological work will include rehabilitation on direct disturbed areas, ecological uplift activities and pest exclusion area(s) adjacent to the footprint on nearby areas such as Ardgour and Bendigo Stations. A full

description of the various activities comprising the establishment, operation and rehabilitation within the BOGP is provided in the Assessment of Environmental Effects prepared by Mitchell Daysh Limited. However, by way of summary, the BOGP includes the following components:

- The establishment of the RAS Open Pit and SRX Open Pit, which are planned to form partial pit lakes at closure;
- The establishment of RAS Underground mine;
- The establishment of the CIT Open Pit, which is the smallest of footprints and is planned to be progressively backfilled with waste rock from the RAS Open Pit and profiled to integrate with the surrounding terrain. Rehabilitation will enable nearby native herb fields to be re-established at the completion of mining activities;
- The establishment of the small SRX Open Pit, which will be backfilled with waste rock before being covered with soil to form the engineered landform for the adjoining SRX Open Pit ("SRX ELF");
- A conventional hard rock gold processing plant (1.2 million tonnes per annum expandable to 1.8Mtpa) applying modern Carbon-in-Leach ("CIL") technology constructed in the lower reach of Shepherds Valley. The plant will operate in a closed water circuit with the Tailings Storage Facility (TSF). Residual chemicals in the tailings slurry will be detoxified and/or precipitated with specialist plant;
- The operation of the process plant will be supported by ancillary facilities such as maintenance workshops, raw material and process chemical storage, fuel depot, laboratory and warehousing. Mine offices, carparking and security services will also be established;
- The construction of the plant in the lower reaches of the Shepherds Valley will include the realignment of Shepherds Creek;
- The establishment of water storage dams and tankage for use in the process plant, dust suppression and drinking water supply;
- The establishment of a TSF in the upper reach of Shepherds Valley (including clean water diversion drains), which will utilise waste rock from mining activities within the project site;
- The establishment of permanent engineered landforms in the Shepherds Valley (Shepherds ELF) and an unnamed creek west of RAS pit (WELF);
- The establishment of temporary topsoil, vegetation and brown rock stockpiles around the project site;
- The extraction of groundwater from the Bendigo Aquifer for use in mining-related activities as well as supplying BOGP drinking water and replacing small irrigation water takes from Shepherds Creek. Bore water will be pumped to the processing plant via a pipeline over a distance of approximately 7 km;
- The establishment of supporting infrastructure / activities for the project, such as the upgrade of Ardour Road and parts of Thomson Gorge Road to provide improved access to the BOGP, internal mine access and haul roads, water pipelines and underground utilities, and electricity supply to the project site from Lindis Crossing via a new 66kV overhead powerline that will follow the existing road reserve corridor;

- A realignment of part of Thomson Gorge Road, via Ardgour Station (Ardgour Rise) is planned to provide public access through to the Manuherikia Valley;
- Main explosives magazines and emulsion mixing facilities (located outside the project site on Ardgour Terrace);
- The establishment of non-operational infrastructure associated with the BOGP on the Ardgour Terrace, including security, first aid and administrative offices, geology facilities, high voltage substation and temporary construction workers accommodation;
- The establishment of pest exclusion area(s) for ecological enhancement activities; and
- Main explosives magazines and emulsion mixing facilities (located outside the project site on Ardgour Station).

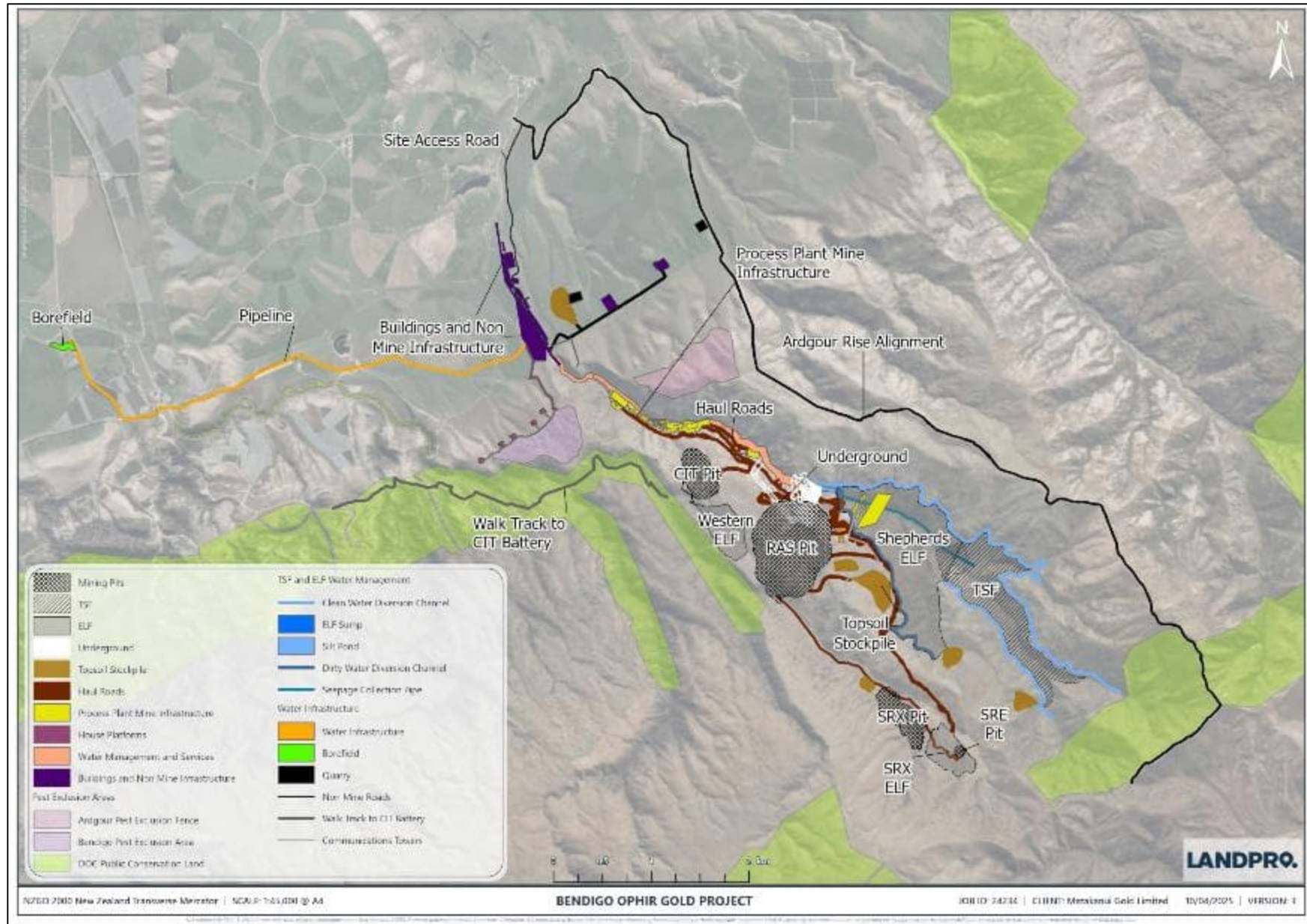


Figure 1. Overview site layout of the Bendigo-Ophir Gold Project (BOGP). Source: Matakanaui Gold Limited.

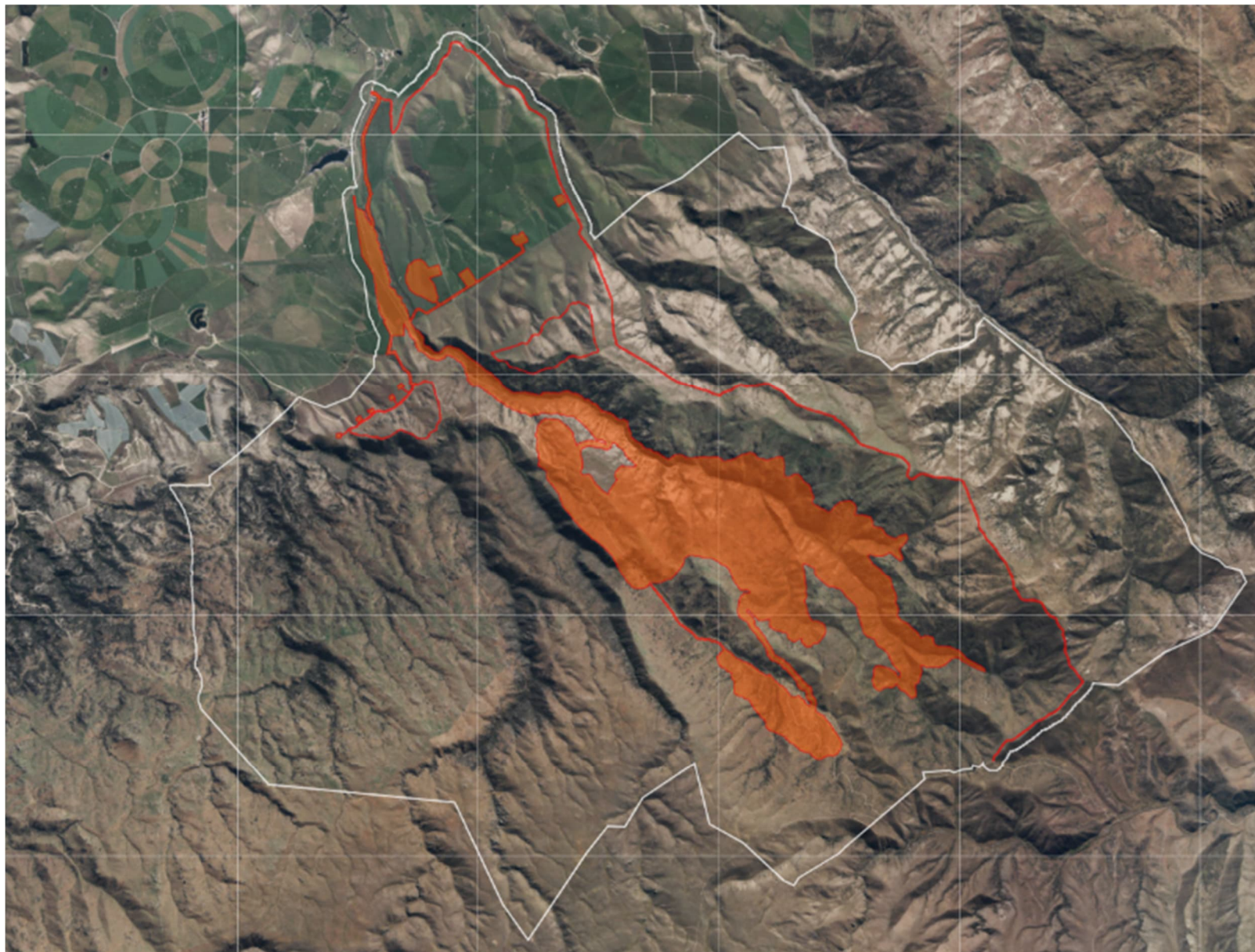


Figure 2. Direct Disturbance Footprint (DDF) (red/orange polygon) within the Ecological Study Area (ESA) (white border).

1.2 Purpose and scope

RMA Ecology Limited has been engaged by MGL to undertake ecological investigations and to prepare ecological values assessments for vegetation, wetlands, birds and herpetofauna¹. Habitat NZ Limited has been engaged by MGL to undertake ecological investigations and to prepare ecological values assessments for animal pests, invertebrates and bats. These ecological values assessments will form the basis of an ecological effects assessment that will be prepared by Alliance Ecology Limited to support an application for resource consents under the Fast-Track Approvals legislation².

Broadly, the scope of this report is to describe the avifauna values of the Direct Disturbance Footprint (DDF) and the Surrounding Landscape (SL, which make up the wider 5,386 ha Ecological Study Area (ESA) (Figure 2). Specifically, this report contains:

- A description of the methods employed to investigate avifauna values within the ESA;
- A description of the ecological context of the ESA and wider Dunstan Mountains;
- A desktop assessment of avifauna values present in the ESA and surrounds;
- A field survey of terrestrial, wetland and aquatic avifauna values;
- A bird species inventory;
- Assessment of distribution, abundance and species richness of birds present in the DDF and SL, with particular focus on native species, and those classified as Regionally or Nationally At Risk or Threatened;
- Assessment of avifauna values by vegetation communities in the ESA;
- Assessment of avifauna ecological value within the DDF; and
- Comment on ecological significance of avifauna within the DDF and SL.

The scope of this report is limited to assessing avifauna ecological values. It does not include a comprehensive assessment of effects of the Project on these values. It does, however, provide a brief summary of potential effects and management options to be considered in the full Assessment of Ecological Effects report.

¹ This report was prepared in accordance with an approved variation (dated 16 May 2024) of our original approved offer of service (dated 24 October 2023).

² The Fast-Track Approvals Bill was introduced to the House on 7 March 2024 and is currently proceeding through Select Committee.

1.3 Ecological study area

The ESA covers 5,386 ha (Figure 2). The extent of the ESA was designed to allow for ecological investigations to extend beyond the DDF and in doing so aid understanding of the wider landscape and the relative value of features within the DDF.

The ESA includes both agricultural and conservation land. It includes a mix of private land and Crown land administered by the Department of Conservation (DOC) (Figure 3). The present vegetation communities are a result of disturbances both contemporary and historical, and both natural and human-induced. The terrain has a range in elevation from c. 300 m to c. 1,300 m above sea level. The lower elevation vegetation communities, as well as those communities nearer to the Lindis/Clutha valley, are comparably more disturbed than the higher elevation communities, near Thomsons Saddle, along the south-eastern edge of the ESA.

The DDF is completely contained within the ESA. The DDF is 610.6 ha and encompasses proposed BOGP gold mining and ancillary activity areas that will cause direct habitat loss through vegetation clearance and/or earthworks³, Ardgour Rise (Thomson Gorge Road realignment)⁴, and the construction zone for the proposed predator proof fences⁵.

The analysis of values in this report apply to the DDF, as provided by MGL. We understand this footprint includes a range of buffers from 0 – 100 m, with widths varying for different components of the design. We have assumed vegetation clearance and/or earthworks will occur in the entirety of this area. We understand that the area is designed to account for potential minor changes in the DDF over future revisions due to engineering and design alterations.

The buffers included in the DDF are not designed to cover indirect effects on birds. We have not mapped a wider indirect effects buffer for disturbance effects through blasting noise, machinery operation noise, human activity or lighting effects, as this information was not available in sufficient detail at the time of writing, and studies on New Zealand bird responses to these disturbances are lacking. Instead, statements around potential wider effects are made. The SL includes all areas within the ESA which are not in the DDF. Note that the DDF and SL definitions in this report are not the same as those in the terrestrial invertebrate survey report⁶. This (avifauna) report does not include an additional buffer within the DDF, and this report does not have any satellite sites with regard to the SL.

1.4 Bird survey area

The majority of the ESA was surveyed for birds (Figure 2 and Figure 4). The entire DDF was surveyed for birds. Within the SL, the majority of Ardgour Station, and a sample of Bendigo Station was surveyed, including the DDF and areas within the Rise and Shine Creek catchment. Areas of Crown land at the head of Dry Creek, Shepherds Creek and Bendigo Creek were not targeted in surveys, but incidental observations were recorded during other ecological surveys.

³ Shapefile provided to RMA Ecology Ltd by Matakanui Gold Limited on 14 April 2025.

⁴ Shapefile provided to RMA Ecology Ltd by Matakanui Gold Limited on 15 April 2025.

⁵ Shapefile provided to RMA Ecology Ltd by Matakanui Gold Limited on 7 April 2025 (as a polygon for the sanctuary itself). The construction corridor for this fence (5 m width) was advised by HabitatNZ Ltd on 9 March 2025.

⁶ Habitat NZ Ltd. (2024). Bendigo-Ophir Gold Project: Terrestrial Invertebrate Survey. HabitatNZ Ltd., Auckland. 54 p.

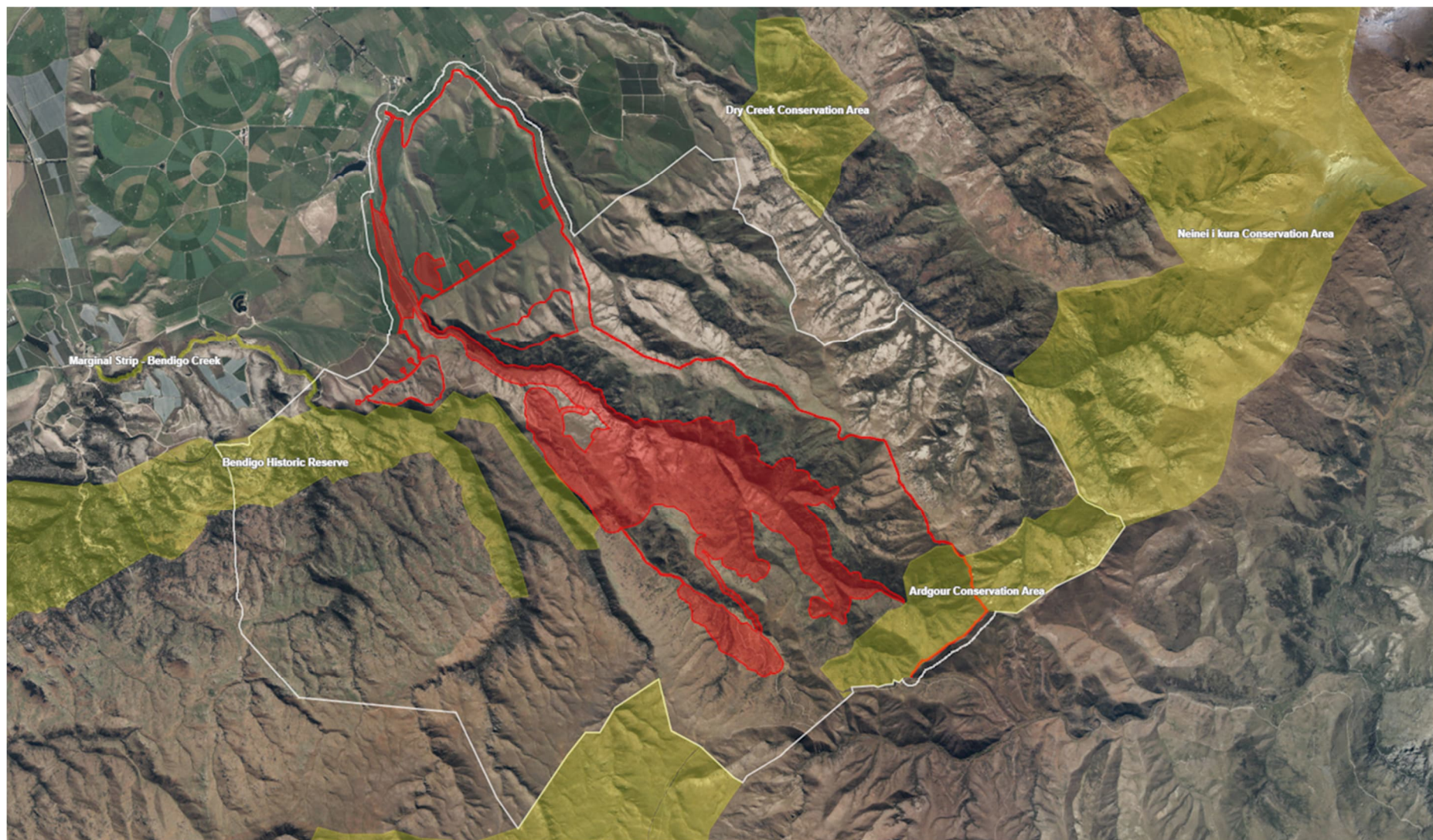


Figure 3. Public Conservation Land (yellow polygons) within the Ecological Study Area (ESA; white boundary), the direct disturbance footprint (DDF; red polygons) and the surrounding area.

2.0 Methods

The methods employed to assess avifauna values within the ESA include four components:

- Desktop assessment;
- Field survey;
- Data analysis; and
- Assessment of value and significance.

2.1 Desktop assessment

A desktop assessment was undertaken of the ecological context and avifauna values of the ESA. Information sources included:

- iNaturalist records;
- eBird New Zealand Bird Atlas records;
- Otago Regional Council habitat mapping; and
- Journal articles and other publications including consent applications.

The conservation status of bird species was checked against the regional⁷ and national⁸ conservation status lists for birds.

2.2 Field survey

Field survey for birds took place between October 2023 and January 2025, with the most fieldwork occurring in early 2024. A range of methodologies were employed to target specific groups or species of birds.

2.2.1 Five-minute bird counts

Five-minute bird counts (5MBC) are the standard methodology used for surveying relative abundance of birds in terrestrial environments in New Zealand⁹. They were originally designed for monitoring forest birds, but are also suited to scrub and open environments.

Five-minute bird survey stations were established at 100 'type 1' monitoring stations that were positioned on an 800 m grid across the ESA (Figure 4). These 'type 1' monitoring stations were also used as vegetation, lizard and invertebrate monitoring points. Additional 'type 2' bird (and vegetation) monitoring stations were established on a 400 m grid surrounding each central 'type 1' vegetation, bird, lizard and invertebrate

⁷ Jarvie, S., McKinlay, B., Palmer, D., Rawlence, N. J., & Thomas, O. (2025). *Regional Conservation Status of Birds in Otago*. Otago Regional Council, Otago Threat Classification Series 6. ISSN 2816-0983 (web PDF), ISBN 978-1-7385867-4-5 (web PDF).

⁸ Robertson, H. A., Baird, K. A., Elliott, G. P., Hitchmough, R. A., McArthur, N. J., Makan, T. D., Miskelly, C. M., O'Donnell, C. F. J., Sagar, P. M., Scofield, R. P., Taylor, G. A., & Michel, P. (2021). *Conservation status of birds in Aotearoa New Zealand, 2021*. New Zealand Threat Classification Series 36. Department of Conservation, Wellington. 43 pages.

⁹ Hartley, L., & Greene, T. (2012). *Birds: incomplete counts—five-minute bird counts Version 1.0*. Department of Conservation, New Zealand.

monitoring station. The central 'type 1' monitoring stations were labelled with a number (2, 3, 5, 6, 8-11, 13-24) and 'A'. The type 2 bird and vegetation monitoring stations were labelled with the corresponding number and then letter 'B' for the station to the NW, 'C' for the station to the NE, 'D' for the station to the SE, and 'E' for the station to the SW.

An additional 33 five-minute bird count stations were established in the SL, as randomized stratified samples to cover under-represented vegetation communities. They are labelled AVP (1 to 20), EVP (1 to 10) and SP (1 to 3). EVP stations are located on the site of a proposed predator proof sanctuary on Ardgour Station.

A single five-minute bird count (5MBC) was completed at each bird monitoring station, to survey terrestrial birds and provide an overview of bird species present and their relative abundance, distribution and species richness within the DDF and the SL. Most 5MBC were completed in January and February 2024.

Standard 5MBC survey protocol was employed, whereby all bird species seen and heard within five minutes were recorded¹⁰. Unbounded counts were used, with no cut-off distance. Surveys were timed using an electronic timer (cellphone or stopwatch). No bird was knowingly counted twice, but birds seen or heard in different directions or distances were counted as separate, unless observed to move between these locations. To reduce variability, surveys avoided the dawn and dusk chorus, being conducted between 1.5 hours after sunrise and 1.5 hours before sunset. Date and start time were recorded. Counts were not conducted during rainy or particularly windy conditions. Environmental variables were recorded, including temperature, wind, noise, sun and precipitation. Department of Conservation 5MBC data forms were used (Appendix A).

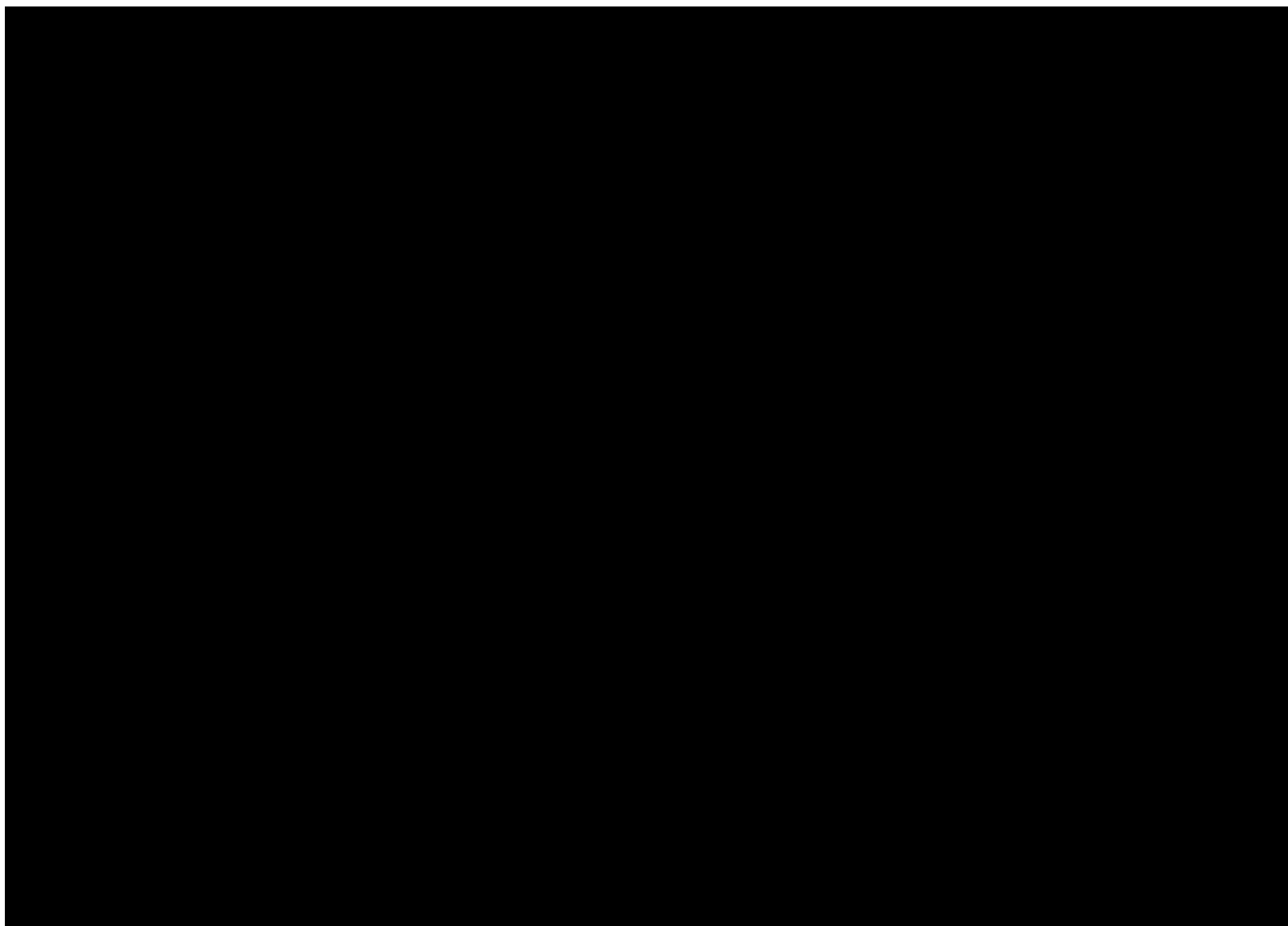
Counts were conducted by suitably qualified and experienced RMA Ecology staff. For the first 5-10 counts, staff completed counts together to calibrate methodology, including scoring of environmental variables and discernment of number of birds of a species present, where observed at multiple distances or directions.

A mosaic of vegetation types exists across the site. Vegetation type was recorded at the point where each 5MBC was undertaken. However, birds could be heard for several hundred metres from this point, and may be present in a range of vegetation types, which sometimes differ from the vegetation at the 5MBC point. However, on balance, the counts are likely to correspond to the dominant vegetation type in which the birds are present.

Five-minute bird counts are less suitable for rare or cryptic bird species¹¹. For these species, targeted survey methods were employed, as described below.

¹⁰ Dawson, D. G., & Bull, P. C. (1975). *Counting birds in New Zealand forests*. Notornis, 22(2), 101–109.

¹¹ Hartley, L., & Greene, T. (2012). *Birds: incomplete counts—five-minute bird counts Version 1.0*. Department of Conservation, New Zealand.



2.2.2 Wetland bird survey

Highly cryptic species of wetland birds such as fernbird, marsh crake, spotless crake, and Australasian bittern are difficult to detect using 5MBC, as they generally remain hidden in dense vegetation and seldom call.

To increase the probability of detecting these species in wetland habitats, targeted call playback at wetlands is generally utilised to elicit a response. Most of these species are more likely to respond to playback during the breeding season (spring and summer), with October being optimal timing.

Six wetlands in the SL in Ardour Station with potential habitat for these cryptic wetland bird species were surveyed by call playback prior to wetland delineation (points 11-16 in Figure 5). Most wetlands within the DDF did not contain sufficient tall vegetation to provide cryptic wetland birds with refuge. These wetlands were able to be visually assessed for these species of birds while they were being mapped, and were deemed unsuitable habitat.

The string of large valley floor wetlands along Rise and Shine Creek was assessed as having the best potential to provide habitat for cryptic At Risk and Threatened wetland avifauna. Call playback surveys at Rise and Shine Creek were replicated three times from September to November 2024, during calm weather conditions with no noise. The survey was undertaken at 10 points approx. 200 m – 400 m apart along the boundary of the wetland (points 1-10 in Figure 5). The survey points were in areas with visual overviews across the width and length of the wetland so that any vegetation movement during the playback could also be seen and assessed with binoculars.

Prior to beginning the playback calls at each survey point, a minute of silence was undertaken to assess the wetland for movement and bird sound. Each target wetland bird species call was then played for a duration of 30 seconds, followed by a period of silence to listen for any birds that may call back. This was repeated for all four bird species.

A small hand-held speaker was utilised to play calls from the NZ Birds online database. The speaker was placed approximately 10 m from the ecologist/s undertaking the survey to ensure any birds calling back would be heard. Binoculars were used to visually scan over the wetland vegetation.

2.2.3 Waterfowl survey

Open water bodies in and around the ESA were surveyed for waterfowl by visual counts with binoculars from viewpoints where the entire waterbody was visible. At least five minutes was spent with binoculars at each waterbody, which was sufficient to census each waterbody due to their small size and lack of vegetation.

There are two established waterbodies in the ESA (waterbodies 1 and 2), both small (0.1 and 0.3 ha) and shallow artificial ponds with a narrow margin of fringing reeds and trees. Surveys of these ponds were replicated three times, on separate days, due to the highly mobile nature of waterfowl. Two larger (up to 3.75 ha) irrigation ponds on the margins of the ESA (waterbodies 3 and 4) are lined, relatively deep, and have no fringing vegetation. The former was surveyed once, and the latter three times. These irrigation ponds lie outside the ESA but provide an indication of waterfowl present in the area (Figure 6).

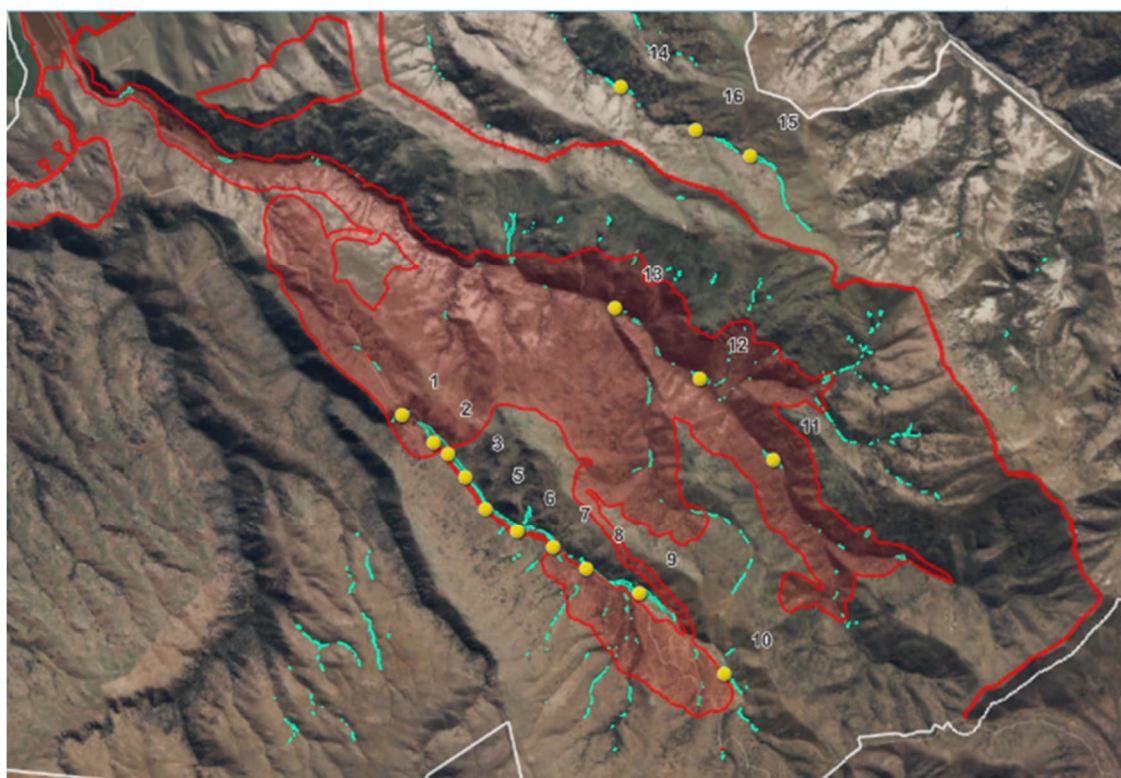


Figure 5. Wetland bird playback points (yellow circles) within the ESA (white boundary). Also shown are wetlands (cyan polygons) and the DDF (red polygons).

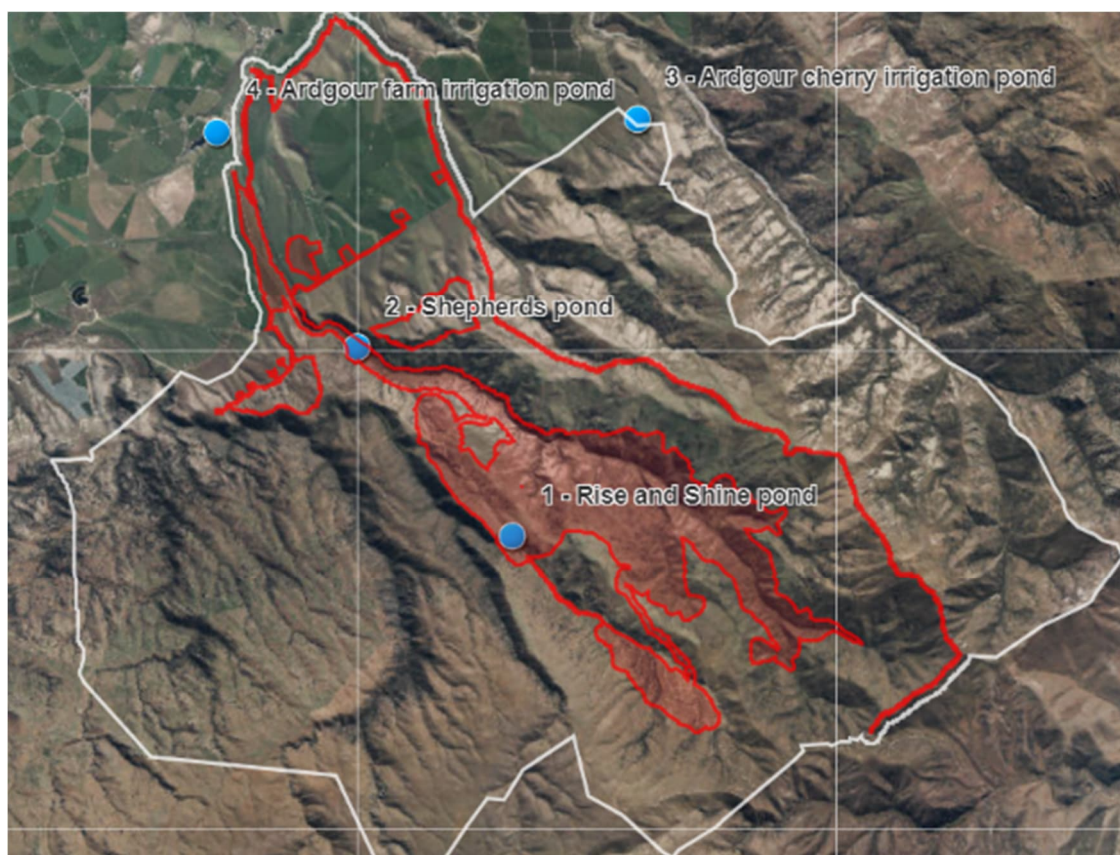


Figure 6. Overview of waterbodies surveyed for waterfowl in and around the ESA, including 1 - Rise and Shine Pond (in DDF), 2 - Shepherd's Pond (in DDF), 3 - Ardgour cherry irrigation pond (outside ESA), 4 - Ardgour farm irrigation pond (Tarras Farm Partnership) (outside ESA). Also shown are the ESA (white boundary) and the DDF (red polygons).

2.2.4 Incidental observations

Rare and uncommon species are more challenging to survey using 5MBC, as these counts provide only short temporal snapshots of survey effort. Replication overcomes this to some degree, but the most comprehensive and effective survey methodology for the rarer terrestrial Threatened and At Risk species, such as falcon and pipit, consisted of incidental observations by experienced staff during other ecological survey works on site. Although somewhat biased by unequal distribution of survey effort (i.e. time spent in each area) this method provided the best indicator of relative abundance and distribution, simply due the considerable amount of time spent by surveyors in all parts of the ESA.

Over 2,500 person hours were spent onsite by suitably experienced RMA Ecology staff, within parts of Ardgour Station and Bendigo Station within the ESA undertaking wetland, bird, vegetation, rare plant, and lizard assessments. This survey effort was undertaken mostly within the nesting season for the bird species present, including New Zealand falcon and pipit (both August to March, with a peak in spring and summer).

Although staff were focused on other survey tasks during these hours, they were alert for falcon, pipit and any other rare birds. Falcons are easily detected due to their highly conspicuous and distinctive nature when flying or calling, while pipits are moderately conspicuous in their movements, are readily flushed when moving, are not shy of people, and have distinctive calls.

Additional time on site (estimated at another 2,500 person hours) was undertaken by others with knowledge of birds during their assessments of pest animals and terrestrial invertebrates (HabitatNZ), and incidental sightings of birds were passed on to the RMA Ecology ornithologist.

2.2.5 Falcon nesting survey

Targeted rapid assessments for falcon presence and nesting were undertaken in high-quality nesting habitat in and around the DDF (Figure 7). These habitats were identified by mapping particularly bluffy areas with numerous elevated ledges, on aerial imagery and in the field. Searches were undertaken during the peak of the breeding season in November 2024, when falcon are likely to be highly territorial.

Methods involved manual walk-through with call playback to illicit a response, visual searches in bluffy areas and in the air using binoculars, and drone flyover. Falcons are known to be highly territorial and protective of their nests, with aggressive dive-bombing attacks on humans and predatory birds posing a potential threat such as harriers and magpies. Observations of predatory bird presence and interactions with falcons contributed to understanding the likelihood of falcon nesting.

While these targeted surveys provided valuable information about falcon nesting and distribution, they were not designed to definitively confirm the presence or absence of nests. They do not comprise a comprehensive survey of abundance and distribution of falcon and nest sites, which would require satellite or radio tracking devices, and require extensive time investment and permits, both of which were not available to this degree for this project. This level of accuracy was not deemed necessary as the presence of falcon and suitable nesting habitat, combined with a general knowledge of territory size from literature reviews, are sufficient to assess the value and the level of effect from the BOGP.

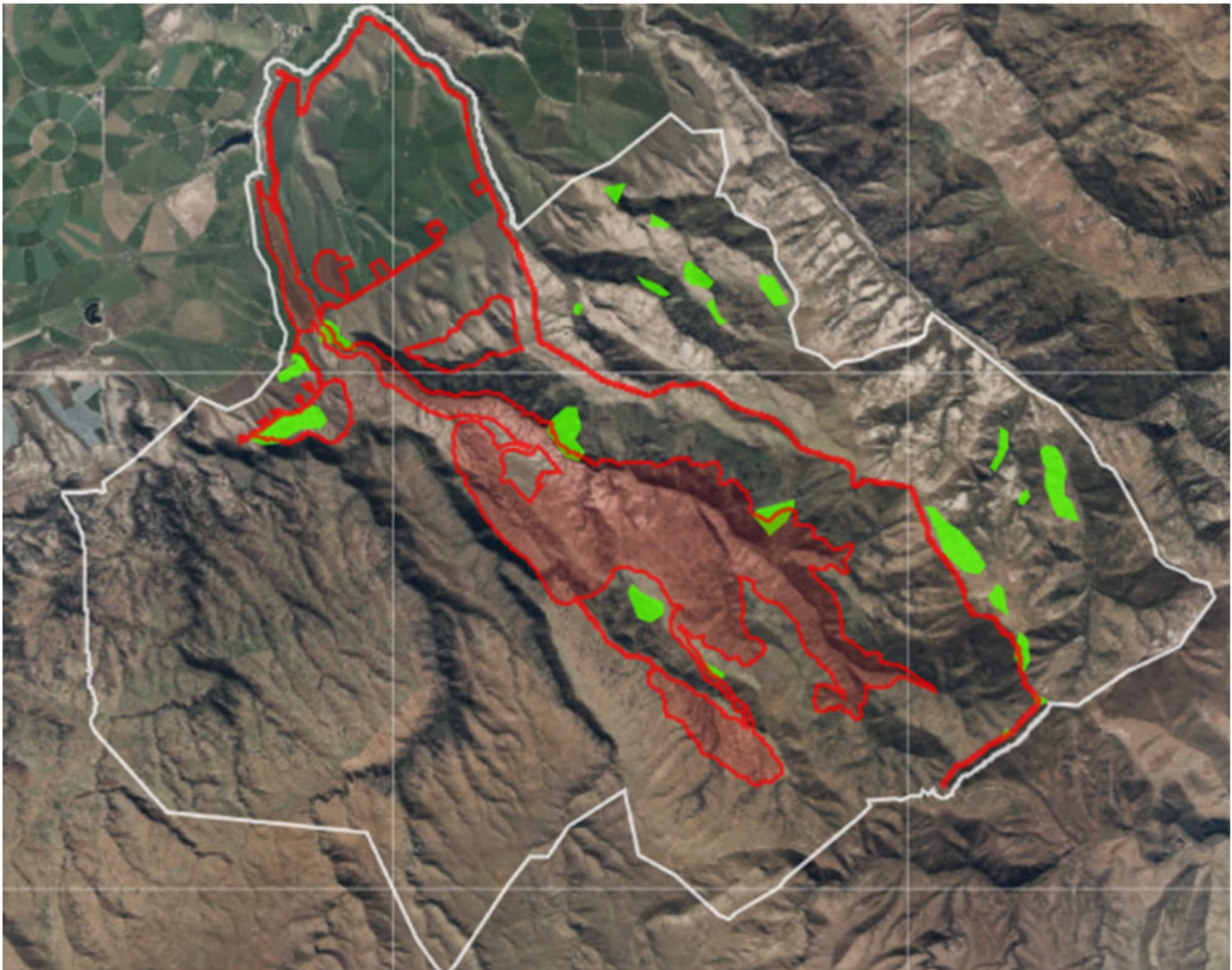


Figure 7. Targeted falcon nest survey sites (green polygons) within the ESA (white polygon). The red polygon delineates the DDF.

2.2.6 Species inventory

An inventory of bird species within the ESA was compiled, including species identified in 5MBC, as well as incidental species detected while completing other ecological surveys.

2.2.7 Survey effort adequacy

To assess the adequacy of 5MBC survey effort for characterising bird species present at the site, the cumulative number of bird species detected was plotted against 5MBC stations (as a proxy for effort; each plot taking a similar amount of effort).

The data from the five-minute bird counts conducted at 133 stations was arranged chronologically based on the order of completion. Species recorded during the initial bird count were classified as 'new' species. For each subsequent count, any newly identified species were added to the cumulative species detections associated with that station number. This process continued until cumulative new species detections were calculated for all 133 five-minute bird counts.

2.3 Data analysis

2.3.1 Five-minute bird count data

A generalized linear model (GLM) was employed to evaluate the relationship between native and exotic bird species, both within and beyond the DDF. This model is appropriate for data with a non-linear distribution, such as the count data from the 5MBC surveys. A GLM was computed using a Poisson distribution with the `glm` function in the stats package in R. The Poisson distribution is usually suitable for count data. Location (DDF or SL) and bird status (exotic or native) were used as interacting predictor variables.

Trends in the total number of birds counted at each 5MBC station (relative abundance) were statistically assessed. An evaluation of overdispersion in the Poisson GLM model residuals meant this was not an appropriate analysis. Instead, a generalised negative binomial model was computed using the `glm.nb` function from the MASS package in R. An AIC comparison also supported the use of the negative binomial model (AIC = 1291) over the Poisson GLM (AIC = 1592).

The number of species found at each 5MBC station was statistically assessed. Overdispersion in the Poisson GLM model residuals were within acceptable parameters to retain the GLM as the appropriate model for assessing trends in species richness. To analyse native bird abundance by vegetation community, confidence intervals (95 %) were estimated for the mean number of native birds counted at stations across vegetation communities. Due to low sample sizes, further statistical comparison was not possible.

2.3.2 Wetland, waterfowl, falcon and incidental surveys

Due to the targeted nature of wetland, waterfowl, falcon and incidental surveys (and corresponding spatially uneven survey effort) and limited bird detections, no statistical analysis of results was possible. Results have been presented as raw data tables, with maps to illustrate distribution.

2.4 Assessment of value and significance

Ecological value was assessed for each Threatened or At Risk bird species confirmed or likely to occur in the DDF and wider indirect effects area.

In addition, considerations for significance assessment are noted, having regard to the significance criteria in the Ottago Operative Regional Policy Statement (2019) and proposed Regional Policy Statement (2021), as well as the National Policy Statement for Indigenous Biodiversity (NPS-IB). This does not represent a full significance assessment, but rather likely criteria triggered, and notes to aid completion of a significance assessment in the Assessment of Ecological Effects report.

3.0 Results

3.1 Ecological context

3.1.1 Dunstan Ecological District

The ESA lies within the Dunstan Range, encompassed by the c. 90,000 hectares of the Dunstan Ecological District (ED) in Central Otago. The Dunstan Range is a characteristically flat-topped Otago mountain range, which lies in the rain-shadow of the Southern Alps (McGlone, 1995). The mountains rise above 1600 m a.s.l., with the glacially formed Clutha Valley and Ida Valley on either side at altitudes of 200–400 m a.s.l.

The Dunstan ED presents a unique ecological context shaped by its arid climate, moderate to high altitude, and geological history. Its location—on the leeward side of the Alps, far from the coast—results in a continental climate featuring some of New Zealand's harshest weather. While precipitation is generally low and varies annually, winter tends to bring the highest precipitation, sometimes as snow. Lowland areas experience strong winter frosts and hot summers, while higher elevations endure snowy winters and brief summers (McGlone, 1995).

Land use in the Dunstan ED is primarily extensive pastoral grazing of beef cattle and merino sheep, with more intensive irrigated agricultural and horticultural land use on the terraces and valley floor around Bendigo and the Lindis River.

Bendigo, situated on the northwest side of the Dunstan Range, was once a bustling gold mining settlement, which has left a lasting impact on its natural environment. Historical mining within the ESA centred around the Rise and Shine Creek, where extensive sluicing resulted in significant sediment deposition in the valley floor, potentially inducing or enlarging wetlands by blocking stream channels.

The region is characterized by a mosaic of diverse habitats, including alpine and subalpine vegetation, shrubland, and riverine ecosystems. The dominant vegetation in higher elevations is alpine herbfield, characterized by low-growing, cushion-forming plants adapted to harsh conditions. These plants often have specialized adaptations to conserve water and withstand strong winds and frost. As elevation decreases, alpine herbfield transitions into subalpine shrubland, dominated by species such as mountain totara (*Podocarpus nivalis*) and mountain beech (*Nothofagus solandri* var. *cliffortioides*). The lower slopes and valleys of the Dunstan Range support a variety of shrubland communities, including kanuka (*Kunzea ericoides*) and matagouri (*Discaria toumatou*) scrub.

Areas of Significant Natural Value identified in the Regional Plan include Bendigo Wetland, and Bendigo Reserve (Figure 8). The latter is dryland kanuka dominated, and includes un-mapped areas of wetland.



Figure 8. Areas of Significant Natural Value (Central Otago District Council) are shown as grey polygons.

3.1.1 Vegetation and habitats in the ESA

The Land Cover Database of New Zealand (LCDB version 5.0) indicates the ESA is dominated by low producing grassland, with areas of depleted grassland, and mixed exotic shrubland, as well as areas of matagouri or grey scrub primarily within gullies. Higher elevations are dominated by areas of gravel or rock, and tall tussock grassland.

Onsite vegetation surveys¹² identified seven vegetation communities within the ESA (Figure 9). The lowland flats are cultivated with exotic pasture, while vegetation on the higher altitude peaks are dominated by native dominated tussockland, native herbfield and shrubland, and exotic pasture. North facing slopes tend to be vegetated by mixed (exotic/native) depleted herbfield and grassland, with mixed shrubland and exotic grassland more prevalent on south facing slopes. Gullies are dominated by native scrubland and mixed scrubland (Plate 1).

Vegetation communities are shaped by hot, dry summers, cold winters, a history of fire, and ongoing grazing by sheep, cattle and mammalian pests.

¹² RMA Ecology Ltd. 2025. Bendigo-Ophir Gold Project: Vegetation Values Assessment. Report prepared for Matakanui Gold Ltd.

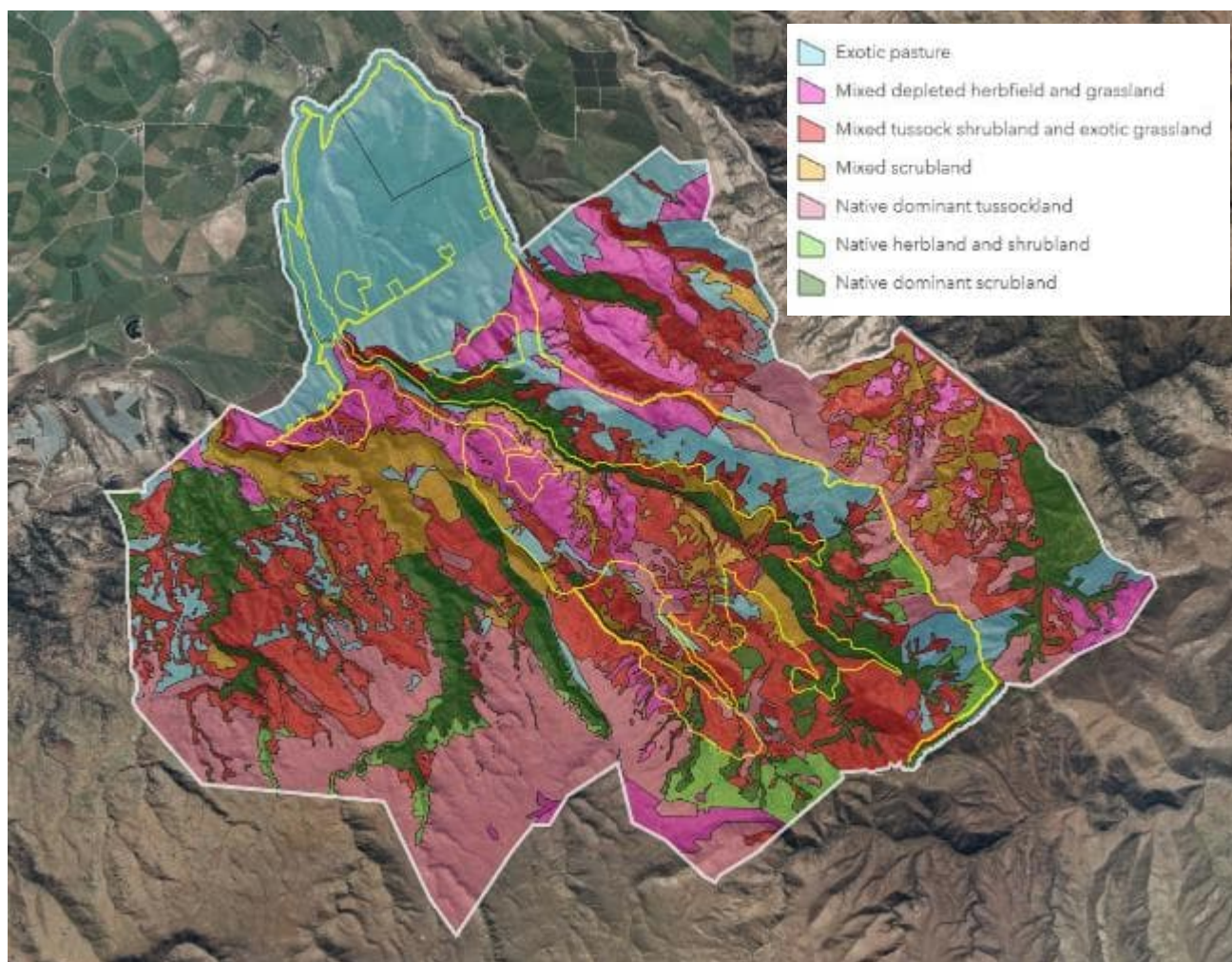


Figure 9. Vegetation communities within the ESA, excluding wetlands (as per the Vegetation Values Assessment¹³). Also shown are the ESA boundary (white line) and DDF boundary (yellow line).

¹³ RMA Ecology Ltd. 2025. Bendigo-Ophir Gold Project: Vegetation Values Assessment. Report prepared for Matakanui Gold Ltd.



Plate 1. An overview of Rise and Shine Valley, illustrating the mosaic of vegetation types present in the DDF, including wetland, scrub, shrubland, tussock and grassland.

Wetland area in the ESA totals 11.17 ha and is composed primarily of swamp/marsh in valley floors and gullies, but with considerable coverage of fen, largely in gullies, as well as hillside seepages (Figure 10)¹⁴. Wetlands onsite are relatively small, apart from several larger swamp/marsh complexes in the valley floor of Rise and Shine Creek, the largest of which is 2.59 ha in area. Wetlands within the ESA are almost exclusively dominated by herbaceous vegetation. Vegetation community structure is predominantly grassland, sedgeland and herbfield, with these community structures present across wetland classes. Most wetlands are moderately to heavily grazed, impacting habitat quality for wetland birds. Water tables are generally at or below ground level, with the exception of a number of valley floor swamps, which have shallow open water.

The schist rock outcrops and bluffs characteristic of most Central Otago mountain ranges, are scattered throughout the ESA, with the exception of the lowland terraces.

Open water bodies are limited to two artificial ponds, in the lower Shepherds Creek, and in the Rise and Shine Valleys.

¹⁴ RMA Ecology Ltd. 2025. Bendigo-Ophir Gold Project: Wetland Values Assessment. Report prepared for Matakanaui Gold Ltd.

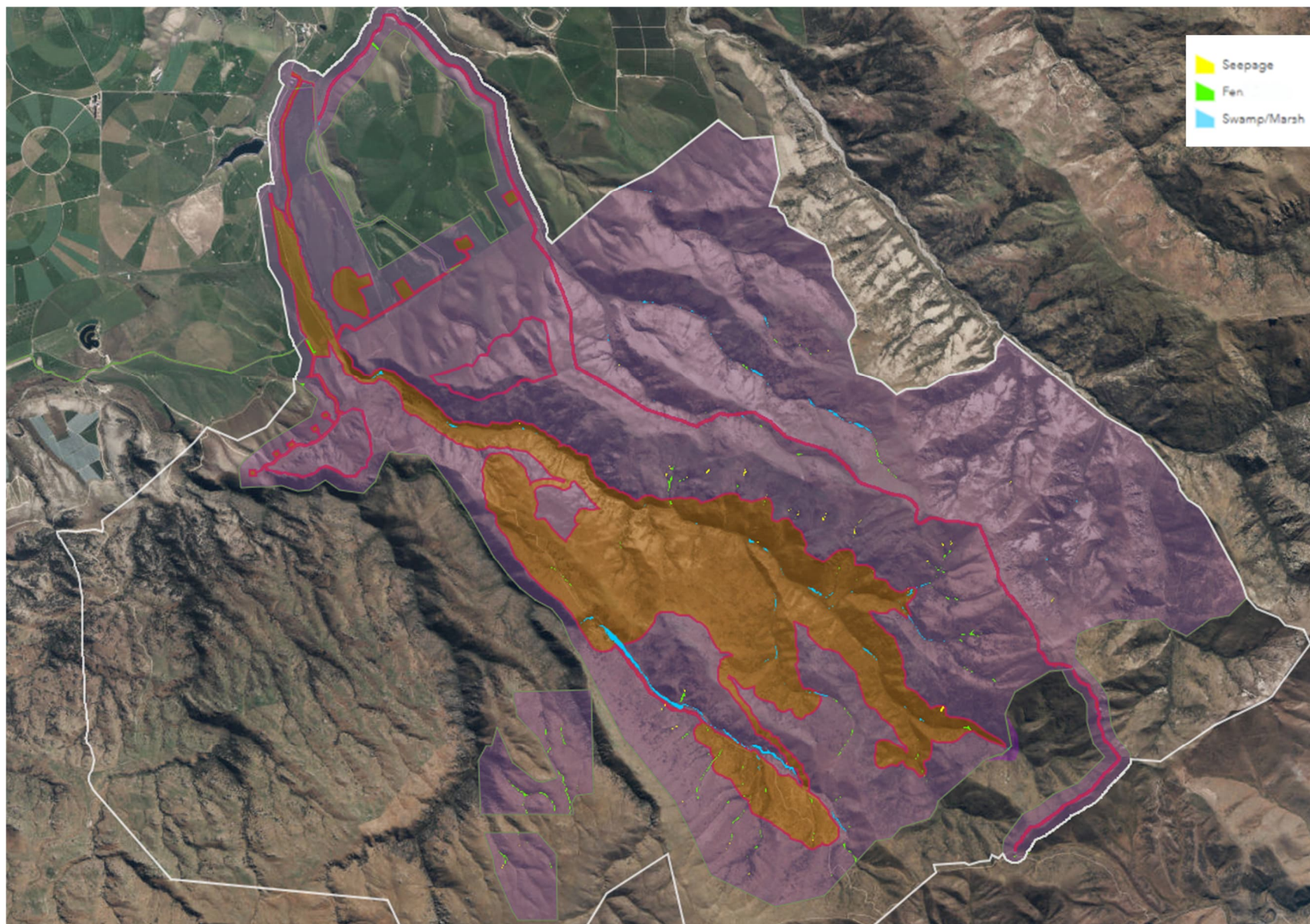


Figure 10. Distribution of wetlands within areas of the DDF (orange shaded and red linework) and surrounding landscape surveyed for wetlands (purple polygons) within the ESA (white polygon). Wetlands are displayed by wetland class.

3.2 Avifauna desktop assessment

Desktop assessment indicates a variety of terrestrial, wetland and freshwater birds are present in the wider area within 10-15 km radius of the DDF. In total, 48 bird species have been recorded by others in the wider area, including 30 native species, of which three are Threatened and eight are At Risk species. No desktop records of Threatened or At Risk species are located in the DDF.

The majority of wetland bird and waterfowl records are located outside the ESA at Bendigo wetland and Lake Dunstan. Bendigo Wetland is a 154 ha Regionally Significant Wetland located at the head of Lake Dunstan, and is also an area of Significant Natural Value (Figure 8). It is located 6 km west of the easternmost extent of the ESA (and 1.85 km east of the easternmost extent of the Thomson Gorge Road realignment).

The Clutha River flows into the lake, creating a high diversity of habitats for indigenous wetland flora and fauna. It provides regionally important feeding and breeding sites for water fowl such as New Zealand scaup (*Aythya novaeseelandiae*), paradise shelduck (*Tadorna variegata*), black swan (*Cygnus atratus*), exotic waterfowl, as well as pied stilt (*Himantopus himantopus*) and other waders¹⁵. There are relatively large numbers of Australasian crested grebe (*Podiceps cristatus australis*, classified as Threatened - Nationally Vulnerable)¹⁶, and Bendigo wetland and Lake Dunstan are recognised as Australasian crested grebe habitat under the Otago Regional Council's 'Otago ecosystems and habitats' maps (Figure 11). Also present are Australasian coot (*Fulica atra australis*), black shag (*Phalacrocorax carbo novaehollandiae*) and little shag (*Phalacrocorax melanoleucos brevirostris*).

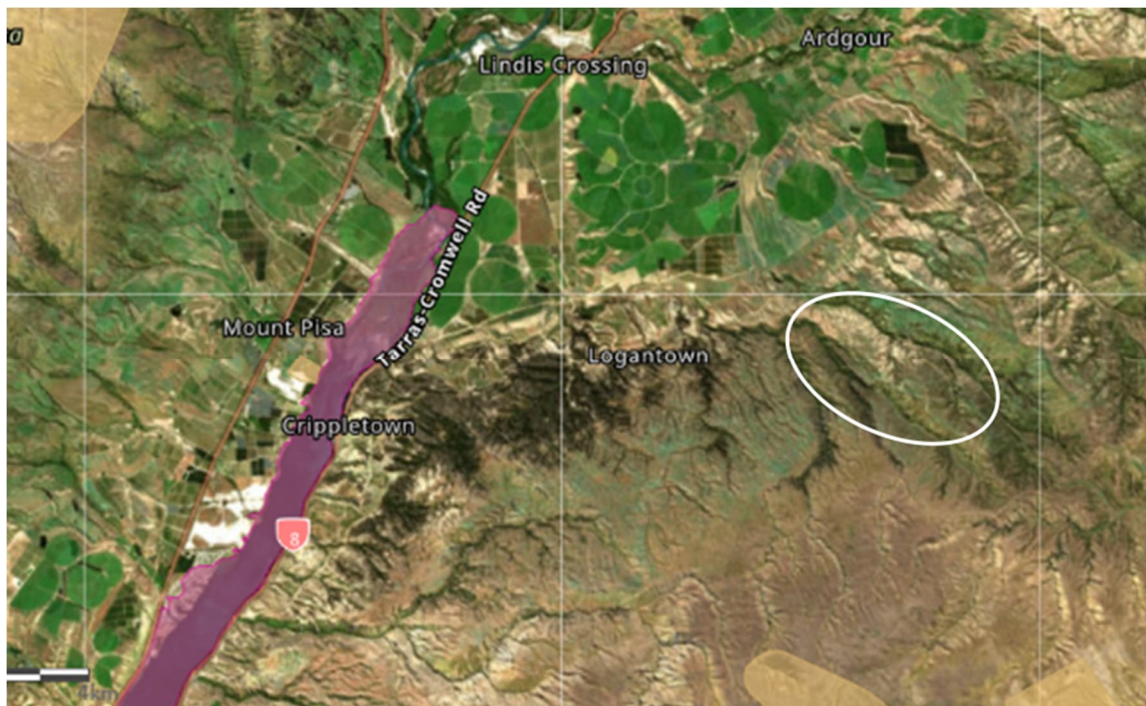


Figure 11. Australasian crested grebe habitat under the Otago Regional Council's 'Otago ecosystems and habitats' maps (purple polygon) relative to the general location of the DDF (white ellipse).

¹⁵ Fish and Game New Zealand (2010) Comments on the Consultative Draft Proposed Plan Change 2 (Regionally Significant Wetlands) to the Regional Plan: Water for Otago. Fish and Game New Zealand, Otago Region, Dunedin.

¹⁶ Ornithological Society of New Zealand, Otago Branch (2009) George Chance Memorial Census of Great Crested Grebes in Central Otago, February 2009.

Along the Clutha River bed and the shore of Lake Dunstan, an assemblage of Threatened and At Risk braided river bird species are recorded, including black-fronted tern, black-billed gull, banded dotterel, wrybill and South Island pied oystercatcher.

Black-fronted tern, black-billed gull, and South Island pied oystercatcher are braided riverbed specialists present on the nearby Clutha River which do occasionally feed in cultivated fields adjacent to braided rivers, particularly after recent ploughing. The cultivated fields within the ESA are likely too distant from the riverbed for regular use or breeding by braided river birds, but are likely to receive occasional visits by feeding birds. There are no online records of these braided riverbed and wetland Threatened and At Risk species within the ESA.

However, there is an isolated record (by others) of a fernbird detection in matagouri scrub along the Rise and Shine stamper battery track in the SL of the ESA (refer Section 3.3.7). Relatively abundant habitat for fernbird exists in the ESA in the form of scrub and wetland.

Tui were not recorded from the local area (within 5kms of the site). There is a recent record of bellbird from the Bendigo Scenic Reserve in 2024 (David Norton, *pers. comm.*).

New Zealand Falcon – eastern form (Threatened – Nationally Vulnerable) are present throughout the wider area including the ESA, and there are occasional records of New Zealand pipit (At Risk – Declining) within the wider area.

3.3 Avifauna field survey

During general and targeted field surveys, 30 bird species were detected within the DDF, including 11 native species, one Threatened species (New Zealand Falcon) and two nationally At Risk species (New Zealand pipit and black shag).

3.3.1 Five-minute bird counts

3.3.1.1 Relative abundance

Relative abundance of native birds averaged 2.15 birds per 5MBC within the DDF, compared to 1.63 in the SL (Figure 12). This difference is not significant (p -value = 0.35), as variability in counts was high, ranging from 0 to 12 native birds per count.

Exotic birds dominate in the DDF and SL, being significantly more abundant than native birds (p -value < 0.001) (Figure 12). There was no significant difference in the relative abundance of exotic birds within the DDF (7.44 birds per 5MBC) and in the SL (7.05 birds) (p -value = 0.72).

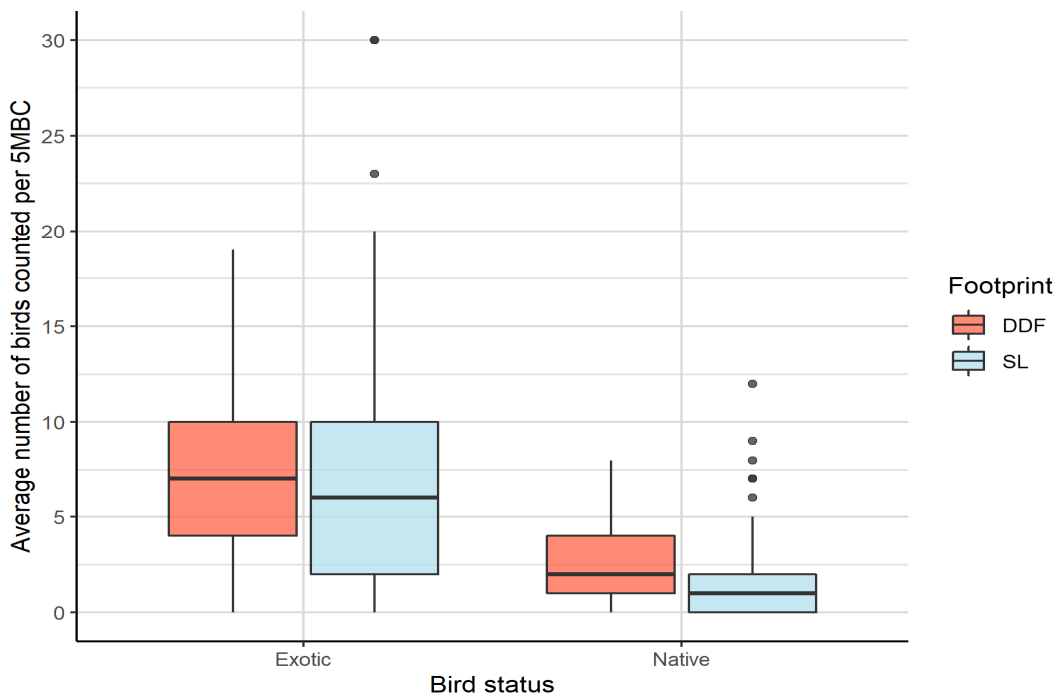


Figure 12. Box and whisker plots of native and exotic bird abundance in the Direct Disturbance Footprint compared to the Surrounding Landscape.

3.3.1.2 Species richness

Exotic birds dominated in terms of species richness, which was significantly higher than that of native species.

For native birds, the number of species per 5MBC averaged 1.17 within the DDF, compared to 0.93 in the surrounding landscape. This difference is not statistically significant (p -value = 0.862). Only two native bird species were relatively common; silvereye and grey warbler. Harrier and fantail were infrequent, and NZ Pipit and NZ falcon were rare.

For exotic birds, species richness for counts within the DDF averaged 3.88 species per 5MBC (Figure 15), which is significantly higher (p -value < 0.01) than exotic species richness in the local area outside the footprint (at an average of 2.96 species per 5MBC).

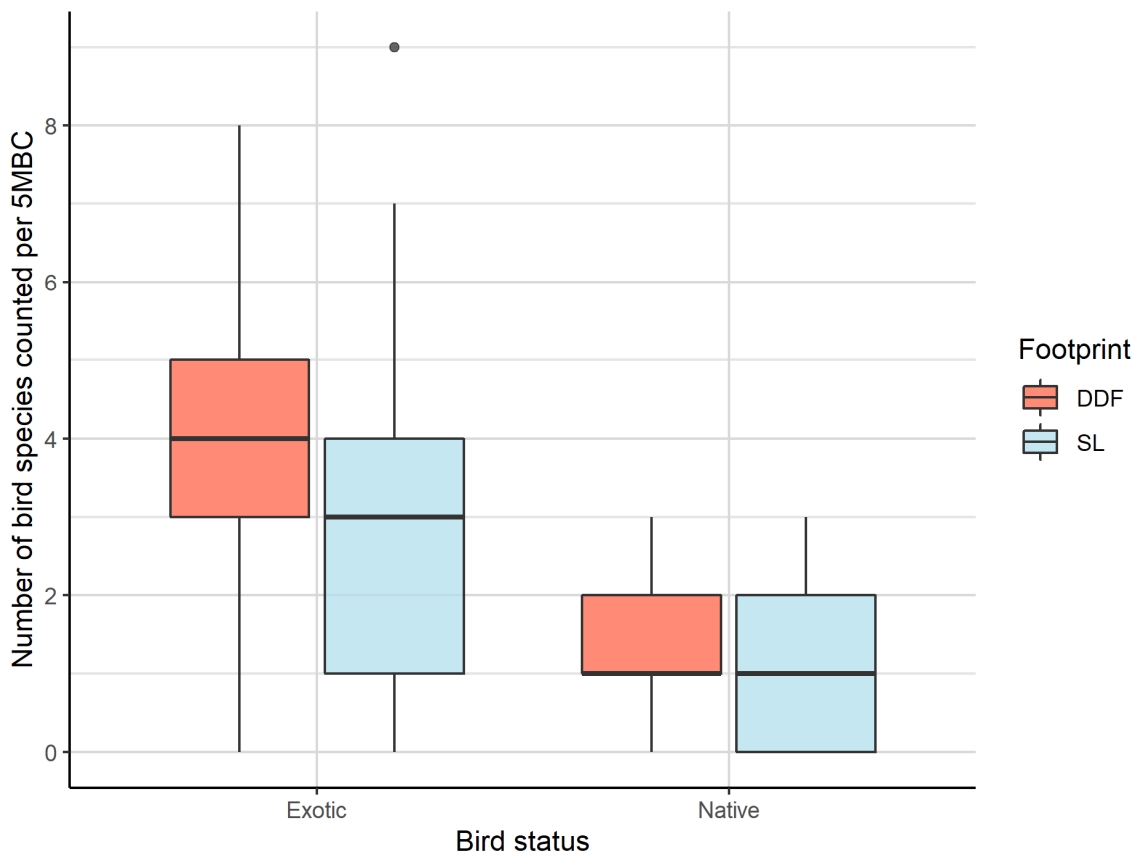


Figure 13. Box and whisker plot of native and exotic bird species richness in the DDF versus the SL. Bars indicate 95% confidence intervals.

3.3.1.3 Native bird abundance by vegetation community

The relative abundance of native birds varied across vegetation communities, from a low of 0.88 to a high of 3.0 native birds (Figure 14). Overall, woody vegetation supported the highest numbers of native birds, particularly grey warbler, silvereye and fantail (Figure 15). The three vegetation communities which supported the most native birds include 'Native dominant scrubland' (mean = 3), 'Mixed scrubland' (mean = 2.38) and 'Mixed tussock shrubland and exotic grassland' (mean = 2.33). The three vegetation communities with the fewest native bird counts include 'Native herbland and shrubland' (mean = 0.88), 'Native dominant tussockland' (mean = 1), and 'Mixed depleted herbfield and grassland' (mean = 1). 'Exotic pasture' supported an intermediate number of native birds (mean = 1.85) with confidence intervals overlapping with all other vegetation communities. NZ pipit were recorded in exotic grassland, native tussockland and mixed grassland/tussockland/shrubland.

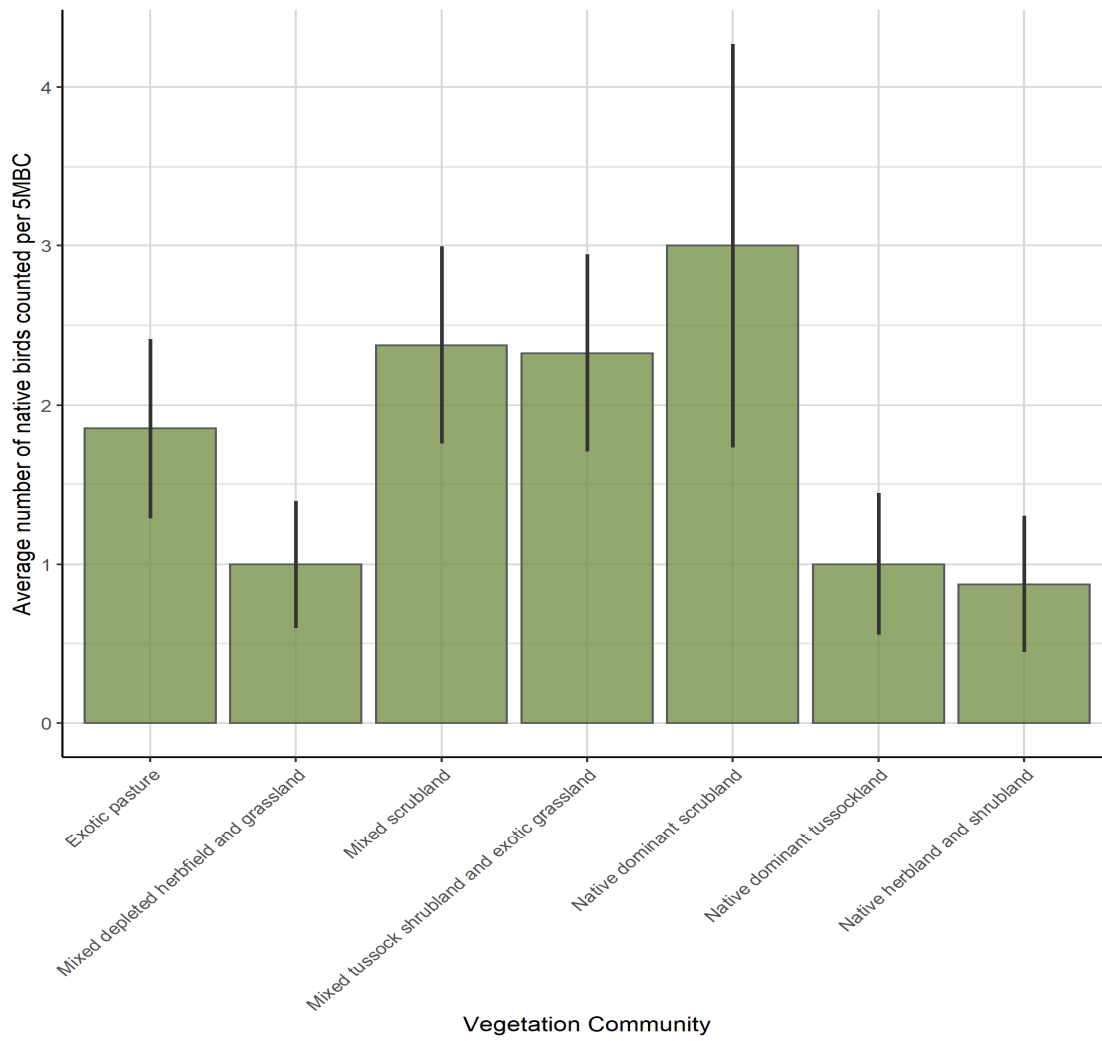


Figure 14. Native bird relative abundance by vegetation type in the ESA, in 5MBC. Bars indicate 95% confidence intervals.

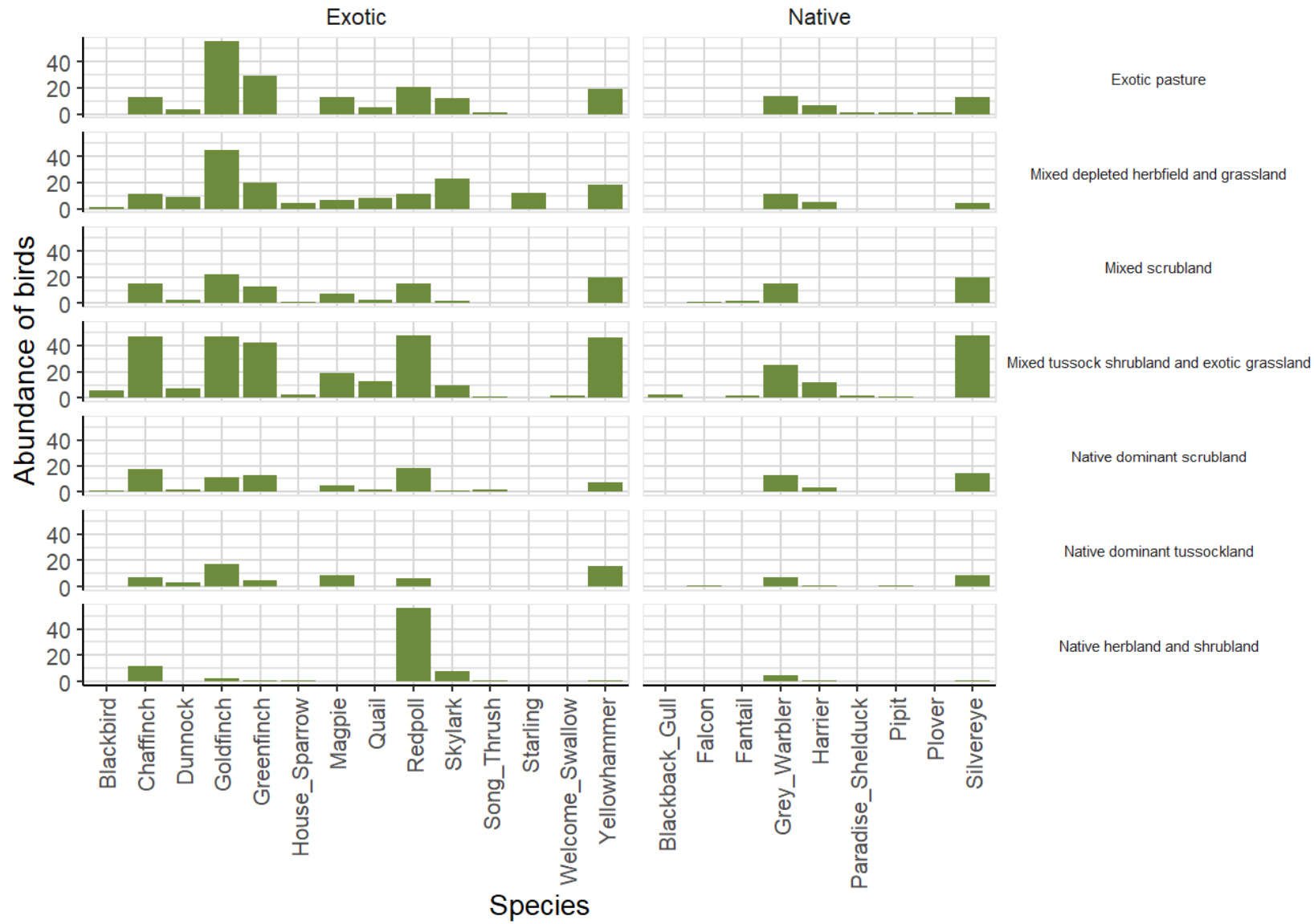


Figure 15. Relative abundance of all bird species by vegetation type in the ESA, for five-minute bird counts.

A mosaic of vegetation types exists across the site. Vegetation type was recorded at the point where each 5MBC was undertaken. However, birds could be heard for several hundred metres from this point, and may be present in a range of vegetation types, which sometimes differ from the vegetation at the 5MBC point. However, on average, the counts are likely to correspond to the dominant vegetation type in which the birds are present.

3.3.2 Waterfowl

No Threatened or At Risk waterfowl were detected in any of the four waterbodies in or adjacent to the ESA (see Figure 6).

Two native and one exotic waterfowl species were detected on the two artificial ponds within the DDF (Table 1). These results reflect the small size and limited habitat potential of these waterbodies. The Rise and Shine Pond was partially or fully dry during parts of the summer, likely due to seasonal flow changes and water take for mining exploration. This pond was also surveyed several times when dry, but no waterfowl or wading birds were detected. These ponds are too small and lack sufficient marginal vegetation to support Threatened species such as Australasian crested grebe, white heron and Australasian bittern. They are likely to receive occasional visits from black shags and little shags, but could not support resident or breeding pairs.

Adjacent to the ESA, the larger Tarras Farm Partnership irrigation pond supported exotic mallards and two native species of duck, New Zealand scaup and Australian shoveler (both Not Threatened). The Ardour cherry irrigation pond, constructed less than a year ago, supported no waterfowl (but was only visited once by surveyors).

Table 1. Waterfowl detected in waterbodies within the ESA and marginally outside the ESA. Note, the number of birds for waterbodies 1 and 2 are for three surveys combined, while those for waterbodies 3 and 4 are for single surveys.

Bird species	National Threat status	Regional Threat status	Waterbody			
			1. Rise and Shine pond (in DDF)	2. Shepherds pond (in DDF)	3. Tarras Farm Partnership irrigation pond. (Outside ESA)	4. Ardour farm irrigation pond (Outside ESA)
Mallard	N/A (Exotic)	N/A (Exotic)	2	5	0	6
Paradise shelduck	Not Threatened	Not Threatened	2			
NZ Scaup	Not Threatened	Not Threatened				1
Australian Shoveler	Not Threatened	Not Threatened				2
Grey teal	Not Threatened	Not Threatened	2			

In the DDF, open water habitat quality for waterfowl is relatively low, due to limited refuges and habitat heterogeneity, and periodic drying. Ponds 1 and 2 have minimal fringing vegetation cover (primarily grazed grasses and tall trees), and a lack of reed beds. Extent is very limited, totalling 0.4 ha over ponds 1 and 2 (Plate 2).



Plate 2. Artificial Ponds 1 (left) and 2 (right) within the DDF.

3.3.3 Wetland birds

No wetland birds were detected in the ESA, despite repeated surveys in the highest quality habitats during the optimal time of year for wetland bird activity and detection.

Habitat for wetland birds is limited and of poor quality, being constrained spatially and temporally. At-Risk and Threatened wetland birds such as Australasian bittern, South Island fernbird, spotless crane and marsh crane require moderate to large areas of dense vegetative cover, ideally over shallow water to provide sufficient food and protection from predators. Preferred habitat consists of *Carex secta* or raupo over shallow water or on the edge of shallow open water.

Within the ESA, no shallow open water with suitable fringing vegetation exists. Swamps and fens with *Carex secta* are sparsely covered and small in area. Water tables are generally at or below the ground level. Moderate to heavy grazing and trampling also removes vegetative cover required for cryptic wetland bird refuges. The larger swamps in the valley floor of Rise and Shine Creek provide the best potential habitat, as they are dominated by swarding sedges reaching up to 60 cm high. However, these sedges die back over autumn and winter, and do not grow back to provide sufficient cover for cryptic wetland bird species until November or December, which is too late for the peak of the breeding season. These factors result in unsuitable habitat for breeding and resident populations of cryptic wetland birds, such as Australasian bittern, marsh crane and spotless crane.

Other Threatened species such as black stilt and white heron are occasional visitors to riverbeds and seasonally dry irrigation ponds in the main Clutha Valley floor, but within the ESA habitat is unsuitable and there are no records and no likelihood of these species visiting wetlands in the ESA.

3.3.4 Species inventory

Across 133 five-minute bird counts, 23 bird species were identified, including eight native species. The most abundant birds overall were exotic finches, but native silvereye and grey warbler were also common, at 0.78 and 0.5 detections per 5MBC. The Threatened New Zealand falcon and At Risk New Zealand pipit were uncommon to rare, at 0.02 detections per 5MBC. A full inventory of bird species recorded in 5MBC can be found in Appendix C.

3.3.5 Incidental counts

A number of falcon and pipit incidental observations were made (see sections 3.3.8 and 3.3.9). Two additional species not recorded in 5MBC or targeted surveys were detected incidentally; one black shag, flying over the DDF, and one tomtit, in willows below the stamper battery in the SL (Appendix D). South Island Pied Oystercatcher (SIPO) were observed incidentally by Habitat NZ and Barrie Wills, primarily in autumn, flying over and/or feeding in the cultivated fields on the Clutha Valley terraces in the DDF and SL.

3.3.6 Survey effort adequacy

We are confident that avifauna values within the DDF, and surveyed parts of the SL have been comprehensively characterised. Over 50 person hours were dedicated to bird survey within the ESA. Other ecological assessments conducted by RMA Ecology staff within the ESA made up a further 2,400 person hours, providing numerous incidental bird observations, including the most of the Threatened and At Risk bird observations. Photopoints provide another indication of our comprehensive on-the-ground coverage of the site (Figure 16), noting they display only a subset of areas covered.

A cumulative species detection curve was used to assess survey effort adequacy for detecting bird species. Over two thirds (16) of these species were detected by the fifteenth 5MBC (Figure 17). Within the first 100 counts, completed in 19 days during summer, an average of 1.1 new species were detected per day, or 0.22 species per count.

The number of cumulative new species detected begins to level off by plot 15. Within the last 33 counts, completed over 8 days in spring, there was one new species detected, representing an average of 0.1 new species detected per day, or 0.03 species per count.

Overall, the levelling off of the cumulative species detection chart provides a high degree of confidence that survey effort was sufficient to detect all or most of the terrestrial bird species resident onsite. Some species which were visiting or flying over were also detected.

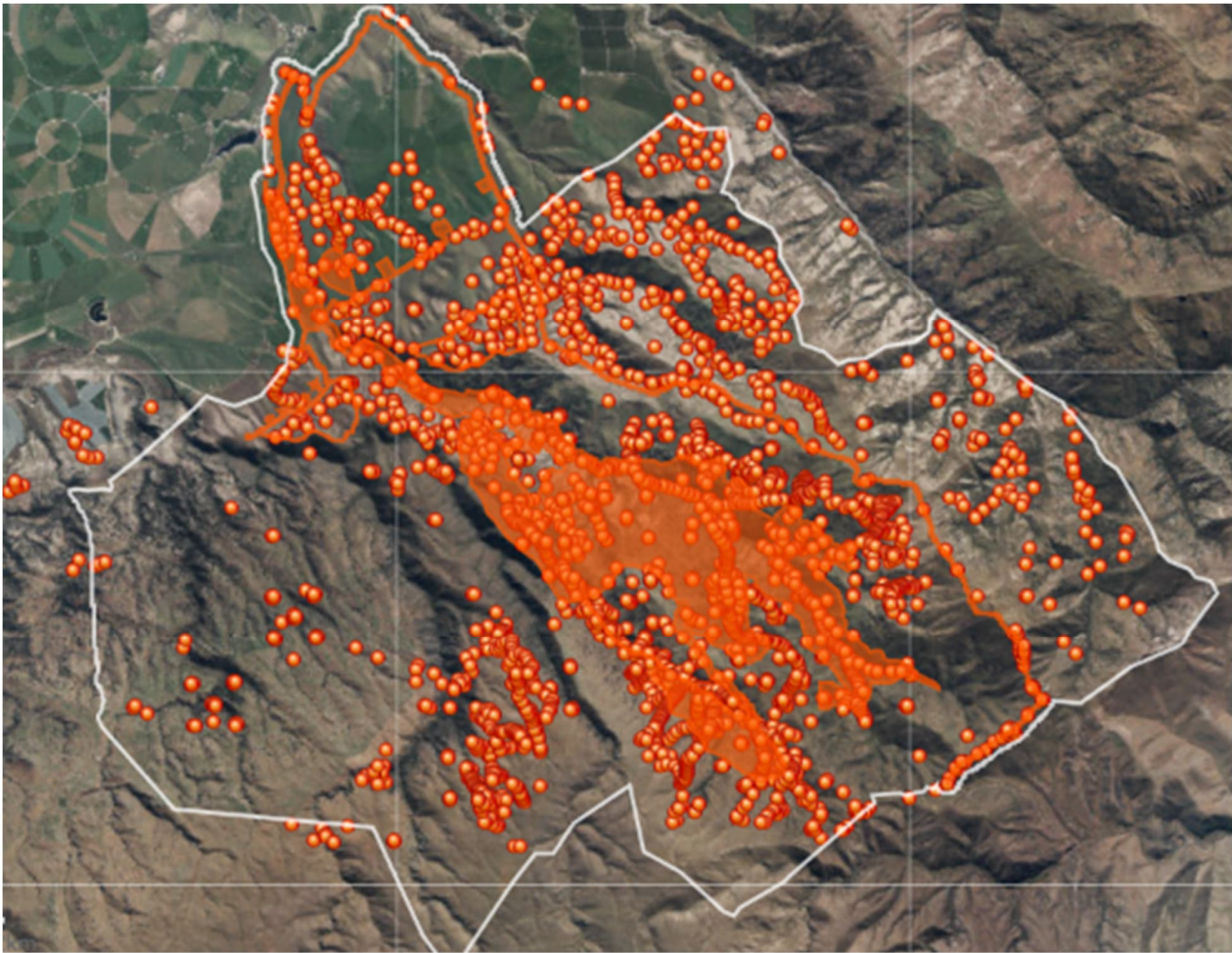


Figure 16. Photo points (orange circles) within the DDF (red polygon) and ESA (white polygon).

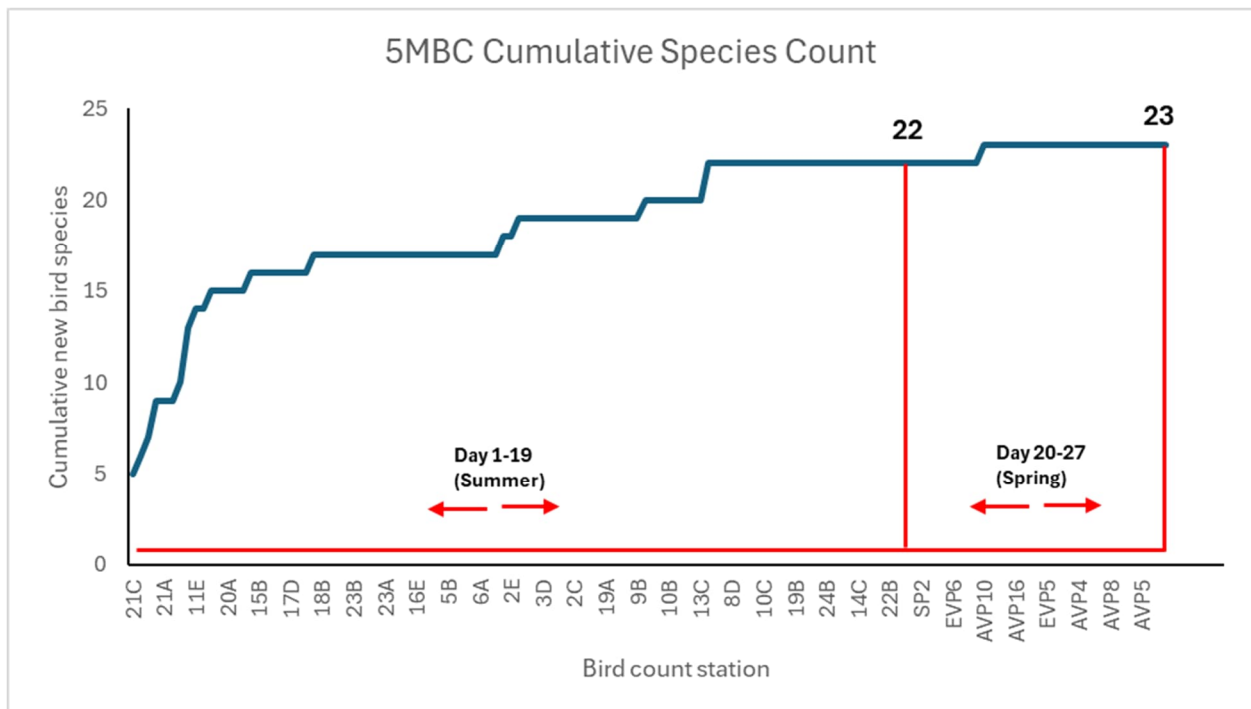


Figure 17. Cumulative new species detections across 133 five-minute bird counts within the ESA (note, only a selection of 5MBC station labels is shown on the x-axis). Does not include incidental counts.

3.3.7 Threatened or At Risk species

Six bird species of conservation concern were detected in the ESA: two species classified as nationally or regionally Threatened, and four species classified as nationally or regionally At-Risk. Where species had different threat classifications at national versus regional levels, the higher (more severe) classification was used for this assessment. Their threat status, distribution in the DDF and SL, and relative abundance are detailed in Table 2.

No Threatened or At Risk wetland birds or waterfowl were detected, other than a single vagrant black shag seen flying over the site, but not associated with the habitat.

The background, habitat, threats, distribution, and abundance of the primary Threatened and At Risk species are described further in the following sections.

3.3.8 New Zealand Falcon

The New Zealand Falcon is indigenous and endemic to New Zealand. Three distinct forms are recognised nationally:

- Southern form is Threatened–Nationally Endangered
- Eastern form is Threatened–Nationally Vulnerable
- Bush form is Threatened–Nationally Increasing

The national population size of all forms combined is uncertain but likely between 5,000–8,000 birds¹⁷, with the eastern form being the less rare form¹⁸. Regionally in Otago, the population is estimated at 1,000-5,000 and is stable and considered a national stronghold¹⁹. NZ Falcon are widespread across most of New Zealand south of Waikato, with the Eastern form being present in Otago east of the divide, including the Bendigo area. The primary threats to New Zealand falcon nationwide are electrocution from electricity grids, predation, collisions with man-made objects including vehicles, habitat loss and human persecution.

There were six falcon detections in the DDF, and seven in the SL (Figure 18). Most were incidental observations and these results may reflect the additional time per unit area spent in the DDF. It was clear that the mid and upper parts of Shepherds Creek catchment are regularly used by falcon. Eight of twelve observations were within the Shepherds catchment and predicted indirect disturbance footprint. Behaviour which was strongly suggestive of nesting was evident.

Eastern New Zealand falcon nest on cliff ledges or ground ledges²⁰. High-quality falcon nesting habitat in the ESA is present in the form of rock bluffs and tors in both the DDF and Surrounding Landscape (Figure 19). Nesting behaviour, in the form of repeated dive-bombing of harriers and magpies, was observed twice in one day in November 2024 in a bluffy gully in mid Shepherds Creek (Plate 3).

¹⁷ <https://www.doc.govt.nz/nature/native-animals/birds/birds-a-z/nz-falcon-karearea/>

¹⁸ Fox, Nicholas C. 1977. The biology of the New Zealand Falcon (*Falco novaeseelandiae* Gmelin 1788). Ph.D. thesis. University of Canterbury, Christchurch, New Zealand. 421pp.

¹⁹ Jarvie, S., McKinlay, B., Palmer, D., Rawlence, N. J., & Thomas, O. (2025). Regional Conservation Status of Birds in Otago. Otago Regional Council, Otago Threat Classification Series 6. ISSN 2816-0983 (web PDF), ISBN 978-1-7385867-4-5 (web PDF).

²⁰ Fox, Nicholas C. 1977. The biology of the New Zealand Falcon (*Falco novaeseelandiae* Gmelin 1788). Ph.D. thesis. University of Canterbury, Christchurch, New Zealand. 421pp.

Table 2. Nationally and Regionally Threatened and At-Risk bird species found in the ESA, with observed distribution by habitat type, in the DDF and SL, using the DAFOR index for relative abundance, D: Dominant (most common, present in more than half of the area), A: Abundant (common but not as prevalent as dominant species), F: Frequent (observed regularly but in smaller numbers than abundant species), O: Occasional (not commonly seen, appearing sporadically), R: Rare (in very low numbers). Note, only one black shag was observed, flying over multiple habitat types in the DDF and SL over Rise and Shine Ck and Thomson Saddle.

	Common name	National threat status	Regional threat status	DDF likely popln.	Regional population	Regional population trend	NPS-IB specified highly mobile fauna	Direct Disturbance Footprint (DDF)				Surrounding Landscape (SL)			
								Grass and tussock land	Scrub and shrub land	Wet land	Open water	Grass and tussock land	Scrub and shrub land	Wet land	Open water
<i>Falco novaeseelandiae</i>	NZ falcon – eastern	Threatened - Nationally Vulnerable	Threatened - Regionally Vulnerable	1 pair	1000-5000	Stable ±10 %	Yes	R*	R*	R		R*	R*	R	
<i>Anthus novaeseelandiae</i>	NZ pipit	At Risk – Declining	Not Threatened	5-15 pairs	No info	Stable ±10 %	Yes	R*	R			R*	R		
<i>Poodytes punctatus punctatus</i>	SI fernbird	At Risk – Declining	At Risk - Regionally declining		5000–20000	10-30% decline	Yes							R ¹	
<i>Zosterops lateralis lateralis</i>	Silvereye	Not Threatened	At Risk - Regionally declining	Common	20,000-100,000	10-30% decline		O	F*			O	F*		
<i>Phalacrocorax carbo novaehollandiae</i>	Black Shag	At Risk - Relict	Threatened - Regionally Endangered	Visiting	250-1000	Stable ±10 %		R (Fly over)	R (Fly over)	R (Fly over)		R (Fly over)	R (Fly over)		
<i>Haematopus finschi</i>	SIPO	At Risk – Declining	At Risk - Regionally declining	Visiting	1000–5000	Decreasing 30–50 %	Yes	O				O			

* Known or likely to be breeding. ¹ Desktop assessment only, not detected in field survey and unlikely to be naturally present.

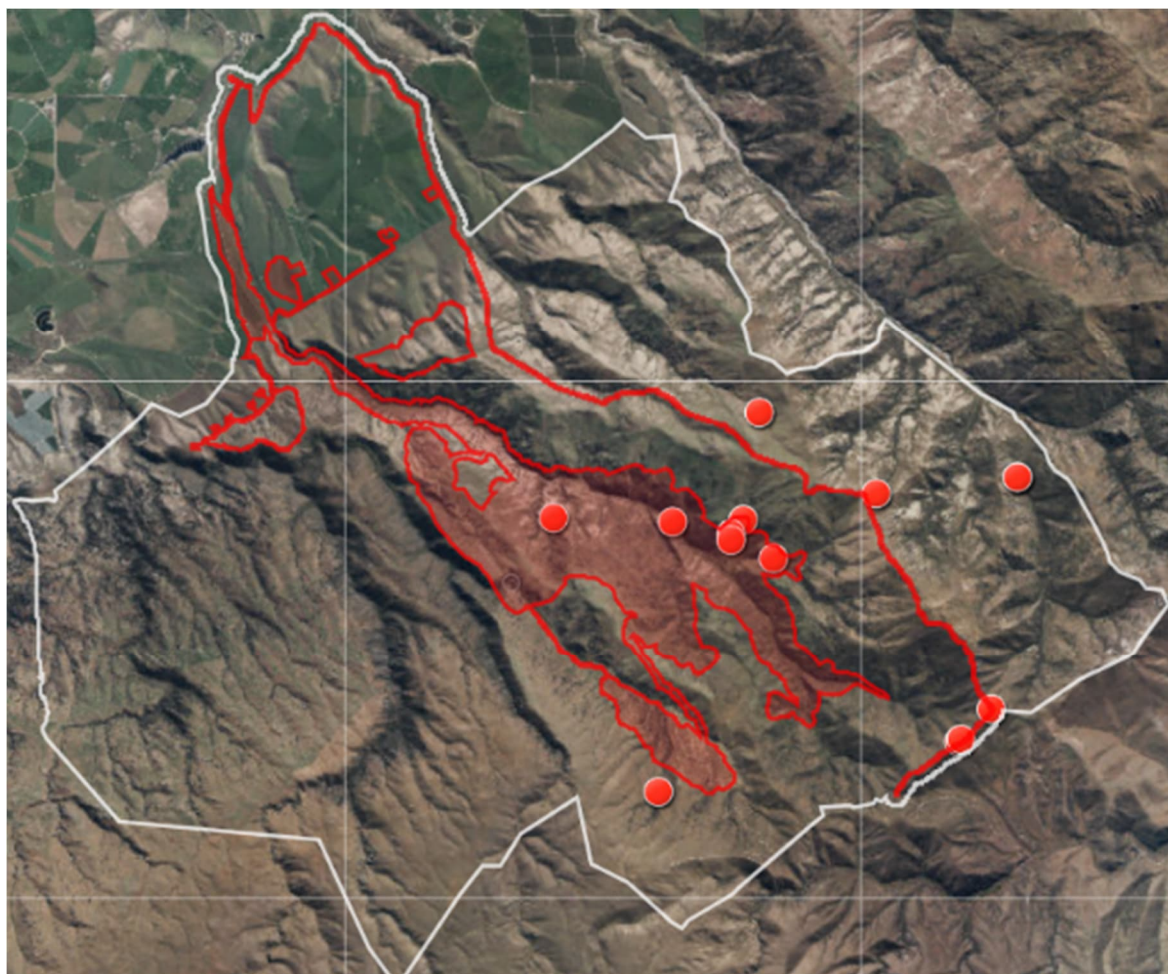


Figure 18. New Zealand falcon observations (red circles) in the ESA (white polygon) during five-minute bird counts, targeted falcon nesting surveys and incidental observations. The DDF is outlined in red.



Plate 3. The area in mid-Shepherds Valley where falcon nesting behaviour was observed twice. These rock outcrops on the margin of the DDF are ideal nesting habitat for falcon.

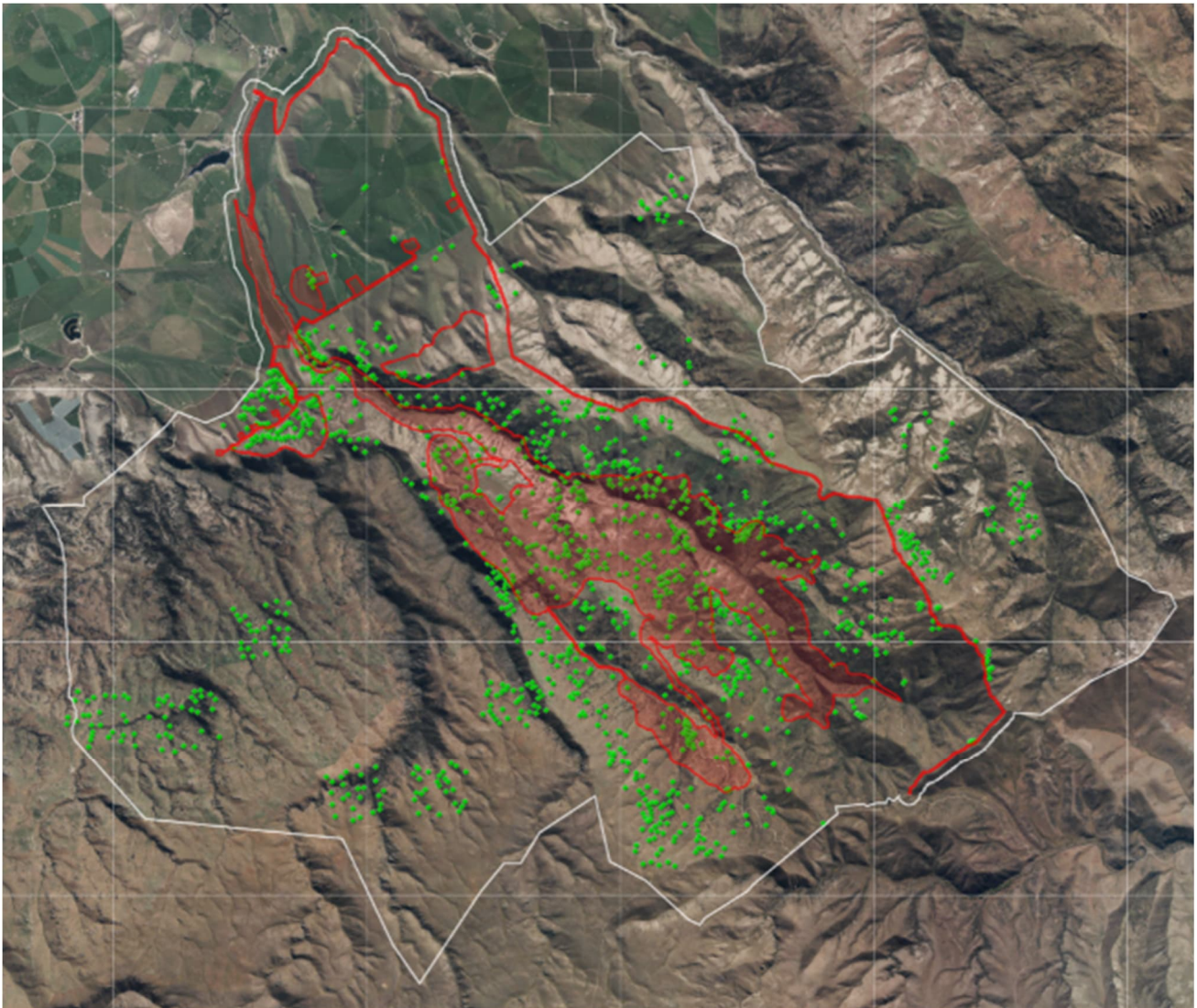


Figure 19. Indicative desktop mapping of rock outcrops and bluffs (green diamonds) within Shepherds Valley and Rise and Shine Valley (attempted census) and subsamples of the remainder of the ESA (clusters on green dots where census was focussed on small representative areas). Note, large areas on this map that show no rock outcrops outside of the DDF were not assessed.

Within the ESA at BOGP, the DDF spans 610 ha (6.1 km²). The potential indirect disturbance footprint for falcon (related primarily to blasting noise disturbance) is estimated to extend to the Rise and Shine Creek and Shepherds Creek catchment boundaries, encompassing approximately 2,000 ha (20 km²). This is based on the noise graphics provided in the acoustic report by Marshall Day Acoustic (Appendix F), and is essentially an estimated guess (based on experience of the author with falcon in other non-mining locations), as there is no modelling or quantitative study that we know of that has sought to determine the radius at which falcon are sensitive to disturbance from mining blasting.

This area is likely to support at least one pair of falcons, but is unlikely to support more than two pairs, based on territory size recorded elsewhere in New Zealand. This estimate aligns with the detection of one likely nest site within the Shepherds Creek, and Rise and Shine catchments, and the corresponding cluster of observations in this area (Figure 18). Observations at the head of Shepherds Creek and Dry Creek may be the same pair or a second pair.

3.3.9 New Zealand pipit

New Zealand pipits are widespread in rough open habitats from the coastline to alpine shrublands at c.1,900 m. Farmland population estimates for pipits were 0.37 pairs/per ha on Chatham Island, and 0.036 pairs/ha at Waipu Caves, Whangarei.

Initially, forest clearance likely provided benefits to pipits, but their population density has decreased as land use has intensified. Habitats such as heavily grazed pasture and drained wetlands support fewer pipits compared to rough pasture with patches of fern or wetlands such as marshes and bogs. Pipits have also suffered declines in drought-prone regions and have vanished from many islands where rats are present. Although they inhabit clear-felled pine forest blocks in the central North Island, they are more frequently preyed upon by New Zealand falcons there, unlike introduced passerines. Conversely, pipits have thrived on some islands following the successful eradication of rats.

The New Zealand pipit has a lower threat status regionally compared to nationally, i.e., Regionally Not Threatened cf. to Nationally At Risk - Declining. This is because in Otago there is no evidence of decline for New Zealand pipit populations, with the species still well distributed in suitable habitat types in the region that are not as impacted as elsewhere in the country²¹.

Four New Zealand pipits were detected in the DDF, with eleven detections in the SL (Figure 20). It is estimated there could be 5-20 pairs in the DDF, based on these detections, their detectability, overall habitat availability, and territory size in other studies.

²¹ Jarvie, S., McKinlay, B., Palmer, D., Rawlence, N. J., & Thomas, O. (2025). *Regional Conservation Status of Birds in Otago*. Otago Regional Council, Otago Threat Classification Series 6. ISSN 2816-0983 (web PDF), ISBN 978-1-7385867-4-5 (web PDF).

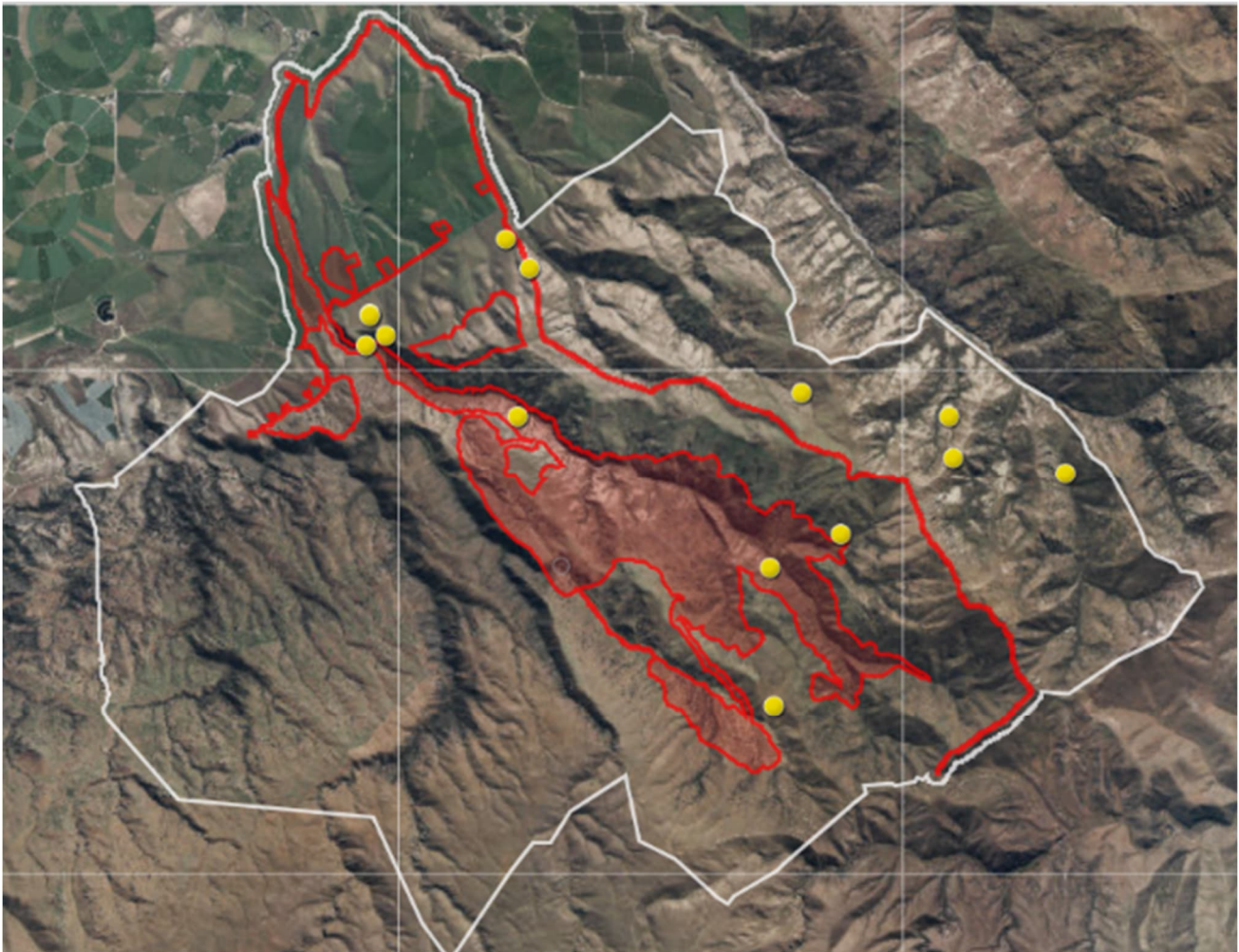


Figure 20. New Zealand pipit observations (red circles) in the ESA (white polygon) during five-minute bird counts, and incidental observations. The DDF is outlined in red.

3.3.10 South Island fernbird

The South Island fernbird (*Bowdleria punctata punctata*) is classified as Nationally and Regionally At Risk – Declining. The regional population trend in Otago is estimated at a 10-30 % decline, with numbers estimated at 5,000–20,000 birds²². Fernbird are largely absent from Central Otago District, but a few scattered observations exist around the margins.

Desktop assessment returned one isolated record of a South Island fernbird along the stamper battery track, with an “*unmistakable song, and call from matagouri along the track*”. This record has not been followed up by OSNZ or other parties to verify it, and is approximately 50 km from the nearest fernbird record in Central Otago (also isolated). It was submitted by a DOC employee, and could well be a vagrant or isolated resident individual. The closest 5MBC station to the Stamper Battery track was 100 m.

During this survey, no fernbirds were detected during call playback surveys in wetlands, nor in extensive five-minute bird counts and incidental observations, including several around the Stamper Battery Track area. We therefore assume that fernbird are not present on the site or in the immediate surrounds.

²² Jarvie, S., McKinlay, B., Palmer, D., Rawlence, N. J., & Thomas, O. (2025). *Regional Conservation Status of Birds in Otago*. Otago Regional Council, Otago Threat Classification Series 6. ISSN 2816-0983 (web PDF), ISBN 978-1-7385867-4-5 (web PDF).

3.4 Avifauna significance

When assessed under the significance criteria in the operative Otago RPS (2019) and the proposed RPS (2021), only one criterion needs to be met to achieve significance.

Within the operative RPS, significance criteria 2a (Rarity) is satisfied by the presence of species which are Threatened or At Risk, regionally or nationally. The DDF qualifies as it provides habitat for Threatened and At Risk species in Table 2.

The criteria for identifying areas that class as Significant Natural Areas in the proposed Otago RPS (2021) expands on the criteria and their application in the operative RPS, particularly the rarity criterion:

1. *What qualifies as an SNA*

(1) *An area qualifies as an SNA if it meets any one of the attributes of the following four criteria:*

(a) representativeness:

(b) diversity and pattern:

(c) rarity and distinctiveness:

(d) ecological context.

(2) *Rarity criterion;*

If an area would qualify as an SNA solely on the grounds that it provides habitat for a single indigenous fauna species that is At Risk (declining), and that the species is widespread in at least three other regions, the area does not qualify as an SNA unless:

(a) the species is rare within the region or ecological district where the area is located; or

(b) the protection of the species at that location is important for the persistence of the species as a whole.

(3) *If an area would qualify as an SNA solely on the grounds that it contains one or more indigenous flora species that are Threatened or At Risk (declining), and those species are widespread in at least three other regions, the area does not qualify as an SNA unless:*

(a) the species is rare within the region or ecological district where the area is located; or

(b) the protection of the species at that location is important for the persistence of the species as a whole.

2. *Context for assessment*

(1) *The context for an assessment of an area is:*

(a) its ecological district; and

(b) for the rarity assessment only, its ecological district, its region and the national context.

3.5 Avifauna value assessment

An ecological value assessment of individual Threatened and At Risk bird species found or likely to be present in the DDF is presented in Table 5. National and Regional threat status were used to determine value.

Species which are resident and breeding or potentially breeding include:

- New Zealand falcon – eastern form (Threatened – Vulnerable) were confirmed to be present in the DDF and SL during the survey, and exhibited behaviour indicative of breeding on the margin of the DDF. The DDF is of a size capable of supporting up to one pair, and combined with the wider potential disturbance area, has the potential to support one to two pairs (territory size in plantation forestry averages 9 km squared²³, but territories are likely to be larger in open tussock areas due to reduced prey availability. Eastern falcon nesting territories average 3.80-3.95 km apart²⁴, corresponding to territories averaging approximately 15 km²). This species is a specified highly mobile fauna under the NPS-IB, and is of very high ecological value;
- New Zealand pipit (At Risk – Declining) were confirmed to be present during the field survey and were noted to be “uncommon” with an estimated 5-20 pairs in the DDF, favouring open vegetation communities including exotic pasture, native tussockland and mixed grassland/tussockland/shrubland. This species is a specified highly mobile fauna under the NPS-IB (although to our knowledge this area is not identified by Council as a Highly Mobile Fauna Area under Clause 3.20 of the NPS-IB). The species is of high ecological value; and
- Black shag (At Risk - Relict) were confirmed to be present during the survey, although only one individual was detected flying over. Low quality habitat of limited extent exists in the form of two artificial ponds, which could provide a food source for travelling individuals for short periods, but could not support breeding. This species is a specified highly mobile fauna under the NPS-IB, (although to our knowledge this area is not identified by Council as a Highly Mobile Fauna Area under Clause 3.20 of the NPS-IB, and the use of the area by black shag may be less than intermittent). The species is of high ecological value.
- Other species listed in Table 5 are unlikely to be breeding on the site.

Additional species not detected, but likely to be present as residents or occasionally, are listed in Table 5. They include three braided river bird species - little shag, black-fronted tern, and black-billed gull. They are all specified highly mobile fauna in the NPS-IB. Although no suitable braided river breeding habitat exists in the DDF, the braided river species may on occasion roost and feed in cultivated fields near to braided rivers, particularly when ploughed. This occurs primarily during their non-breeding season, in autumn or winter, when the site was not surveyed. The likelihood of occasional presence of these species over the cultivated flat fields in the NW of the site is moderate.

Overall, four avifauna species are of very high ecological value, two are of high value, two are moderate-high, and one is moderate, with the remainder being of low ecological value.

Two habitat features, ponds and rock outcrops, were assessed for ecological value (Table 6). Assessments for other vegetation communities providing avifauna habitat are provided in the vegetation and wetland reports.

²³ Thomas, B., Minot, E. O., & Holland, J. D. (2010). *Home Range and Habitat Use of the New Zealand Falcon (Falco novaeseelandiae) within a Plantation Forest: A Satellite Tracking Study*. International Journal of Ecology, Article ID 829702.

²⁴ Fox, Nicholas C. 1977. The biology of the New Zealand Falcon (*Falco novaeseelandiae* Gmelin 1788). Ph.D. thesis. University of Canterbury, Christchurch, New Zealand. 421pp.

Table 5. Ecological value assessment of Threatened, At Risk and locally uncommon bird species present or likely in the DDF.

Species	Habitat	National threat status	Regional threat status	Ecological Value	Justification
<i>Species present in DDF:</i>					
New Zealand falcon – eastern form	Tussockland, scrub, herbfield, exotic pasture, herbfield and wetland. Nests in rock outcrops and bluffs	Threatened – Nationally Vulnerable	Threatened – Regionally Vulnerable	Very High	Based on regional threat status.
New Zealand pipit	Tussockland, exotic pasture, herbfield, shrubland.	At Risk – Declining	Regionally Not Threatened	High	Based on national threat status (higher than regional)
Black Shag	Lakes, ponds and rivers.	At Risk – Relict	At Risk – Relict	Moderate-High	Based on regional threat status. Occasional use of ponds likely.
Silvereye	Scrub, shrubland, exotic pasture.	Not Threatened	At Risk – Declining	High	Based on regional threat status - as common locally in SL.
South Island Pied Oystercatcher	Braided river beds and coastline. May occasionally feed in cultivated fields, esp. in winter.	At Risk – Declining	Threatened - Regionally Vulnerable	Very High	Based on regional threat status. Occasional use of cultivated fields detected
Tomtit	Forest and scrub	Not Threatened	Not Threatened	Moderate	Locally uncommon
<i>Species potentially present in the DDF:</i>					
Little Shag	Lakes, ponds and rivers.	At Risk – Relict	At Risk – Relict	Moderate-High	Based on national threat status. Occasional use of ponds likely.

Black-billed gull	Braided river beds and coastline. May occasionally feed in cultivated fields, esp. in winter.	At Risk – Declining	Threatened - Regionally Vulnerable	Very High	Based on regional threat status. Occasional use of cultivated fields likely, esp. after ploughing.
Black-fronted tern	Braided river beds and coastline. May occasionally feed in cultivated fields, esp. in winter.	Threatened – Nationally Endangered	Threatened - Regionally Endangered	Very High	Based on national threat status. Occasional use of cultivated fields likely, esp. after ploughing.

Table 6. Ecological value assessment of habitat features in the DDF.

Habitat	Value	Justification
Ponds / open water	Moderate-high	Two At Risk species - black shag and little shag - likely to occur on occasion.
Rock outcrops, tors and bluffs	Very High	Nationally Threatened Falcon found and likely nesting.

4.0 Potential adverse effects on avifauna

This section includes an indicative list of potential adverse effects that may result from the project on bird life during construction and ongoing operation. An effects assessment is included in the report prepared by Alliance Ecology Ltd.

- Habitat loss can be expected across the entirety of the 610 ha DDF, through earthworks and vegetation clearance associated with development of the three proposed mine pits, the tailings storage facility and associated infrastructure. Habitat loss is expected to primarily impact terrestrial species such as falcon, pipit, silvereye, grey warbler and fantail, through loss of food/prey, nesting sites and shelter/cover. Habitat loss impacts on wetland birds are predicted to be nil, due to their absence in the survey. Impacts on native waterfowl are predicted to be low, due to the very limited area of open water habitat, and very low numbers of native waterfowl within the impact area.
- Direct mortality through earthworks and vegetation clearance. Birds are sufficiently mobile to avoid impacts, but nests are vulnerable.
- Disturbance effects from mine construction and operation on native birds within the DDF and adjacent parts of the SL. Disturbances can be visual (movement of people and machinery, artificial light at night) or noise and vibration related (primarily machinery/vehicle operation and blasting). Potential effects of disturbance on native birds include short term displacement, long term displacement, reduced feeding rates, reduced nest attendance and breeding success, and energy and time costs impacting survival rates.

The potential disturbance effects of mine blasting on the high avifauna values at the Bendigo wetland and Lake Dunstan, located 8.5 kilometres west, warrant additional attention, as the acoustic assessment report does not cover this area.

Roading upgrades (as close as 1.8 km Bendigo Wetland) and lighting may have the potential to disturb indigenous and threatened birds at Bendigo wetland, or while birds are flying east to/from the wetland. Wetland birds and waterfowl are known to be highly mobile.

- Vehicle strike. Mine operation is predicted to result in approximately 150 vehicle movements per day, and construction will result in approximately 350 vehicle movements per day²⁵. This carries a potential disturbance risk (to foraging, courtship, nesting), and a vehicle collision risk for birds in the DDF, including pipits and falcons.
- Habitat fragmentation and loss of ecological connectivity. Disturbance effects from blasting may influence birds' flight habits over or near the site, including through Thomson Gorge saddle. Although the saddle is a natural low point in the Dunstan Range commonly used by helicopters, only one black shag was seen flying this route, so it is unlikely to be a major flyway for birds.
- Impacts on birds through habitat degradation. This may include ongoing effects on birds through facilitation or exacerbation of the spread of exotic/invasive species, any water quality or quantity impacts on wetlands and ponds through sedimentation, or through contamination with leachates.
- Electrocution from uninsulated power poles/pylons or other uninsulated electrical infrastructure is likely to be the primary source of mortality where falcon populations overlap with uninsulated

²⁵ Marshall Day Acoustics. 2024 Bendigo Ophir Gold Project Assessment of noise and vibration effects. Rp 001 20230685. Unpublished report prepared for Matakani Gold Ltd. 30p.

electrical grids, especially where there are few tree perches. Electrocutation occurs when falcons touch two power lines, or a line or other live component and a pylon.

5.0 Conclusion

This avifauna survey provides an understanding of the baseline avifauna values within the Bendigo-Ophir Gold Project (BOGP) Ecological Study Area (ESA).

Avifauna values are moderate, being dominated by exotic species.

Six Threatened, At Risk or locally uncommon indigenous species are present within the DDF (falcon, pipit, silvereye, black shag, tomtit and South Island Pied Oystercatcher) and an additional four (little shag, black-billed gull, and black-fronted tern) are potentially present on occasion within the DDF.

Two avifauna species are of very high ecological value, four are of high value, two are moderate-high value, and one is moderate, with the remainder being of low ecological value.

This baseline values assessment and the direct and potential indirect effects outlined in this report will aid in the preparation of the Assessment of Environmental Effects (AEE), and in managing potential impacts from mining operations as per the effects management hierarchy.

Appendix A: Example of 5-minute bird count data form

Indicative example of a completed five-minute bird count data form. This was a training/calibration survey, hence there were multiple observers. Full bird count results are available on request.

FIVE MINUTE BIRD COUNT STANDARD DATA FIELD FORM										
Observer	Date		General location		Specific location					
Observer	JL, HK, ZM, MN		Date 2-A-24		General location Madakani		Specific location			
Line number										
Station number	13D		13B		10B		10A		10D	
Grid ref (Easting, 7 digits)										
Grid ref (Northing, 7 digits)										
Start time (24 hour)	1320		1607		0921		1050		1230	
Temperature (1-6)	5		5		4		4		4	
Wind (0-3)	0		0		0		0		0	
Other noise (0-2)	0		1		0		0		0	
Sun (minutes)	0		5		0		0		0	
Precipitation type (N,M,R,H,S)	N		N		N		N		N	
Precipitation value (0-5)	0		0		0		0		0	
Species	Seen	Heard	Seen	Heard	Seen	Heard	Seen	Heard	Seen	Heard
Yellowhammer										
Goldfinch										
Redpoll										
Swallow										
Paradise Duck										
Harrier										
Wheatear										
Greenfinch										
Quail										
Chaffinch										
Silvereye										
Forktail										
Cicadas	None		None		None		None			None
Sun (0-5) Record approximate duration, in minutes, of bright sun on the canopy immediately overhead Time 24 hour clock, at the beginning of each count Temperature 1 freezing < 0°C 2 cold 0-5 °C 3 cool 6-10 °C 4 mild 11-15 °C 5 warm 16-22 °C 6 hot > 22 °C Wind The average for each five-minute count on a modified Beaufort scale: 0 Leaves still or move without noise (Beaufort 0 and 1) 1 Leaves rustle (Beaufort 2) 2 Leaves and branches in constant motion (Beaufort 3 and 4) 3 Branches or trees sway (Beaufort 5, 6 and 7) Seen and Heard Birds that are first heard should be entered under H (even if they are later seen), birds that are first seen should be entered under S. Adding H and S should give the total number of birds observed Unbounded Counts are unbounded Other Noise i.e. Other than wind the average for the five minutes 0 not important 1 moderate 2 loud Precipitation type Average for each count N None M Mist R Rain H Hail S Snow Precipitation value 0 None 1 Dripping foliage 2 Drizzle 3 Light 4 Moderate 5 Heavy										

Appendix B: Desktop assessment bird species list

This desktop bird species inventory includes recent (within 10 years) eBird and iNaturalist observations covering the wider area, including four 10 x 10 km grid squares which also cover parts of the Clutha River and Lake Dunstan. For Threatened or At Risk birds, location relative to the ESA is specified.

Species	National Threat Status	Latest recorded location	Desktop – recorded in ESA?
Australian coot <i>Fulica atra</i>	At Risk – Naturally Uncommon	Lake Dunstan and Bendigo wetland - iNaturalist	Not in ESA
Australasian crested grebe <i>Podiceps cristatus</i>	Threatened – Nationally Vulnerable	Lake Dunstan and Bendigo wetland - iNaturalist	Not in ESA
Australasian Harrier <i>Circus approximans</i>	Not Threatened	221–233 Ardgour Rd, Cromwell NZ-Otago - 44.88281, 169.36721	
Australasian shoveler <i>Spatula rhynchotis</i>	Not Threatened	Lake Dunstan - iNaturalist	
Australian Magpie <i>Gymnorhina tibicen</i>	Introduced and Naturalised	139 Oliver Road, Bendigo, Otago, NZ (-44.883, 169.326)	
Banded Dotterel <i>Anarhynchus bicinctus</i>	At Risk – Declining	Bendigo Reach	Not in ESA
Bellbird <i>Anthornis melanura</i>	Not Threatened	139 Oliver Road, Bendigo, Otago, NZ (-44.883, 169.326) Bendigo Scenic Reserve (2024)	
Blackbird <i>Turdus merula</i>	Introduced and Naturalised	139 Oliver Road, Bendigo, Otago, NZ (-44.883, 169.326)	
Black Shag <i>Phalacrocorax carbo</i>	At Risk – Relict	145-100 Oliver Road, Bendigo, Otago, NZ (-44.882, 169.322)	Not in ESA
Black Swan <i>Cygnus atratus</i>	Not Threatened	Bendigo Reach, Bendigo, Otago, NZ (-44.88, 169.326)	
Black-billed Gull <i>Larus dominicanus</i>	At Risk – Declining	Bendigo Reach	Not in ESA
Black-fronted Tern <i>Chlidonias albobristatus</i>	Threatened – Nationally Endangered	Bendigo Reach	Not in ESA
California Quail <i>Callipepla californica</i>	Introduced and Naturalised	139 Oliver Road, Bendigo, Otago, NZ (-44.883, 169.326)	
Canada Goose <i>Branta canadensis</i>	Introduced and Naturalised	Bendigo Reach, Bendigo, Otago, NZ (-44.88, 169.326)	
Common Chaffinch <i>Fringilla coelebs</i>	Introduced and Naturalised	139 Oliver Road, Bendigo, Otago, NZ (-44.883, 169.326)	
Dunnock <i>Prunella modularis</i>	Introduced and Naturalised	NZ-Otago-Tarras-213-235 Ardgour Road (-44.883, 169.364)	
South Island fernbird <i>Poodytes punctatus</i>	At Risk – Declining	Stamper battery track, Rise and Shine – DOC and not considered naturally occurring at this site	In SL in ESA
Goldfinch <i>Carduelis carduelis</i>	Introduced and Naturalised	Lindis Crossing, Otago, NZ (-44.882, 169.357)	
Greenfinch <i>Chloris chloris</i>	Introduced and Naturalised	Tarras-Cromwell Road, Tarras NZ-Otago - 44.88002, 169.35519	
Grey Teal <i>Anas gracilis</i>	Not Threatened	139 Oliver Road, Bendigo, Otago, NZ (-44.883, 169.326)	

Grey Warbler <i>Gerygone igata</i>	Not Threatened	139 Oliver Road, Bendigo, Otago, NZ (-44.883, 169.326)	
Greylag Goose <i>Anser anser</i>	Introduced and Naturalised	9383, Bendigo NZ-Otago (-44.9004, 169.3254)	
House Sparrow <i>Passer domesticus</i>	Introduced and Naturalised	Tarras-Cromwell Road, Tarras NZ-Otago -44.88002, 169.35519	
Little Shag <i>Microcarbo melanoleucos</i>	At Risk – Relict	The Island	Not in ESA
Mallard <i>Anas platyrhynchos</i>	Introduced and Naturalised	1651–1729 Tarras-Cromwell Rd, Cromwell NZ-Otago -44.91243, 169.31692	
Mallard x grey duck hybrid	Not Threatened		
New Zealand Falcon – eastern form <i>Falco novaeseelandiae</i>	Threatened – Nationally Vulnerable	Bendigo Reach	Not in ESA
New Zealand Fantail <i>Rhipidura fuliginosa</i>	Not Threatened	Kanuka loop track 3	
New Zealand Pigeon <i>Himiphaga novaeseelandiae</i>	Not Threatened	Bendigo Reach, Bendigo, Otago, NZ (-44.88, 169.326)	
New Zealand Pipit <i>Anthus novaeseelandiae</i>	At Risk – Declining	iNaturalist - riverbed to south	Not in ESA
New Zealand Scaup <i>Aythya novaeseelandiae</i>	Not Threatened	139 Oliver Road, Bendigo, Otago, NZ (-44.883, 169.326)	
Paradise Shelduck <i>Tadorna variegata</i>	Not Threatened	Bendigo Reach, Bendigo, Otago, NZ (-44.88, 169.326)	
Pied Stilt <i>Himantopus himantopus</i>	Not Threatened	Bendigo wetland	
Pukeko <i>Porphyrio melanotus</i>	Not Threatened	1651–1729 Tarras-Cromwell Rd, Cromwell NZ-Otago -44.91243, 169.31692	
Redpoll <i>Acanthis flammea</i>	Introduced and Naturalised	Bendigo	
Ring-necked Pheasant <i>Phasianus colchicus</i>	Introduced and Naturalised	Bendigo	
Rock Pigeon <i>Columa livia</i>	Introduced and Naturalised	Lindis Crossing, Otago, NZ (-44.882, 169.357)	
Kingfisher <i>Todiramphus sanctus</i>	Not Threatened	139 Oliver Road, Bendigo, Otago, NZ (-44.883, 169.326)	
Silvereye <i>Zosterops lateralis</i>	Not Threatened	Lindis Crossing, Otago, NZ (-44.882, 169.357)	
Skylark <i>Alauda arvensis</i>	Introduced and Naturalised	139 Oliver Road, Bendigo, Otago, NZ (-44.883, 169.326)	
Song Thrush <i>Turdus philomelos</i>	Introduced and Naturalised		
South Island Pied Oystercatcher (SIPO) <i>Haematopus finschi</i>	At Risk – Declining	Bendigo Reach, Bendigo, Otago, NZ (-44.88, 169.326)	Not in ESA
Southern Black Backed Gull <i>Larus dominicanus</i>	Not Threatened	1651–1729 Tarras-Cromwell Rd, Cromwell NZ-Otago -44.91243, 169.31692	
Spur-winged Plover <i>Vanellus miles</i>	Not Threatened	1651–1729 Tarras-Cromwell Rd, Cromwell NZ-Otago -44.91243, 169.31692	

Starling <i>Sturnus vulgaris</i>	Introduced and Naturalised	Lindis Crossing, Otago, NZ (-44.882, 169.357)	
Welcome Swallow <i>Hirundo neoxena</i>	Not Threatened	221–233 Ardgour Rd, Cromwell NZ-Otago - 44.88281, 169.36721	Yes
White-faced Heron <i>Egretta novaehollandiae</i>	Not Threatened	1651–1729 Tarras-Cromwell Rd, Cromwell NZ-Otago -44.91243, 169.31692	Yes
Yellowhammer <i>Emberiza citrinella</i>	Introduced and Naturalised	NZ-Otago-Tarras-213-235 Ardgour Road (- 44.881, 169.356)	Yes

Appendix C: Five-minute bird count species list

Bird species detected in five-minute bird counts in the ESA, in order of relative abundance (average number counted per 5MBC point count).

Species	native/ exotic	Threatened / At Risk	Number Seen	Number Heard	Total Count	Average count per station
Goldfinch	exotic		54	122	176	1.32
Redpoll	exotic		51	96	147	1.11
		Regionally At Risk - Declining				
Silvereeye	Native		18	86	104	0.78
Yellowhammer	exotic		24	80	104	0.78
Greenfinch	exotic		18	70	88	0.66
Chaffinch	exotic		6	68	74	0.56
Warbler, Grey	native		5	61	66	0.50
Magpie, Australian	exotic		3	50	53	0.40
Quail, California	exotic			21	21	0.16
Dunnock	exotic		4	13	17	0.13
Harrier, Australasian	native		14	1	15	0.11
Starling	exotic		12		12	0.09
Unknown			5	6	11	0.08
Skylark	exotic		2	7	9	0.07
Sparrow, House	exotic		1	7	8	0.06
Fantail, South Island	exotic		1	3	4	0.03
Gull, Southern Black-backed	native		2	1	3	0.02
		Nationally At Risk - Declining				
Pipit, NZ	Native			3	3	0.02
Blackbird	exotic		1	1	2	0.02
		Nationally & Regionally Threatened - Vulnerable				
Falcon, NZ	Native		2		2	0.02
Shelduck, Paradise	native		2		2	0.02
Swallow, Welcome	exotic		1	1	2	0.02
Plover, Spur-winged	native			1	1	0.01
Total for all birds			226	698	924	6.95

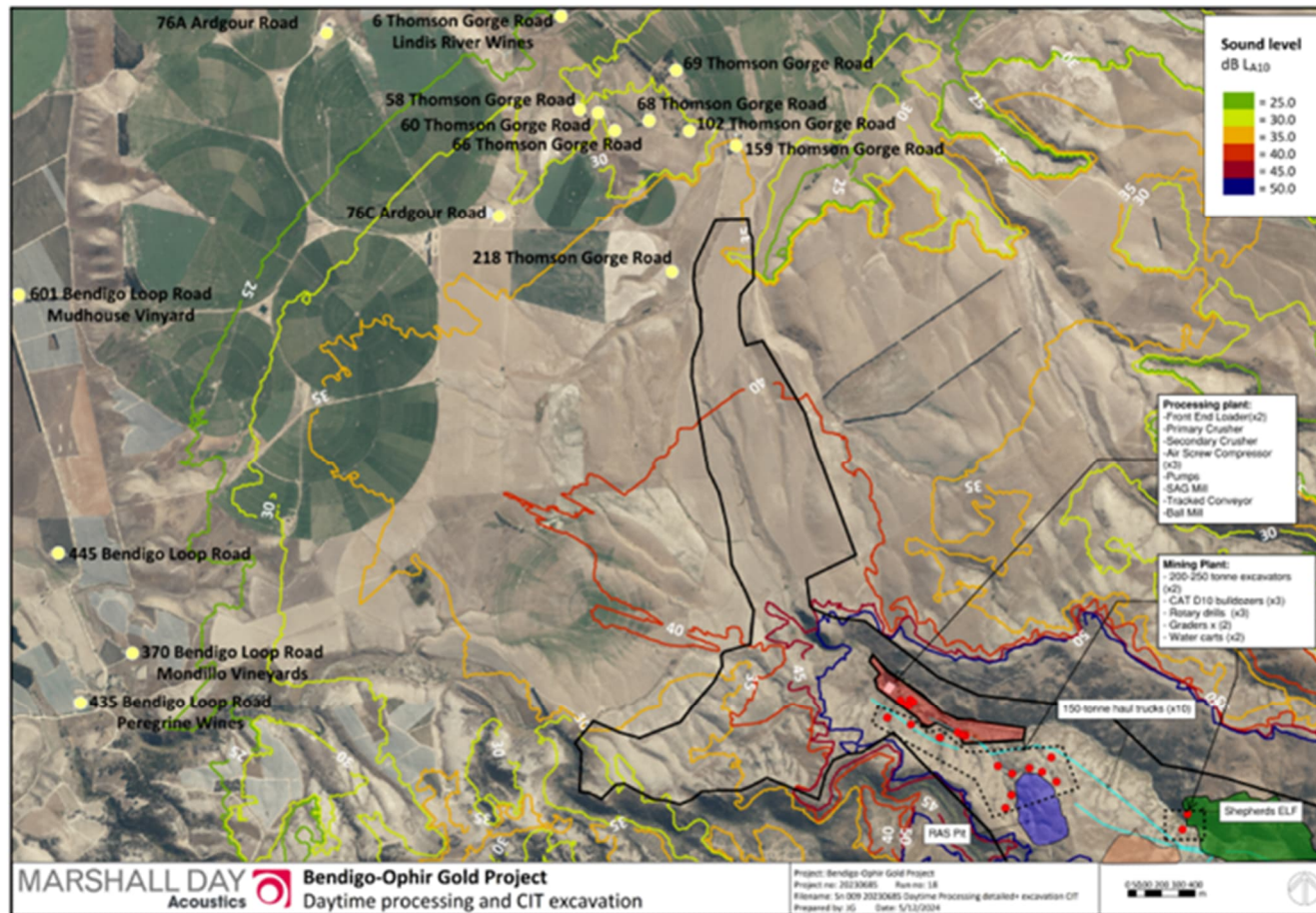
Appendix D: Incidental detection species list

Additional bird species detected in the ESA during incidental observations.

Species	native/ exotic	Threatened / At Risk	Total Count	Notes
Black shag	Native	At Risk - Relict	1	Seen flying over Rise and Shine Creek towards Thomson Gorge Rd saddle, in DDF
South Island tomtit	Native	Not Threatened	1	Heard in willows east of stamper battery, in SL

Appendix E: Acoustic modelling profiles for operational noise

Predicted worst case operational noise profiles for the CIT pit (excludes blasting noise and vibration). Sourced from Marshall Day Acoustics and Assessment of noise and vibration effects²⁶.



²⁶ Marshall Day Acoustics. 2024 Bendigo Ophir Gold Project Assessment of noise and vibration effects. Rp 001 20230685. Unpublished report prepared for Matakani Gold Ltd. 30p

